

## 3.3 Wall Construction

### Introduction

Sections 3.1 and 3.2 deal with the specifics of laying and the fixing of reinforcing steel.

This section primarily looks at the grouting and general construction of the wall.

### Clean-out Openings

For most concrete masonry walls, clean out openings will be required.

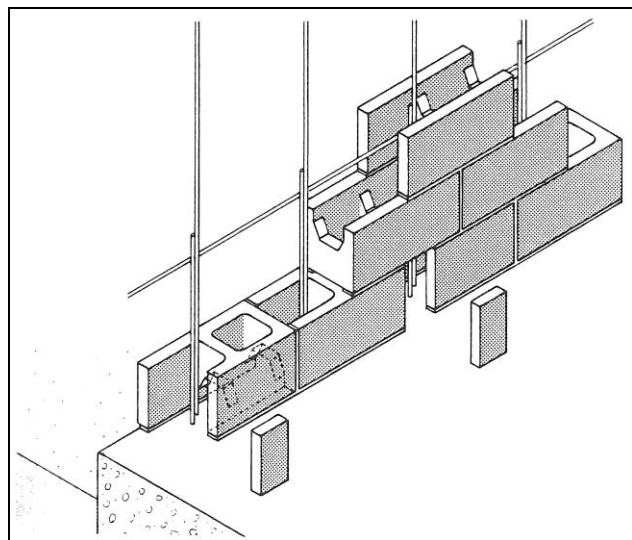


Figure 1: Clean-out Units

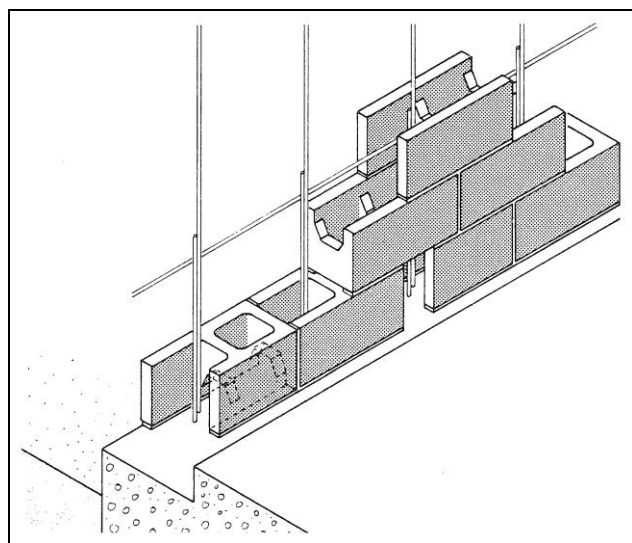


Figure 2: Clean-out Units in Rebated Base

It is usual to cut a face shell creating a 75 mm – 100 mm wide opening the full height of the block. See

Figures 1 and 2. Note that for partial fill construction, an edge rebate is required to comply with weathertightness requirements.

This is to enable any debris/loose mortar etc., to be cleaned out from the base of the wall before grouting.

The clean outs should be positioned at every bar position for partially filled masonry or at 800 mm centres for solid filled walls.

Where fixing of vertical steel has to be carried out after block laying, the clean outs have to match the steel positions.

To facilitate cleaning out for solid fill walls the first course is an inverted 2016 (1516) block with a layer of sand spread on the concrete foundation surface before further courses are laid.

### Cleaning Out

Once the block laying for the wall is completed, the base course is cleaned out usually by water jet aided by compressed air.

After an inspection to check cleanliness and adequate steel tying, the clean out pieces are mortared back into place where a fair face finish is required or a temporary plywood shutter is braced over the opening or tied to steel.

### Grouting

There are four different methods described in NZS 4210 Clause 2.11.6, one relates to low lift (1.2 m high) and three relate to high lift systems up to 3.6 m.

The most structurally efficient way of grouting is the High Lift Grouting with Expansive Admixture.

This is the method specified in the Manual and is illustrated by the following sequence of steps, where the scaffolding shown is diagrammatic:

#### Step 1:

Clean-out grout space and remove all debris and loose material from the construction joint. See Figure 3, page 2.

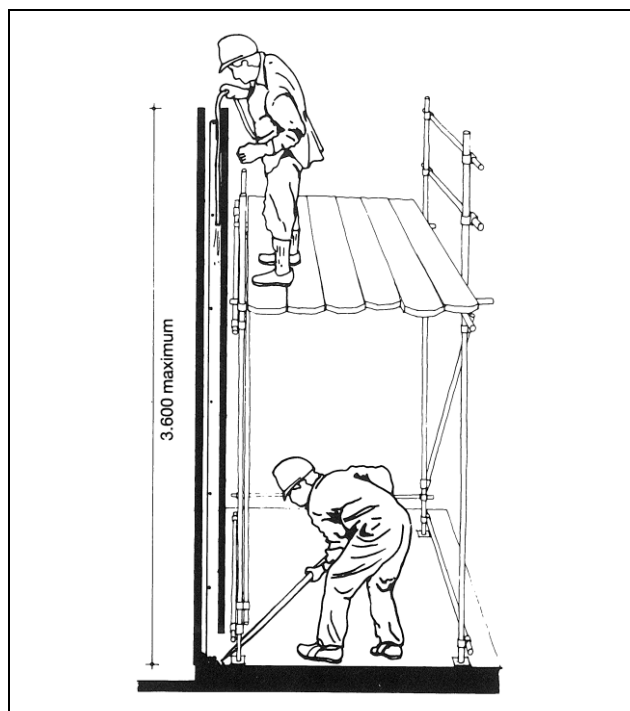


Figure 3: Step 1

## Step 2:

Grout the wall in a semi continuous operation to the top. See Figure 4.

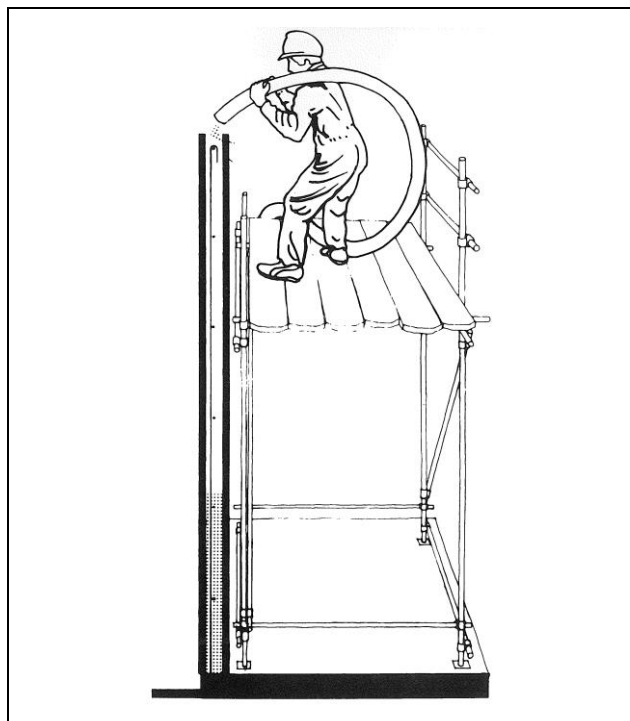


Figure 4: Step 2

## Step 3:

Consolidate the grout using a bar or rod minimum diameter 16 mm. This can be done by full depth

rodding or by using a 25 mm pencil vibrator. When dealing with window openings it is important to use a 25 mm vibrator in the cells adjoining the opening to ensure grout flow along the sill line. See Figure 5.

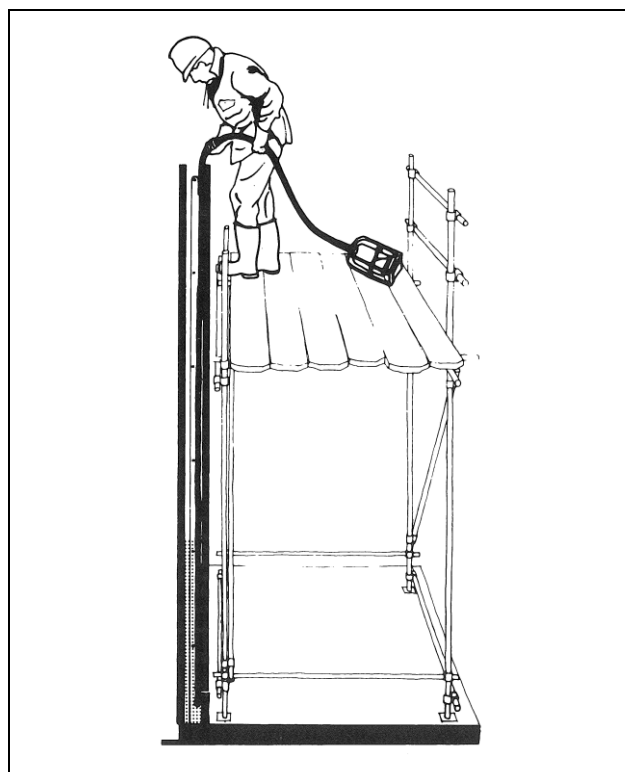


Figure 5: Step 3

## Step 4:

Trowel down the top of the wall after grout expansion has taken place. See Figure 6.

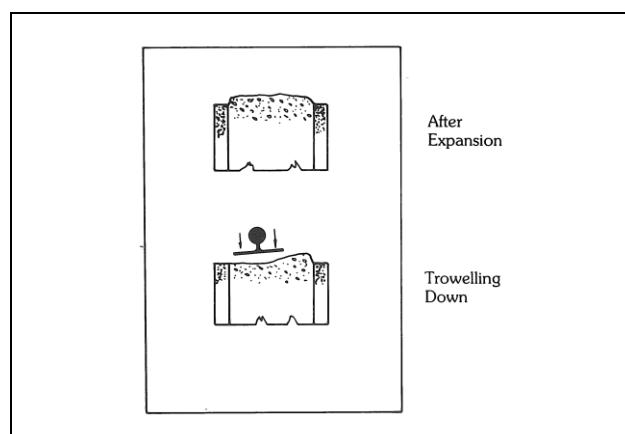


Figure 6: Step 4

Evidence that the expansion agent is working is often accompanied by the outside of the masonry shells taking on a "wet appearance". Testing has shown that significantly improved bond between face shells and the grout core is experienced when using the agent.



## Control Joints

Horizontal wall movements mainly associated with shrinkage may require the use of control joints. Since the movements are influenced by various design factors such as the amount of horizontal steel, the positioning of the joints is the responsibility of the designer.

To control movements in masonry walls from various kinds of stresses, increasing use is being made of control joints.

Control joints are continuous vertical joints built into concrete masonry walls at places where stresses might concentrate. To keep control joints as unnoticeable as possible, care must be taken to build them plumb and of the same thickness as the other mortar joints. If the control joint is to be exposed to the weather or to view, it should be sealed with a suitable caulking compound. Edges of the masonry in the control joint may have to be primed before caulking to prevent the dry masonry from absorbing oils from the compound.

Recommendations of manufacturers of caulking materials regarding priming should be followed.

Control joints should be spaced at not more than 8.0 m intervals. One type of control joint can be built with standard whole and half blocks. Placing a vertical strip of 10 mm thick expanded polystyrene or weatherproof impregnated softboard in the joint provides a base against which a joint filler/sealant may be placed and compacted. These vertical strips should be approximately 30 mm narrower than the wall thickness. See Figure 7.

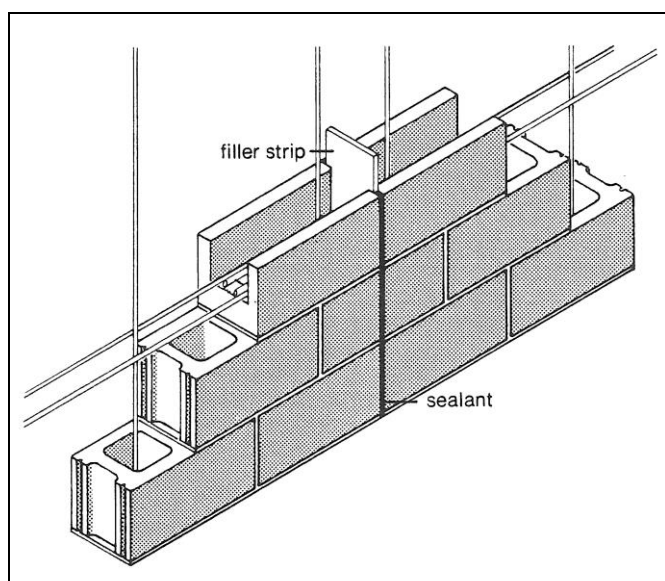


Figure 7: Control Joint Using Standard Whole and Half Unit

It is recommended that masking tape be applied to the face of the concrete masonry on both sides of the joints before applying the filler/sealant, thereby confining the filler/sealant to the joint and preventing the marking of the block face. The masking tape is removed after the surface of the filler/sealant has become firm.

A control joint block (Figure 8), available in some areas, provides lateral support by means of tongue-and-groove-shaped ends of the block. These control joint blocks are made in half-length units and interlock with the recessed web-end of standard whole units. The vertical control joint is caulked on both faces with a filler/sealant as mentioned above.

In NZS 4229 structures, some recommendations are given as to position in Section 13 of that document as follows:

Longitudinal shrinkage stresses in concrete masonry shall be controlled by providing vertical control joints at not more than 6 m centres.

Vertical control joints shall be located:

- (a) Within 600 mm of return angles in T and U-shaped floor structures;
- (b) Within 600 mm of L shaped corners or by restricting the spacing to the next control joint to 3.2 maximum;
- (c) At changes in wall height, exceeding 600 mm;
- (d) At changes in wall thickness.

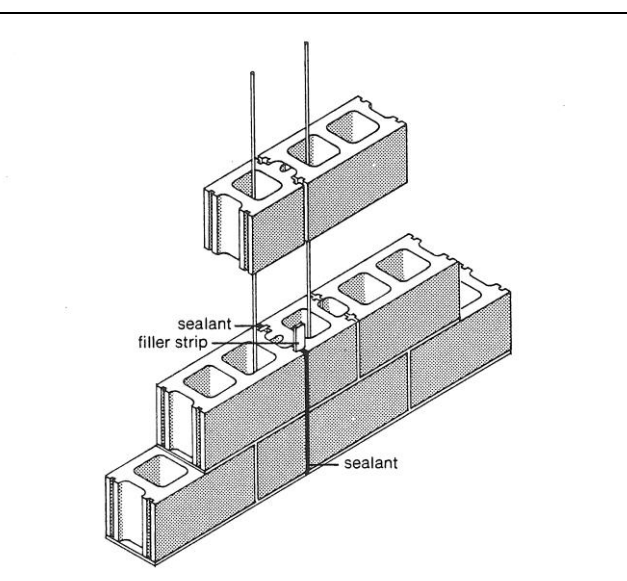


Figure 8: Control joint using control joint units

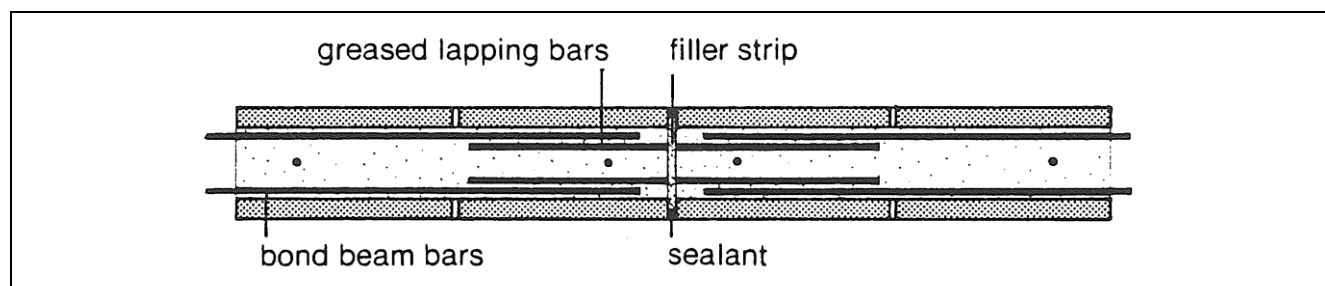


Figure 9: Plan of control joint at bond beam

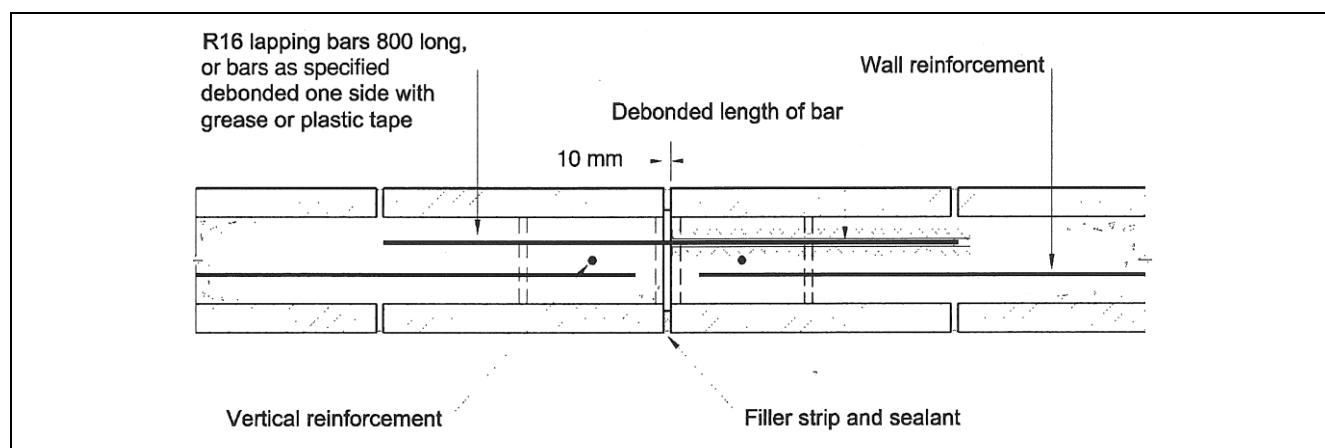


Figure 10: Typical Control Joint

In all cases the vertical cores both sides of a control joint should be grouted and reinforced, while bond beam reinforcement should be arranged to allow anticipated movement to occur.

One way of doing this is to stop the bond beam at the control joint and to bridge the joint with round steel dowel bars lapped with the bond beam reinforcing bars. The round dowel bars must be well greased to allow movement. See Figure 9, page 3.

For NZS 3604 structures, control joint spacing for walls 2 metres high are 8 m, 1.2 m height 12 m and 800 mm high 24 mm maximum. A typical control joint is shown in Figures 8 (page 3) and 10.

## Construction Joints

Construction joints may be required between different masonry wall lifts. A horizontal construction joint will occur on the top of the uppermost masonry unit. The level of the construction joint, however, should not be lower than 20 mm from the top of this unit. See Figure 11.

The horizontal construction joint should be roughened to remove laitance and any loose matter lying on the surface of the hardened grout. This is a similar process to the preparation of the construction joint between the masonry wall and its supporting concrete beam or foundation. It is generally easy to

wash and brush the joint a few hours after the grout has hardened to provide a clean surface ready for the next lift. See Figure 12.

At the position of this intermediate horizontal construction joint it will, of course, be necessary to form clean out ports, as was required for starting off at the ground level. A sand covering of the cleaned surface will keep droppings from sticking to the surface. Cleaning out of the horizontal joint is required before placing the next lift.

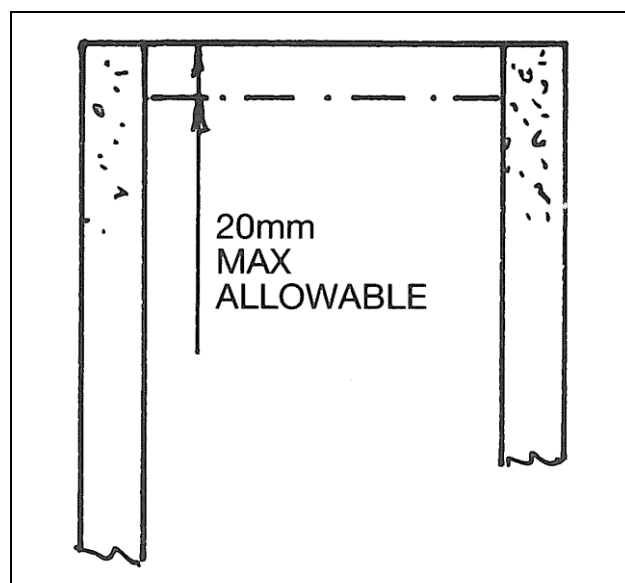


Figure 11: Horizontal Construction Joint





Figure 12: Construction Joint Preparation

## Temporary Bracing

A point which can often be overlooked is the need for temporarily bracing the concrete masonry during construction.

An ungrouted wall is very susceptible to failure from strong winds. Typically, a wall over 1 metre in height is at significant risk. See Figure 13.

It is important to take some measures to brace the wall in order to prevent its premature failure. Typically bracing at 3 metre centres is recommended.

## Cold Weather Construction

The precautions for cold weather construction are shown:

- Water used for mixing mortar shall be heated;
- Masonry shall be protected for not less than 24 hours after laying by covers, blankets, heated enclosures, or the like to ensure that the mortar can gain strength without freezing or harmful effects from cold winds; and
- No frozen materials or materials containing ice shall be used.

## Hot Weather Construction

We have just discussed precautions to be taken during cold weather. It is also necessary to consider problems that might occur during hot weather construction. Generally, when the air temperature rises above 27°C, or there is a drying wind even

through the temperature may be lower, it is necessary to take some additional precautions.

These are shown below:

- Masonry units may be lightly dampened before laying;
- Mortar shall be kept moist and not spread the wall more than two unit lengths ahead of the units being placed;
- The mortar shall be prevented from drying so rapidly that it cannot cure properly. This may be done by applying a very light fog spray several times during the first 24 hours after laying or by some other protective measures over the same period; and
- Grout shall be protected from too rapid drying.

Various research tests have shown advantages in carrying out these recommended practices.

## Weathertightness

The basic requirements for achieving weathertightness are fully discussed in the CCANZ publication *CCANZ CP01: Code of Practice for Weathertight Concrete and Concrete Masonry Construction*, which is an approved approach for E2/AS3 of the New Zealand Building Code.

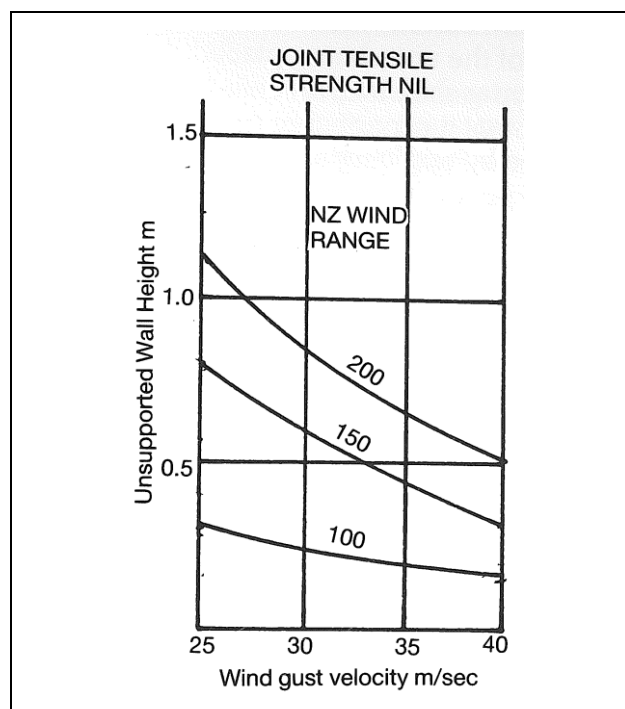


Figure 13: Maximum Unsupported Height of UngROUTED Masonry During Construction

## Basic Construction Details

The concept details on the following pages, indicate basic uses of concrete masonry in building construction. They are presented as guides to detailing and construction and not as finite solutions to a wide variety of situations and conditions.

The details are primarily based upon NZS 4229 and NZS 3604. Reference to these two New Zealand Standards is often necessary to check the specific application of the detail to the job under design.

The exact size, number and positioning of reinforcing bars must be considered in every case. Wall thicknesses, footing widths and other matters must likewise be considered in each and every case.

Certain site conditions might require that masonry or insitu concrete footings should be treated with a damp proof course to prevent ground moisture rising

up into masonry walls. This matter is to be individually considered bearing in mind site conditions, structural design, construction procedure and other relative factors. Damp proof courses can be provided by painting the top of the footing with a bituminous or similar emulsion, but such a coating would prevent a full bond between mortar and footing and between grouted cores and footing.

A full mortar bed of waterproof mortar at the top of the footing might be acceptable, but in any and every case the matters of damp proofing and structural bond must be individually considered.

Cavities of cavity walls or veneer walls must be drained and ventilated as indicated, and moisture must be prevented from rising from a cavity into the roof space. This matter is more fully described under the Veneer walls section of this manual.

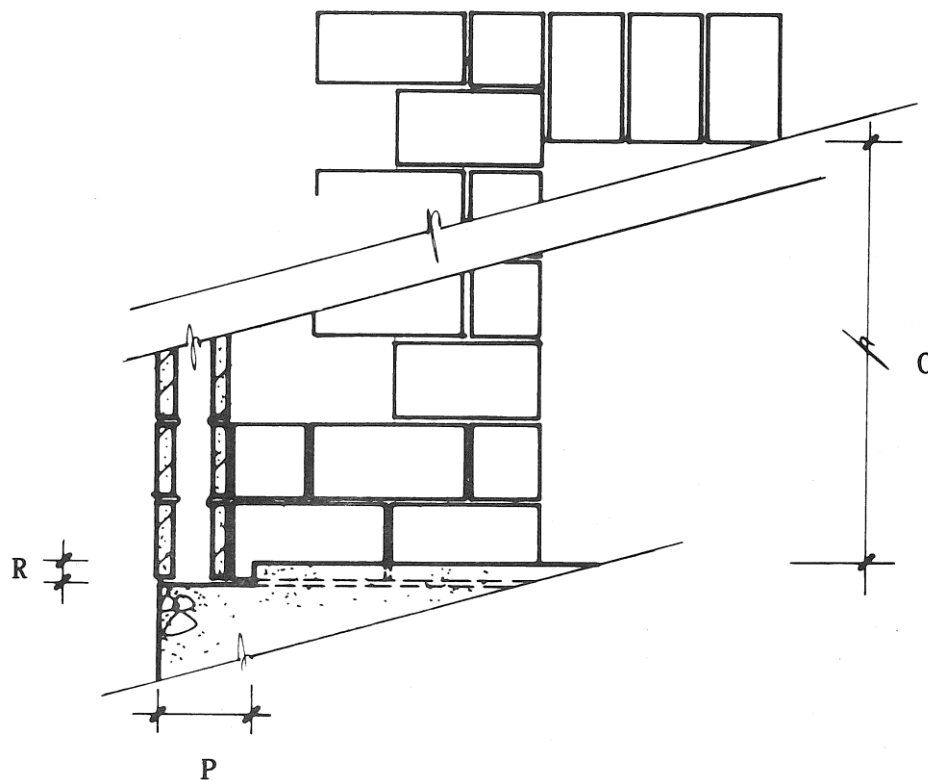
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## F0 FOUNDATION

CONCRETE MASONRY WALL  
CONCRETE SLAB  
PERIMETER STEPDOWN 20-50 mm



F0/A

### F0/A

A nominal stepdown to improve weathertightness of the structure at floor level can be used – 20-50 mm. The following consequences on the modular construction must, however, be considered:

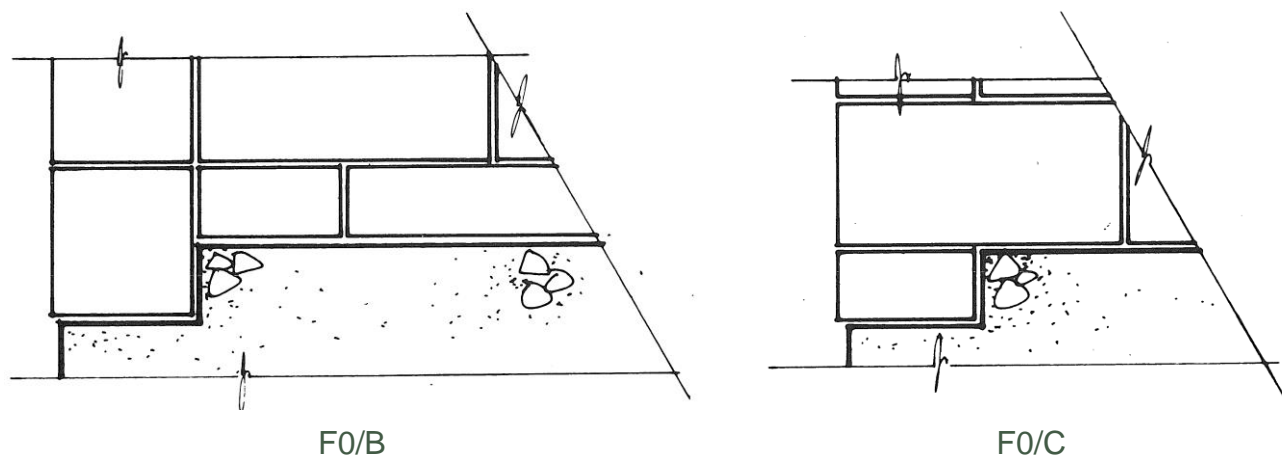
1. Rebate required for any bonded internal walls.
2. Opening dimension from floor to modular head position will be reduced by the depth of rebate chosen. To maintain a satisfactory opening size and block coursing, it will be necessary to trim standard lintel blocks.
3. Width of rebate should be wide enough to permit the satisfactory provision of clean-out ports and their subsequent reinstatement.
4. Provisions to drain unfilled cells by way of weep holes should be made.

See also Modular Masonry Section

R = Rebate Depth: 20-50 mm  
O = Clear Opening: To suit individual requirements  
P = Width of rebate to allow for cleanout port



## F0



### F0/B and F0/C

A half high modular step down to improve the weathertightness of the structure at floor level can be used.

The following consequences on the modular construction must, however, be considered:

#### F0/A

1. No rebate is required for internal walls by using a half high course of masonry.
2. For partial fill, clean-out ports at each reinforcing bar position in the half high course should be provided.

For solid fills, the internal half high course should be grout filled after laying prior to proceeding further. An inverted 20.16 unit would then be laid incorporating clean-outs – see F1 (or 15.16).

3. Door openings - see Note F0/A2.
4. Drainage of unfilled cells - see Note F0/A4.

#### F0/B

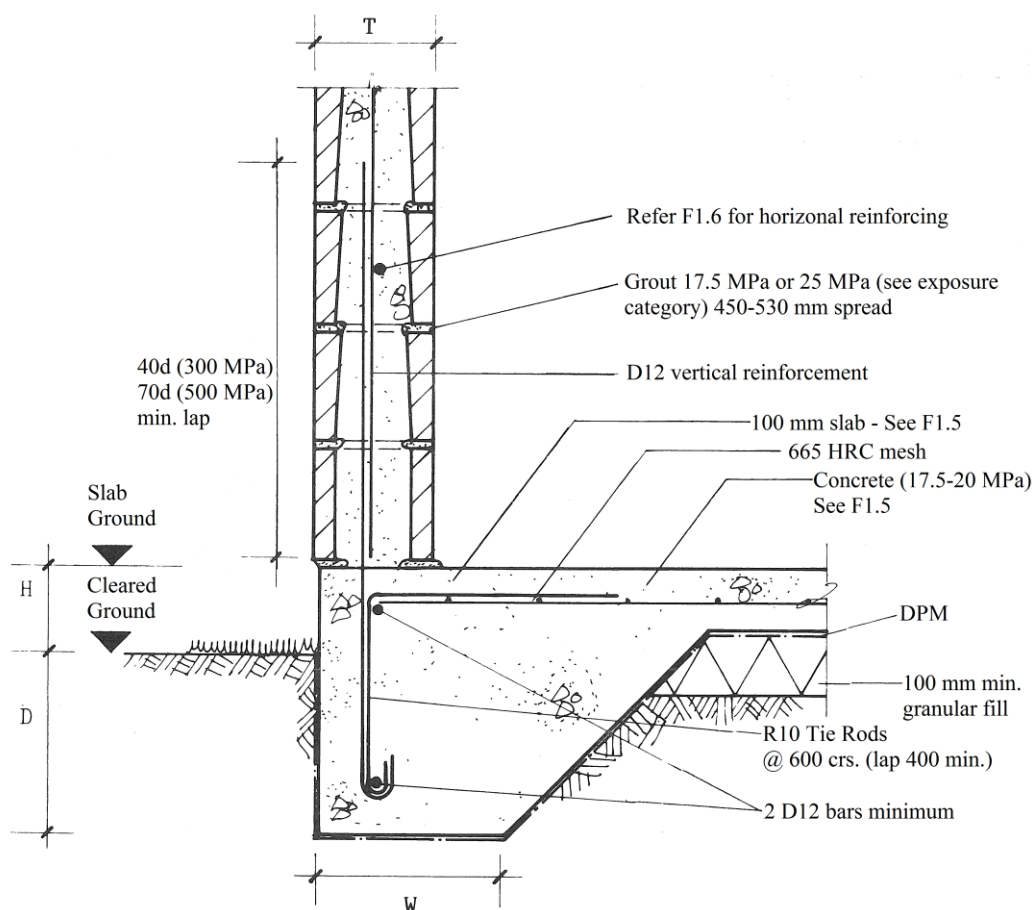
1. No rebate is required for internal walls by using a half high course of masonry on the external wall.
2. For partial fill see F2 details.
3. Door openings are related to modular sizes.
4. Drainage of unfilled cells - see F0/A4.

See also Modular Masonry Section.



## F1 FOUNDATION

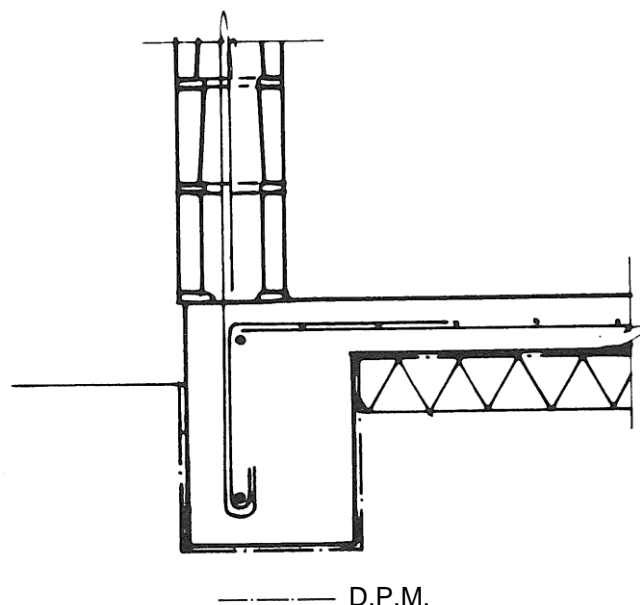
CONCRETE MASONRY WALL  
SOLID FILLED CONSTRUCTION  
CONCRETE SLAB  
CONCRETE FOOTING



F1/A SLOPING FOOTING

<b>H = Height of slab above ground:</b>	100 mm above paved surface. 150 mm above unpaved surface.
<b>D = Minimum depth of footing:</b>	Typically 300 mm depending on soil type. See Section 3 NZS 4229.
<b>W = Footing width:</b>	Minimum 300 mm depending on wall loading. See Section 6 NZS 4229.
<b>T = Masonry Thickness:</b>	140 mm for 15 series 190 mm for 20 series 240 mm for 25 series

## F1



**F1.1** Principal Masonry units used in this detail are:

- Type 16; 05.

**F1.2** Bottom course formed by using inverted 20.16 blocks enabling full length rodding to remove mortar droppings from slab interface (or 15.16).

**F1.3** Cleanout ports at 800 mm crs usually formed by cutting outside face from bottom course, to be replaced and firmly wedged after cleanout and vertical steel in position.

**F1.4** Setting the masonry into a rebated foundation detail can improve the weathertightness of the wall at that joint. The use of a rebate alters the notional modular door opening size. See F0.

**F1.5** Concrete slab strength 17.5-20 MPa quoted is appropriate to domestic and non-direct wearing light duty floors. Commercial floors should have strength selected from 25-40 MPa as appropriate to condition. Floor thickness of 100 mm is taken from NZS 4229 for domestic loading. The spacing of control joints determines the size of mesh used in the floor.

**F1.6** Steel spacing for non-specific design is as follows:

Seismic Zone	Horizontal Spacing of Vertical Steel (D12) mm	Vertical Spacing of Horizontal Steel (D16) mm
3(A)*	600	600
2(B)	800	800
1(C)	800	1,200 (2 No. D16)

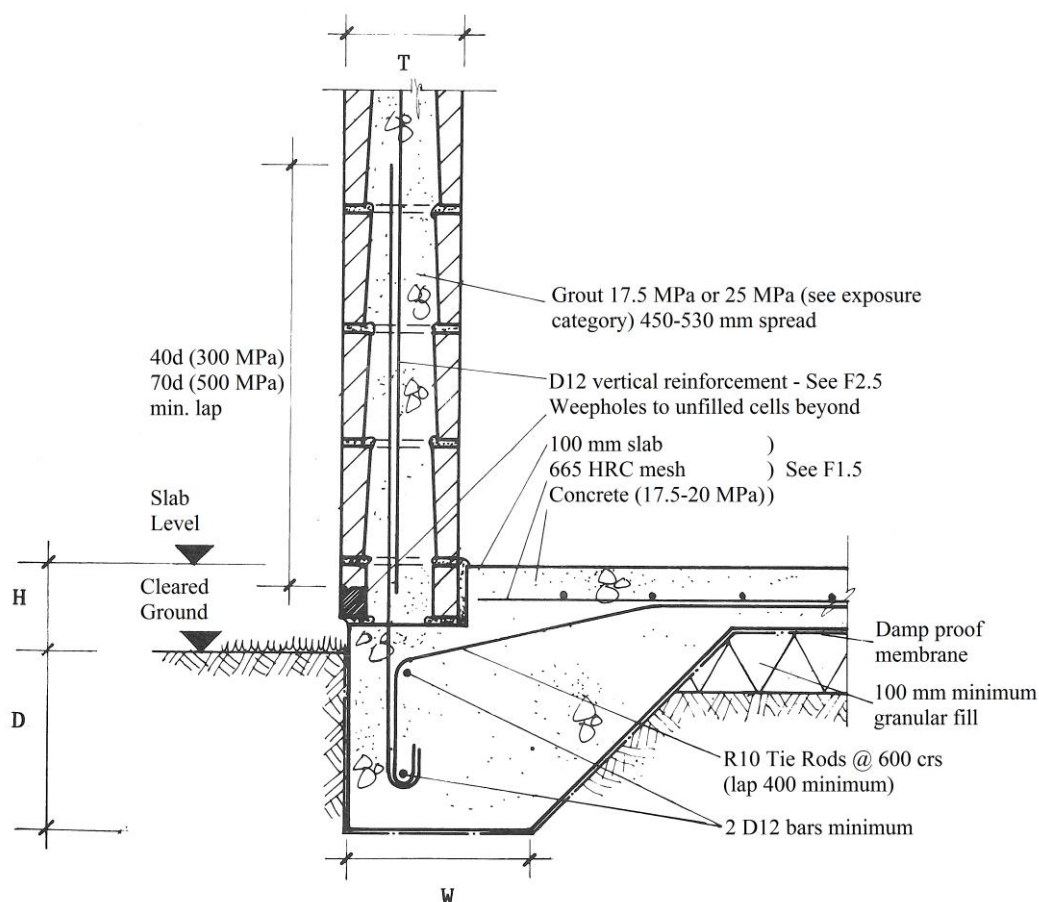
**F1.7** Refer NZS 4229 Sections 4, 5, 6.

\*( ) Zone references prior to 2010.



## F2 FOUNDATION

CONCRETE MASONRY WALL  
PARTIAL FILLED CONSTRUCTION  
CONCRETE SLAB  
CONCRETE FOOTING



F2/A SLOPING FOOTING

**H = Height of slab above ground:**

100 mm above paved surface.  
150 mm above unpaved surface.

**D = Minimum depth of footing:**

Typically 300 mm depending on soil type. See Section 3 NZS 4229.

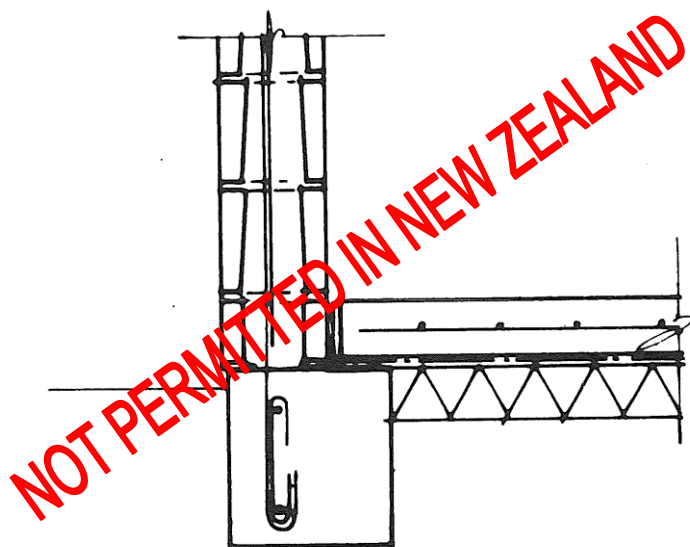
**W = Footing width:**

Minimum 300 mm depending on wall loading. See Section 6 NZS 4229.

**T = Masonry Thickness:**

140 mm for 15 series  
190 mm for 20 series  
240 mm for 25 series

## F2



F2/B FREE SLAB

— — — — — D.P.M. 0.25 mm polythene or multi-laminate polythene sheet

**F2.1** Principal Masonry units used are:

- Type 01; 05; 14; etc.

**F2.2** Provide weepholes in vertical joints midway between filled cells.

**F2.3** Provide cleanout ports at vertical bar locations for cleanout and vertical lap tie.

**F2.4** Provide a stepdown on external wall from the slab to the masonry bed to permit moisture egress.

On a perimeter wall, where obstructions prevent external cleanouts, use internal cleanouts in the second course.

**F2.5** Horizontal spacing for vertical steel (non-specific design) is:

- 600 mm Zone B
- 800 mm Zone C

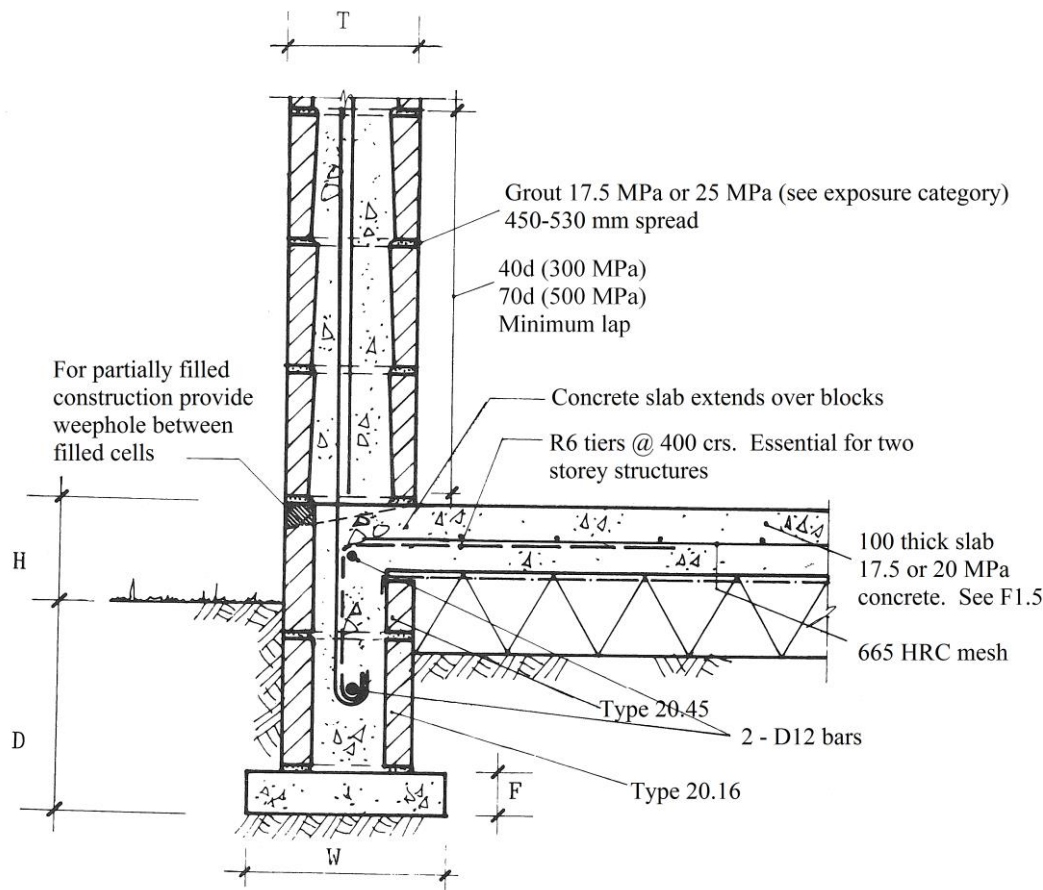
**Note:** Horizontal steel not required where bond beam is within 2.8 m maximum height.

**F2.6** Detail may be used for solid filled construction - Refer F0 Section B.



## F3 FOUNDATION

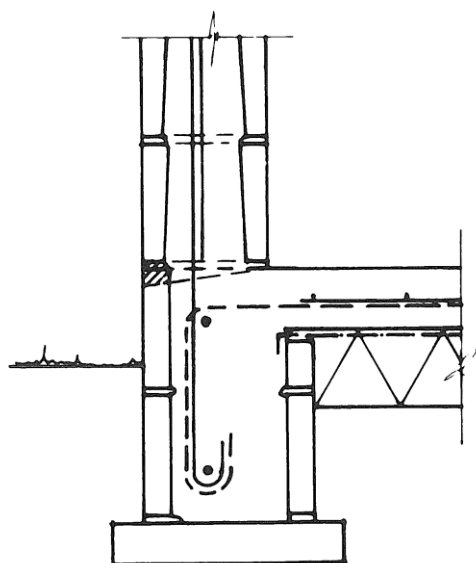
### CONCRETE MASONRY WALL CONCRETE FLOOR SLAB



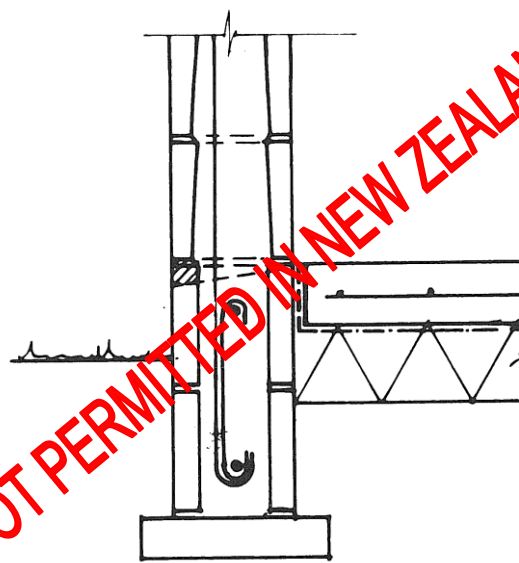
F3/A UNIFORM FOOTING TIED SLAB

<b>H = Height of slab above ground:</b>	100 mm above paved surface. 150 mm above unpaved surface.
<b>D = Minimum depth of footing:</b>	Typically 300 mm depending on soil type. See Section 3 NZS 4229.
<b>W = Screed width:</b>	Minimum wall thickness + 100 mm. 17.5 MPa concrete. See Section 6 NZS 4229.
<b>F = Screed Thickness:</b>	60 mm minimum
<b>T = Masonry Thickness:</b>	140 mm for 15 series 190 mm for 20 series 240 mm for 25 series

## F3



F3/B WIDE FOOTING



F3/C FREE SLAB

— · — · — D.P.M. typically 0.25 mm polythene or multi-laminate polythene sheet

**F3.1** Principal masonry units used in this detail are:

- Footings - Type 16; 45
- Partially filled construction - Type 01; 05 wall etc.
- Solid filled construction - Type 16; 05 wall etc.

**F3.2** For foundations less than 1.2 m high, inverted bottom course sand cleanouts are not necessary.

**F3.3** Fill foundation core as casting floor slab.

**F3.4** Where available, use Type 45 units as top of foundation and run D.P.M. over face shell to permit full integration with slab.

**F3.5** In solid filled construction use inverted Type 16 units above slab level to permit nodding of slab junction.

**F3.6** In partially filled construction provide weepholes in vertical joints midway between filled cells and cleanouts at vertical base. These to be provided at slab level.

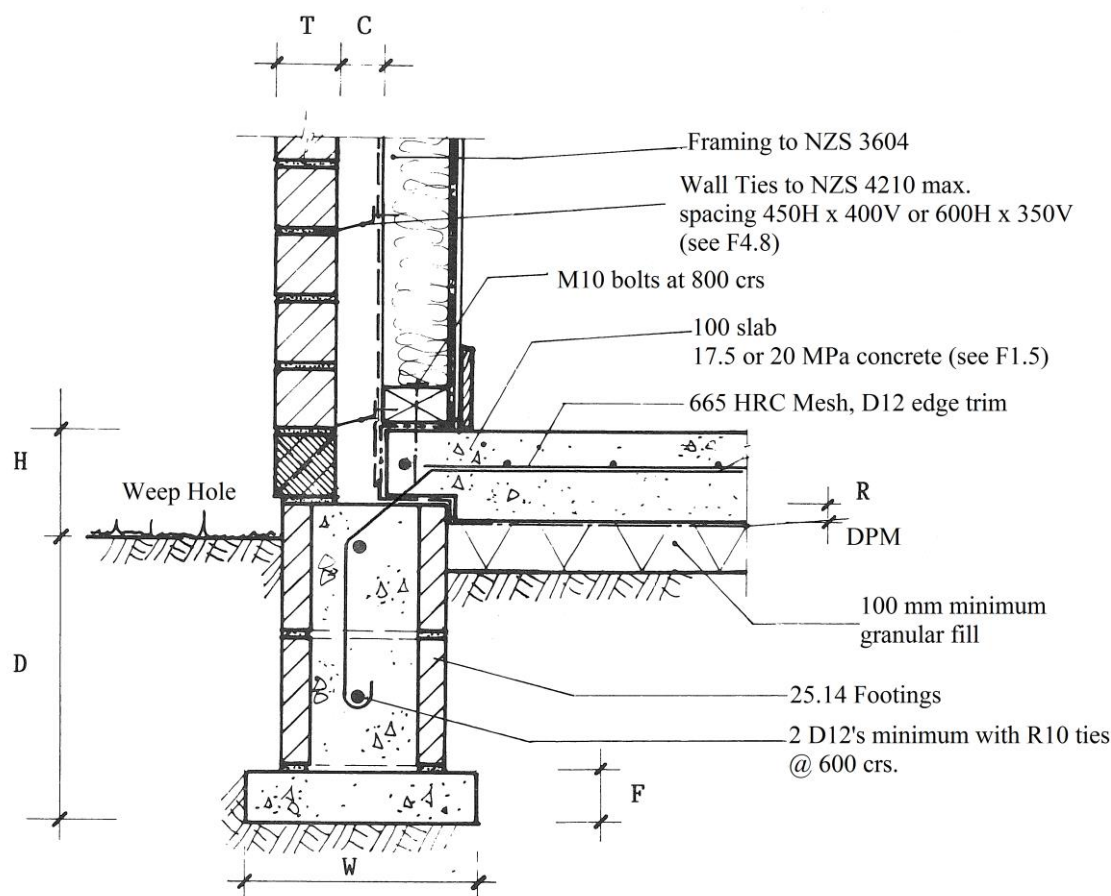
**F3.7** All foundations must be excavated to horizontal benches. Soil conditions dictate the width of footings or sub-footings. See Section 4, 5 and 6 of NZS 4229.

**F3.8** For horizontal spacing of vertical steel see F1 and F2 details.



## F4 FOUNDATION

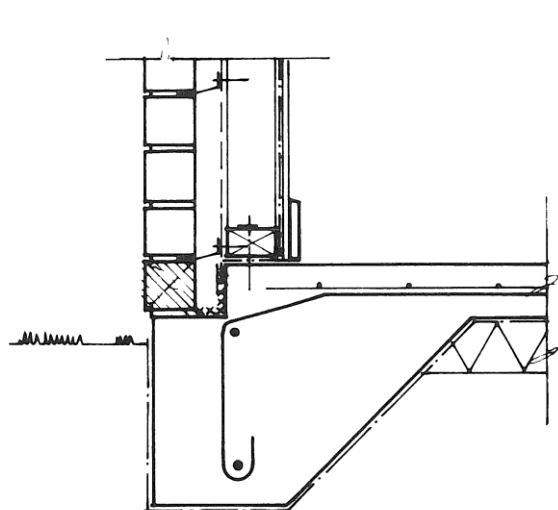
### MASONRY VENEER CLADDING TIMBER FRAME WALL CONCRETE SLAB



F4/A MASONRY FOOTING

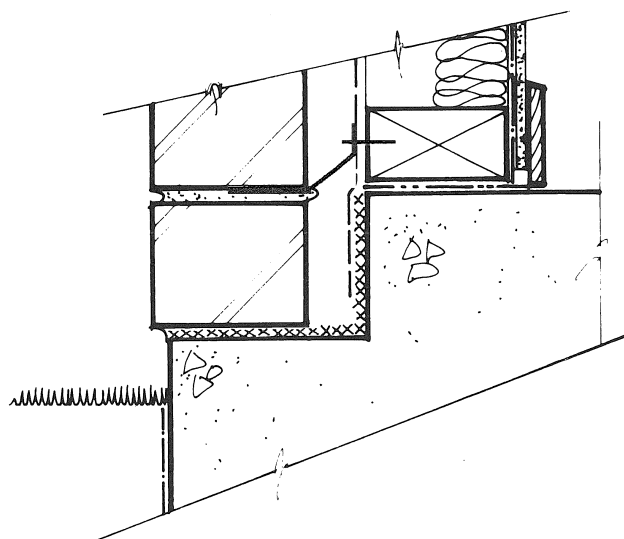
<b>H = Height of slab above ground:</b>	100 mm above paved surface. 150 mm above unpaved surface.
<b>D = Minimum depth of footing:</b>	Typically 300 mm depending on soil type. See Section 3 NZS 4229.
<b>W = Screed Width:</b>	Minimum 300 mm depending on wall loading. See Section 6 NZS 4229.
<b>F = Screed Thickness:</b>	60 mm minimum.
<b>T = Veneer Thickness:</b>	70 mm minimum.
<b>C = Cavity Width:</b>	40 mm minimum NZS 4210. 75 mm maximum.
<b>R = Rebate:</b>	25 mm

## F4



F4/B CONCRETE FOOTING

----- D.P.M.      ..... Building Paper



F4/C BUILDING MEMBRANES

----- Malthoid D.P.C.      XXXXXX Bitumen Coating

### F4.1 Principal Masonry Units used in this detail:

- Footing - Type 25.14

### F4.2 Ventilation of cavity to exterior at top and bottom is required.

### F4.3 Ensure cavity is free from pipes and services which would pass moisture from the rear face to the framing.

### F4.4 Provide weepholes in vertical joints of bottom course at approximately 800 mm crs.

### F4.5 Minimum step of 50 mm required between veneer seat and slab level.

### F4.6 Where practical bring slab D.P.M. up the face of framing and fasten behind wall building paper. Overlap by at least 75 mm.

### F4.7 Where integral slab prevents D.P.M. from folding up face of slab, paint edge of slab and masonry seat with bitumen emulsion to within 50 mm of footing face.

### F4.8 Wall tie spacing relates to 87 mm veneer construction. Special tie conditions apply for 70 mm construction.

Technical drawing illustrating a cross-section of a wall-to-floor connection detail, showing the foundation, wall, and floor assembly with various components and dimensions labeled.

**Dimensions:**

- T:** Thickness of the wall.
- B:** Height of the wall above the floor level.
- H:** Total height of the wall section shown.
- D:** Depth of the foundation below the floor level.
- F:** Thickness of the mass concrete sub-footing.
- W:** Width of the foundation.

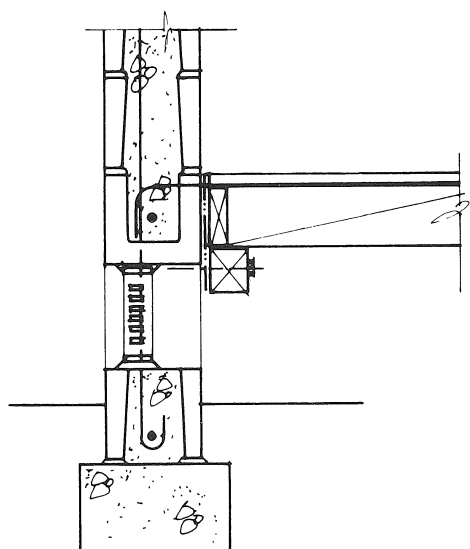
**Components and Details:**

- Grout 450-530 mm spread:** Indicated at the top of the wall.
- D12 vertical reinforcement:** Vertical bars within the wall.
- Malthoid or similar:** Dimpled surface on the wall.
- Flooring system complying with NZS 3604 Section 5:** The floor assembly above the wall.
- 40 mm solid blocking at multi-grip nailplate @ crs. to bearer:** Blocking between the wall and the floor bearer.
- 25 x 1 mm galvanised strap @ 1.200 crs. nailed with ten 50 x 25 flathead nails. May be at block joint:** Strap connecting the wall to the floor bearer.
- D16 or 2-D12 minimum:** Horizontal reinforcement bar within the wall.
- Timber stringer to NZS 3604 Table 6. Fixed using M12 bolt (typically 1200 crs.):** The floor bearer.
- Malthoid DPC:** Dimpled surface on the foundation.
- D16 or 2-D12 minimum:** Horizontal reinforcement bar within the foundation.
- Mass concrete sub-footing (10 MPa):** The base foundation.

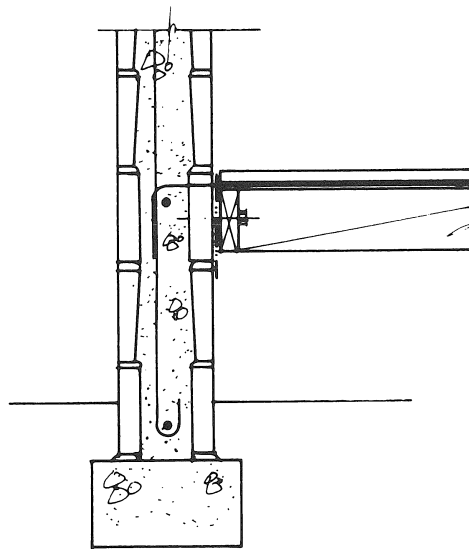
<b>H = Bearer Height above ground:</b>	150 mm minimum.
<b>B = Height above ground of flooring:</b>	450 mm minimum.
<b>D = Foundation Depth:</b>	Typically 300 mm depending on soil type. See Section 3 NZS 4229.
<b>W = Sub-footing Width:</b>	Minimum 300 mm depending on wall loading. See Section 6 NZS 4229.
<b>F = Sub-footing Thickness:</b>	150 mm or greater. See Section 6 NZS 4229.
<b>T = Masonry Thickness:</b>	140 for 150 series wall 190 for 20 series wall 240 for 25 series wall



## F5



F5/B VENTILATOR (<1.8 M)



F5/C BOUNDARY JOISTS

### F5.1 Principal units used in this detail:

- Footing - Type 16 inverted
- Partially filled construction - Type 01; 05; 14
- Solid filled construction - Type 16; 05

### F5.2 Minimum sub-floor clearances are shown.

In addition a crawl space of 450 min. height shall be provided to permit visual inspection. The 150 minimum height corresponds to the minimum height of masonry piles. Timber piles must extend 300 mm above ground level.

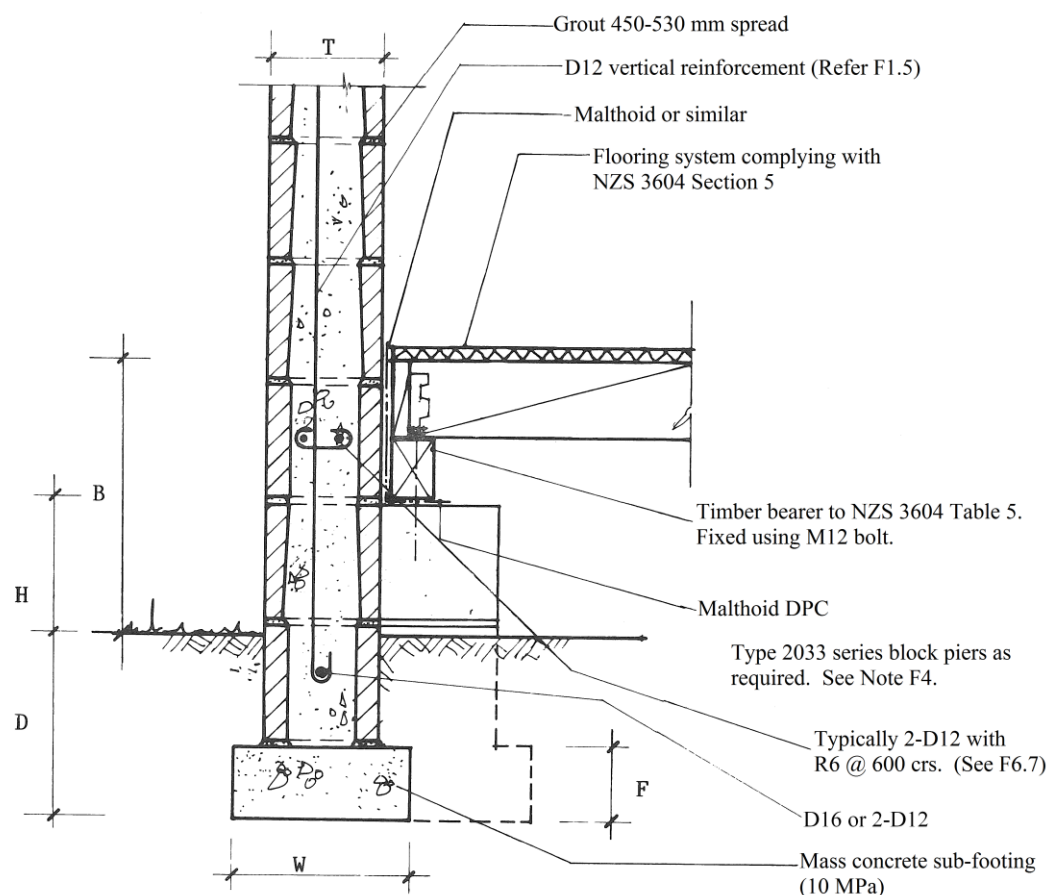
### F5.3 Foundation plinths formed by 2033 'L' shaped units can be used as an alternative to bolting bearer to wall.

### F5.4 In partially filled construction weepholes, in vertical joints between filled cells, are to be provided above bond beams.

### F5.5 For diaphragm limitations refer, to Detail I2.

## F6 FOUNDATION

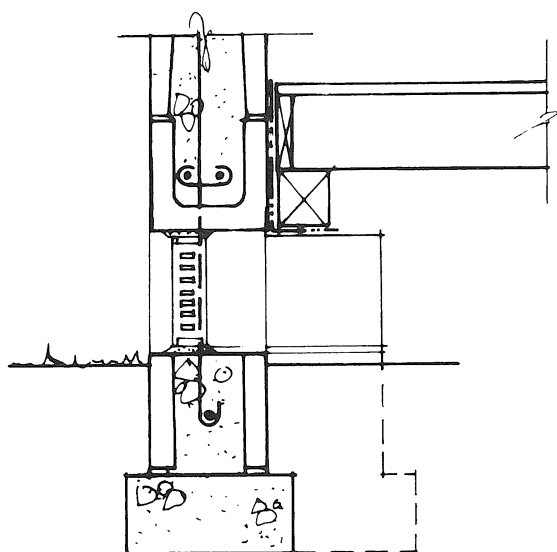
### CONCRETE MASONRY WALL (with BOND BEAM) TIMBER FLOOR



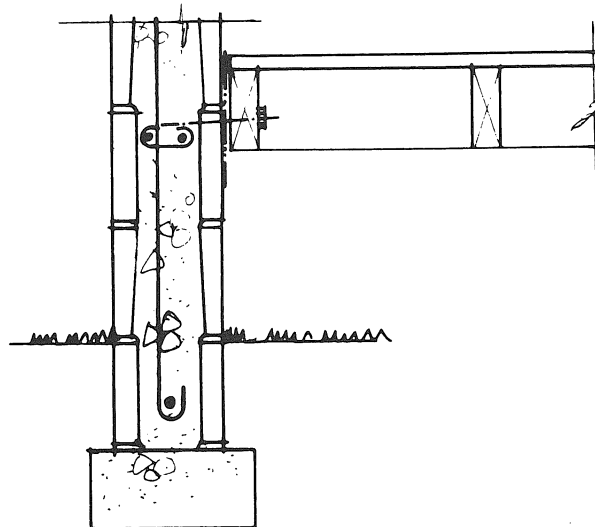
F6/A BEARERS ON MASONRY PLINTHS

<b>H = Bearer Height above ground:</b>	150 mm minimum.
<b>B = Height above ground of flooring:</b>	450 mm minimum.
<b>D = Foundation Depth:</b>	Typically 300 mm depending on soil type. See Section 3 NZS 4229.
<b>W = Sub-footing Width:</b>	Minimum 300 mm depending on wall loading. See Section 6 NZS 4229.
<b>F = Sub-footing Thickness:</b>	150 mm minimum. See Section 6 NZS 4229.
<b>T = Masonry Thickness:</b>	140 for 150 series wall 190 for 20 series wall 240 for 25 series wall

## F6



F6/B VENTILATOR



F6/C BOUNDARY JOIST

### F6.1 Principal units used in this detail:

- Footing - Type 16 inverted
- Partially filled construction - Type 01; 05; 14
- Solid filled construction - Type 16; 05

### F6.2 Bearers, blocking and boundary joists separated from blockwork by malthoid.

### F6.3 Foundation plinths as required for bearers.

### F6.4 Minimum sub-floor clearances are shown. In addition a crawl space of 450 minimum height shall be provided to permit visual inspection. The 150 minimum height corresponds to the minimum height of masonry piles. Timber piles must extend 300 mm above ground level.

### F6.5 Bearers may be bolted onto wall instead of 2033 plinths. Bond beam restraints as required by NZS 4229 Section 10.

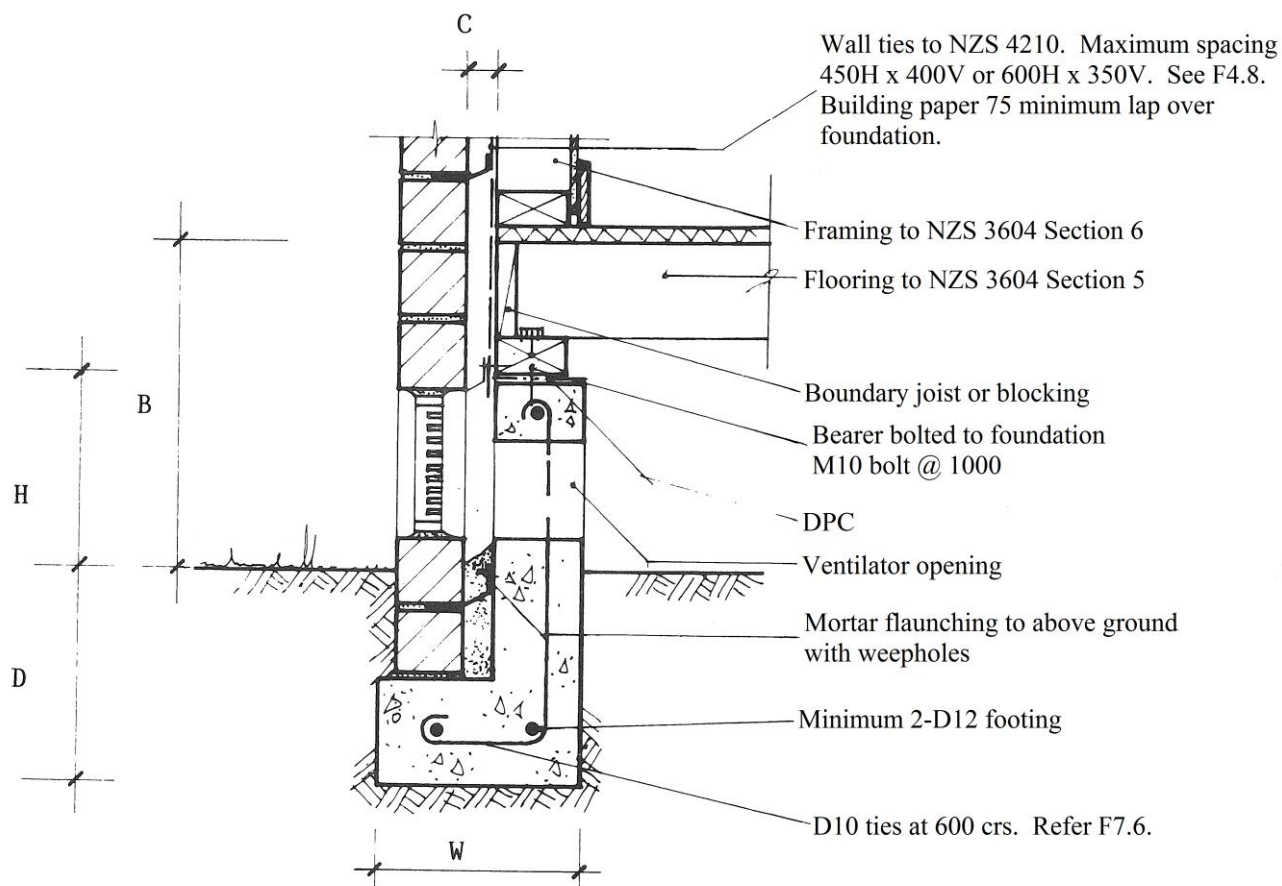
### F6.6 In partially filled construction, weepholes in vertical joints between filled cells are to be provided above bond beams.

### F6.7 Bond beam reinforcement determined from NZS 4229 Table 10.1.



## F7 FOUNDATION

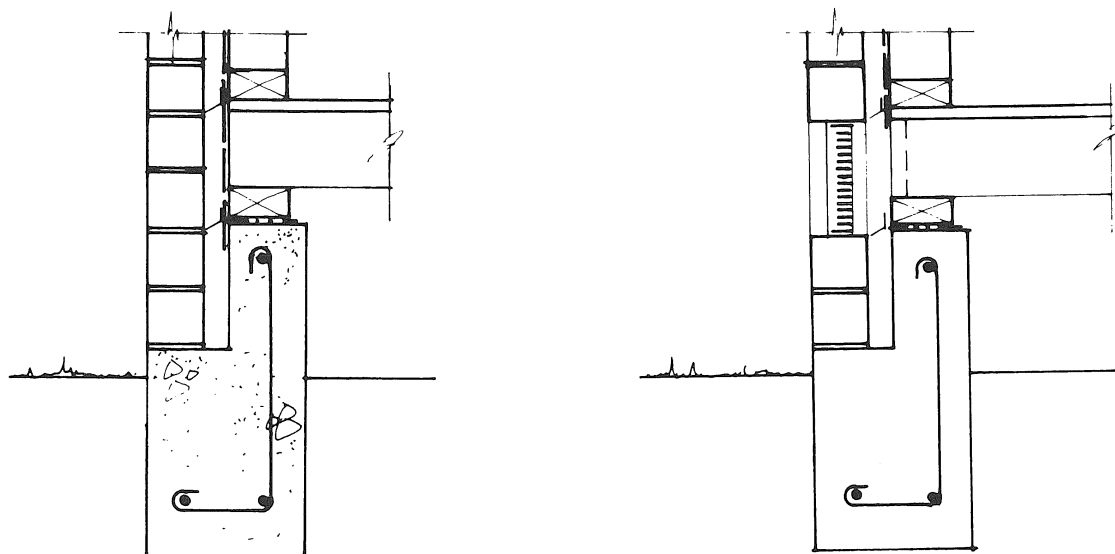
MASONRY VENEER  
TIMBER FRAMING  
TIMBER FLOOR  
CONCRETE FOOTING



F7/A MASONRY BELOW GROUND LEVEL

<b>H = Bearer Height above ground:</b>	150 mm minimum.
<b>B = Height above ground of flooring:</b>	450 mm minimum.
<b>D = Foundation Depth:</b>	Typically 300 mm depending on soil type. See Section 3 NZS 4229.
<b>W = Sub-footing Width:</b>	Minimum 300 mm depending on wall loading. See Section 6 NZS 4229.
<b>C = Cavity Width:</b>	40-75 mm, NZS 4210

## F7



F7/B MASONRY VENEER ABOVE GROUND

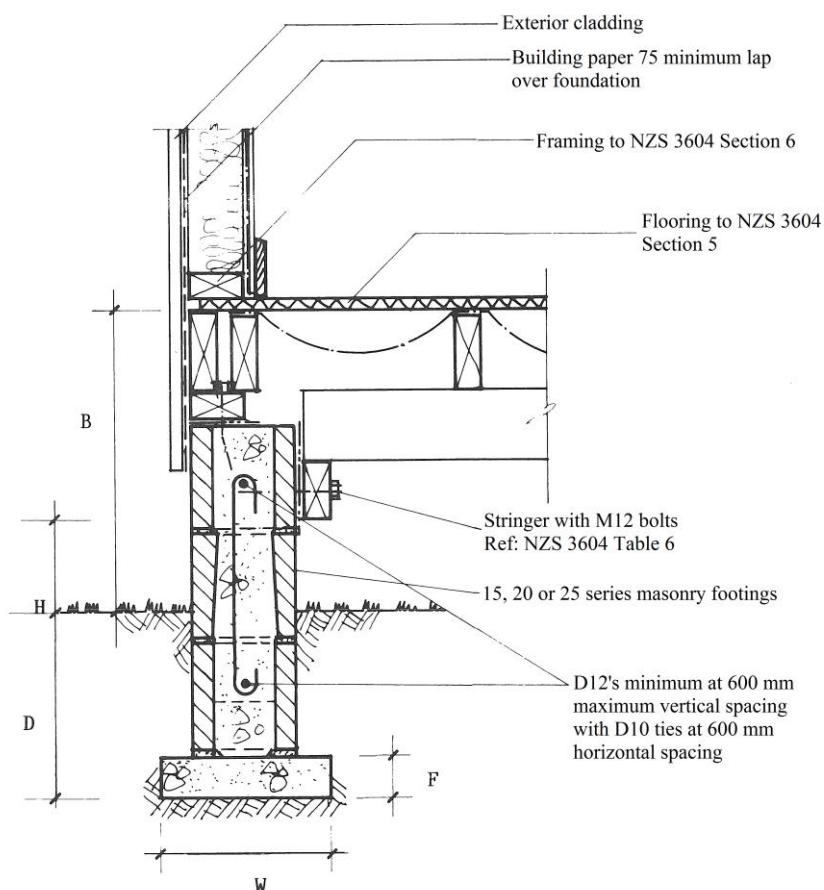
F7/C VENTILATOR (< 1.8 M)

——— D.P.M.    - - - - Building Paper    - - - - Malthoid D.P.C.    ××××× Bitumen Coating

- F7.1** Ventilation of cavity to exterior at top and bottom required.
- F7.2** Grilled sub-floor ventilators required at 1.800 m crs. maximum.
- F7.3** Where veneer extends below finished ground level, raise flaunching in cavity above ground and provide external slope.
- F7.4** Provide weepholes in vertical joints above flaunching or seating at 800 mm maximum crs.
- F7.5** Extend building paper a minimum of 75 mm below bearer.
- F7.6** Horizontal steel typically D10's @ 600 crs.

## F8 FOUNDATION

TIMBER FRAME WALL  
TIMBER FLOOR  
CONCRETE MASONRY FOOTING

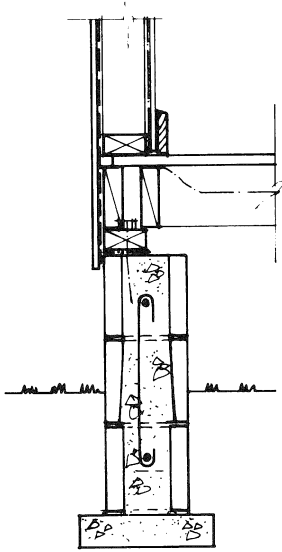


F8/A STRINGER SUPPORT

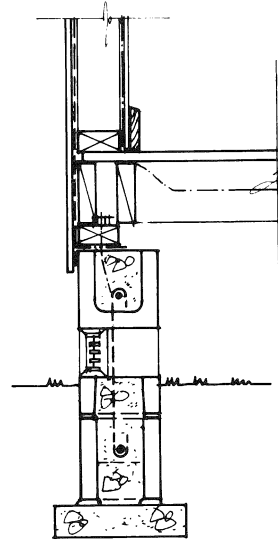
<b>H = Bearer Height above ground:</b>	150 mm minimum.
<b>B = Height above ground of footing:</b>	450 mm minimum.
<b>D = Foundation Depth:</b>	Typically 300 mm depending on soil type. See Section 3 NZS 4229.
<b>W = Sub-footing Width:</b>	Minimum 300 mm depending on wall loading. See Section 6 NZS 4229.
<b>F = Sub-footing:</b>	60 mm minimum. 17.5 MPa concrete.



## F8



F8/B FRAMING PLATE



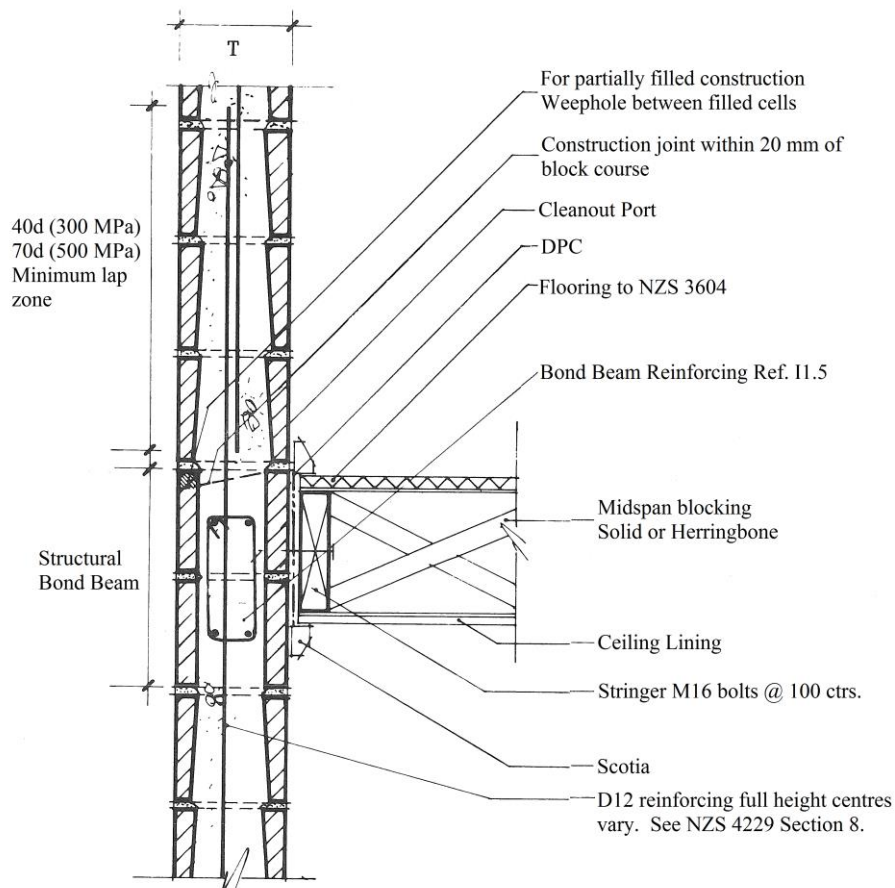
F8/C VENTILATOR

**F8.1** Principal masonry units used are Type 16 units.

**F8.2** Where flooring diaphragm action is required, see NZS 3604 for fixing requirements.

## I1 INTERMEDIATE FLOOR

### CONTINUING CONCRETE MASONRY WALL STRUCTURAL BOND BEAM

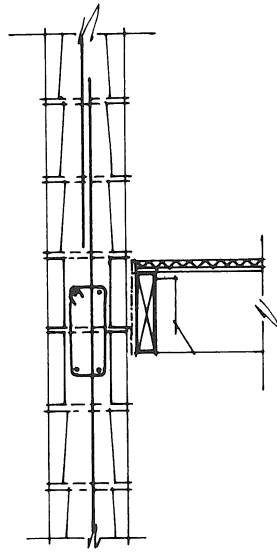


### I1/A FLOOR CONNECTIONS (PARALLEL TO JOISTS)

**T = Wall Thickness:**

140 mm for 15 series  
190 mm for 20 series  
240 mm for 25 series

F7



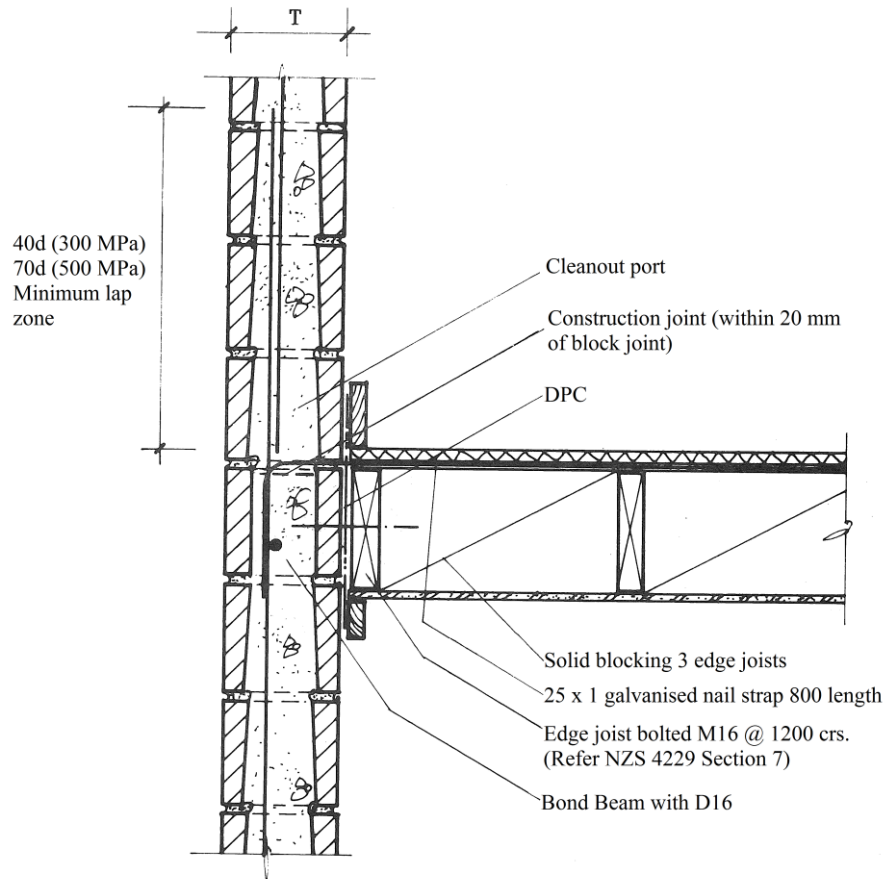
I1/B STRINGER SUPPORTING JOISTS

- I1.1 Provide lower wall construction joint within 20 mm of top of block course. Strike with outward fall where practical.
- I1.2 In solid filled construction inverted Type 16 blocks for lower course of upper wall.
- I1.3 In partially filled construction provide weepholes and cleanout ports midway between filled cells and cleanouts at vertical reinforcement.
- I1.4 Separate all timber from masonry with DPC.
- I1.5 Refer to NZS 4229 Table 10.1 for reinforcement and permissible spans of bond beam.
- I1.6 Wall thickness may change at junction from thicker lower to thinner upper wall.



## I2 INTERMEDIATE FLOOR

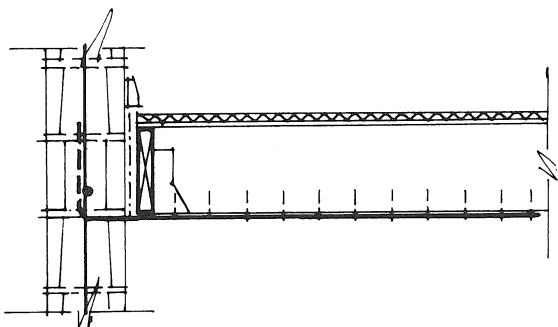
### CONTINUING CONCRETE MASONRY WALL TIMBER DIAPHRAGM FLOORING



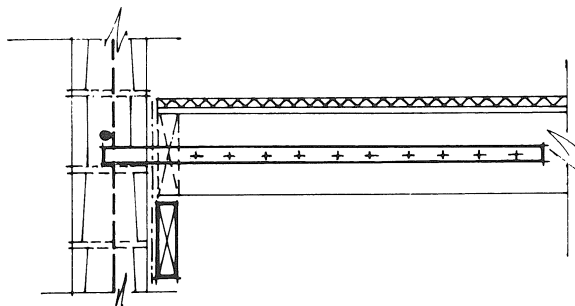
I2/A BOUNDARY JOIST SUPPORT

**T = Masonry Thickness**

## I2



I2/B STRINGER SUPPORTING JOISTS



I2/C STRINGER BELOW  
INTERMITTENT BLOCKING

### I2.2 Structural diaphragm must comply with the following:

- (a) length between supports shall be less than twice depth;
- (b) be of running bond pattern sheet material (c) sheets shall be greater than 1,800 x 900;
- (c) sheets shall be fastened along each edge to boundary members at centres specified (typically 3.15 mm dia. nails at 150 crs.) and every intermediate member at 300 crs;
- (e) all sheets to lap over a 180 x 50 member;
- (f) fasteners shall not be less than 10 mm from edge. See also NZS 3604 requirements.

### I2.3 Floor diaphragms shall not span more than 16 mm between supports.

### I2.4 25 mm x 1 mm galvanised nail strap to be twisted around vertical steel and cast with lower wall grout lift.

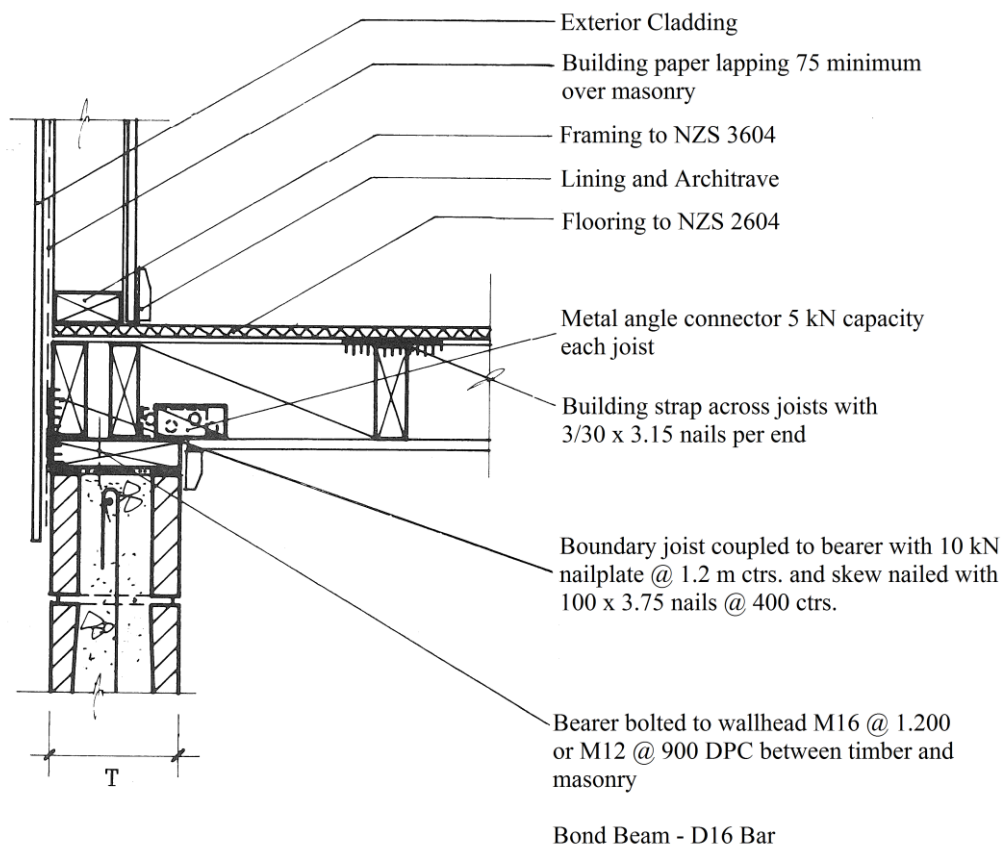
### I2.5 25 x 1 galvanised nail strap to be nailed to joist or blocking for minimum of 800 mm with no less than ten 50 x 25 flathead nails.

### I2.6 25 x 1 galvanised nail strap may extend along upper or lower face of the joists.

### I2.7 Wall thickness may change at junction from thicker lower to thinner upper wall.

## I3 INTERMEDIATE FLOOR

TIMBER FRAMED WALL ABOVE  
TIMBER DIAPHRAGM  
CONCRETE MASONRY WALL BELOW

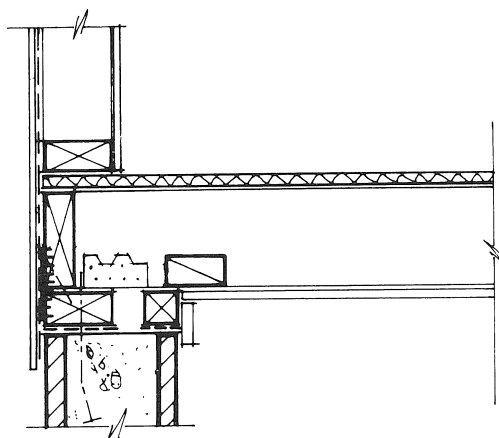


### I3/A PARALLEL WITH JOISTS

T = Masonry Thickness



## I3

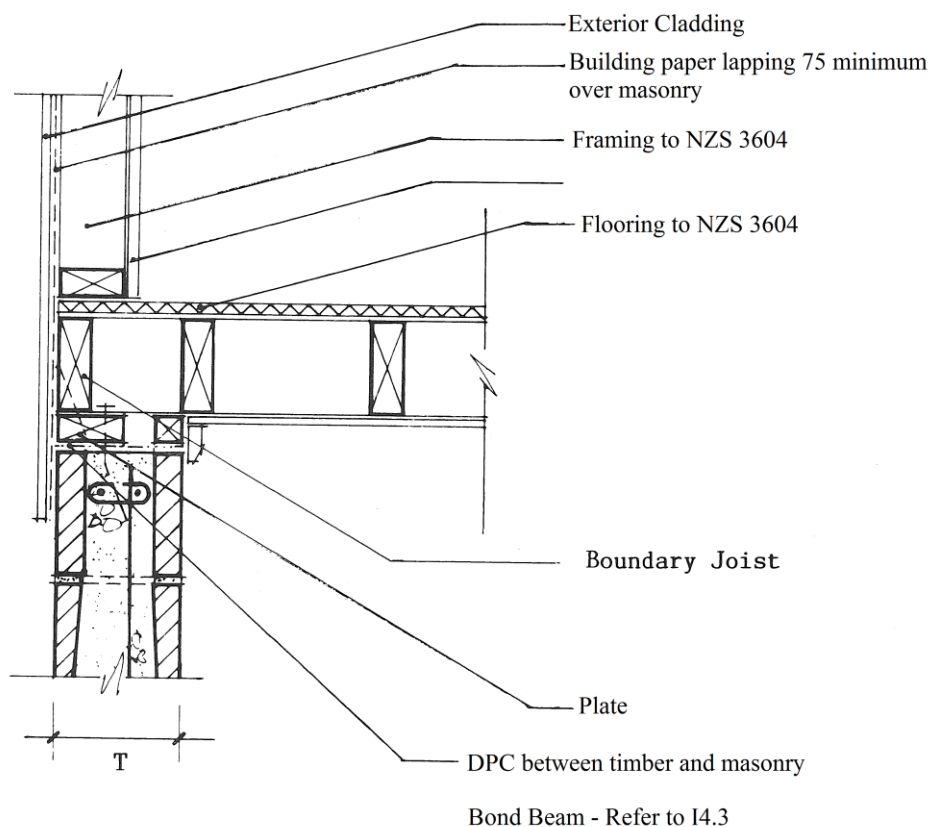


I3/B SUPPORTING FLOOR JOISTS

- I3.1** Continuous plate required to be bolted to top of the masonry wall with M16 bolts at 1200 mm crs. Or M12 bolts at 900 mm crs.
- I3.2** Plates shall be continuous over minor openings and be fastened to the wall within 200 mm of the opening extent.
- I3.3** The boundary joist or blocking is to be fastened to the plate by 100 x 3.75 skew nails at 400 crs. and by nail plates (10 kw capacity) at 1.2 m crs.
- I3.4** Refer 12.2 and 12.3 for details of diaphragm dimensions and fixings.
- I3.5** For details of the bond beam requirements for a diaphragm system refer, NZS 4229 Section 10.

## I4 INTERMEDIATE FLOOR

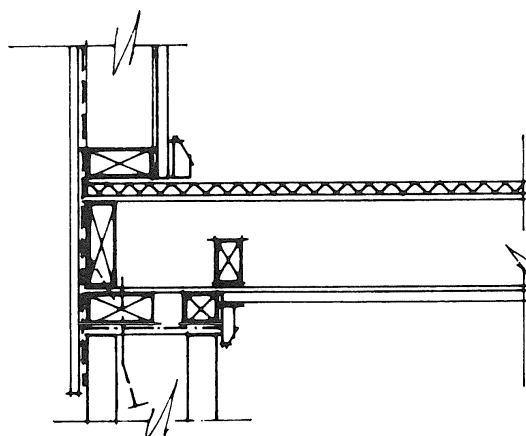
TIMBER FRAMED WALL ABOVE  
STRUCTURAL BOND BEAM  
CONCRETE MASONRY WALL BELOW



### I4/A PARALLEL WITH JOISTS

**T = Masonry Thickness**

I4



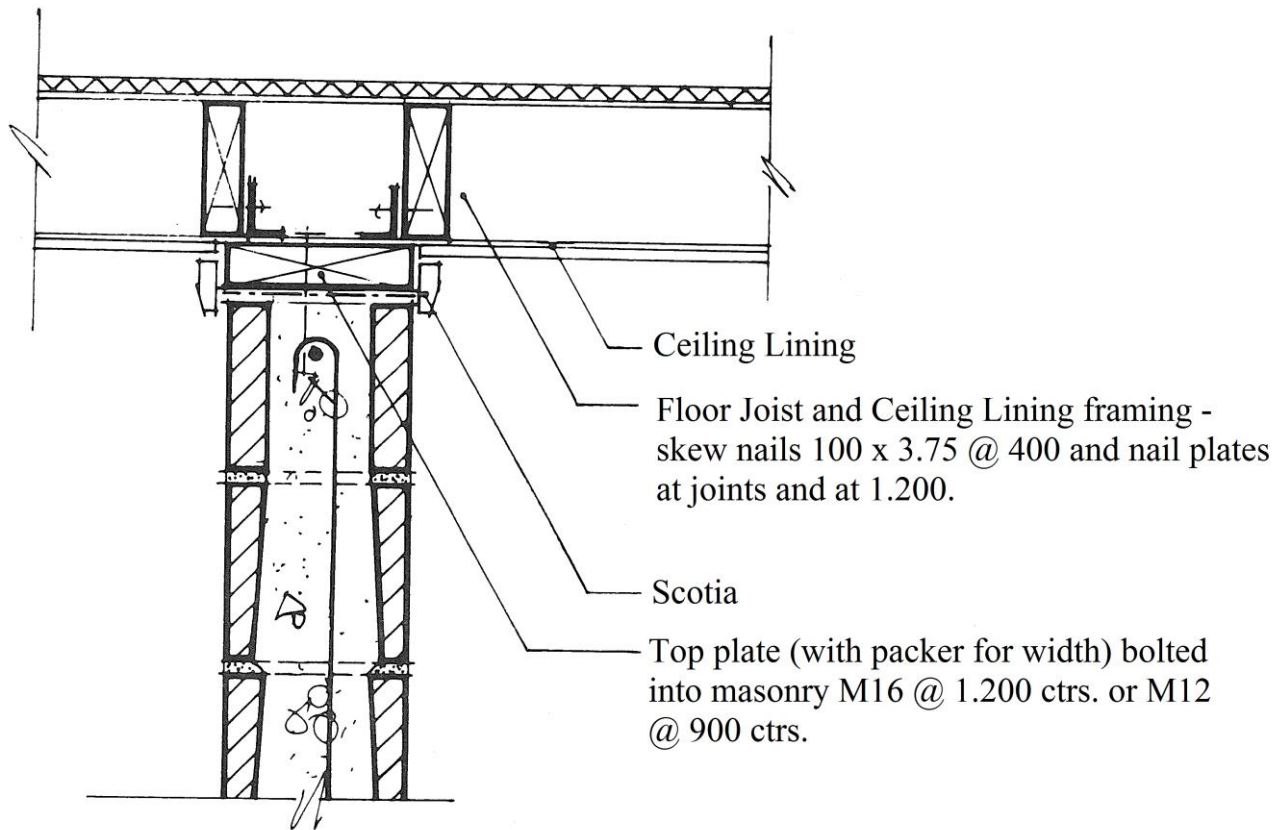
I4/B SUPPORTING FLOOR JOISTS

- I4.1** Refer to Notes on I1 for masonry details.
- I4.2** Continuous plate required to be bolted to top of the masonry wall with M10 bolts or dowels at 1.4 maximum crs.
- I4.3** Refer to Table 10, NZS 4229 for top bond beam reinforcing.



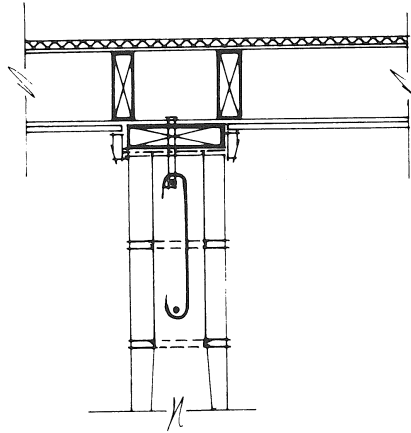
## I5 INTERMEDIATE FLOOR

LOWER CONCRETE WALL  
(with DIAPHRAGM TO FLOOR)  
TIMBER FLOOR



I5/A PARALLEL WITH FLOOR JOISTS

I5

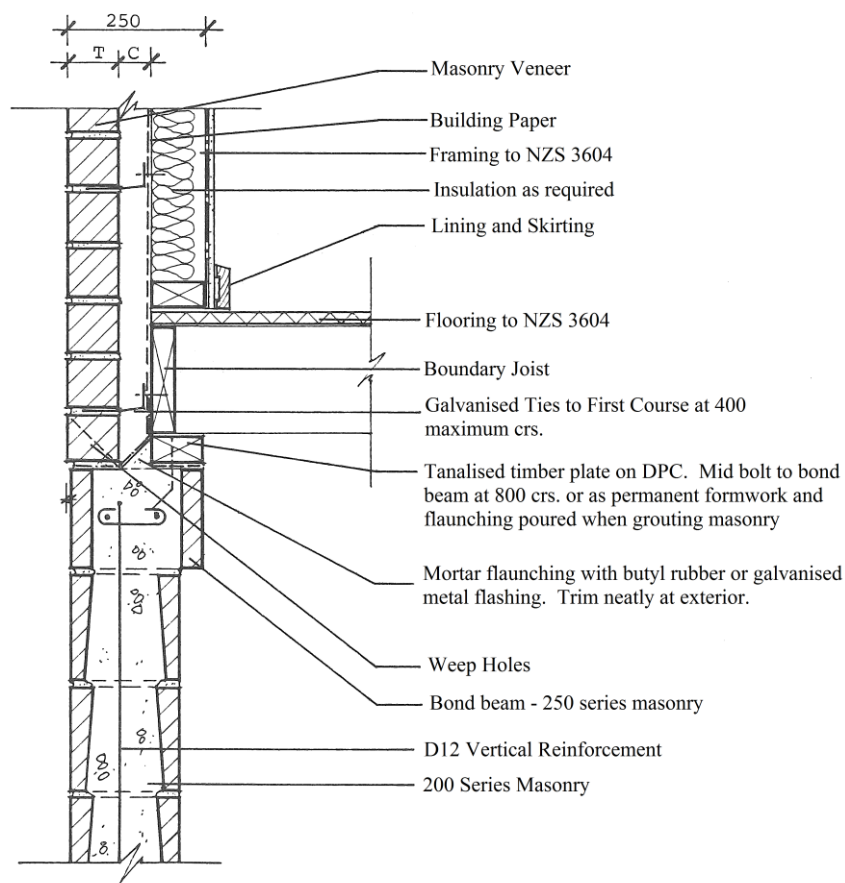


I5/B PERPENDICULAR TO JOISTS

- I5.1** Continuous plate required to be bolted to top of the masonry wall with M16 bolts at 1200 mm crs or M12 bolts at 900 mm crs.
- I5.2** Plates shall be continuous over minor openings and be fastened to the wall within 200 mm of the opening extent.
- I5.3** The boundary joist or blocking is to be fastened to the plate by 100 x 3.75 skew nails at 400 crs. and by nail plates (10 kN capacity) at 1.2 m crs.
- I5.4** Refer 12.2 and 12.3 for details of diaphragm restraints.

## I6 INTERMEDIATE FLOOR

MASONRY VENEER  
TIMBER FRAMING  
TIMBER FLOOR  
CONCRETE MASONRY WALL



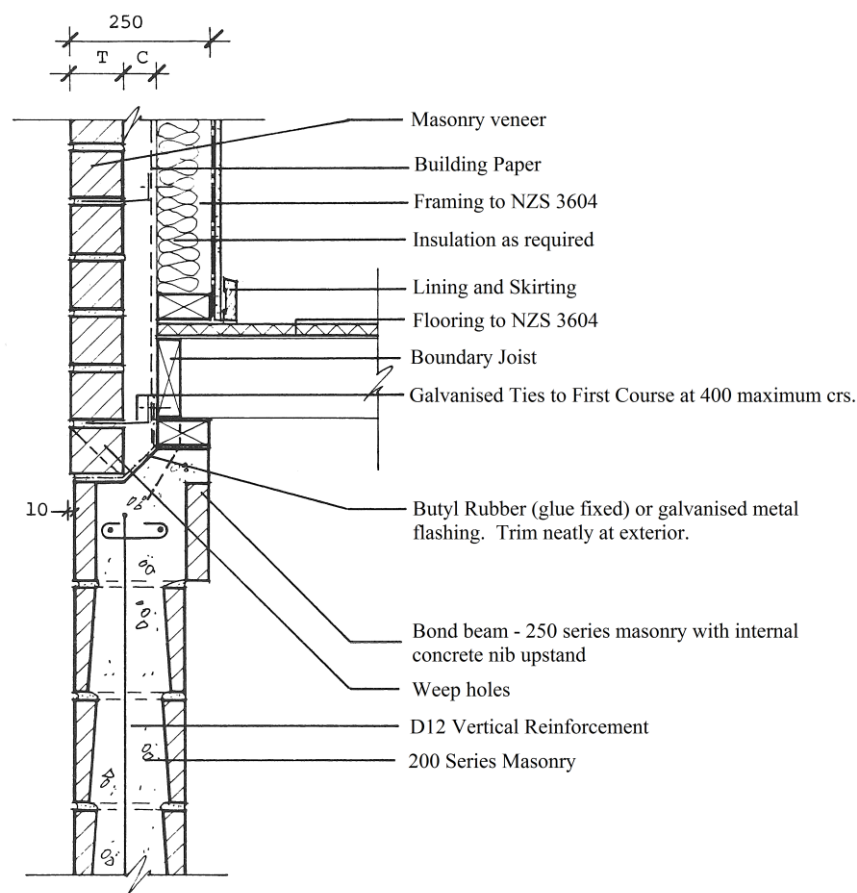
I6/A

**T = Veneer Thickness:** 70 mm minimum.

**C = Cavity:** 40-75 mm.



### ALTERNATIVE CONCRETE UPSTAND



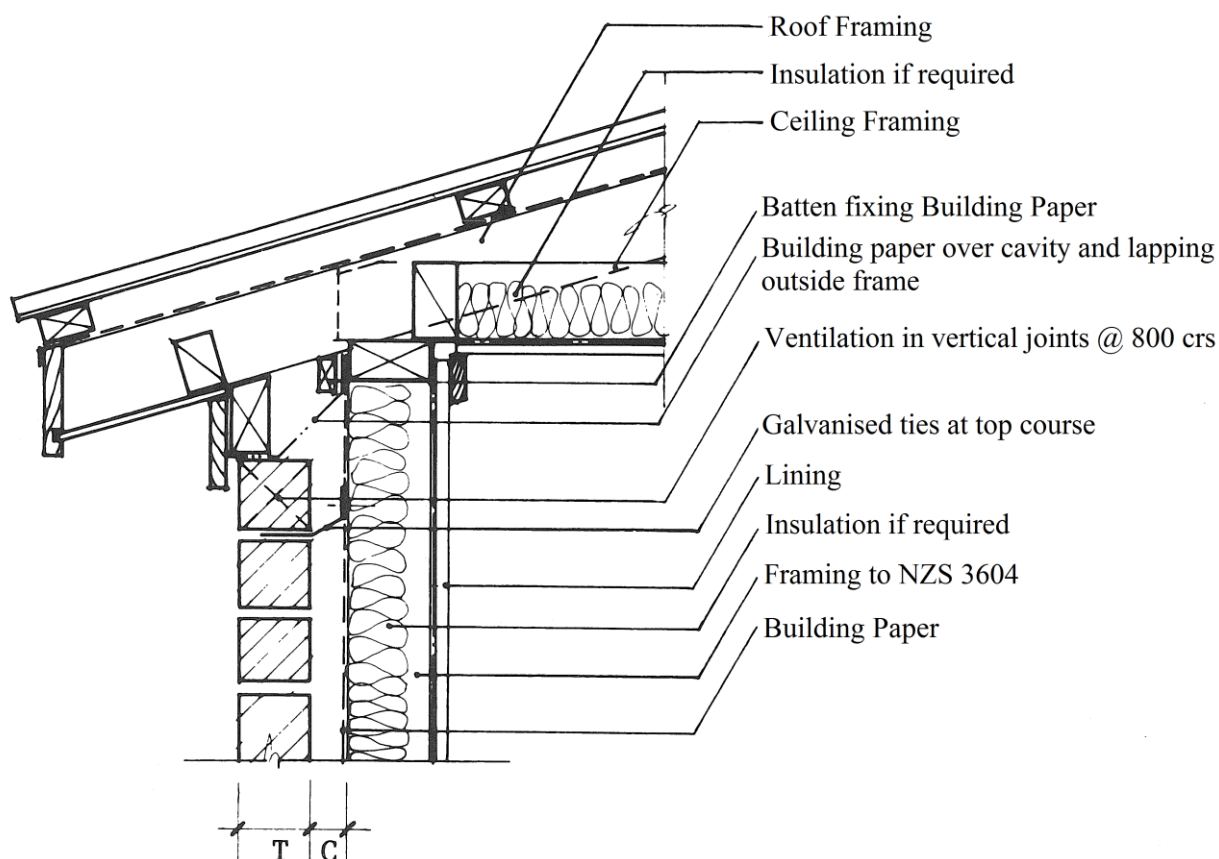
I6/B

**T = Veneer Thickness:** 70 mm minimum.

**C = Cavity:** 40-75 mm.

## R1 ROOF

MASONRY VENEER CLADDING  
TIMBER FRAMING  
HORIZONTAL CEILING



R1/A SLOPING SOFFIT

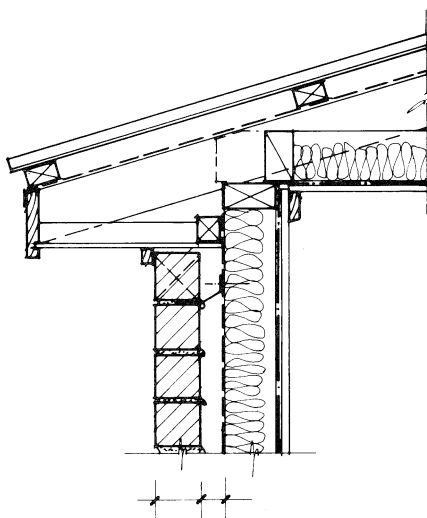
**T = Veneer Thickness:**

70 mm minimum.

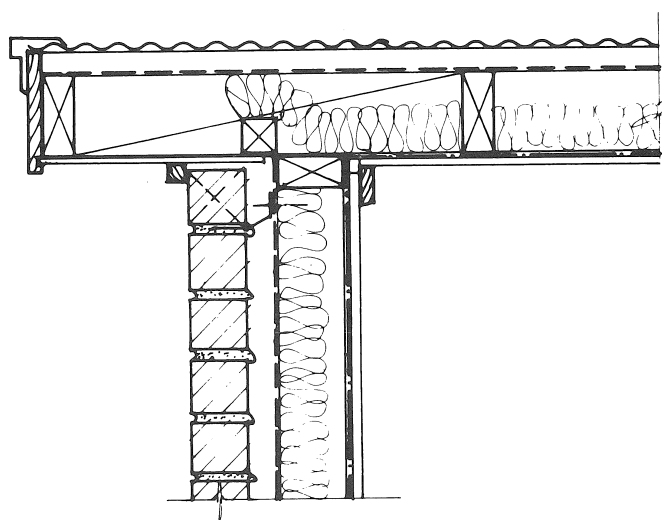
**C = Cavity**

Not less than 40 mm, NZS 4210.  
Not more than 75 mm.

R1



R1/B HORIZONTAL SOFFIT

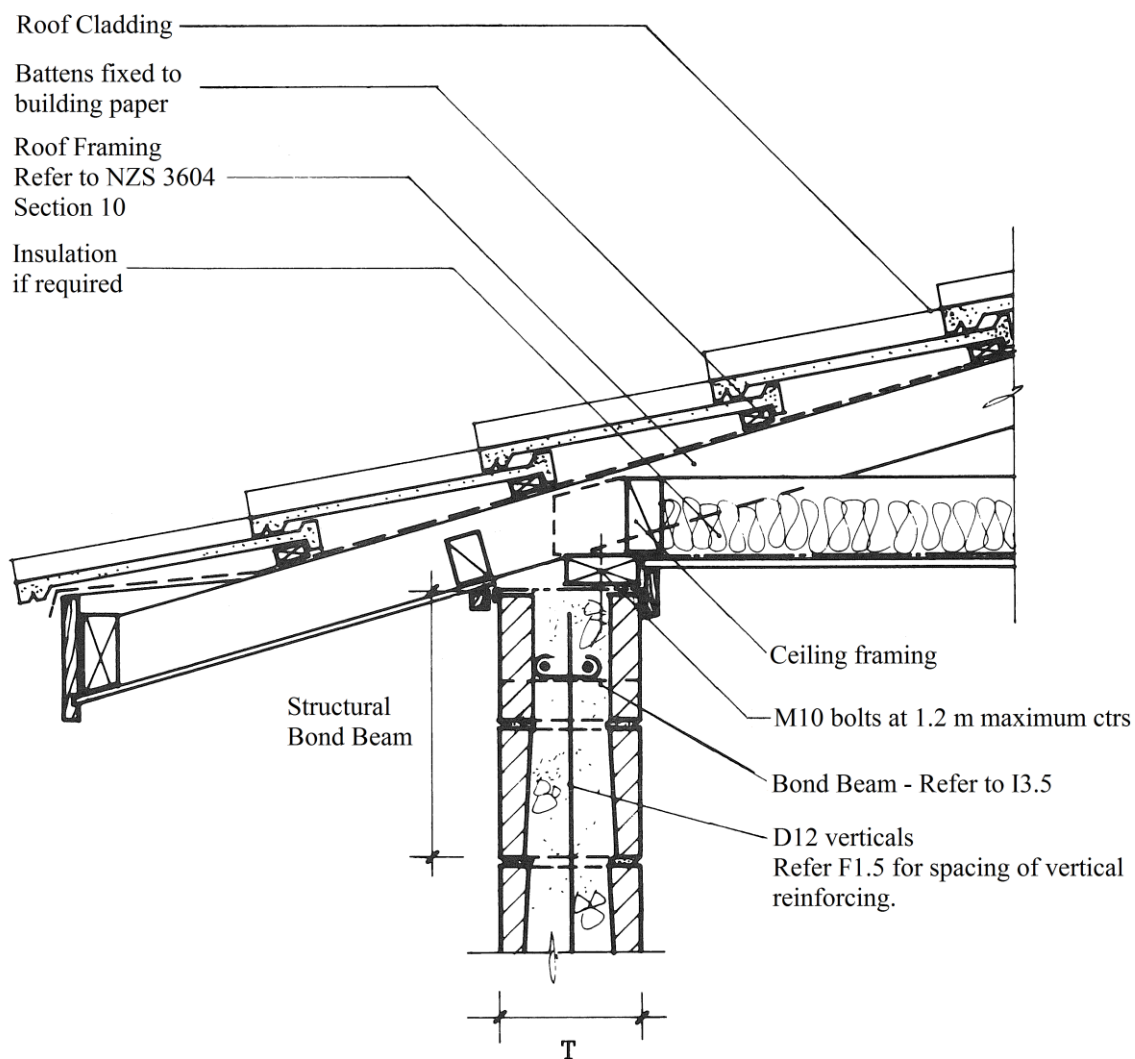


R1/C GABLE WALL



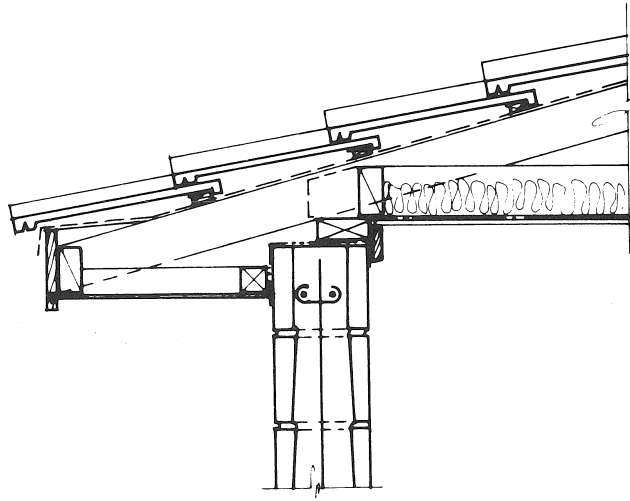
## R2 ROOF

### CONCRETE MASONRY WALL WITH TOP BOND BEAM HORIZONTAL CEILING

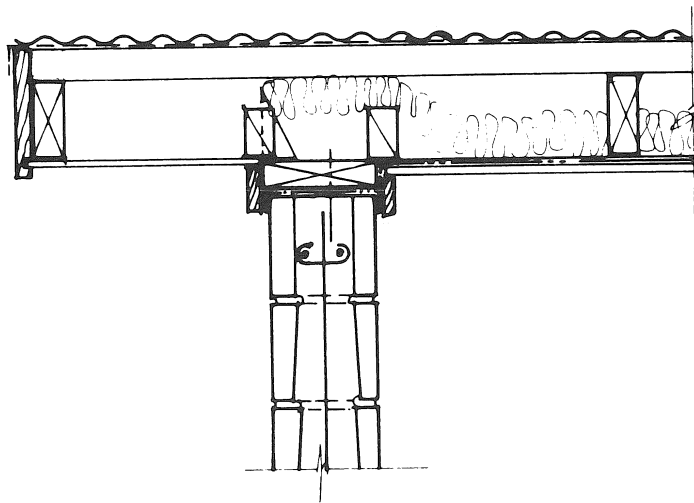


R2/A SLOPING SOFFIT

R2



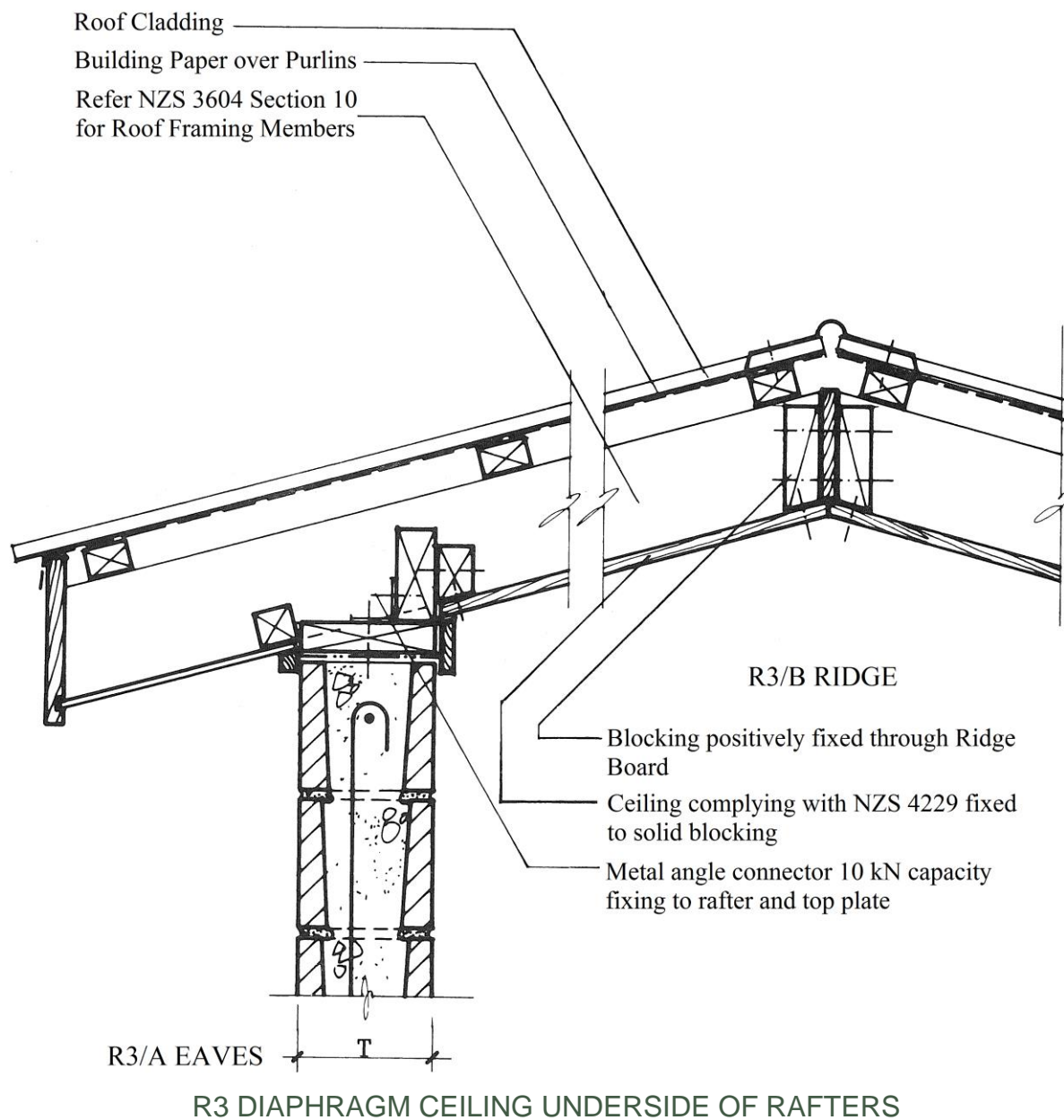
R2/B HORIZONTAL SOFFIT



R2/C GABLE WALL

## R3 ROOF

### CONCRETE MASONRY WALL SLOPING DIAPHRAGM CEILING TO UNDERSIDE OF RAFTERS

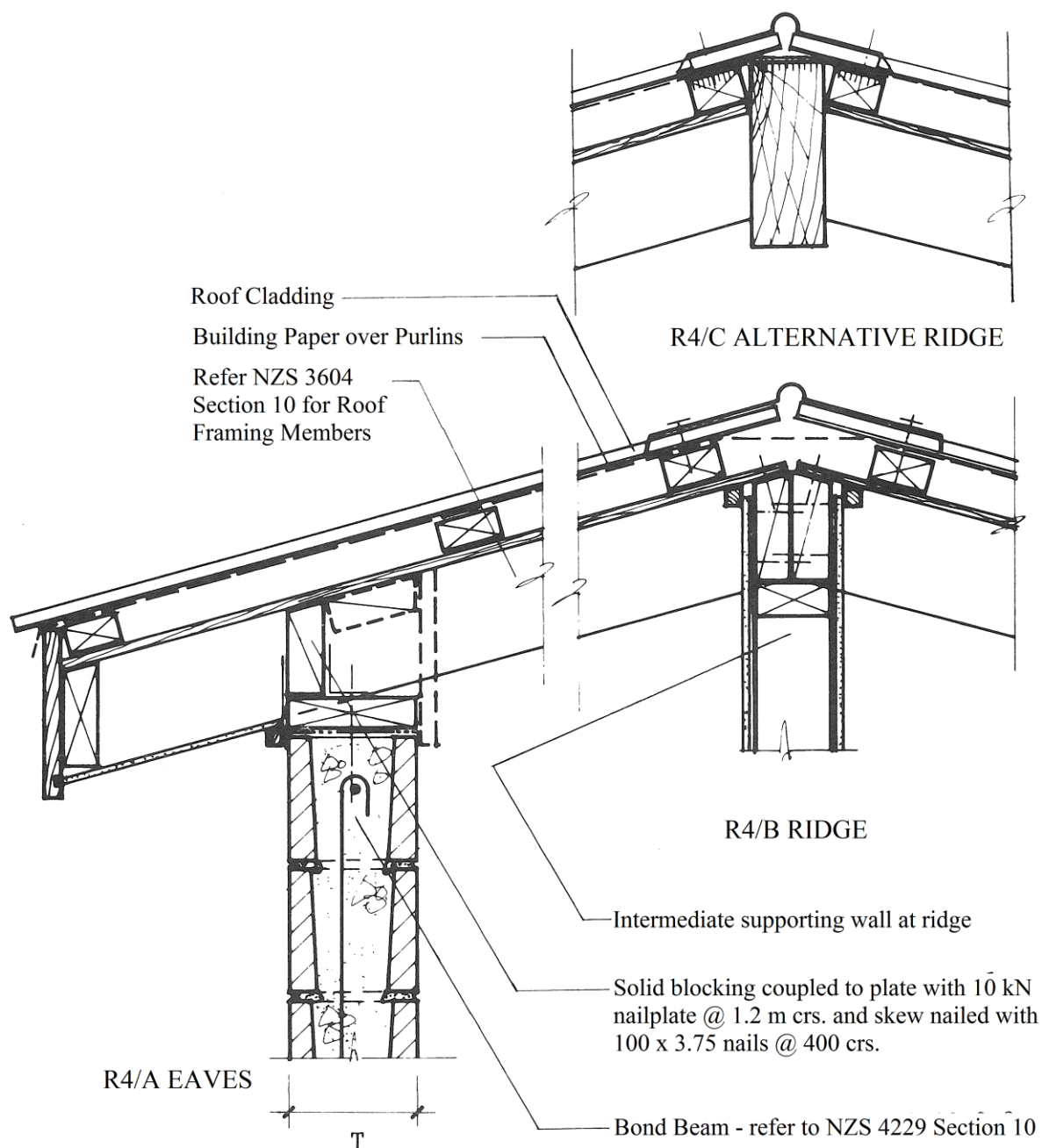


T = Masonry Thickness



## R4 ROOF

CONCRETE MASONRY WALL  
SLOPING DIAPHRAGM CEILING  
EXPOSED RAFTERS



R4 DIAPHRAGM CEILING UP TO TOP OF RAFTERS

T = Masonry Thickness