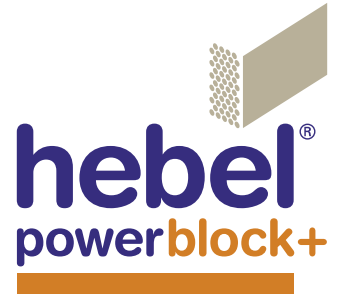




The better way to build



Design & Installation Guide



HEB - 2006
Environmentally Innovative Products



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1.0 Introduction

CSR Panel Systems is a division of CSR Building Products Limited, one of Australia's leading building products companies.

CSR Panel Systems manufactures Hebel® Autoclaved Aerated Concrete (AAC). The AAC in Hebel® products is manufactured from sand, lime and cement to which a gas-forming agent is added. The liberated gas expands the mixture, forming extremely small, finely dispersed air pockets, resulting in lightweight aerated concrete.

CSR Panel Systems has manufactured Hebel® products that have won wide acceptance as innovative and environmentally preferable building materials. This is due to their lightweight nature, excellent thermal, fire and acoustic properties and design versatility. These inherent properties of Hebel® products help achieve quick and cost efficient construction practices as well as providing for comfortable operating environments inside the buildings all year round.

Build a premium home with Hebel® PowerBlock +™

Hebel® PowerBlocks are large AAC Blocks with a standard face dimension of 600mm x 200mm, laid in much the same way as bricks but using Hebel® Adhesive to form a monolithic structure. Typically, external walls use a single skin of 250mm thick blocks while internal, non-loadbearing walls use 100mm thick blocks. Hebel's tight manufacturing tolerances deliver beautifully flat, true surfaces that are easily rendered and painted.

Walls built with Hebel® PowerBlock +™ are strong and durable, providing the security of solid masonry coupled with exceptional thermal and acoustic insulation properties. With over three times the thermal resistance of double brick, Hebel® PowerBlocks exceed the Building Code of Australia (BCA) for energy

efficiency regulations for zones 1,2, 3 and 5 without the need for additional bulk insulation.

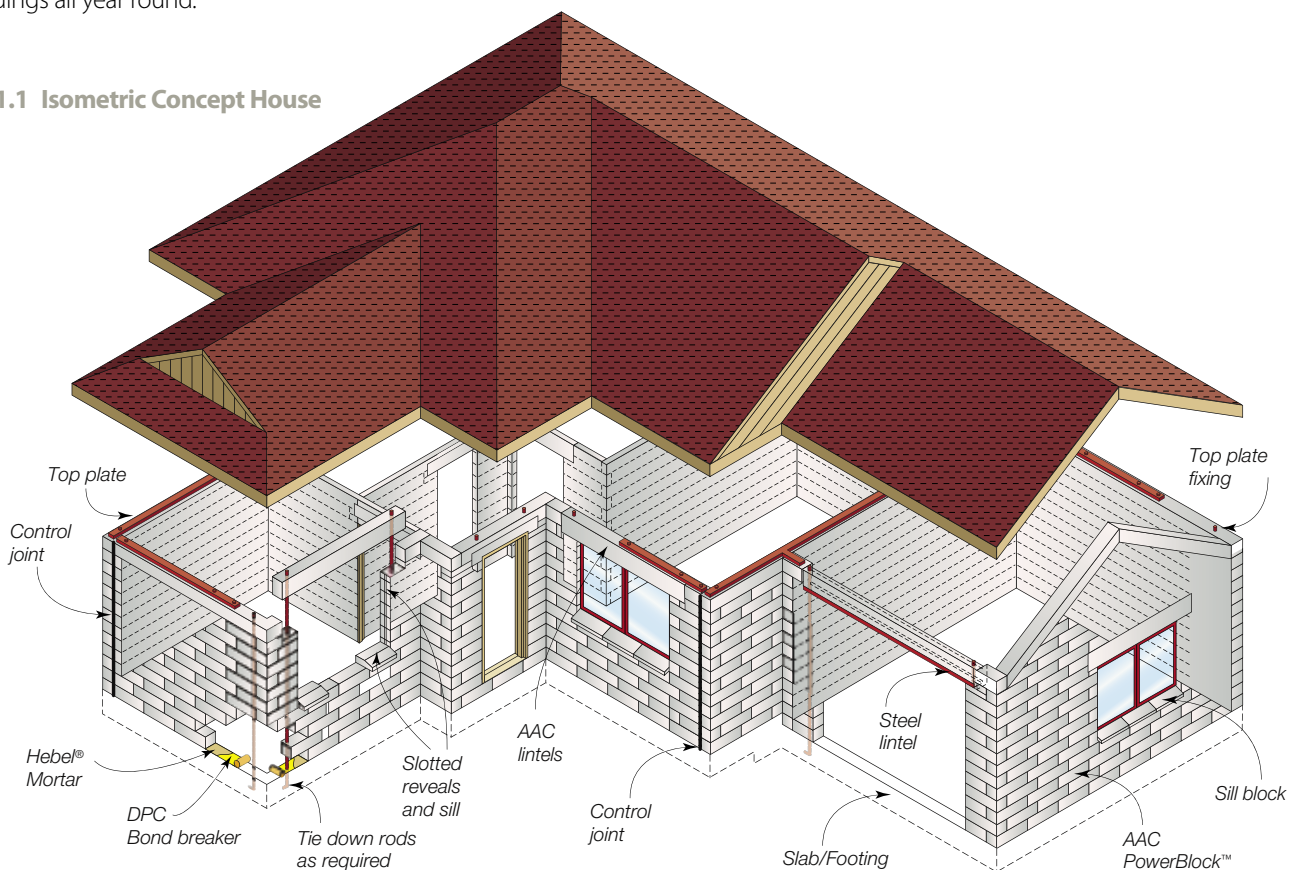
Hebel® PowerBlocks are non combustible and can achieve an Fire Resistance Level (FRL) of up to 240/240/240.

For detached houses, this is well above the requirements for building right up to the boundary line and making Hebel® an ideal choice for bushfire prone areas.

Compared to traditional double brick construction, Hebel® PowerBlock +™ walls can be laid much faster, saving building time and costs. Building with Hebel® Blocks may create more internal floor area for the same building dimensions.

Hebel® Lintels can be used over windows, doors and garage door openings. Hebel® also supplies sill blocks for under windows to complement the overall look of your home.

Fig 1.1 Isometric Concept House



2.0 Benefits

The many benefits of using Hebel® PowerBlocks include:

Solid and strong: Hebel® PowerBlocks are made from Autoclaved Aerated Concrete (AAC), a strong, solid masonry building material with the advantage of being 25% the weight of conventional concrete.

Acoustic Performance: Significantly reduced sound transmission from room-to-room.

Thermal Resistance: Unique thermal properties result in a more stable inside temperature, reducing the energy required to heat and cool your home, thereby reducing energy bills.

Environmentally friendly: 73% less embodied energy and 61% less greenhouse gas emissions than comparative masonry products*.

*Source: LCA Report GECA 2006

Fire Protection: Non-combustible blocks with frameless construction deliver superior fire resistance. Hebel® PowerBlock +™ systems also allow you to build right up to your boundary line.

Pest resistance: Not a food source for termites or vermin and no cavity construction eliminates the chance of harbouring pests.

Design Freedom: Hebel® PowerBlock +™ Wall Systems provide absolute freedom to design and build your ultimate dream home – without compromise.

Technical Support: Competent technical support through Hebel® distributors.

Energy Efficiency

The unique combination of thermal resistance and thermal mass make building with Hebel® a smart choice for meeting Australia’s stringent building regulations.

The thermal performance of a building depends on a number of factors such as orientation and size and aspect of windows. The R-Value of walls and floors can significantly affect the energy-rating outcome of dwellings. A 250mm Hebel® PowerBlock +™ has 3 times the R-Value of a cavity brick wall (BCA Vol. 2 Figure 3.12.1.3). The use of Hebel® in walls and floors will provide increased thermal performance that can allow more

flexibility with other design aspects of a building.

The thermal efficiency of Hebel® systems will also reduce the reliance on heating and cooling appliances. The combined effects of running a heater less in winter and fans or air conditioning less in summer can have a big impact on energy costs and the environment.

Single Skin Construction

The AAC masonry constructed from Hebel® PowerBlock +™ products is called “Plain Masonry” and the blocks are masonry units referred to as a “Solid Unit”. The type of solid unit is “Autoclaved aerated concrete masonry unit” complying with AS/NZS 4455 – Masonry Units and Segment Pavers.

The larger face dimension and being a single skin, Hebel® PowerBlock +™ walls are erected quickly when compared to double brick construction.

Image 2.1: Hebel® PowerBlock +™ home



3.0 Energy Efficiency

Table 3.1 shows a number of different external wall configurations and identifies which satisfy the BCA requirement for

Climate Zones 1 to 8. Table 3.2 lists the component R-Values used as a basis for Table 3.1. For more information on Hebel®

and energy efficiency refer to Section 3 and Appendix C and D of the Hebel® Technical Manual.

Table 3.1: BCA Energy Efficiency Compliance

Wall Configuration	Satisfies BCA Requirements								
	Climate Zone:	1*	2*	3*	4	5	6	7	8
Class 1 & Class 10a Minimum R-Value:		1.4	1.4	1.4	2.2	1.9	2.2	2.4	3.3
1. 250mm Block Only		Y	Y	Y	N	Y	N	N	N
2. 250mm Block + 25mm Cavity		Y	Y	Y	Y	Y	Y	N	N
3. 250mm Block + 25mm Cavity + Sarking		Y	Y	Y	Y	Y	Y	Y	N
4. 250mm Block + 25mm Cavity + 75mm PowerPanel		Y	Y	Y	Y	Y	Y	Y	N
5. 250mm Block + 40mm Cavity + R1.0 Insulation		Y	Y	Y	Y	Y	Y	Y	N
6. 250mm Block + 25mm Cavity + Double Sided RFL + 25mm Cavity		Y	Y	Y	Y	Y	Y	Y	Y
7. 250mm Block + 90mm Cavity + R2.0 Insulation		Y	Y	Y	Y	Y	Y	Y	Y

*Note: For elevated ground floor slabs an R-Value of 1.9 is required.

Table 3.2: Wall Element R-Value

System Number	Construction	Overall Thickness	R-Value	R _w	R _w + C _{tr}
401	8mm Render in Texture Coat and Paint 250mm Hebel PowerBlock + 10mm Gyprock	268 mm	2.1	48	43
402	8mm Render in Texture Coat and Paint 250mm Hebel PowerBlock + 28mm furring channels @600mm centres 10mm Gyprock	296mm	2.3	51	43
403	8mm Render in Texture Coat and Paint 250mm Hebel PowerBlock + 28mm furring channels @600mm centres Non reflective (normal sarking) 10mm Gyprock	296mm	2.3	51	43
404	8mm Render in Texture Coat and Paint 250mm Hebel PowerBlock + 28mm furring channels @600mm centres Reflective foil 10mm Gyprock	296mm	2.6	51	43
405	8mm Render in Texture Coat and Paint 250mm Hebel PowerBlock + 28mm furring channels @600mm centres with 50mm 11kg - Bradford Glasswool Non reflective (sarking) 10mm Gyprock	296mm	3.1	53	44
406	8mm Render in Texture Coat and Paint 250mm Hebel PowerBlock + 8mm Render in Texture Coat and Paint	216mm	2.1	48	43

4.0 Fire

Hebel® AAC has a BCA Group Number 1. Hebel® PowerBlock +™ walls satisfy BCA2008 Vol.2 Clause 3.7.1.5 (a) (iii) masonry construction and therefore suitable for boundary wall construction on a Class 1 building.



5.0 Acoustic

Table 5.1 provides acoustic performance levels for PowerBlock +™ walls. For alternatives and composite wall construction, Table 3.2 are acoustic performance for PowerBlock +™ systems.

Table 5.1: Acoustic Performance

PowerBlock +™ Thickness	R _w	R _w + C _{tr}
100	38	35
150	43	40
250	45	42

Values for PowerBlock +™ only, no linings.

6.0 Design Approach

There are 2 methods of construction – typical and tie-down. Typical is the most common method of building whilst the tie-down method is required for cyclonic or high wind areas (as determined by an engineer). This guide provides information for both building methods.

Important Note

It is the responsibility of the architectural designer and engineering parties to ensure that the information in the Hebel® PowerBlocks Design and Installation Guide is appropriate for the intended application. The recommendations of this guide are formulated along the lines of good building practice, but are not intended to be an exhaustive statement of all relevant data. Hebel® accepts no responsibility for or in connection with the quality of the recommendations or their suitability for any purpose when installed.

Scope

The Hebel® PowerBlocks Design and Installation Guide has been created to provide information for detached residential buildings. The design information in this guide has been condensed from the Hebel® Technical Manual and AS3700 Masonry structures. The design basis is AS3700 Masonry structures, Section 12 Simplified design of masonry for small buildings. The footing and slab design is based on AS2870 Residential slabs and footings – Construction.

Refer to Table 6.1 for Building Geometry Limitations.

Design Parameters

The structural design information in this guide is based on the data and assumptions in Table 6.2, 6.3 and 6.4.

Design Sequence

Fig. 6.1 details Hebel® recommendations for how to design a Hebel® PowerBlock +™ home.

Fig 6.1: Flow Chart

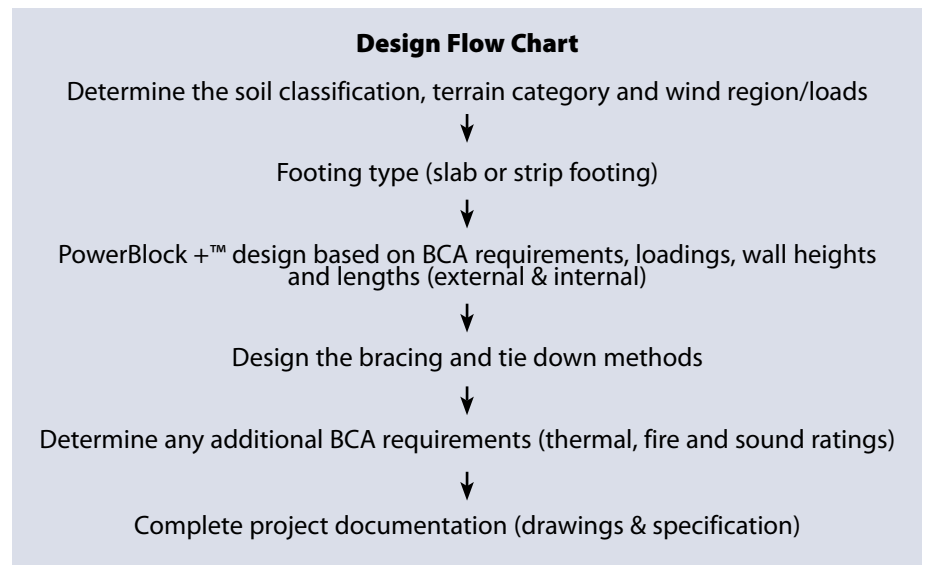


Table 6.1: Building Geometry Limitations

2 storeys max	
Max. height to underside of eaves	6.0m
Max. height to top of roof ridge	8.5m
Max. building width incl. verandah but not eaves	16.0m
Max. building length	5x width
Max. lower storey wall height	3.0m
Max. upper storey wall height	2.7m
Max. floor load width on external wall	3.0m (6.0m single span floor)
Max. roof load width on external wall	3.0m (6.0m rafter/truss span)
Max. floor load width on internal wall	6.0m

Where the building geometry is outside the above limitations, the designer must refer to the Hebel® Technical Manual and AS3700 Sections 1-11.

Table 6.2: Design Parameters

Hebel® PowerBlock +™ material properties:	
Nominal Dry Density	470 kg/m ²
Working Density (S.T.)	611 kg/m ²
Working Density (L.T.)	500 kg/m ²
Characteristic Compressive Strength, f'_m	2.25 MPa
Characteristic Flexural Tensile Strength, f'_{mt}	0.20 MPa
Characteristic Shear Strength, f'_{ms}	0.30 MPa
Characteristic Modulus of Elasticity, E_{ST}	1125 MPa
Characteristic Modulus of Elasticity, E_{LT}	562 MPa

Table 6.3 Design Parameters - Permanent and Imposed Actions

Permanent Actions (Dead Loads):	
Floor - Superimposed	1.00 kPa
Roof - Tile	0.90 kPa
Roof - Sheet	0.40 kPa
Framed Floor/Deck - Timber	0.50 kPa
Framed Deck - Tile	0.50 kPa
Pergola Roof - Tile	0.80 kPa
Pergola Roof - Sheet	0.32 kPa
Hebel® PowerFloor™ System	0.80 kPa
Hebel® Floor Panel System - 250mm	1.90 kPa
Hebel® PowerBlock +™ Wall - 250mm, 2700mm (H)	4.60 kN/m
Hebel® PowerBlock +™ Wall - 150mm, 2700mm (H)	2.76 kN/m

Imposed Actions (Live Loads): In accordance with AS 1170. 1:2002	
Floor - general	1.50 kPa
Deck	2.00 kPa

Table 6.4 Design Parameters - Wind Actions (General wall areas)

Wind Classification (AS4055)	Wind Pressure (kPa)	
	Serviceability, W_s	Ultimate, W_u
N1	0.41	0.69
N2	0.41	0.96
N3	0.61	1.50
N4	0.91	2.23
N5	1.33	3.29
N6	1.82	4.44
C1	0.61	2.03
C2	0.91	3.01
C3	1.33	4.44
C4	1.82	5.99

Image 6.1: Hebel® PowerBlock +™ home



Image 6.2: Hebel® PowerBlock +™ home



7.0 Structure

7.1 Slabs and Strip Footings

Site Classification

Site Classifications are generally carried out for new housing developments, be they part of a subdivision or an individual allotment. The purpose of the site classification is to assess the subsurface conditions and therefore enable determination of the most appropriate foundations/floor slabs (i.e. the classification will generally determine the appropriate dimensions for house footings and / or floor slabs).

Site Classification is carried out in accordance with the Australian Standard AS2870-1996: "Residential Slabs and Footings".

The available Classes include S (slightly reactive), M (moderately reactive), H (highly reactive), E (extremely reactive), or P (problem site). Classes S, M, H, and E refer generally to sites in which clayey soils will form the founding strata. The classification indicates how reactive the clay subsoil is to changes in moisture content. The reactivity (shrinking and swelling) of the clay can have a significant impact on the footings/slabs of a building slab, which need to be designed to counteract the movements of the clay soils.

Sites classified as Class P generally present difficulties for the proposed construction. The P classification more often than not suggests deep and/or uncontrolled fill, which cannot provide suitable bearing for the house. In these

situations, the house is either founded on the stable materials beneath the fill (i.e. deep footings/piers), or the fill is removed and replaced with compacted, controlled fill.

Slab Design

All Hebel® PowerBlock +™ homes must have footings and slabs designed to AS 2870 "Full Masonry". Local engineering advice should always be sought.

Fig 7.1.1 Isometric Concept House

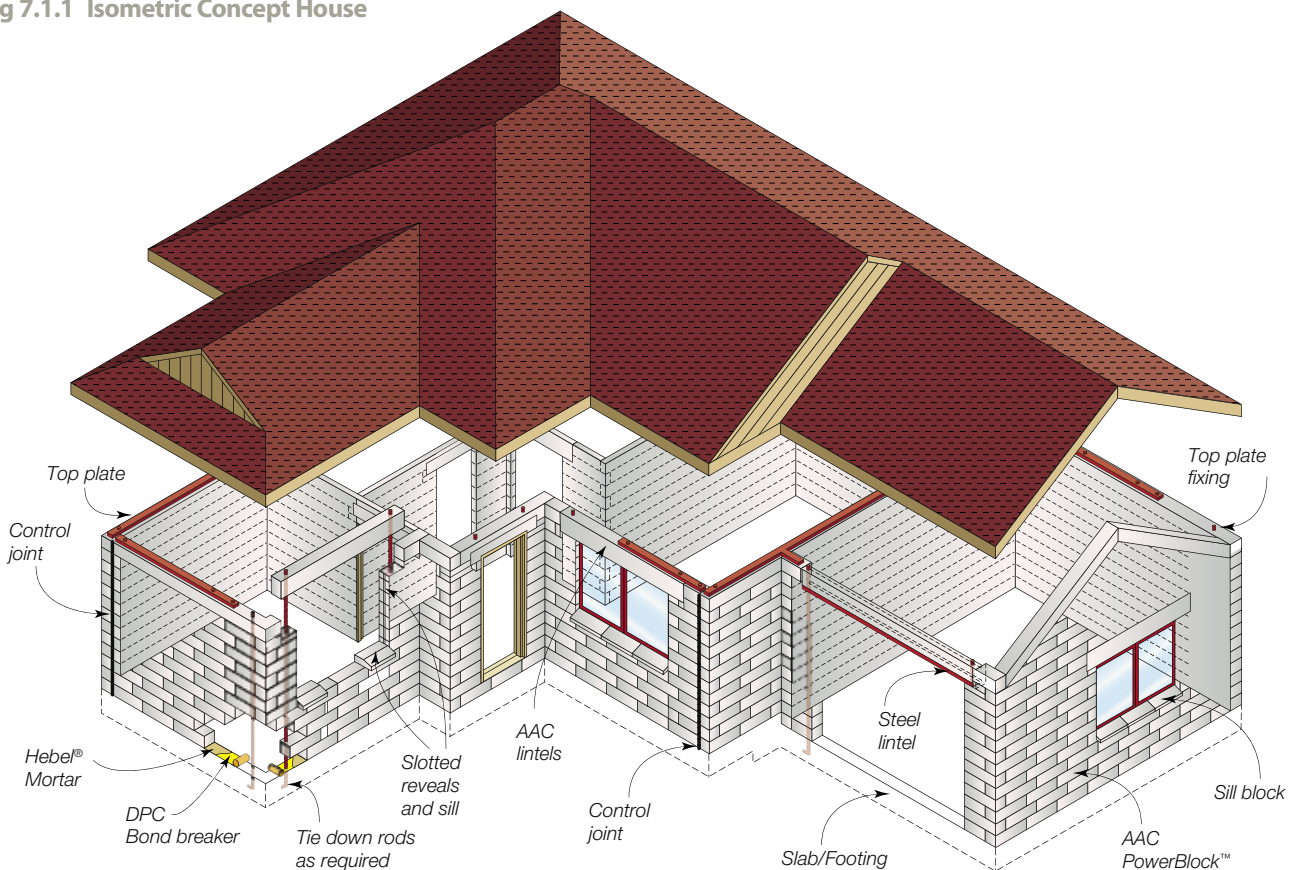


Fig 7.1.2: Slab on Ground

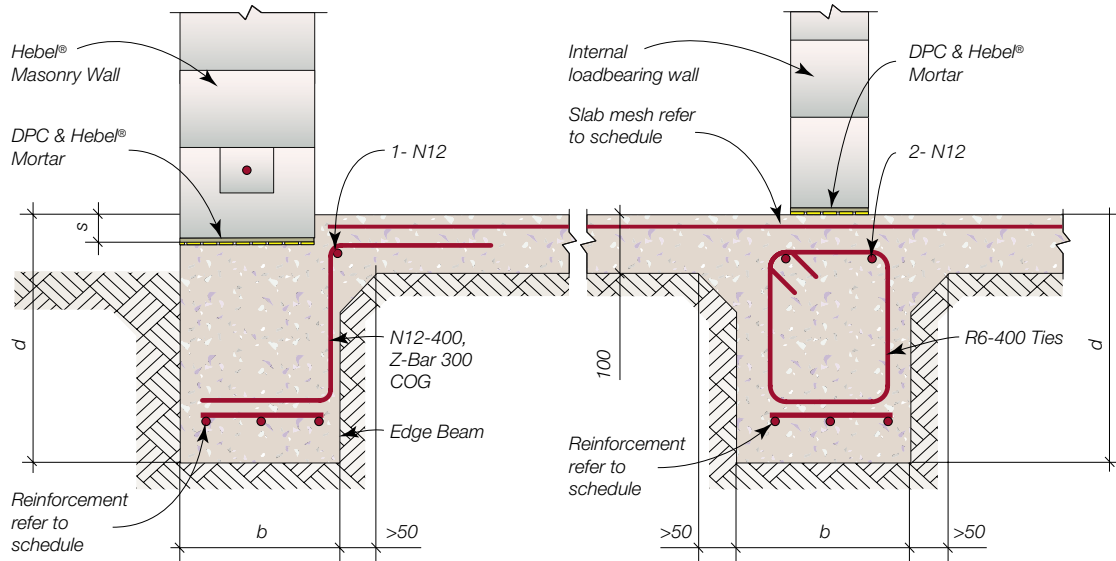


Table 7.1.1 Slab on Ground

SITE CLASS	TYPE OF CONSTRUCTION	EDGE AND INTERNAL BEAMS					SLAB MESH		
		Depth (d) mm	Bottom Reinforcement	Max. Spacing Centre to Centre (m)	Setdown (s) mm	Width (b) mm	Slab Length <18m	Slab Length <18m & <25m	Slab Length <25m & <30m
CLASS 'A'	Hebel® Masonry Wall	400	3-L8TM	-	50	350	SL72	SL82	SL92
		400	3-L8TM	-	100	350	SL72	SL82	SL92
		400	3-L8TM	-	150	400	SL72	SL82	SL92
		400	3-L8TM	-	>200	450	SL72	SL82	SL92
CLASS 'S'	Hebel® Masonry Wall	400	3-L11TM	5.0 (Note 1)	50	350	SL72	SL82	SL92
		400	3-L11TM	5.0 (Note 1)	100	350	SL72	SL82	SL92
		400	3-L11TM	5.0 (Note 1)	150	400	SL72	SL82	SL92
		400	3-L11TM	5.0 (Note 1)	>200	450	SL72	SL82	SL92
CLASS 'M'	Hebel® Masonry Wall	500	3-L12TM	4.0	50	350	SL82	SL82	SL92
		500	3-L12TM	4.0	100	350	SL82	SL82	SL92
		500	3-L12TM	4.0	150	400	SL82	SL82	SL92
		500	3-L12TM	4.0	>200	450	SL82	SL82	SL92
CLASS 'M-D'	Hebel® Masonry Wall	SITE SPECIFIC ENGINEERING REQUIRED							
CLASS 'H'	Hebel® Masonry Wall	SITE SPECIFIC ENGINEERING REQUIRED							
CLASS 'H-D'	Hebel® Masonry Wall	SITE SPECIFIC ENGINEERING REQUIRED							
CLASS 'P'	Hebel® Masonry Wall	SITE SPECIFIC ENGINEERING REQUIRED							

GENERAL NOTE: This table is to be read in conjunction with the requirements of AS2870 and AS3600.

NOTES:

1. A 10% increase in the spacing is permitted where the spacing in the other direction is 20% less than specified.
2. Where the number of beams in a particular direction satisfies the requirements of the maximum spacing given above, the spacing between individual beams can be varied provided that the spacing between any two beams does not exceed the spacing given in the above figure by 25%. These allowances for increased beam spacings do not override the maximum spacings between edge beams and first internal beams as required by clause 5.3.9.
3. For two storey timber framed floor or Hebel® floor panel construction, the width of the edge beams must be increased by 100mm and the bottom reinforcement must be increased by one bar of the same diameter.

Fig 7.1.3: Strip Footing, Double Brick Sub-Floor

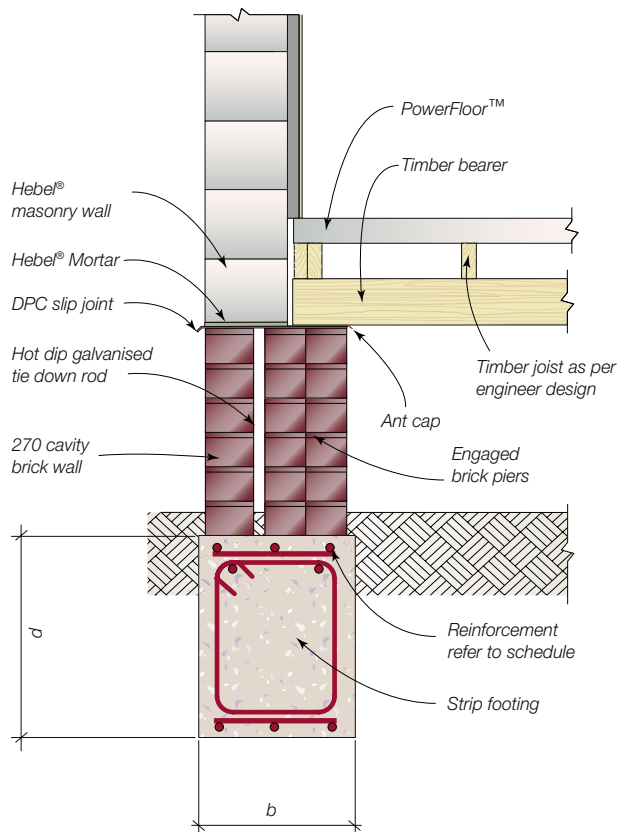


Fig 7.1.4: Strip Footing, Concrete PowerBlock +™ Sub-Floor

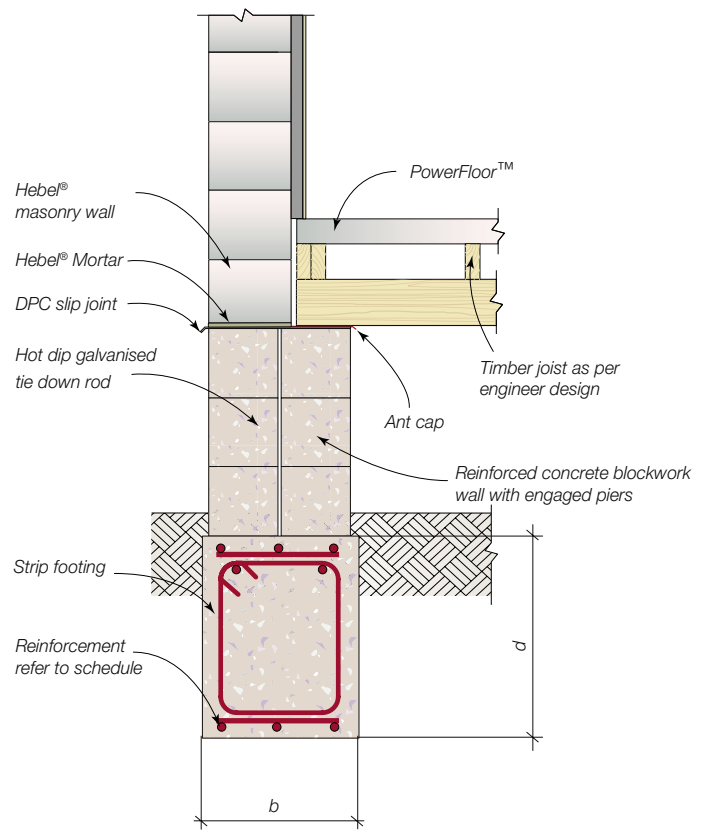


Table 7.1.2 - Strip Footing

Site Class	Type of Construction	Depth (d) mm	Width (b) mm	Reinforcement
CLASS 'A'	Hebel® Masonry Wall	300	450	4-L8TM
CLASS 'S'	Hebel® Masonry Wall	400	450	4-L11TM
CLASS 'M'	Hebel® Masonry Wall	600	450	4-L12TM
CLASS 'M-D'	Hebel® Masonry Wall	Site Specific Engineering Required		
CLASS 'H'	Hebel® Masonry Wall	Site Specific Engineering Required		
CLASS 'P'	Hebel® Masonry Wall	Site Specific Engineering Required		

GENERAL NOTE: This table is to be read in conjunction with the requirements of AS2870 and AS3600

NOTES:

- For all beams 700mm or deeper, as specified in the table above, internal footings shall be provided at no more than 6m centres, and at re-entrant corners to continue the footings to the opposite external footing.
- Internal strip footings shall be of the same proportions as the external footing and run from external footing to external footing 'side slip joints' consisting of a double layer of polyethylene shall be provided at the sides of the footing only.
- Provide ventilation to the sub-floor in accordance with the BCA.

Sub-Floors On Elevated Sites

Hebel® PowerBlock +™ must not be used at or below ground level. When building a Hebel® PowerBlock +™ structure on a sloping site that is not suitable for a concrete slab, a solid core-filled concrete block or brick substructure may be erected on a strip footing to raise the building and floor system to a level that is clear of the ground resulting in a level building platform that allows sufficient airflow under the floor.

The first course of Hebel® PowerBlocks must be laid on a DPC to stop rising damp and to act as a bond breaker between the different building elements.

Termite Protection

Hebel® PowerBlocks are not a food source for termites. Solid wall construction still requires termite protection. There are many methods to protect your home against a termite invasion and a qualified professional pest control should be consulted to

determine the most suitable method for your design.

The Building Code of Australia recognises an exposed slab edge to a depth of 75mm above finished ground level as adequate termite prevention.

For masonry sub-floor construction a continuous ant cap installed between the brick/ concrete block work and the Hebel® PowerBlock +™ also satisfies the Building Code of Australia termite protection requirements.

7.2 Hebel® PowerBlock +™ Walls

Generally, the minimum recommended wall thickness is:

- 250mm for external walls
- 150mm for internal load-bearing walls.
- 100mm for internal non-load bearing walls.

Hebel® suggests considering a wall as having top and bottom lateral restraints only (one-way vertical span) and designing the appropriate wall thickness, so that retrofitting or changing the location of the movement joints will not be detrimental to the lateral load capacity of the wall. In determining the appropriate wall thickness, the designer shall consider a range of factors relating to relevant codes and project specific considerations, these factors may include:

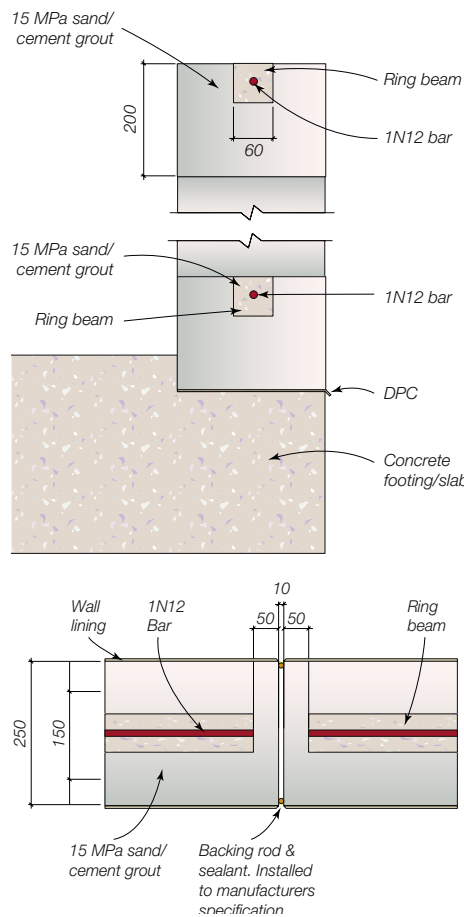
- Movement joint location
- Bracing considerations
- Vertical (compression) loading
- Out of plane wind/earthquake (lateral) loading
- Required fire rating level (FRL).

The particular project loading configurations could result in walls that exceed the above minimum requirements.

Ring Beam (for standard trussed roofs)

A ring beam must be provided at the base and top of perimeter Hebel® walls. The ring beam is 60mm x 60mm with 1N12 bar centrally located. Shear connection ties are to be placed at the location of control joints at 600mm spacings (vertically). See Fig 7.2.1 for ring beam details.

Fig 7.2.1 Typical Hebel® Ring Beam Detail



Bond Beam (for vaulted roofs)

A bond beam is a continuous beam around the perimeter of a building for the purpose of providing lateral stability and bracing to the walls for vaulted/cathedral roofs, to minimise cracking at openings. As a minimum, bond beams are to be located at the top of the walls for each floor level, or at a maximum vertical spacing of 3m. Bond beams are constructed of reinforced concrete which is poured in situ between two Hebel® PowerBlocks. The minimum dimension of the bond beam must be 100mm wide and 200mm high. Bond beam reinforcement should be not less than 2 rows of 12mm deformed bars placed top and bottom in the centre of the beam (overlapped at least 400mm where it joins).

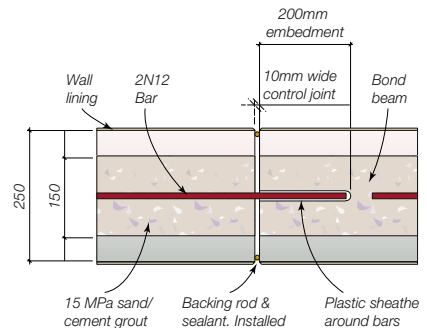
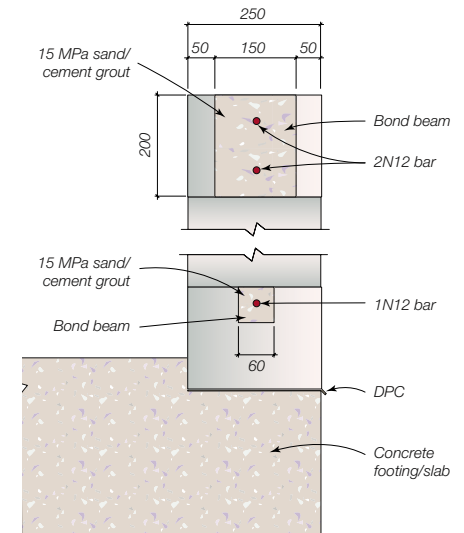
Where bond beams intersect a control joint, it is important to continue the control joint through the beam. The reinforcing bars must pass through the control joint and terminate 400mm past the joint. Where the reinforcing bars are

bridging the control joint, the bars that extend for the 400mm should be fitted into conduit sleeves to allow the wall to expand and contract without causing excessive stress on the wall.

Bond beams must be continuous around a built-in corner.

The ring beam at the base is still required. See Fig. 7.2.1.

Fig 7.2.2 Typical Hebel® Bond Beam Detail



Compression

The assessment of Hebel® PowerBlock +™ wall compression capacity in this Design and Installation Guide is based on the scope of this design guide (see Section 6.0 and Table 6.1). Three top support conditions are applicable:

- 1) Supporting concrete slab above (see Section 14 and Fig. 14.26)
- 2) Supporting floor other than concrete slab above (see Section 14 and Fig. 14.28)
- 3) Face supported framed floor (See Section 14 and Fig. 14.27)

No vertical support of the wall is considered as worst case in the compression capacity assessment. Under that constraint and for wall heights up to 3000mm:

- 250mm load-bearing external PowerBlock +™ walls have adequate compression capacity for all top support conditions.
- 150mm load-bearing internal PowerBlock +™ walls to 3000mm height have adequate compression capacity for the first two top support conditions, but is not suitable for face loaded framed floors. If face loaded timber framed floors are designed both sides of the wall, their spans are within 20% and loading is the same, this can be considered top support condition 2. Otherwise 250mm Hebel® PowerBlock +™ wall is required.

Roof loading on top of the wall through the top plate is considered top support condition 2.

Bending

250mm Hebel® PowerBlock +™ walls up to 3000mm height have adequate bending capacity without edge support in wind classifications N1 to N3.

Table 7.2.1 provides maximum wall lengths between edge restraints for wind classifications N4 to N6 and C1 to C4. Both ends of these walls must have edge support.

Edge support must be an engaged perpendicular wall (bracing wall) or a built-in 89x89x5 SHS column. The designer must detail the plate connections at the base and top of the SHS column and specify adequate ties to the Hebel® PowerBlock +™ work.

Shear

Horizontal forces, such as wind and earthquake loading, applied to a building are to be resisted by bracing walls. Bracing walls are located generally at right angles to the walls subjected to

Table 7.2.1

Wind Classification	Maximum Wall Length Between Edge Supports (m)
N4	3.4
N5	2.6
N6	2.1
C1	3.7
C2	2.8
C3	2.1
C4	1.8

these forces. All bracing components in the building shall be interconnected to adequately transfer the imposed loads to the footings.

Refer to Appendix K in AS3700 for total ultimate racking forces for houses in wind classifications up to N4/C2. Those tables are based on wall height up to 2700mm. For wall height greater than 2700mm up to 3000mm, factor up the loads by 15%. Earthquake categories H1 and H2 are covered by N3/C1 tables and earthquake category H3 is covered by N4/C2 tables.

Table 7.2.2 provides ultimate racking capacities of unreinforced 150mm and 250mm Hebel® PowerBlock +™ walls. This table does not include sliding which the designer must also check depending on compression loads on wall in all wind cases and dowel action at base of wall through hold-down rods.

Lintels General

The minimum bearing lengths at the end of all Hebel® lintels is 150mm or L/8, whichever is greatest. The bearing PowerBlock +™ must extend past the end of the lintel by min. 100mm.

Hebel® Lintels

Hebel® lintels are reinforced sections similar to panels. The lintels are used as supports over doorways, windows and other opening.

Lintels shall be installed so that the surface marked 'THIS SIDE UP' is uppermost, as the section reinforcement may not be symmetrical. Hebel® lintels are not to be cut on-site.

Table 7.2.4 presents the range of standard Hebel® lintels and the associated capabilities.

For larger spans, use structural steel lintels as designed by the project structural engineer.

Steel Lintels

Can be used to support PowerBlock +™ work above openings. refer to Tables 7.2.5 and 7.2.6.

Control Joints

During the life cycle of a building, the building and the materials that it is constructed from will move. These movements are due to many factors working together or individually, such as foundation movement (shrinkage and swelling), thermal expansion and contraction, differential movements between materials, climate and soil condition. This movement, unless relieved or accommodated for, will induce stress in the materials, which may be relieved in the form of cracking. To accommodate these movements and relieve any induced stresses, control joints (vertical gaps) shall be installed to minimise cracking in Hebel® masonry walls.

Location of Control Joints

Where control joints are required they are best positioned:

- At no more than 6m spacing unless more stringent requirements are specified in accordance with AS 2870.1996.
- At intersecting walls and columns.
- At changes of wall height or thickness, or where chases occur.
- To coincide with movement joints in adjacent elements of structure (floor or roof)

- At junctions of dissimilar materials
 - Where architectural or structural features create a 'weak' section
- Movement joints are not normally required below DPC level.

Construction of Control Joints

Straight, unbonded vertical joints are the most common type of control joint. Typically, the vertical joint is 10mm wide and filled with an appropriate backing rod and flexible sealant.

Where stability of the design requires continuity across the joint, Hebel® control joint ties should be set in every second bed joint.

Movement joints must be continuous through the entire block wall and all surface finishes. When the control joint is aligned with a window or door opening, the joint must be continuous and may need to be offset to deal with the lintel spanning the opening. In such a case a slip joint must be provided under that end of the lintel. Control joints must also be continuous through any bond beams which have been installed in the wall. This can be achieved by breaking the bond beam at this joint during its construction. To maintain lateral strength and continuity of the bond beam, the reinforcing rods should bridge the joint with one side of the beam having conduits cast in for the rods to slide while still keeping the wall in plane.

The control joints should be installed as the wall is being constructed as the joint ties must be installed in the centre of the block ensuring the tie is fully bonded with Hebel® adhesive.

Service Penetration

To penetrate services through Hebel® walls, core out an appropriate sized hole (typically 10mm larger diameter than the service) and run the service through. A flexible sealant should be used to seal the gap around the service, this will also prevent any cracking/movement issues that may occur with the stress imposed on the blocks if the services were placed hard against the Hebel® PowerBlock +™.

For penetrations through fire rated walls, an appropriate fire collar must be used with fire rated sealants. To affix the services to the Hebel® walls please refer to the fixing guide in this manual.

Chasing Services Into Hebel®

- Services should be run through cavities where possible to avoid unnecessary chasing into Hebel®.
- Where chasing is necessary some basic guidelines need to be followed.

- All Hebel® products 100mm or less must not be chased
- All chases must comply with the BCA

- The depth of the chase must not exceed 25mm
- The width of the chase must not exceed 25mm
- The maximum number of chases allowed is 2 chases per 1 metre length of wall.
- All chases must be backfilled with a material that will adhere to the wall (Hebel® Patch or a sand /cement patching mix).
- Chasing can be done with a Hebel® Hand Router or a power router fitted with dust extraction

Table 7.2.2 Unreinforced Wall

Wall Length (mm)	Ultimate Racking Capacity (kN)	
	150mm PowerBlock +™	250mm PowerBlock +™
900	-	-
1200	-	0.5
1800	1.0	1.5
2400	1.5	2.5
3000	2.5	4.0
3600	3.5	6.0
4800	6.5	10.5
6000	10.0	16.5

Table 7.2.3 Top-Plate & Hold-Down selection Table

Wind Classification	Top Plate & Hold-Down		Legend
	Tile Roof	Sheet Roof	
N1	A / B / C	B / C	A 90x45 F7 timber top plate / 700mm deep strap @ 1200mm ctrs.
N2	A / B / C	D / F	B 90x45 F17 timber top plate / 1700mm deep strap @ 2400mm ctrs.
N3	D / F	D / F	C 90x45 F17 timber top plate / Φ12mm rod @ 2400mm ctrs.
N4	D / F	D / F	D 90x45 F17 timber top plate / Φ12mm rod @ 1200mm ctrs.
N5	E / G	E / G	E 90x45 F17 timber top plate / Φ12mm rod @ 900mm ctrs.
N6	E / G	E / G	F 100x50x3.0 RHS top plate / Φ12mm rod @ 2400mm ctrs.
C1	D / F	D / F	G 100x50x3.0 RHS top plate / Φ12mm rod @ 1200mm ctrs.
C2	E / G	E / G	
C3	E / G	E / G	
C4	G	G	

Table 7.2.4: Lintel Selection – Hebel® Lintel

Opening Width (mm)	Single Storey or Upper Level of Double Storey		Lower Level of Double Storey			
			Tile Roof		Sheet Roof	
	Tiled Roof	Sheet Roof	Floor Panel	PowerFloor	Floor Panel	PowerFloor
900	A	A	A	A	A	A
1200	B	B	B	B	B	B
1500	B	B	B	B	B	B
1800	C	C	C	C	C	C
2100	D	D	D	D	D	D
2400	D	D	D	D	D	D
2700	E	E	E	E	E	E
3000	E	E	E	E	E	E
3300	-	-	-	-	-	-
3600	-	-	-	-	-	-
3900	-	-	-	-	-	-
4200	-	-	-	-	-	-

Legend (Hebel® product code)	
A	22046 + 22047
B	22038 + 22039
C	22041 + 22042
D	22043 + 22044
E	82066 + 82067

NOTE: Hebel® lintel for 250mm external wall comprises 100mm lintel on outside face and corresponding 150mm lintel on inside face. Top plate to bear across both lintels, min. 25mm bearing on 100mm lintel.

Table 7.2.5: Lintel Selection – Equal Angles

Opening Width (mm)	Single Storey or Upper Level of Double Storey		Lower Level of Double Storey			
			Tile Roof		Sheet Roof	
	Tiled Roof	Sheet Roof	Floor Panel	PowerFloor	Floor Panel	PowerFloor
900	A	A	A	A	A	A
1200	A	A	A	A	A	A
1500	A	A	D	C	D	B
1800	A	A	E	E	E	E
2100	B	A	F	E	E	E
2400	D	B	-	F	-	F
2700	E	C	-	-	-	-
3000	E	E	-	-	-	-
3300	E	E	-	-	-	-
3600	F	E	-	-	-	-
3900	-	E	-	-	-	-
4200	-	F	-	-	-	-

Legend	
A	2/100X100X6 EA
B	2/100X100X8 EA
C	2/100x100x10 EA
D	2/100x100x12 EA
E	2/150x100x10 UA
F	2/150x100x12 UA

NOTE: For unequal angles, the long leg is vertical.

Table 7.2.6: Lintel Selection – Galintel

Opening Width (mm)	Single Storey or Upper Level of Double Storey		Lower Level of Double Storey			
			Tile Roof		Sheet Roof	
	Tiled Roof	Sheet Roof	Floor Panel	PowerFloor	Floor Panel	PowerFloor
900	A	A	A	A	A	A
1200	A	A	A	A	A	A
1500	A	A	A	A	A	A
1800	A	A	A	A	A	A
2100	B	A	A	A	A	A
2400	E	D	D	D	D	B
2700	E	D	D	D	E	D
3000	E	E	E	D	E	D
3300	E	E	-	-	-	E
3600	F	E	-	-	-	-
3900	-	E	-	-	-	-
4200	-	-	-	-	-	-

Legend	
A	Multi-Rib T-Bar - 200x200x7
B	Multi-Rib T-Bar - 200x200x9
C	Traditional T-Bar - 200x10/200x10
D	Traditional T-Bar - 250x10/200x10
E	Traditional T-Bar - 250x12/200x10

7.3 Floor Panel Systems

Hebel® Floor Panels are reinforced AAC panels designed as loadbearing components in commercial, industrial and residential construction applications.

A preliminary thickness of the floor panel can be determined from table 7.3.1 in this guide. Contact your local distributor to confirm the selected floor panel thickness is adequate for the design parameters of span, load, deflection, limit and fire resistance level rating.

After the panels are laid, reinforcing bars are placed between the panels in the recess and around the perimeter of the floor to form the ring anchor system in accordance with Hebel® specifications.

The joints and ring anchor sections should be lightly pre-wetted, filled with minimum 15 MPa concrete grout, and rodded to ensure complete and level filling of the notch and groove. A mix of C1:S3:A2 (5mm maximum coarse aggregate) with 150mm slump is usually suitable. The grout should completely cover the reinforcing.

The hardness of Hebel® Floor Panels is greater than the PowerBlocks. When ring anchors are placed accurately and mortar is poured carefully and screeded properly, the surface is level and smooth.

When Hebel® panels are used in external floor areas such as patios or balconies, it is important to use an approved waterproofing membrane.

Hebel® Floor Panels provide an excellent, solid, stable base for tile, slate, marble and other hard surface flooring, including bathroom, laundry and other wet area applications.

The smooth flat surface is also perfectly suited to carpet, vinyl, timber boards, parquetry and decorative plywood flooring.

Panels in General

Panels should not be cut on site unless they are ordered as cuttable. It is preferred they are ordered from the factory at the desired length. Where panels have been cut the exposed reinforcing should be coated with Hebel® corrosion protection compound or an approved equivalent.

Hebel® panels are supplied ready for use. They can be simply and easily laid into position with only the joints needing to be mortared. Installation is therefore largely dry and generally no formwork or bracing is necessary. The reinforcing in the panels is custom designed for each project.

Panels installed on Hebel® PowerBlock +™ work or steel beans can offer a flooring system that can be laid down exceptionally fast. As well as providing the benefits of rapid construction, differential movement between floors and walls is minimised.

Framed Floors

Hebel® PowerBlock +™ construction can incorporate floor construction using joists. Typically the joists are installed onto bearing plates which distribute the floor loads evenly into the supporting blocks. Hebel® PowerBlocks are easily shaped to infill between the joists. The infill blocks will provide support for the blocks above the floor framing.

Image 7.3.1: Installed Floor Panels



Table 7.3.1: Hebel® Structural Floor Panels

With Flexible Coverings / No Walls Above (L/250 deflection)

Live Load (kPa)		Maximum Panel Length (metres)								
		1.5			2.0			3.0		
Superimposed Dead load (kPa)		0.0	0.5	1.0	0.0	0.5	1.0	0.0	0.5	1.0
Panel Thickness (mm)	150 (4.00)	4.00	3.82	3.60	3.94	3.68	3.49	3.64	3.45	3.30
	175 (4.50)	4.50	4.40	4.16	4.50	4.25	4.03	4.20	4.00	3.83
	200 (5.00)	5.00	5.00	4.73	5.00	4.83	4.60	4.78	4.56	4.38
	225 (5.50)	5.50	5.50	5.24	5.50	5.35	5.10	5.30	5.06	4.86
	250 (6.00)	6.00	6.00	5.77	6.00	5.88	5.63	5.83	5.58	5.37

With Rigid Coverings / Walls Above (L/600 deflection)

Live Load (kPa)		Maximum Panel Length (metres)								
		1.5			2.0			3.0		
Superimposed Dead load (kPa)		0.0	0.5	1.0	0.0	0.5	1.0	0.0	0.5	1.0
Panel Thickness (mm)	150 (4.00)	3.77	3.55	3.39	3.54	3.36	3.22	3.20	3.07	2.96
	175 (4.50)	4.31	4.09	3.92	4.05	3.87	3.73	3.68	3.55	3.44
	200 (5.00)	4.88	4.66	4.48	4.60	4.41	4.26	4.19	4.05	3.94
	225 (5.50)	5.42	5.18	4.98	5.11	4.91	4.75	4.66	4.51	4.39
	250 (6.00)	5.94	5.70	5.50	5.62	5.42	5.25	5.13	4.98	4.85

NOTES TO FLOOR PANEL TABLES:

- Length is calculated based on the minimum bearing.
- Minimum bearing is panel length /80 but not less than 60mm.
- Maximum clear span is panel length less than 2x minimum bearing.
- (Length) is maximum standard panel length in metres.

Image 7.3.2: Installed Floor Panels



Image 7.3.3: Installing Floor Panels



7.4 Decks, Verandahs and Pergolas

When attaching a deck, verandah roof or pergola to your Hebel® PowerBlock +™ Wall, the building designer / project engineer must calculate and determine the loads that will be imposed on the Hebel® PowerBlocks. For conditions equal to or less than those outlined in table 7.4.2, a timber or steel waling plate may be attached to the block wall as shown in Section 14 details 14.34 and 14.35. This must be affixed using the appropriate number and type of fixings as outlined in Tables 7.4.1 and 7.4.2. The fixings must be either Fischer Injection Mortar 10mm x 80mm long or Ramset Injection Mortar 12mm x 160mm long.

Where the loads that will be imposed on the waling plate exceed the table or the structure is to be detached from the Hebel® PowerBlock +™ Walls, a detached post and beam structure may be erected adjacent to the Hebel® wall which will ultimately transfer the load directly into the foundation. This type of construction must be designed and certified by the project engineer.

Table 7.4.1 Deck/Verandah Floor Walling Plate Connection

Deck Flooring Type	Maximum Anchor Spacing (mm)	
	Joist Span = 1.2m	Joist Span = 2.4
Timber	800	400
Tile	600	300

Table 7.4.2 Roof Walling Plate Connection

Wind Classification	Maximum Anchor Spacing (mm)			
	Rafter Span = 2.4m		Rafter Span = 4.0m	
	Sheet Roof	Tile Roof	Sheet Roof	Tile Roof
N1	1500	900	900	500
N2	1300	800	750	450
N3/C1	1000	650	600	400
N4/C2	700	550	400	300
N5/C3	450	400	250	250

Note: Walling plate span capacity to be checked by building designer project engineer.

Image 7.4.1: Decks, Verandahs and Pergolas



8.0 System Components

Products

Hebel® stocks many of the products and materials required to construct your Hebel® home.

Product	Description	Product	Description
	Hebel® Thermoblocks 50mm - 300mm (25mm increments)		Hebel® Adhesive 20 kg bag
	Sill blocks 600x200x50mm thick or 100mm thick, 30° slope		Used for gluing the blocks together at vertical and horizontal joints
	PowerFloor™ Panels 1800mm x 600mm x 75mm		Hebel® Mortar 20 kg bag
	Custom PowerFloor™ Panels 150mm - 250mm x 600mm by up to 6m		Used as thick bed mortar base to provide a level base for the first course
	Hebel® Lintels To suit openings up to 5m		Hebel® HighBuild™ render 20kg bag
	Stair treads 300mm x 175mm x 1m or 1.2m		Used as a preparation coat to level surface providing an even true surface
	Control joint tie Used at every third course in control joints		Hebel® Patch 10kg bag
	Sliding joint tie Fixed to RHS/SHS column every second course		Used to prepare minor chips or damage to blocks
			Corrosion Protection Paint To coat exposed reinforcement during cutting

9.0 Construction Notes

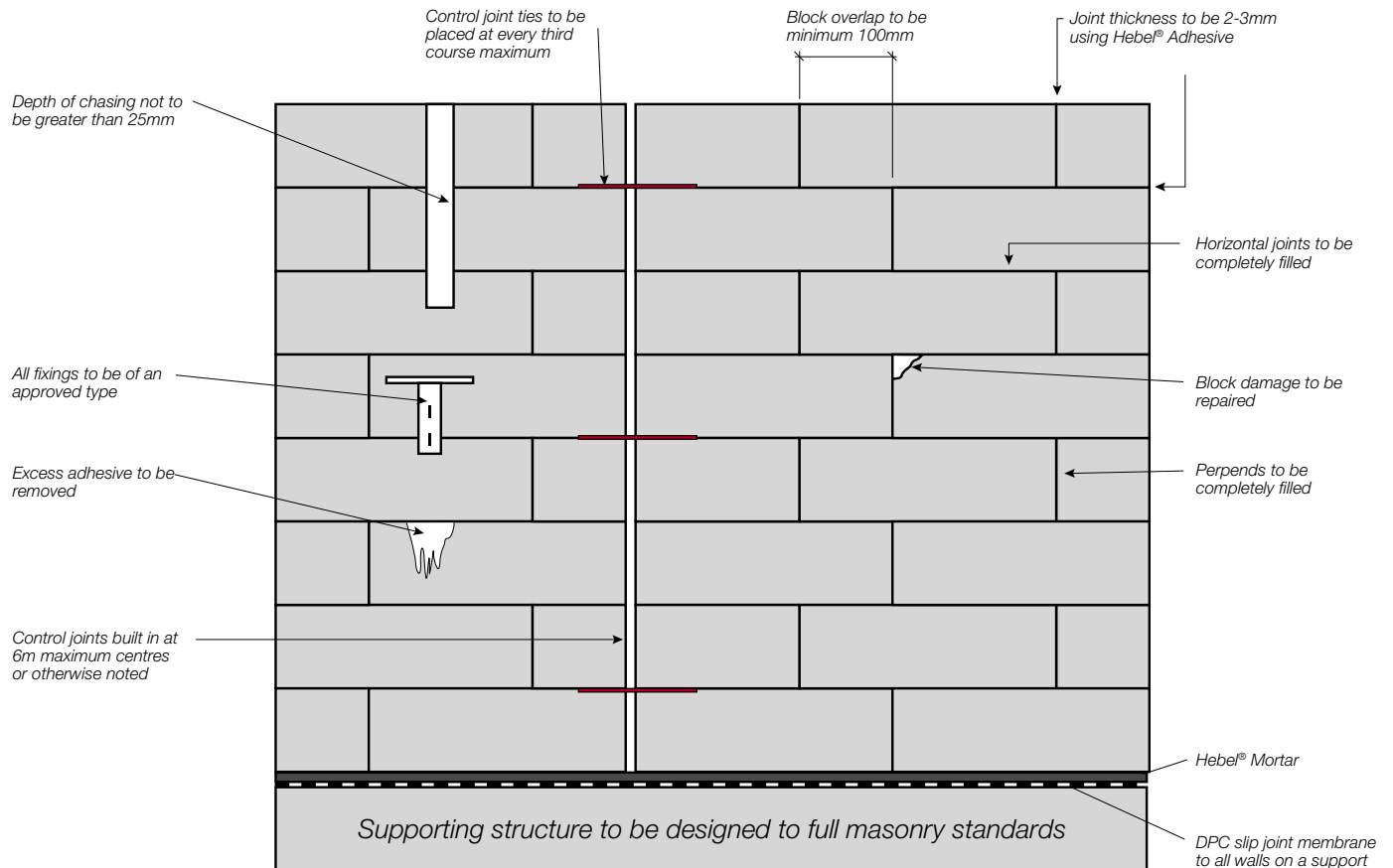
General Notes

1. These notes and details are to be read in conjunction with the project's contract documentation.
2. All materials and workmanship shall be in accordance with this Installation Guide, the current edition of the Hebel® Technical Manual and other Hebel® documentation.
3. Refer to architectural drawings for all setting out dimensions.
4. Do not scale drawings, use written dimensions.
5. Should any omission, penetration, cutting of panels, discrepancy or fault exist, contact the designer
6. All load-bearing walls, bearing on Hebel® floor panels, shall be supported separately in accordance with the project engineer's design.
7. Hebel® accepts no responsibility for the design or selection of supporting walls, lintels, beams, columns or other structural members.
9. Corrosion protection of all structural steelworks shall be specified by the project engineer or architect.
10. The temporary restraint of walls is the responsibility of the builder or installer.
11. PowerBlocks on site should be protected against rain and water saturation. This can best be achieved by leaving the shrink-wrap cap on the top of pallets and covering the top of blockwork if rain threatens. PowerBlocks should not be laid in the rain.

IMPORTANT

12. Ensure engineering tie-down rods are present and located in accordance with the engineer's documentation.
13. Ensure control joint locations are marked out in accordance with the engineering documentation.

Fig 9.1: Wall Construction Diagram



Coatings

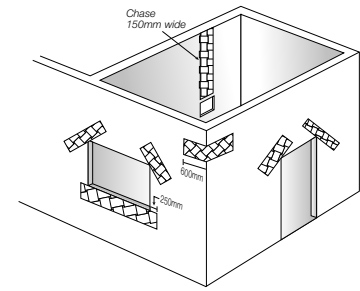
Table 9.1 details Hebel® recommendations for Coating System options for Low Rise and Detached Residential construction to deliver a durable, monolithic appearance.

Hebel® and Dulux® AcraTex® have developed coating systems designed specifically for the Hebel® AAC substrate and warrant these systems for 7 years. Performance requirements for alternate system options are provided. In such circumstances, the project specifier must satisfy themselves that systems are engineered and suitable for relevant project requirements.

General purpose, site or pre-bagged sand and cement renders must not be used on Hebel® PowerBlock +™ walls, owing to potential variability and unsuitability of formulation for Autoclaved Aerated Concrete (AAC).

Conventional exterior low build paint systems must not be used, as their ability to accommodate normal expansion and contraction in order to maintain a crack free protective layer is not assured.

Refer to “High Performance Coating Systems” brochure on the website, for more information.



Reinforcing Mesh Installation

Fully meshing all rendered Hebel® surfaces using alkali-resistant glassfibre mesh is recommended to assist in maintaining render integrity and minimising consequential cracking. The minimum requirement is to mesh at corners of wall openings (doors and windows) to minimise corner cracking. The mesh should be embedded into the wet first pass of Hebel® HighBuild™.

Linings

Plasterboard can be direct fixed to internal Hebel® PowerBlock +™ walls. It is recommended that battens be used behind plasterboard linings on the inside surface of external walls. Fibre Cement sheet linings must be installed on battens.

Table 9.1 Coating systems for Hebel® PowerBlock +™

				Primer		Acrylic Texture Body Coat		Finish Coats		
Hebel® Product	Finish Style	Surface Alignment	Base Render or Levelling Coat	Product Description & Performance Guide	Dulux® AcraTex® Specification	Product Description & Performance Guide	Dulux® AcraTex® Specification	Product Description & Performance Guide	Dulux® AcraTex® Specification	Comment
Power-Block™	Uniform Sand Texture profile	≤3mm	Hebel® HighBuild™ (Render)	Relevant to coatings supplier recommendations	AcraPrime 501/1	OPTION 1: 1-2mm Acrylic Texture Trowel applied Type: AS4548.4 Polymer content (dry): 9% min.	Tuscany or Coventry Coarse	Elastomeric Membrane Type: AS4548.1 Min DFT: 150 micron	AcraShield Matt or Elastomeric 201	2nd coat Elastomeric Membrane recommended dependant on project complexity eg. unbroken broadwall, scaffolding or cutting in detail and coastal areas.
						OPTION 2: Dependant on specifier approval: Sponge finishing of Hebel® HighBuild™ to a project approved standard; plus Elastomeric Membrane finishing system.		Elastomeric Membrane Type: AS4548.1 Min. DFT: 250 micron	Elastomeric 201	Hebel® recommends the installation of 1-2mm Acrylic Texture Coat over the render base coat providing improved consistency of finish, system flexibility and durability.

PowerBlock +™ Laying Procedure

1. First Course

- a. Mix Hebel® Mortar according to the directions on the bag.
- b. Mix Hebel® Adhesive according to the directions on the bag.
- c. Lay a DPC (damp proof course) slip joint membrane at the base of all external and internal walls to allow for differential movement between the blocks and the slab/footing. Cut the DPC around tie rods as required. The DPC must be installed on the slab/footing prior to the application of Hebel® Mortar.
- d. Lay Hebel® Mortar to get first course level and plumb. Accurately position a block and tap into place with a rubber mallet. Ensure that the block is level in all places.
- e. All loose particles and dust must be brushed from the base and vertical end surfaces of all first course blocks before bedding in Hebel® Mortar and applying Hebel® Adhesive.
- f. Apply Hebel® Adhesive to the perpend of the base blocks using a Hebel® notched trowel that matches the block thickness. Ensure full width coverage with 2-3mm final joint thickness.
- g. Position the next block vertically adjacent the first block. Place the block down into position and gently tap the block end horizontally with a rubber mallet to fully close the vertical joint.
- h. Tap the block vertically into the base mortar and level with the first block.
- i. Repeat until the first course is complete.
- j. Bore holes in blocks for tie-down rods using a 40-50mm auger bit and place over rods where required. Rod must be central in hole.

2. Second and Subsequent Courses

- a. All loose particles and dust must be brushed from the top of the first course before applying Hebel® Adhesive.
- b. Apply Hebel® Adhesive to the horizontal surface using a Hebel® notched trowel that matches the block thickness.
- c. Overlap the block joints a minimum of 100mm over joints in the previous course. Normal practice is to overlap by thickness of the intersecting wall.
- d. Install wall ties where required, locating centrally across block thickness and bed into the Hebel® Adhesive.
- e. Position the first block in the second course and gently tap accurately into place with a rubber mallet. Joints must be 2-3mm thick.
- f. Apply Hebel® Adhesive to the perpend of the first block. Position the next block vertically adjacent the first block. Place the block down into position and tap the end with the rubber mallet to fully close the perpend joint. Joints must be 2-3mm thick.
- g. Tap the top of the block until level with the previous blocks laid.
- h. Repeat for subsequent blocks.
- i. Excess adhesive should be cleaned off the block face at the end of each course within 1-2 hours.
- j. Large holes can be patched using Hebel® Patch in accordance with the directions on the bag.
- k. Bore holes in blocks for tie-down rods using a 40-50mm auger bit, and place over rods where required. Rod must be central in hole.
- l. Where required construct a bond beam in the top course of loadbearing walls. Minimum dimension is 100mm wide x 200mm high. Use minimum 50mm thick blocks each

side to form up bond beam. Reinforcement to be minimum 2x N12 deformed bars. Refer to Floor Panel Note 2 for grout specification.

- m. Where required construct a ring beam in the top course of the non-loadbearing walls. Cut/rout 60mm x 60mm recess and place 1x N12 deformed bar centrally. Refer to Floor Panel Note 2 for grout specification.

3. Finishing

- a. Ensure that all perpends are completely filled with Hebel® Adhesive.
- b. Ensure holes and chips are completely filled with Hebel® Patch. Sand back level.
- c. Clean off any remaining Hebel® Adhesive runs.
- d. The blocks can be sanded when dry to ensure a good surface is presented for surface coatings.

4. Base Rendering and Sealants

- a. Mix up Hebel® HighBuild™ render in accordance with the instructions on the bag
- b. Apply alkali-resistant glass fibremesh at corners of wall openings (doors and windows) to minimize corner cracking. The mesh should be embedded into the wet first pass of Hebel® HighBuild™.
- c. Hebel® HighBuild™ should be applied with a hawk and trowel with minimal thickness of 6mm. General purpose, site or pre-bagged sand and cement renders must not be used on Hebel® Autoclaved Aerated Concrete
- d. Render must be stopped at control joints to allow the joint to open/close and function correctly

- e. All control joints and gaps between blockwork and framing around windows must be caulked with an appropriate flexible sealant
- f. Install backing rods approx 10mm from surface
- g. Apply primer to the surfaces
- h. Installed sealants to manufacturer's specifications

5. Coatings for External Walls

- a. Coatings must comprise a high build acrylic texture coat and finish elastomeric paint membrane
- b. Conventional exterior low build paint must not be used
- c. Allow Hebel® HighBuild™ to fully cure (approx 24 hours depending on weather conditions)
- d. Apply primer to the Hebel® HighBuild™
- e. Apply texture body coat such as Dulux® AcraTex®. Ensure texture coat stops at control joints.
- f. Apply finishing sealants in control joints
- g. Apply first finishing paint elastomeric paint membrane
- h. Apply second coat of elastomeric paint membrane as required
- i. Refer to manufacturer's guideline for coating on AAC PowerBlock +™ work and Hebel® HighBuild™

6. Internal Linings

- a. Plasterboard can be direct fixed to internal Hebel® PowerBlock +™ walls.
- b. It is recommended that battens be used behind plasterboard linings on the inside surface of external

Hebel® PowerBlock +™ walls.

- c. Fibre cement sheet linings can not be direct fixed to Hebel® PowerBlocks. Installed fibre cement sheets linings on battens
- d. Hebel® HighBuild™ render may be directly applied to internal block walls as per pervious instructions.

Floor Panel Notes

1. The ring anchor reinforcement shall be a minimum of N12 grade in accordance with AS1302, unless noted otherwise by the project engineer.
2. Hebel® Mortar should be used as grout for the ring anchor system. A nominal composition of 1 Cement: 4 Sand (5mm maximum coarse aggregate) can also be used. Minimum compression strength of $f'_{cg} = 15\text{MPa}$ at 28 days.
3. Additives to reduce the grout shrinkage shall only be used in accordance with the manufacturer's instructions.
4. The installer shall support (chair) reinforcement to enable grout to fully surround the reinforcement. Reinforcement shall not be in contact with the panel when grout is placed.
5. Grout shall be rodded to ensure complete filling of notch and groove.
6. The installer shall provide notch and groove at panel joints as per Hebel® standard detail 5.3.5 on page 7.60 in the Hebel® Technical Manual..
7. Ensure notch is cleared of all loose material and reinforcement cleaned of all foreign material.
8. Lightly pre-wet notch prior to pouring the grout.
9. Panels shall only be cut on-site as

indicated on the engineer's drawings, otherwise contact your distributor or sales representative.

10. Propping of panels may be required to accommodate minor misalignments until 3 days after ring anchor grout is poured.
11. All propping shall be removed from Hebel® Floor Panels before any walls are erected over.
12. Traffic on floor panels is to be avoided for a period of 3 days after the ring anchor grout is poured.
13. All panel dimensions are the responsibility of Hebel's client and are subject to approval by the client before commencing manufacture of panels.

10.0 Tools & Equipment for Construction

Hebel® PowerBlocks can be laid using construction tools/equipment.

String Line – A string line is required to accurately set out and lay Hebel® PowerBlock +™ Walls.

Brick/Blocklaying Profiles – used to gauge the block course are being laid level.

Mixing Bucket – a minimum 20 litre bucket is required for mixing Hebel® Mortar, Hebel® Adhesive and Hebel® HighBuild™ render.

Electric Drill – an electric drill is required to mix the Hebel® Mortar, Hebel® Adhesive and Hebel® HighBuild™ render. It is also used to drill clearance holes in the blocks so they can be placed over the tied down rods where required.

Stirrer – fitted to the electric drill, the stirrer is used to mix the Hebel® Mortar, Hebel® Adhesive and Hebel® HighBuild™ render inside the mixing bucket.

Notched Trowel – the notched trowel is used to apply the Hebel® Adhesive to the Hebel® surfaces. The width of the trowel must match the block thickness to ensure the adhesive is applied with full and even coverage.

Rubber Mallet – a rubber mallet is required to 'tap' the Hebel® PowerBlocks onto the adhesive and into place.

Spirit Level – required to install the blocks level and plumb.

Hand Saw – a Hebel® handsaw can be used to cut Hebel® PowerBlocks to length and height.

Powered Bandsaw – a bandsaw is ideal for cutting Hebel® PowerBlocks. (perfect when there are many site cuts to be performed).

Hebel® Square – a purpose built square is available for use when marking and cutting Hebel® PowerBlocks.

Steel, Plastic and Timber Trowels – these trowels may be required for the installation of the Highbuild render and texture coatings.

Sanding Float – used to even out inconsistencies in the Hebel® PowerBlock +™ Wall in preparation for render/texture coats.

Hebel® Hand Router – may be used to chase services into solid Hebel® walls.

Circular Saw – (fitted with a diamond blade) may be used to chase services into solid Hebel® walls.

Electric Router – may be used to chase services into solid Hebel® walls.

Crane – may be required to lift large Hebel® Lintels and Hebel® custom floor panels.

Lifting Grabs – required for use in conjunction with crane for lifting Hebel® lintels and custom floor panels.

Scaffold – Scaffold is required when building block walls. The amount of scaffold depends on the height of the walls.

Sealant Gun – required to fill the control joints in the Hebel® PowerBlock +™ Walls.

Image 10.1: Hebel® tools



11.0 Fixings for use with Hebel®

LIGHT DUTY UP TO 20 kg Door bell, light fittings, taps			
Product	Diameter	Length	Max. Load
Coarse thread screw	10 - 12g	50mm	25kg
Mungo Nylon Plug - MN4	4mm	20mm	2kg
Hilti impact anchor - HPS-1	5mm	30mm	3kg
Mungo Nylon Plug - MN5	5mm	25mm	4kg
Hilti impact anchor - HPS-1	6mm	40mm	4kg
Ramset Ramplug - nylon	5mm	25mm	5kg
Mungo Nylon Plug - MN6	6mm	30mm	6kg
Hilti impact anchor - HPS-1	6mm	50mm	6kg
Mungo Nylon Plug - MN7	7mm	35mm	7kg
Ramset Ramplug - nylon	6mm	30mm	8kg
Fischer - 4 expansion plug	8mm	40mm	8kg
Mungo Nylon Plug - MN8	8mm	40mm	9kg
Ramset Ramplug - nylon	7mm	35mm	12kg
Ramset Ramplug - nylon	8mm	40mm	16kg
Ramset Ramplug - long	6mm	55mm	16kg
Mungo Nylon Plug - MN10	10mm	50mm	20kg
Tox TFS-L fixings	6mm	50mm	20kg

HEAVY DUTY 50kg - 120kg Grab rails, hose reels			
Product	Diameter	Length	Max. Load
Hilti-RE500 Injection adesive	8mm	80mm	50kg
Fischer Turbo plug	8mm	50mm	58kg
Mungo Nylon plug - MN16	16mm	80mm	60kg
Hilti-RE500 Injection adesive	10mm	90mm	70kg
Fischer Turbo plug	10mm	60mm	74kg
Hilti-RE500 Injection adesive	12mm	110mm	90kg
Mungo Nylon plug - MN20	20mm	90mm	100kg
Mungo Nylon Frame anchor	10mm	80mm	110kg
Mungo Nylon Frame anchor	10mm	100mm	110kg
Mungo Nylon Frame anchor	10mm	120mm	110kg
Mungo Nylon Frame anchor	10mm	200mm	110kg
Ramset Injection Mortar	10mm	130mm	120kg
Tox-KD-DV Heavy D Toggle	10mm	100mm	120kg
Tox-KD-DV Heavy D Toggle	10mm	200mm	120kg
Fischer Injection Mortar	8mm	80mm	121kg
Fischer Injection Mortar	10mm	80mm	125kg
Ramset Injection Mortar	12mm	160mm	125kg

MEDIUM DUTY 20-50 Large light fittings			
Product	Diameter	Length	Max. Load
Ramset Ramplug - long	8mm	65mm	22kg
Ramset Ramplug - nylon	10mm	50mm	25kg
Fischer 4 expansion plug	10mm	50mm	25kg
Fischer twist plug GB	8mm	50mm	25kg
Fischer Universal Frame fix	10mm	50mm	25kg
Tox Metal claw plug	6mm	32mm	25kg
Ramset Ramplug - long	10mm	80mm	27kg
Ramset Ramplug - long	12mm	95mm	28kg
Powers Zip-it	6mm	30mm	28kg
Hilti Frame anchor - HRD-U	10mm	80mm	30kg
Hilti Frame anchor - HRD-U	10mm	100mm	30kg
Tox-VLF Frame fixings	6mm	70mm	30kg
Ramset Ramplug - nylon	12mm	60mm	35kg
Tox Metal claw plug	8mm	60mm	35kg
Mungo Nylon plug - MN12	12mm	60mm	40kg
Fischer twist plug GB	10mm	55mm	40kg
Tox TFS-L fixings	8mm	70mm	40kg
Tox-VLF Frame fixings	8mm	100mm	40kg
Fischer Turbo plug	6mm	50mm	44kg
Mungo Nylon plug - MN14	14mm	70mm	50kg
Tox TFS-L fixings	10mm	70mm	50kg
Tox-VLF Frame fixings	10mm	135mm	50kg

For further information on fixings for Hebel®, refer to the Hebel® Fixing Guide, Section 8 in the Hebel® Technical Manual, available on the website: hebelaustralia.com.au

12.0 PowerBlock +™ Handling

Manual Handling

To minimise the possibility of manual handling injuries, Hebel® suggests the following:

- Use mechanical aids, such as trolleys, forklifts, cranes and levers, or team lifting to move Hebel®.
- Keep the work place clean to reduce the risk of slips, trips and falls, which can cause injury.
- Plan the sequence of installation to minimise panel movements and avoid awkward lifts.
- Good lifting techniques to be adopted to minimise the risk of injury.

Mechanically Assisted Handling

Moving and handling Hebel® Floor Panels and Hebel® Lintels should be done using mechanical aids such as forklifts, cranes and special panel lifting trolleys. Different panel lift attachments are available for installing panels. For purchasing or hire of these devices please contact CSR Panel Systems.

Health, Safety & Personal Protective Equipment (PPE)

Hebel® AAC products are cement-based, which may irritate the skin, resulting in itching and occasionally a red rash. The wearing of gloves and suitable clothing to reduce abrasion and irritation of the skin is recommended when handling Hebel® AAC products.

Approved respirators (AS/NZS1715 and AS/NZ1716) and eye protection (AS1336) should be worn at all times when cutting and chasing. Refer to the Hebel® Material Safety Data Sheets (MSDS).

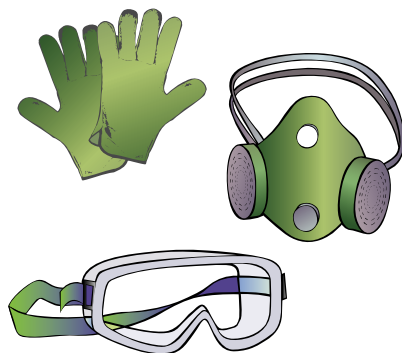
For further information contact CSR Panel Systems or visit the website: hebelaustraliacom.au.

Cutting

The use of power tools when cutting masonry products may cause dust, which contains respirable crystalline silica, with the potential to cause bronchitis, silicosis and lung cancer after repeated and prolonged exposure. When using power or hand tools, on Hebel® products, wear a P1 or P2 respirator and eye protection. When cutting, routing or chasing Hebel® products with power tools, use dust extraction equipment and wear appropriate hearing protection. Refer to the appropriate Hebel® MSDS. For further information, contact CSR Panel Systems or visit the website: hebelaustralia.com.au

Reinforcement exposed during cutting is to be coated with a liberal application of Hebel® corrosion protection paint.

Fig. 12.1 Standard personal protection equipment.



13.0 Delivery & Storage

PowerBlock +™ Delivery

PowerBlock +™ pallets should be unloaded and moved with only approved lifting devices. Before use, the lifting devices should be checked for the required lifting tags. PowerBlock +™ pallets should be unloaded and stored as close to the intended installation area as possible. This will increase work efficiency and minimise the need for secondary lifting.

It is good practice to inspect the delivery for damaged blocks. Unnecessary handling will increase the risk of damage to the Hebel® PowerBlocks.

Care should be taken when cutting the packaging straps, blocks may come away and cause injury or become damaged.

TIP - When a block is damaged it may be possible to cut away the damaged section and use the remaining portion in the wall.

Storage

All materials must be kept dry and preferably stored undercover. Hebel® PowerBlocks should be left on their pallet until they are required. Place the pallet on a level and stable surface. The project engineer should be consulted as to the adequacy of the structure to support Hebel® PowerBlocks if they are not stored directly on the ground or concrete slab.

14.0 Construction Details (Typical)

Base of Wall

Fig 14.1 Hebel® PowerBlock +™ work on Stiffened Raft Slab Foundation (elevation)

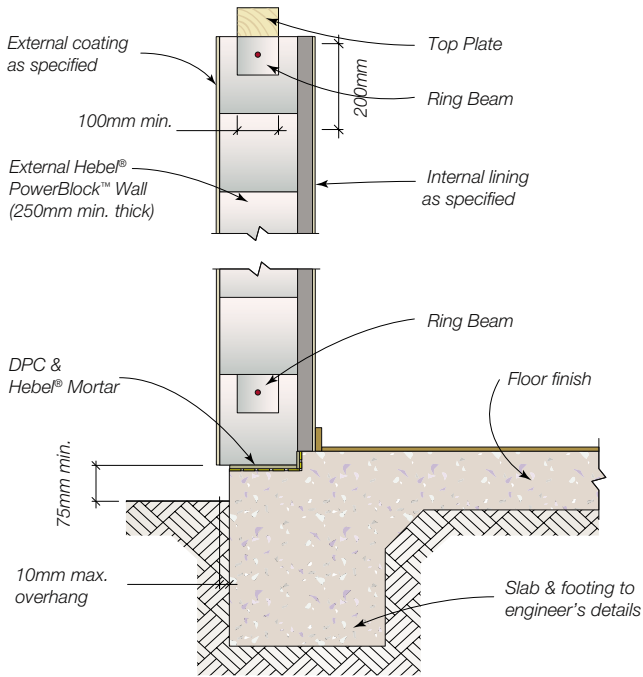


Fig 14.3 Internal Load Bearing Hebel® PowerBlock +™ work on stiffened raft slab foundation (elevation)

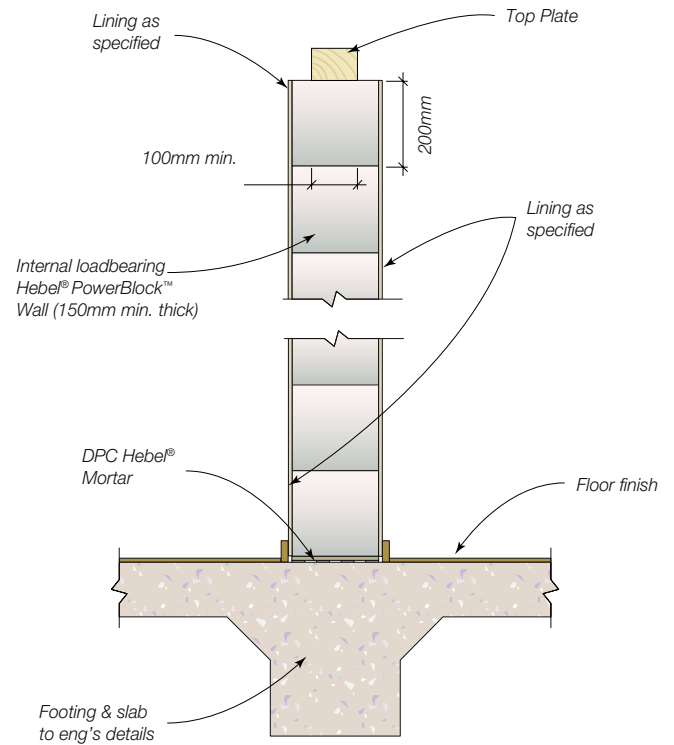


Fig 14.2 Hebel® PowerBlock +™ work showing infill block to slab rebate (elevation)

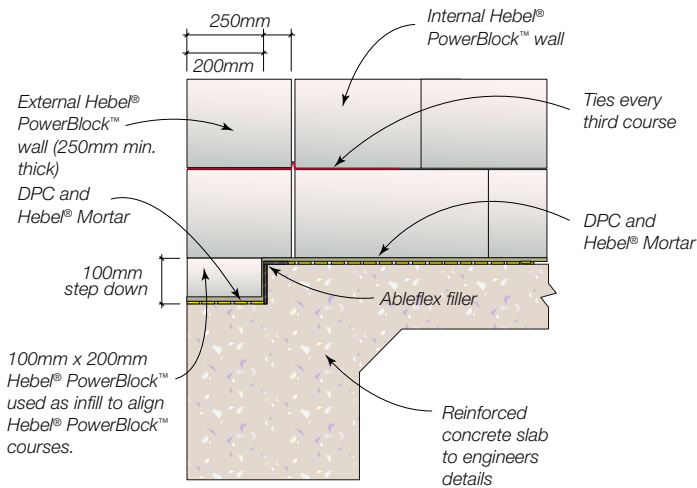


Fig 14.4 Concrete PowerBlock +™ Sub-Floor Detail (elevation)

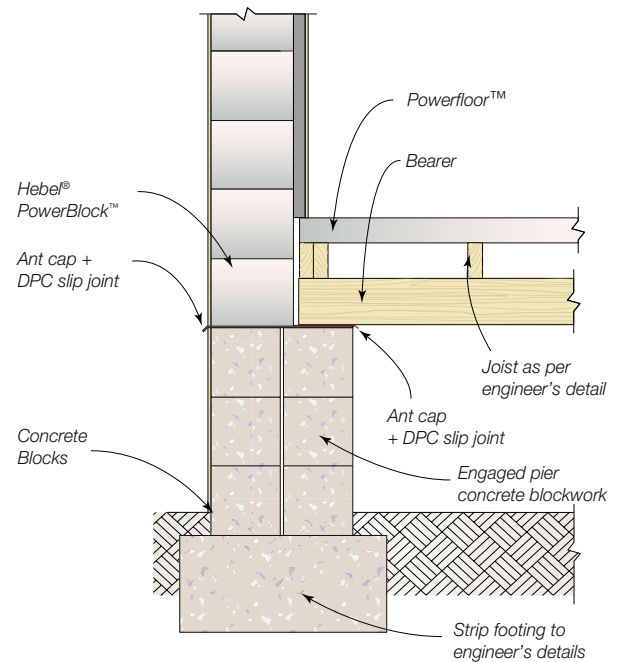


Fig 14.5 Roof Top to Plate Fixing to Hebel® Wall - Strap (elevation) - for vaulted/cathedral roofs

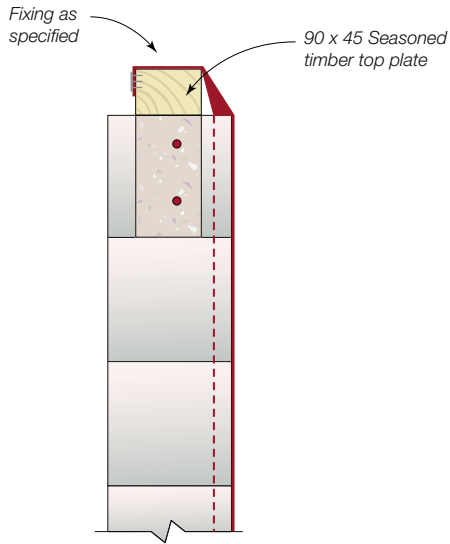


Fig 14.6 Roof Top to Plate Fixing to Hebel® Wall - Strap (elevation) - for typical trussed roof

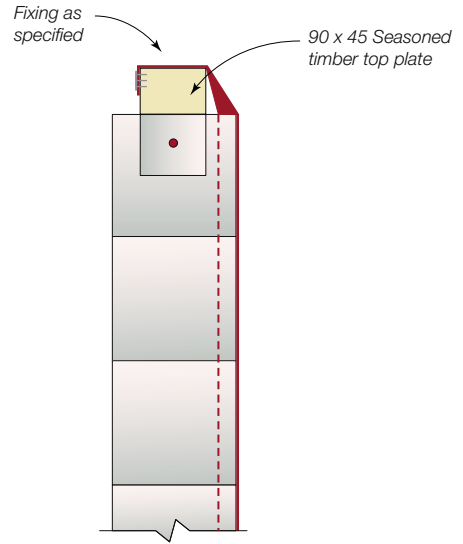


Fig 14.7 Strap Fixing to Hebel® Walls (isometric - typical trussed roof)

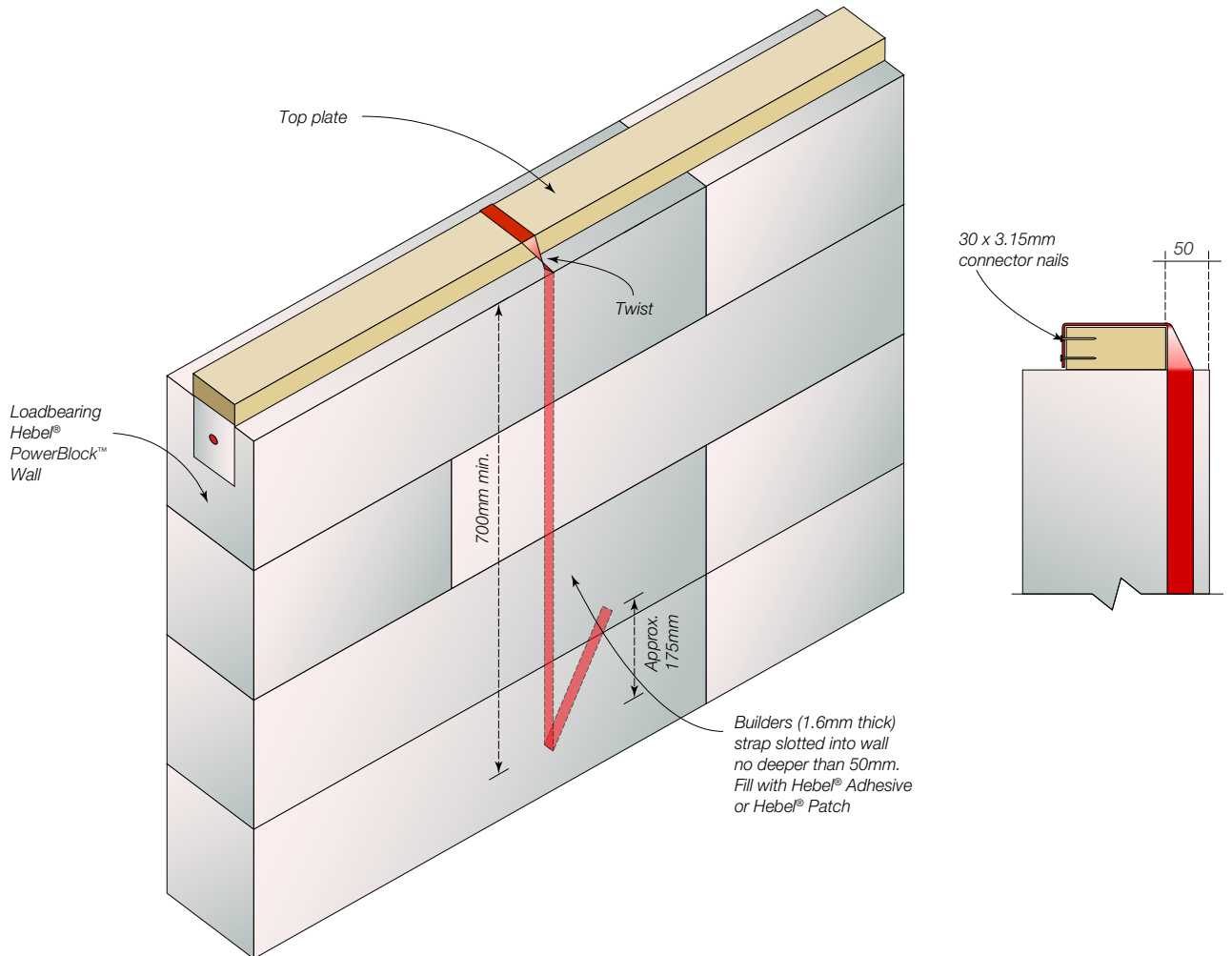


Fig 14.8 Double Brick Sub-Floor Detail (elevation)

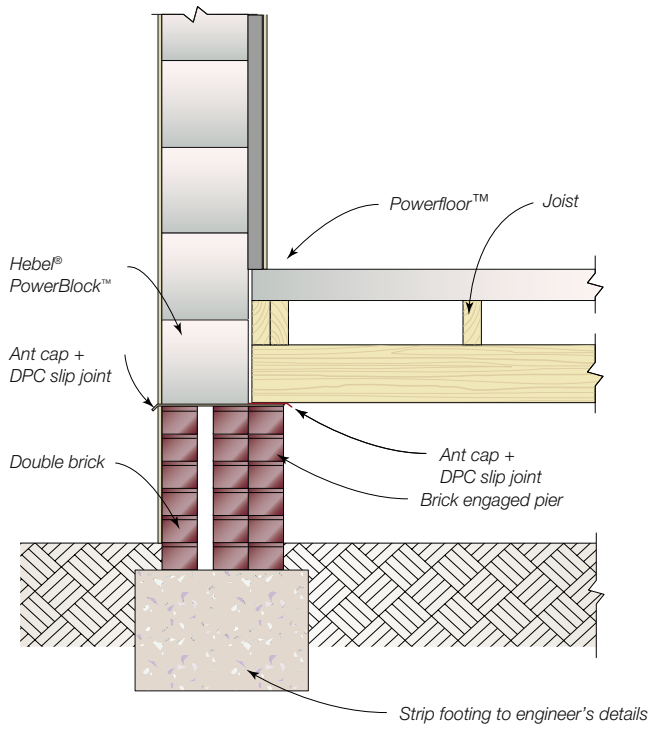
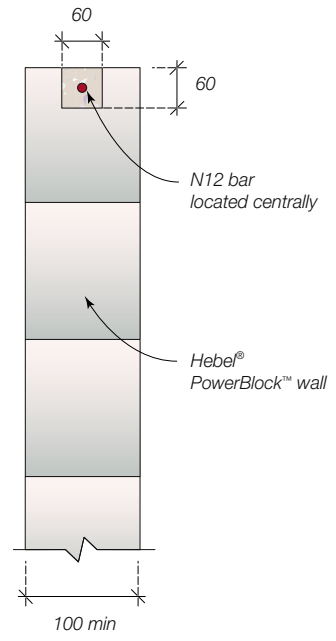


Fig 14.9 Ring Beam Internal Non-Loadbearing Wall (elevation)



Top of Wall

Fig 14.10 Internal Hebel® Load Bearing Wall and Timber Floor Frame Junction (elevation)

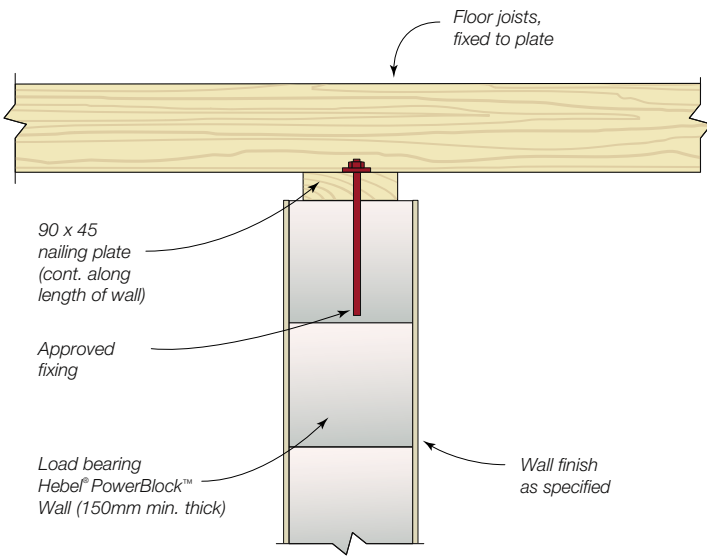


Fig 14.12 Timber Truss/Joist Fixed to Hebel® Walls (elevation)

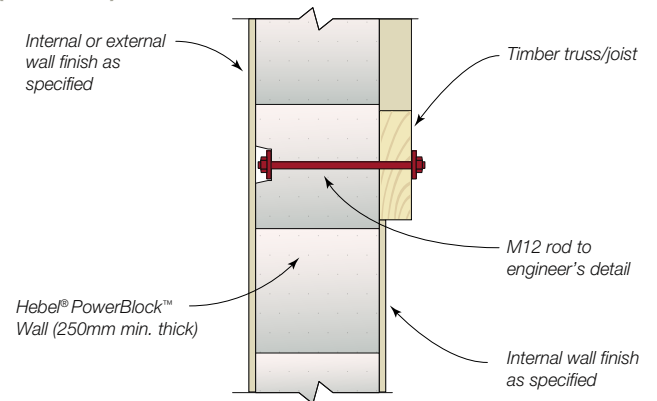


Fig 14.11 Truss Spanning Over Non-Load Bearing Hebel® Walls (elevation)

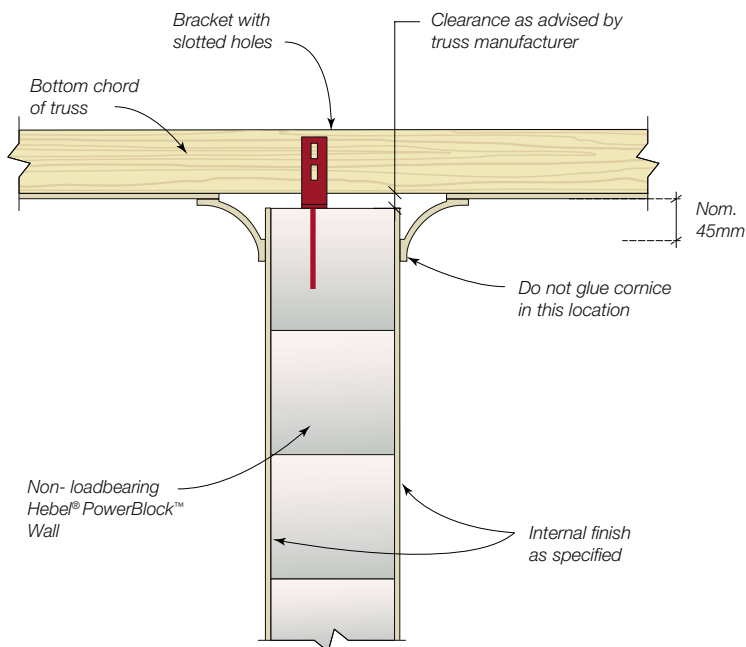


Fig 14.13 Tiled Roof Eave and Hebel® Wall Junction (elevation)

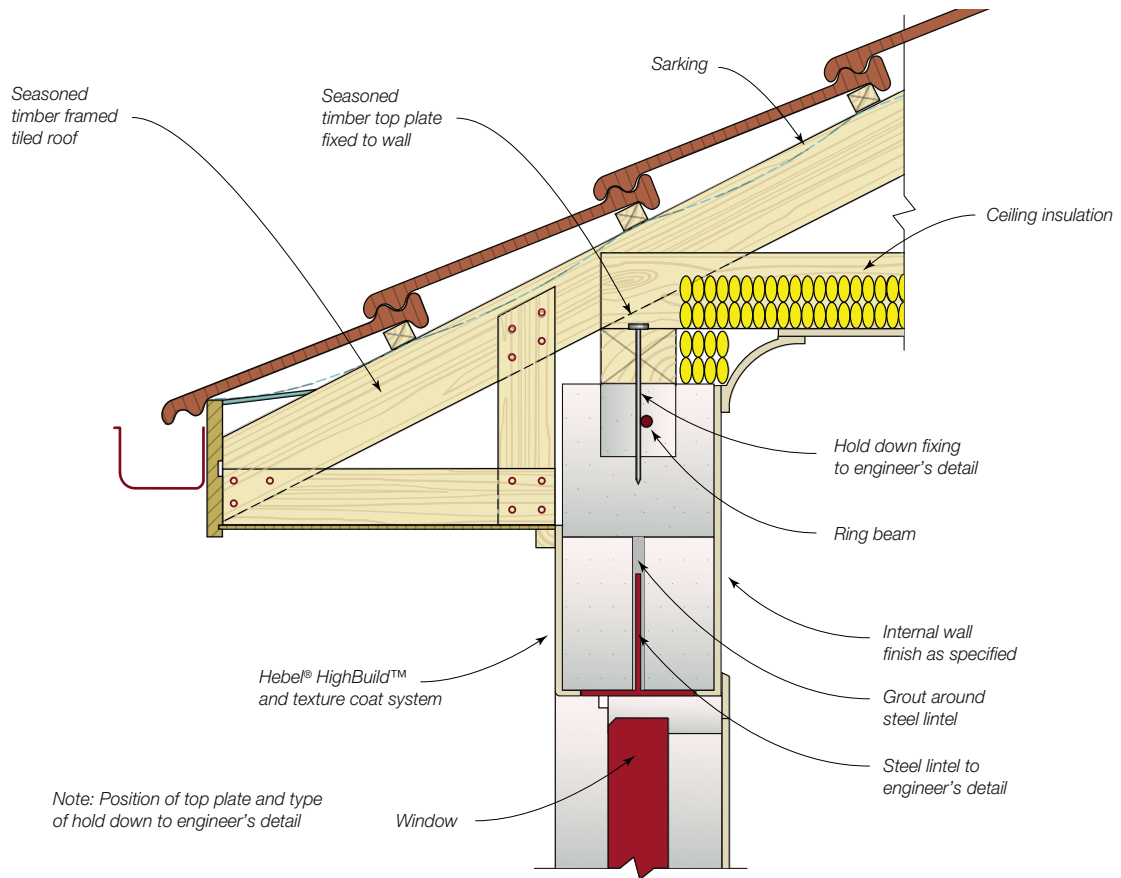
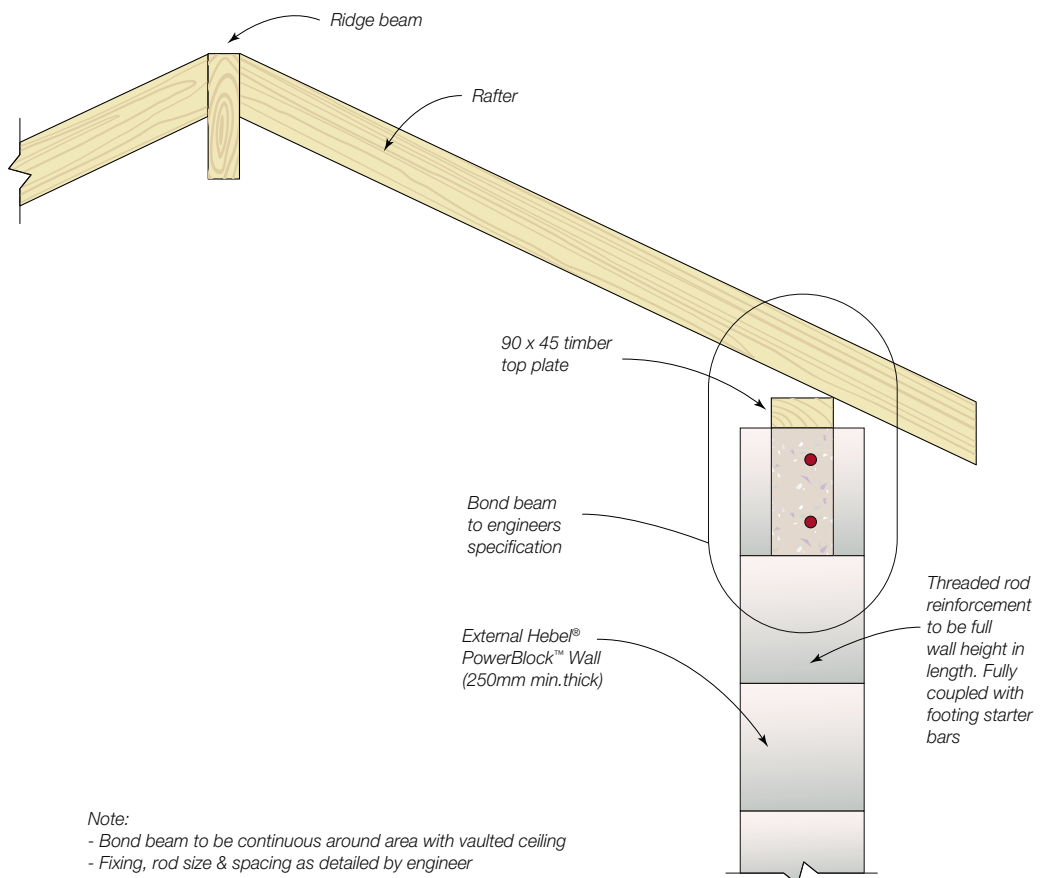


Fig 14.14 Vaulted Ceiling & Roof Top Plate Fixing To Hebel® Wall (elevation)



Wall Junctions

Fig 14.15 External Wall and Internal Partition Wall Junction (plan)

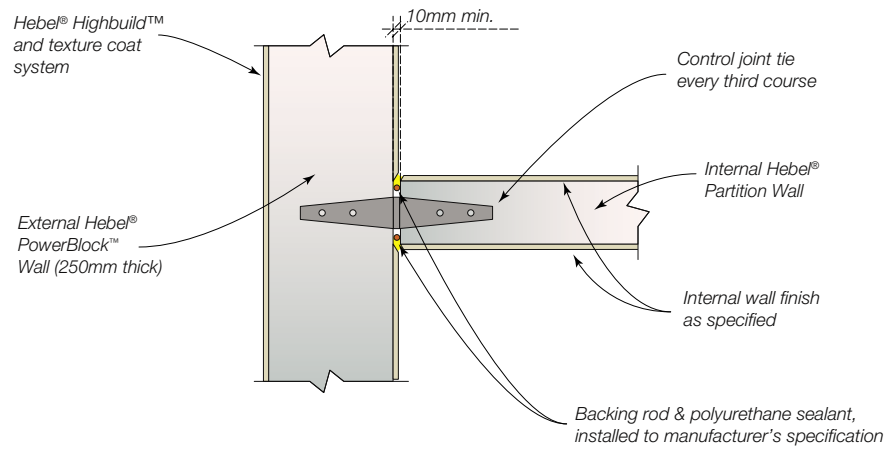
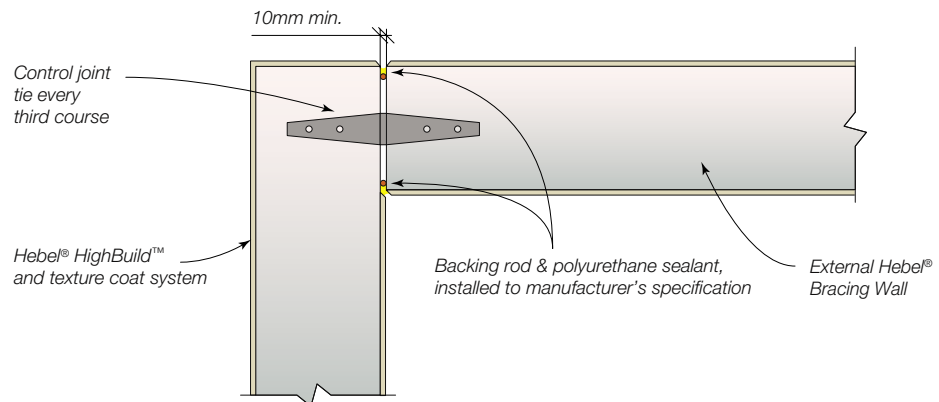


Fig 14.16 External Corner with Control Joint (plan)



Control Joints

Fig 14.17 Control Joint detail (elevation)

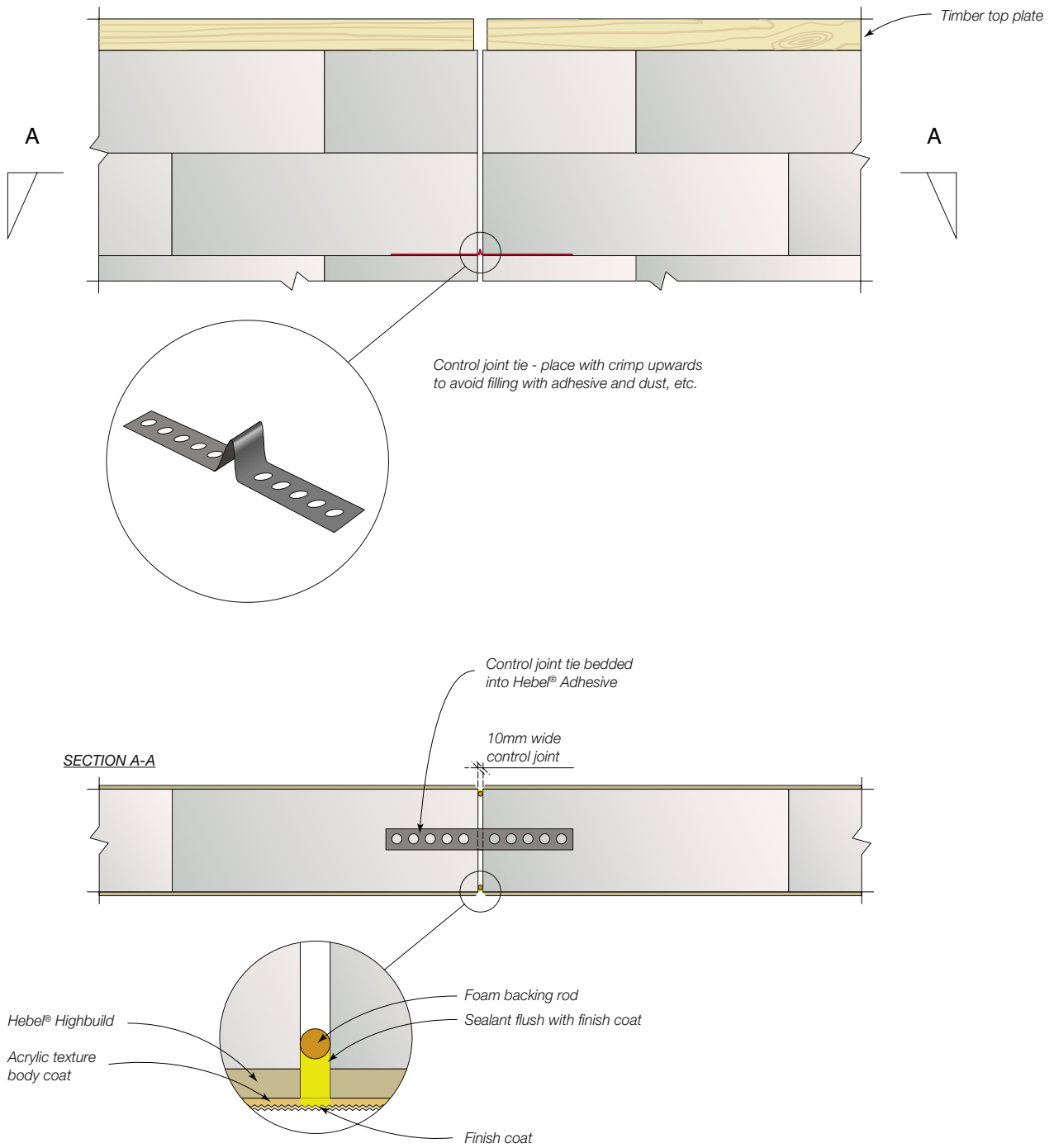


Fig 14.18 Typical Bond Beam Control Joint - elevation

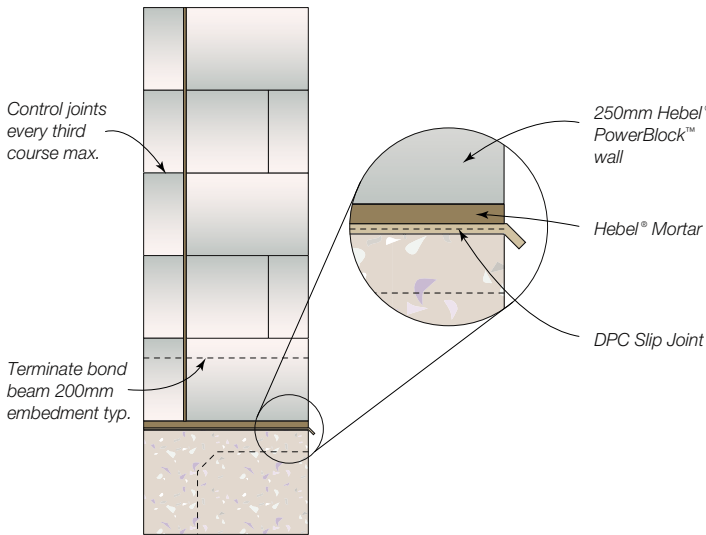


Fig 14.20 Typical Ring Beam Control Joint - elevation

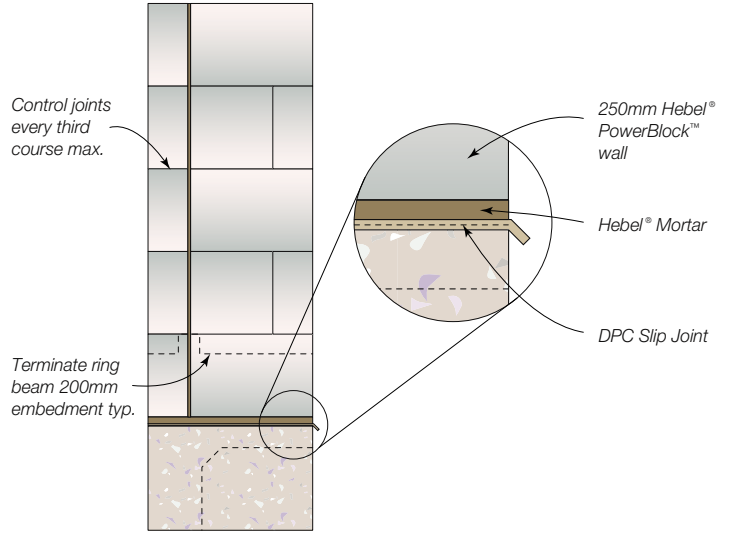


Fig 14.19 Typical Control Joint - plan

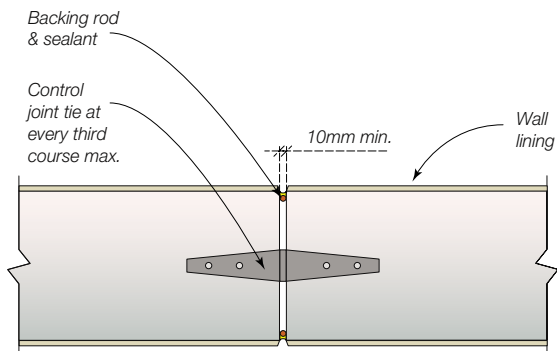


Fig 14.21 Hebel® PowerBlock +™ work Typical Movement Joint Detail (elevation)

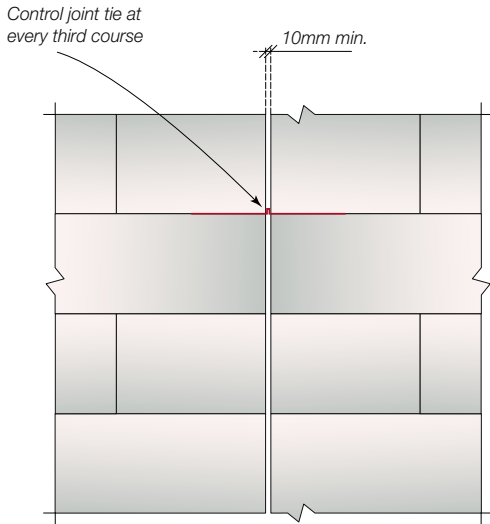


Fig 14.22 Hebel® PowerBlock +™ work Typical Movement Joint Detail (plan)

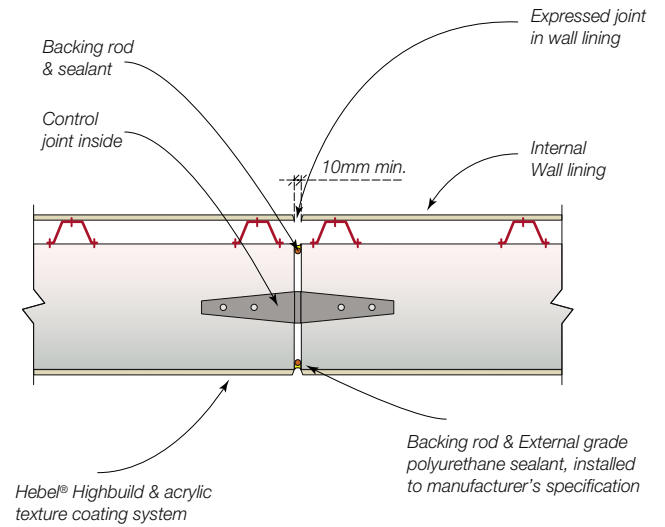


Fig 14.23 Built-in Column Detail (plan)

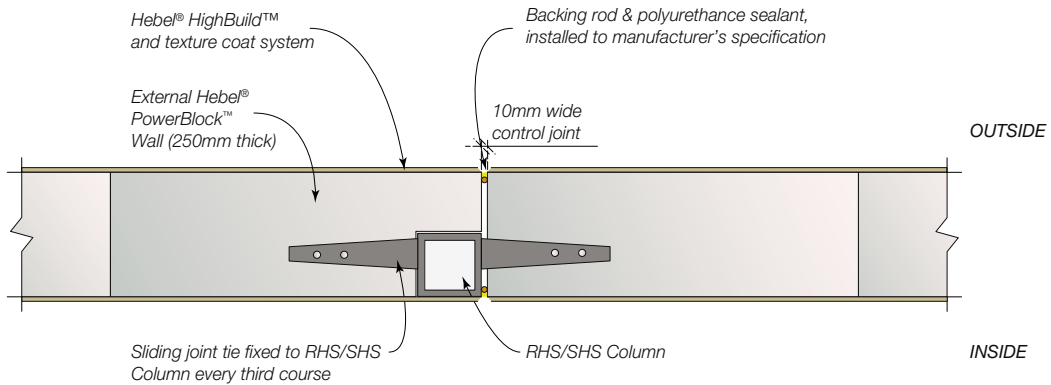
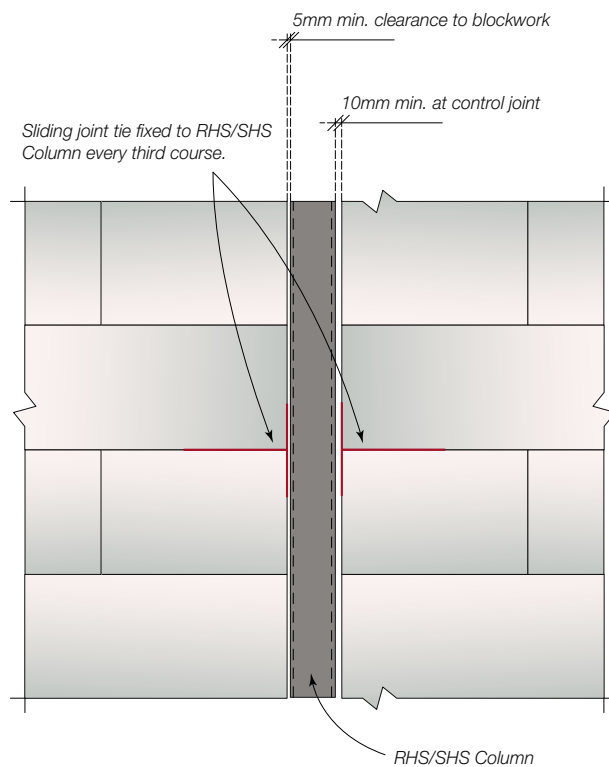


Fig 14.24 Built-in Column Detail (elevation)



Floors

Fig 14.25 Non-Load Bearing Hebel® PowerBlock +™ Wall and Hebel® Floor Panel Detail (elevation)

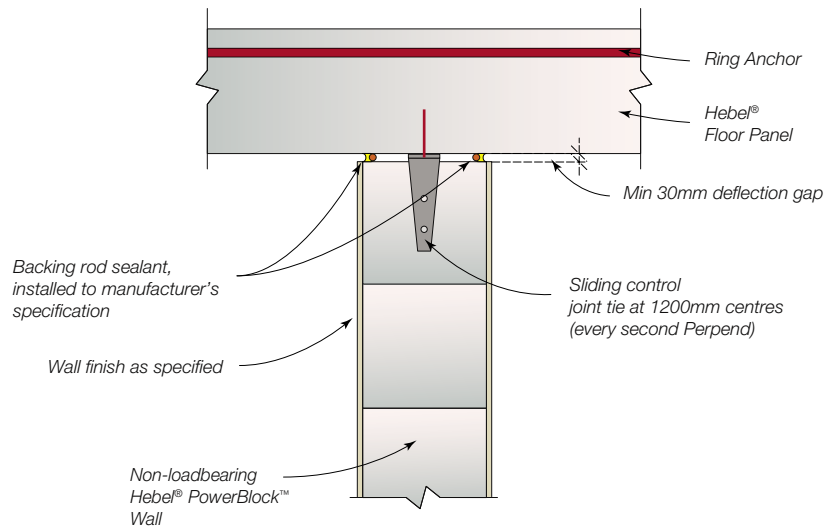


Fig 14.26 Loadbearing Hebel® PowerBlock +™ Wall and Floor Panel Junction Detail (elevation)

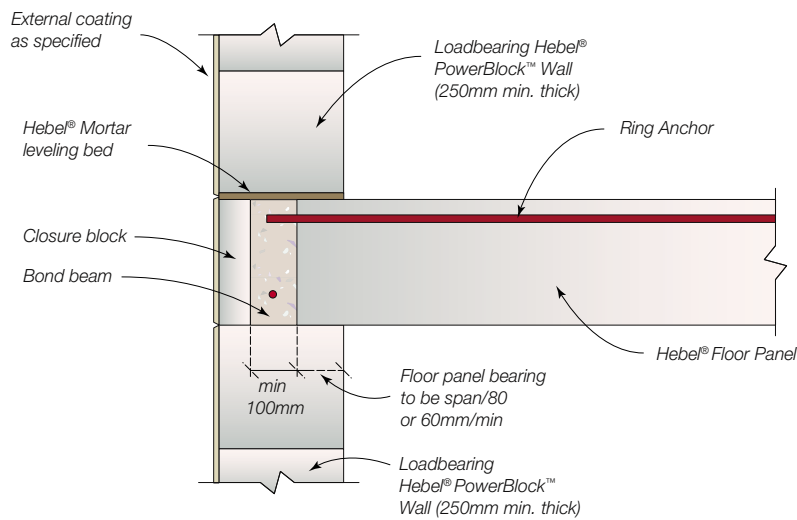


Fig 14.27 Loadbearing Hebel® PowerBlock +™ Wall and Timber Floor Frame Junction Detail (elevation)

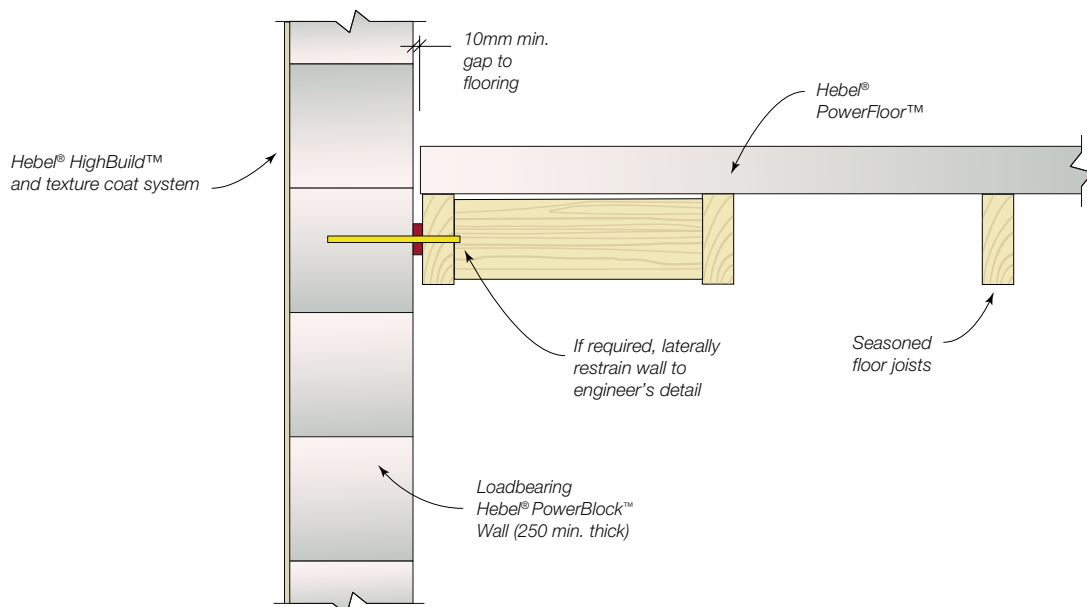
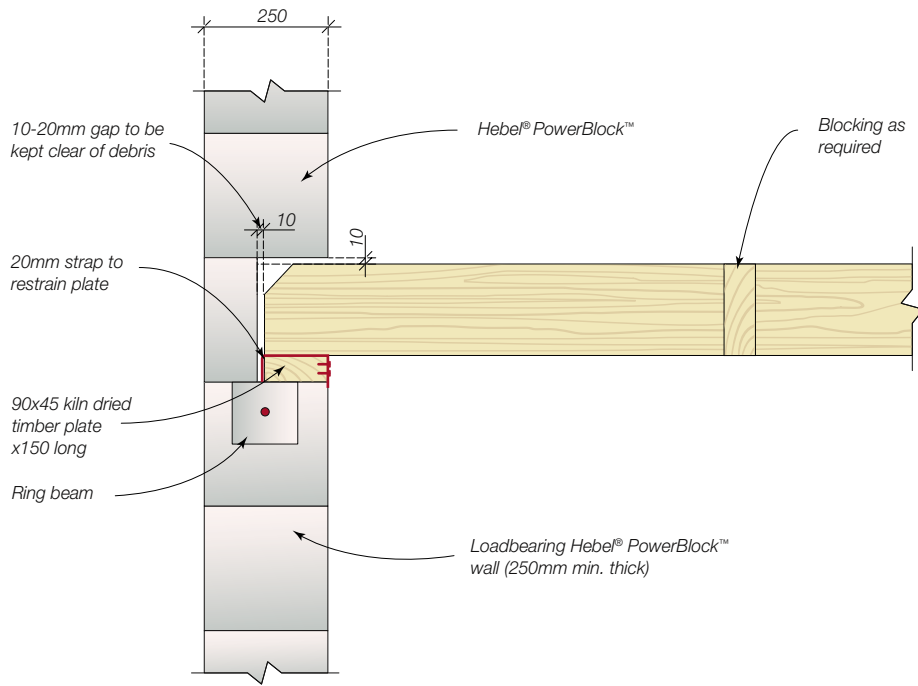


Fig 14.28 Timber Floor Support Detail (elevation)



Elevation - Floor Joists to External Wall

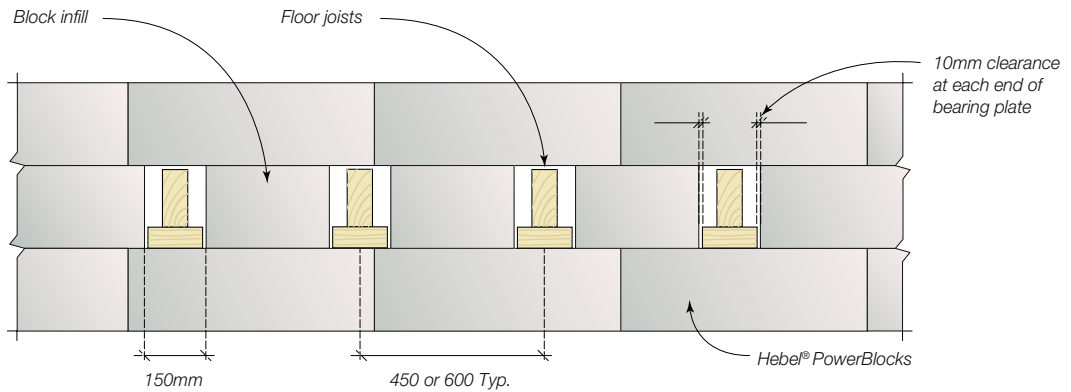


Fig 14.29 Hebel® Flooring Panels using Ring Anchor Construction on Load Bearing Interior Wall (elevation)

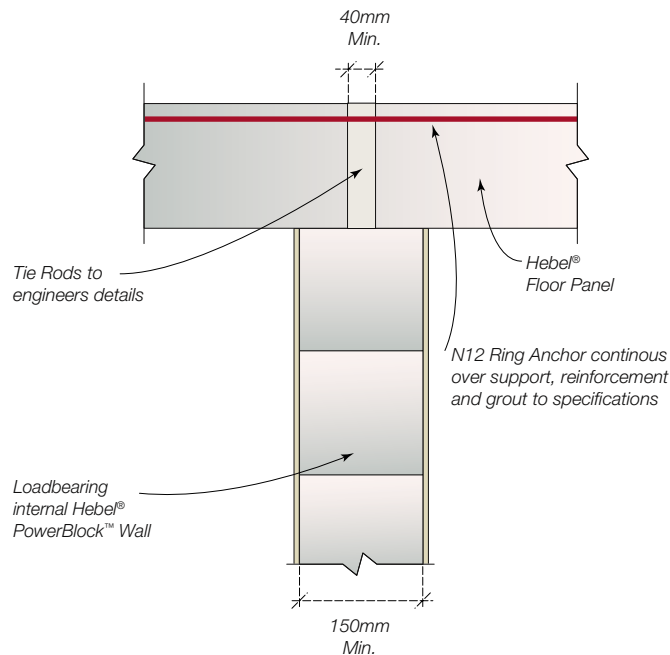


Fig 14.30 Ceiling Support Detail A (elevation)

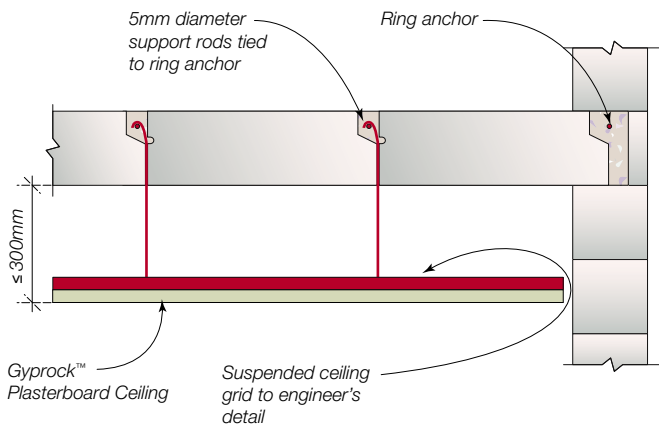
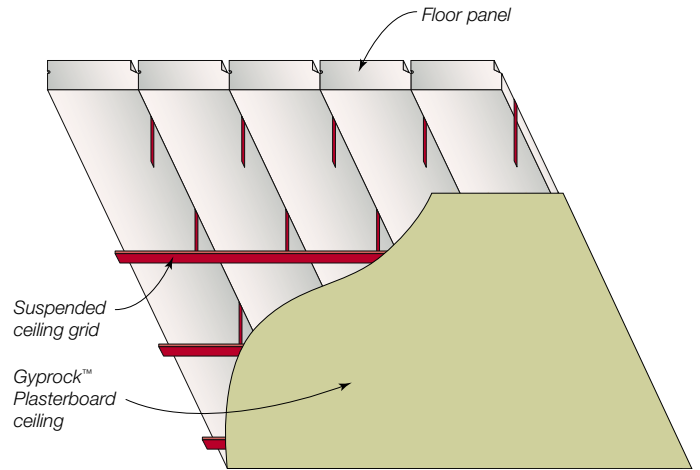


Fig 14.31 Ceiling Support Detail B (isometric)



NOTE: Refer to section 7.12 of the Hebel® Technical Manual for the full set of Details on the Floor Panel System.

Balcony and Deck

Fig 14.32 Balcony Detail (elevation)

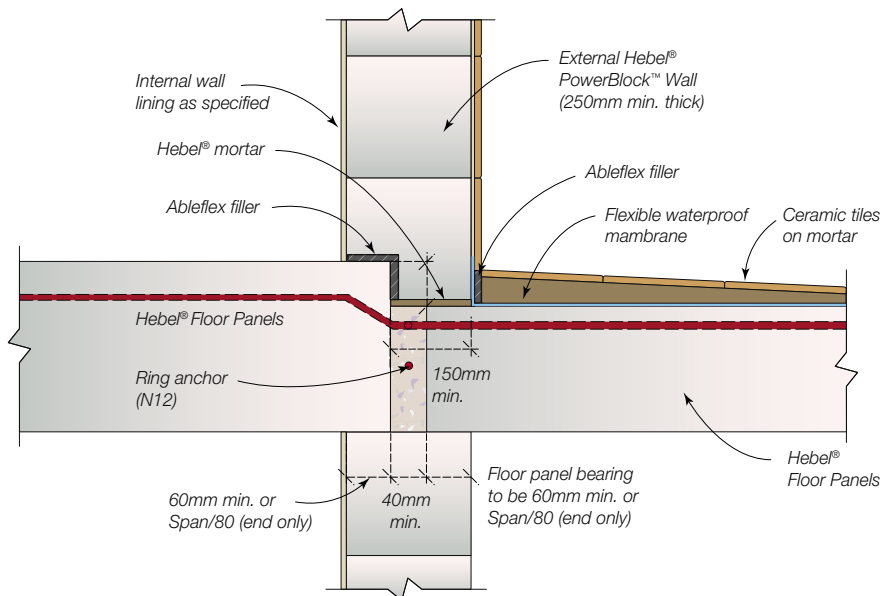


Fig 14.33 Balcony Detail (elevation)

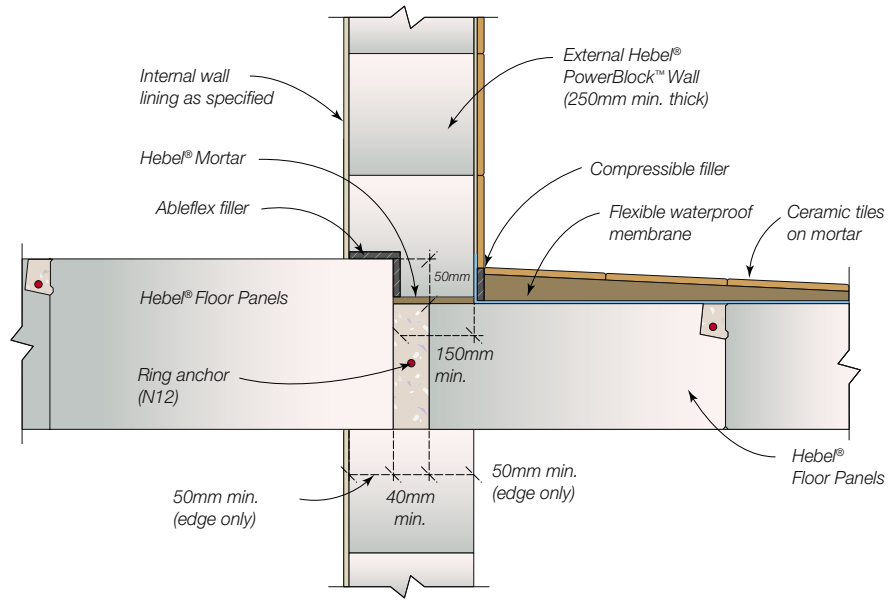


Fig 14.34 Deck Connection Detail (side elevation)

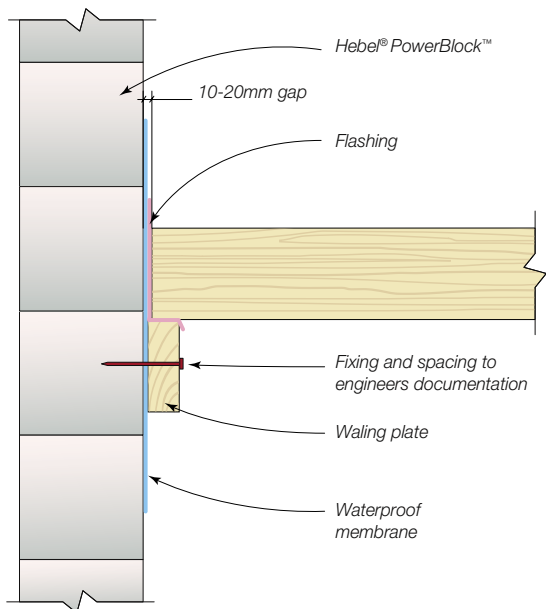
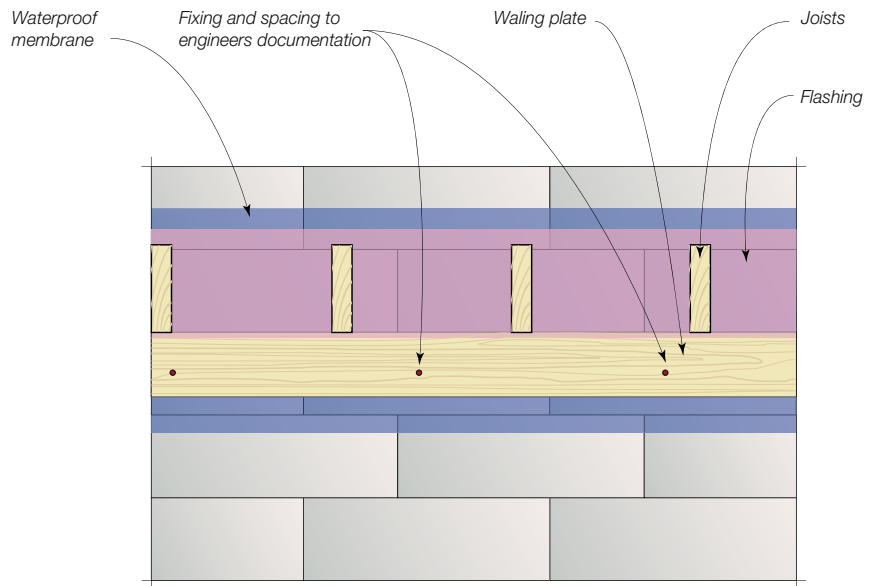


Fig 14.35 Deck Connection Detail (front elevation)



Stairs

Fig 14.36 Stairwell (isometric)

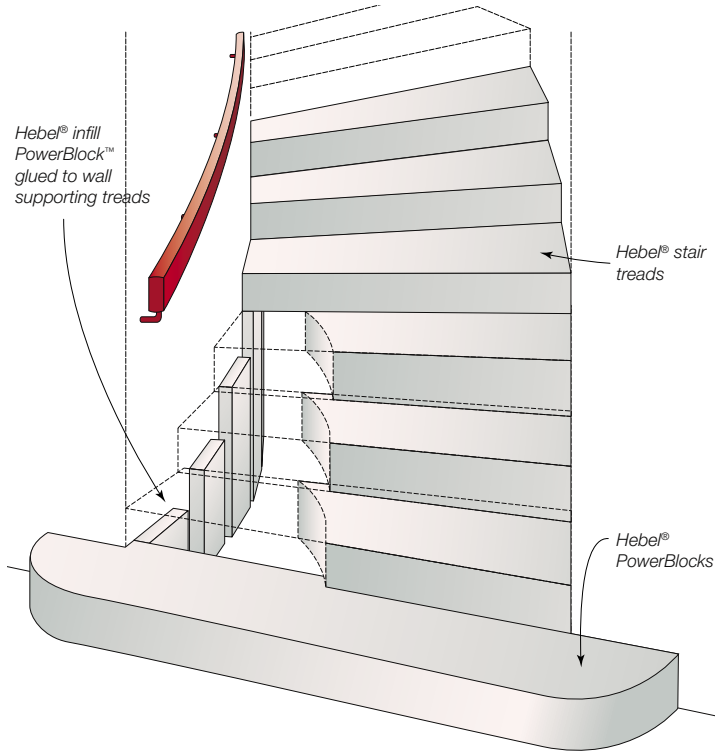


Fig 14.37 Stair Tread Set-Out (isometric)

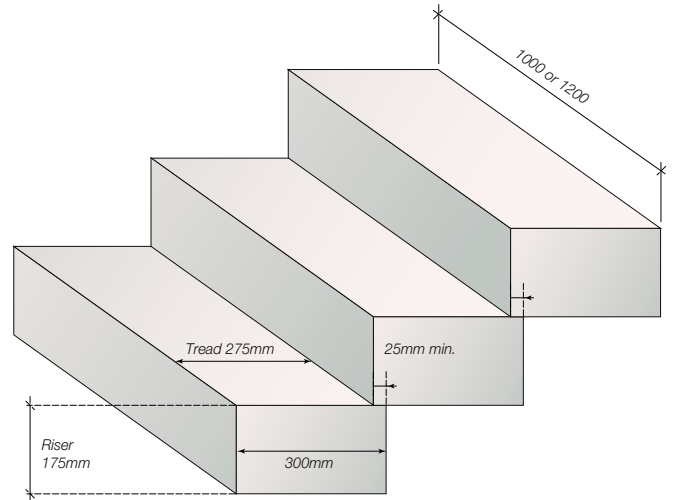
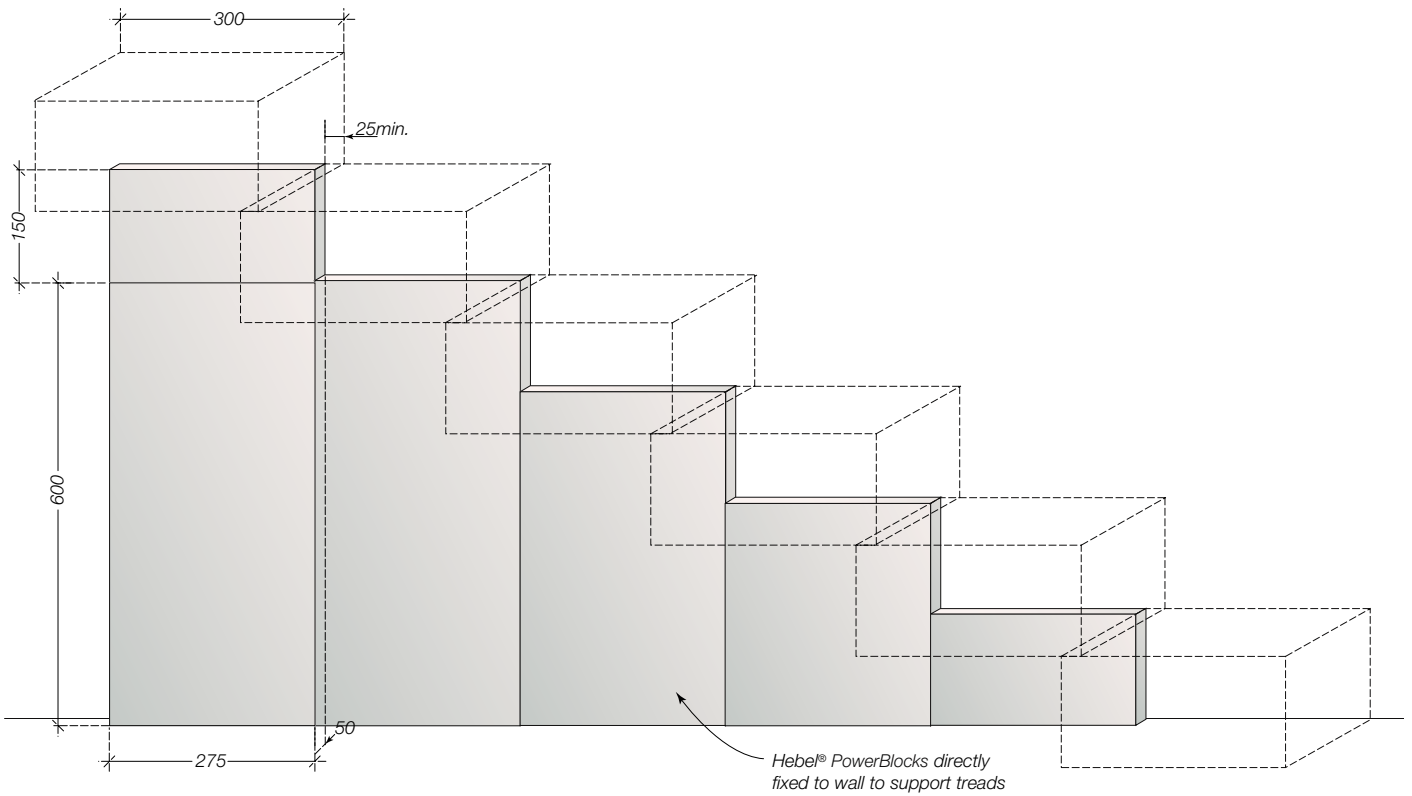
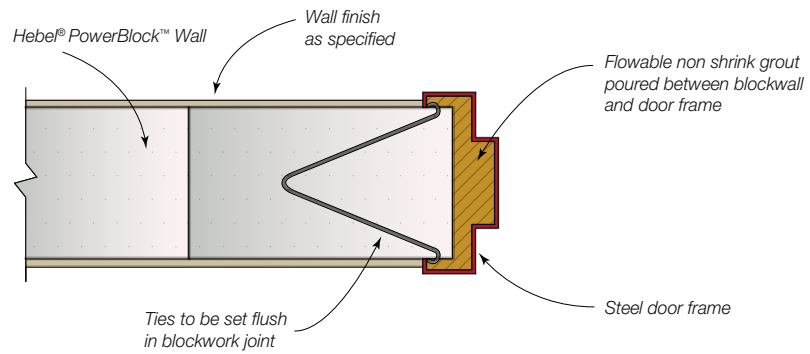


Fig 14.38 200mm wide x 50mm thick Hebel® PowerBlocks adhered to walls on their ends to provide support for treads (isometric)



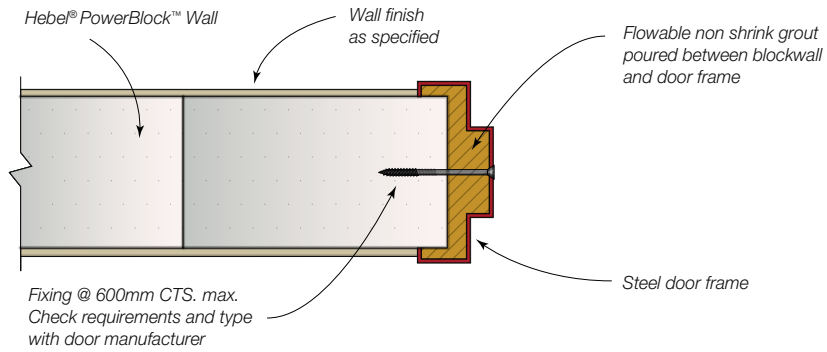
Openings

Fig 14.39 Steel Door Frame (Internal or External) to Hebel® Wall Fixing (plan)



Note: Refer to door frame manufacturer for construction detail

Fig 14.40 Steel Door Frame (Internal or External) to Hebel® Wall Fixing (plan)



Note: Refer to door frame manufacturer for construction detail

Fig 14.41 Timber Door Frame (External) to Hebel® Wall Fixing (plan)

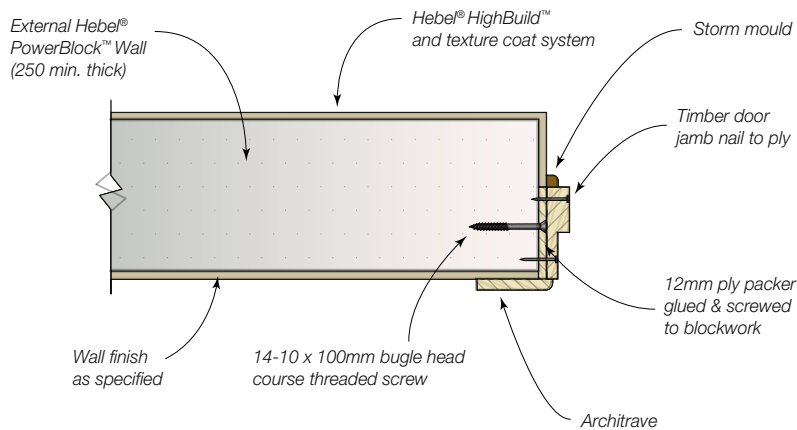


Fig 14.42 Timber Door Frame (Internal) to Hebel® Wall Fixing (plan)

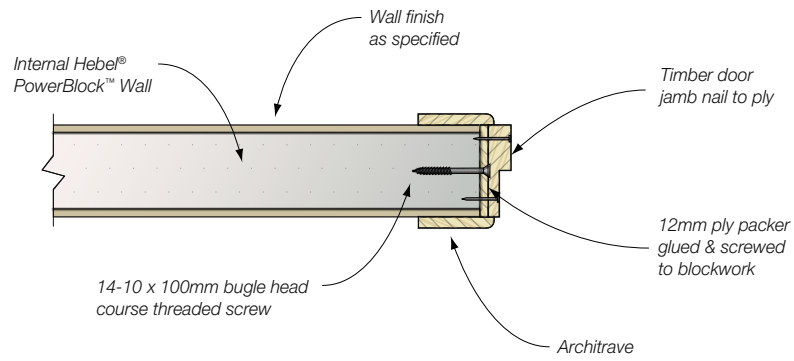


Fig 14.43 Aluminium Window Frame - Window Sill Detail (elevation)

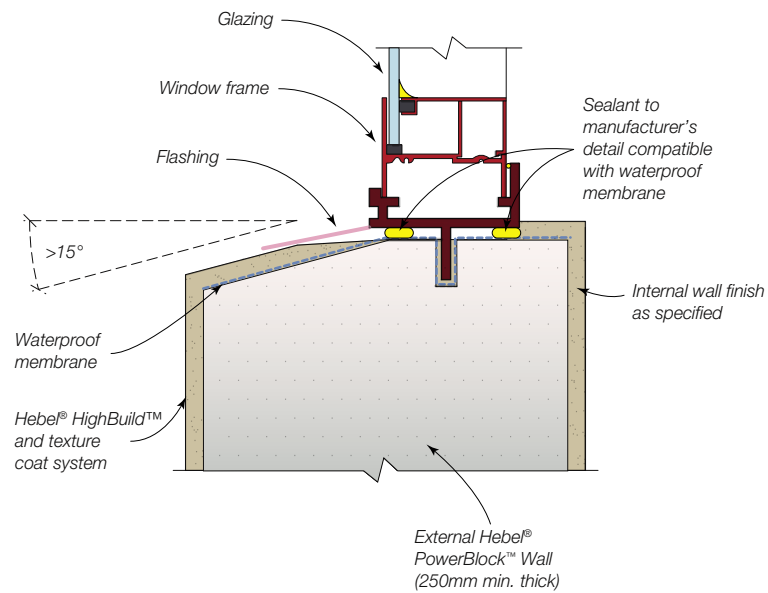


Fig 14.44 Aluminium Window Frame - Window Jamb Detail (elevation)

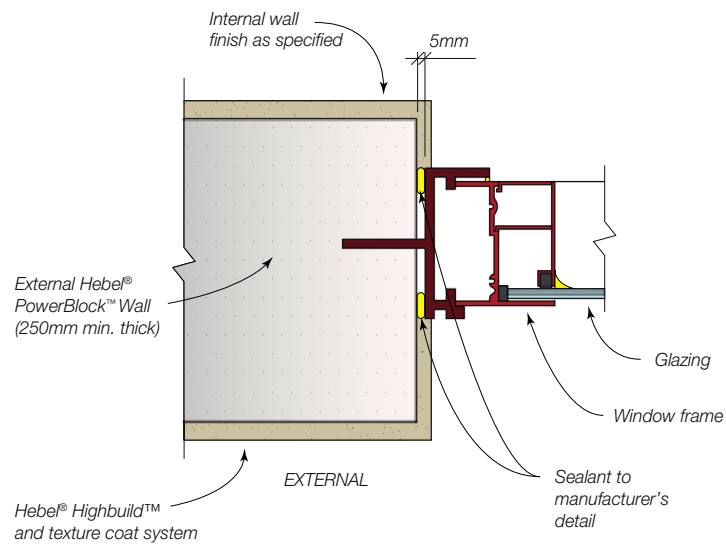


Fig 14.45 Aluminium Window Frame - Window Head Detail (elevation)

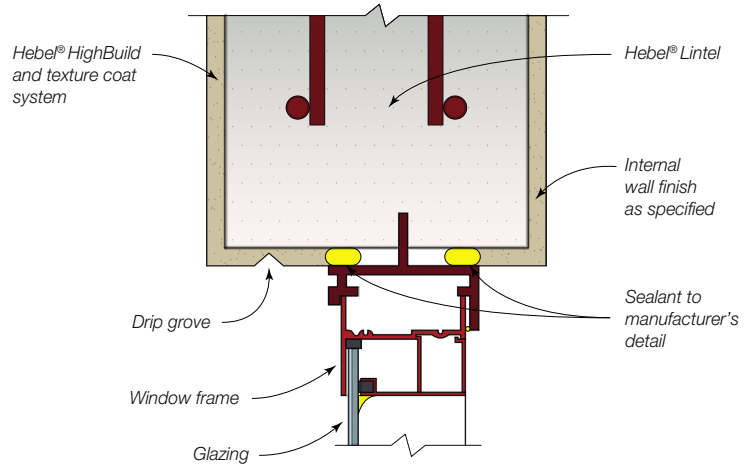
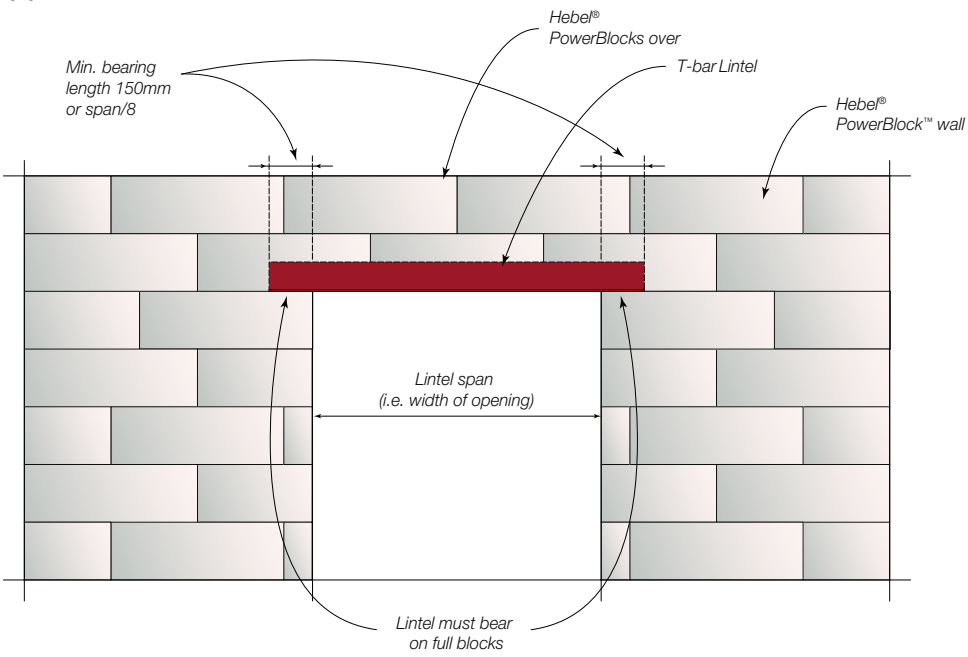
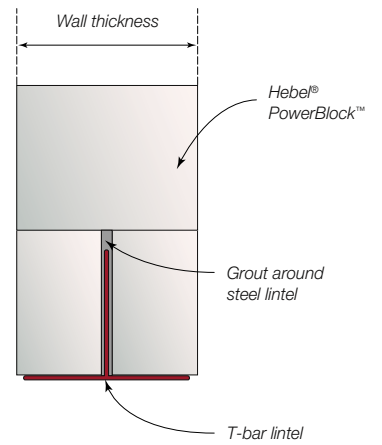


Fig 14.46 Lintel Installation
(a) Elevation



(b) Section



15.0 Construction Details - Tie-down

Required only if specified by design /project engineer

Fig 15.1: Strip Footing, Double Brick Sub-Floor

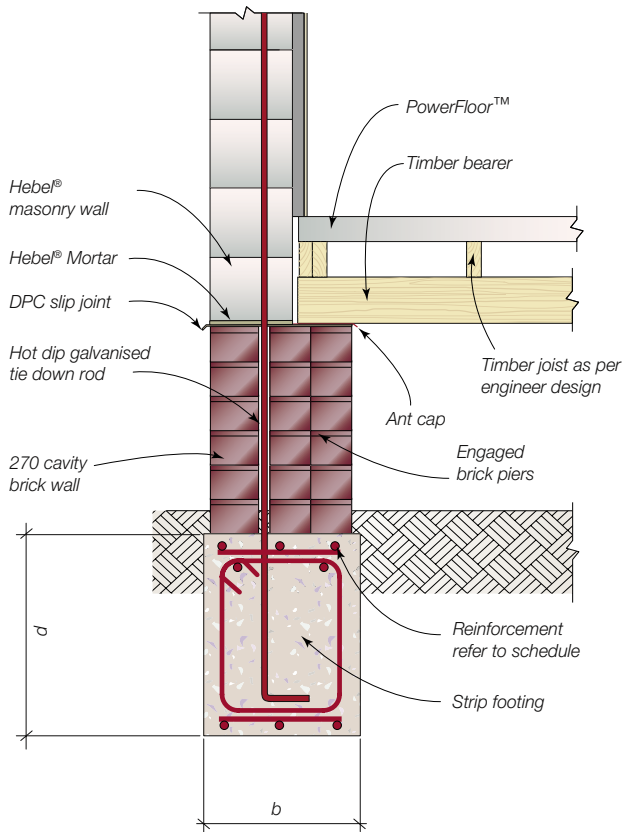
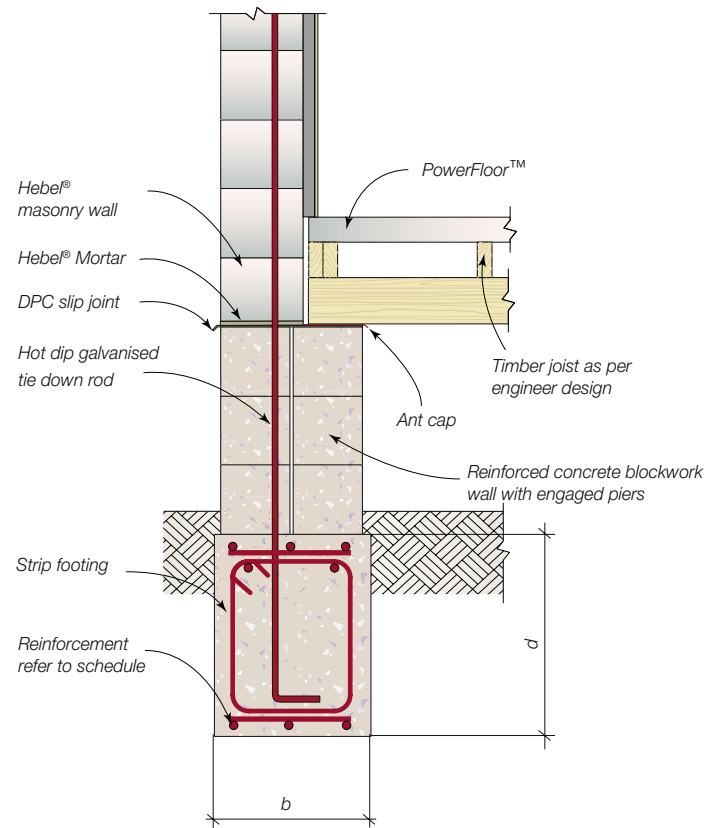


Fig 15.2: Strip Footing, Concrete PowerBlock +™ Sub-Floor



Tie down rods/engineering restraints must be embedded into the footing and pass up through the sub floor and into the Hebel® PowerBlock +™ work.

Table 15.1 Top-Plate & Hold-Down selection

Table

Wind Classification	Top Plate & Hold-Down		Legend	
	Tile Roof	Sheet Roof		
N1	A / B / C	B / C	A	90x45 F7 timber top plate / 700mm deep strap @ 1200mm ctrs.
N2	A / B / C	D / F	B	90x45 F17 timber top plate / 1700mm deep strap @ 2400mm ctrs.
N3	D / F	D / F	C	90x45 F17 timber top plate / Φ 12mm rod @ 2400mm ctrs.
N4	D / F	D / F	D	90x45 F17 timber top plate / Φ 12mm rod @ 1200mm ctrs.
N5	E / G	E / G	E	90x45 F17 timber top plate / Φ 12mm rod @ 900mm ctrs.
N6	E / G	E / G	F	100x50x3.0 RHS top plate / Φ 12mm rod @ 2400mm ctrs.
C1	D / F	D / F	G	100x50x3.0 RHS top plate / Φ 12mm rod @ 1200mm ctrs.
C2	E / G	E / G		
C3	E / G	E / G		
C4	G	G		

Fig 15.3 Hold Down Detail for Reinforced Bracing Walls

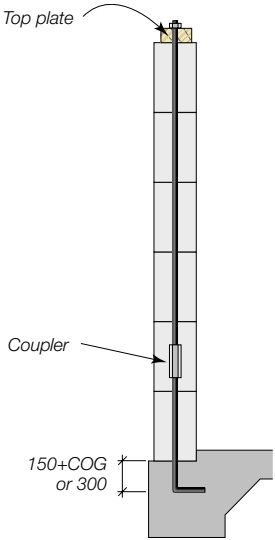
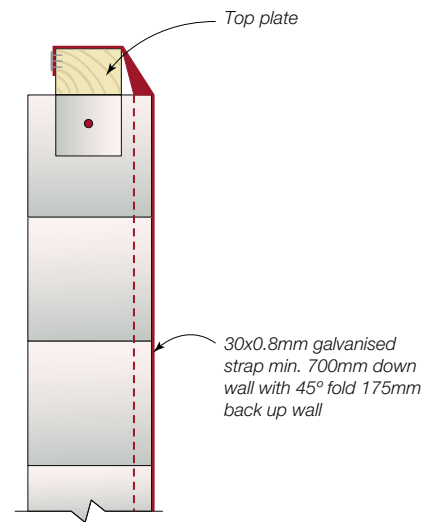


Table 15.2 provides ultimate racking capacities of reinforced 150mm and 250mm Hebel® PowerBlock +™ walls. The reinforcement is N12 bar or 12mm threaded rod at nominal 1000mm centres. The reinforcement must be tied to the footings and wall top plate through the bond beam.

Walls resisting racking forces should be evenly distributed within a house and spaced at a maximum of 8.0m. Ceiling and floor diaphragms must be adequately tied to walls to ensure transfer of forces through to the footings.

For more information about bracing, refer to Section 6.11 of the Hebel® Technical Manual.

Fig 15.4 Roof Top to Plate Fixing to Hebel® Wall - Strap (elevation)

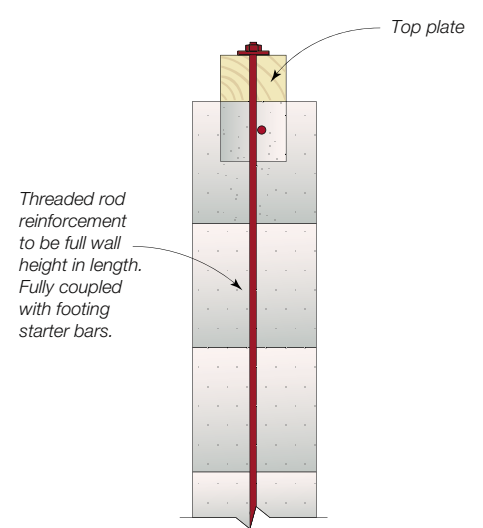


Top Plate Hold-Down

Two tie-down methods are provided in this design guide.

1. Strap – 30x0.8mm cut into inside face of external wall min. 700mm deep.
2. 12mm threaded rod continuous from footing through bond beam to top plate.

Fig 15.5 Roof Top Plate Fixing to Hebel® Wall-Tie-Down Rod (elevation)



Three top plates options are provided in this design guide:

1. 90x45 F7 timber
2. 90x45 F17 timber
3. 100x50x3.0 RHS

The type of hold-down method and spacing depends on the top plate, roof type/span, and wind classification. Refer to Table 15.1 for specifications. For high wind areas, the bracing design is likely to require tie-down rods which will drive that as the hold-down method.

Table 15.2 Reinforced Wall - N12 Bars at Nom. 1000mm CTRS

Wall Length (mm)	Min. No. of N12 Bars	Ultimate Racking Capacity (kN)	
		150mm PowerBlock +™	250mm PowerBlock +™
900	2	5	6
1200	2	8	8
1800	3	16	18
2400	3	24	25
3000	4	36	38
3600	5	45	46
4800	6	54	56
6000	7	63	66

Base of Wall

Fig 15.6 Hebel® PowerBlock +™ work on Stiffened Raft Slab Edge Foundation (elevation)

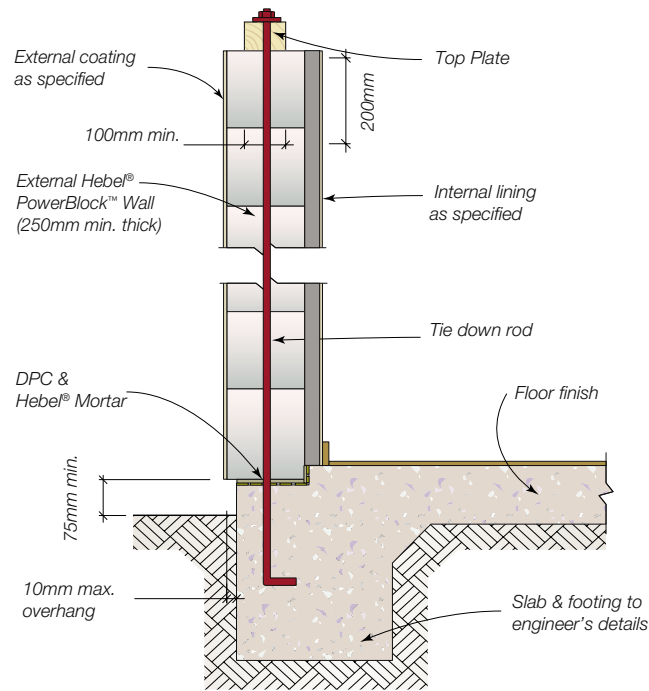


Fig 15.7 Concrete PowerBlock +™ Sub-Floor Detail (elevation)

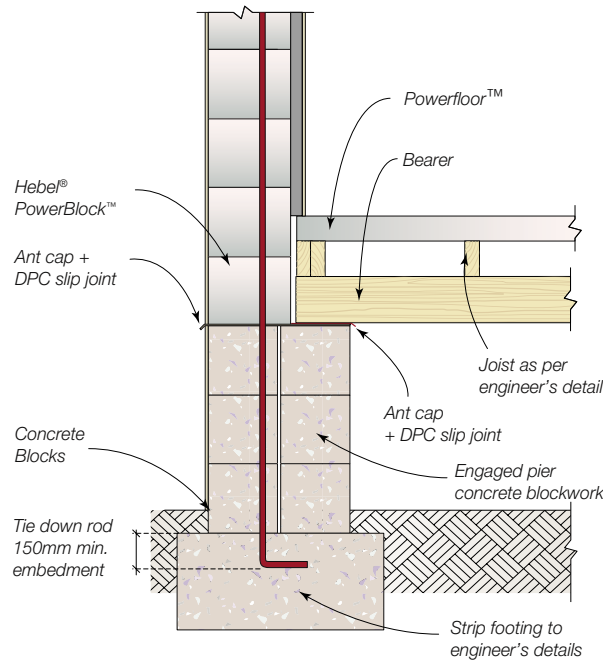


Fig 15.8 Double Brick Sub-Floor Detail (elevation)

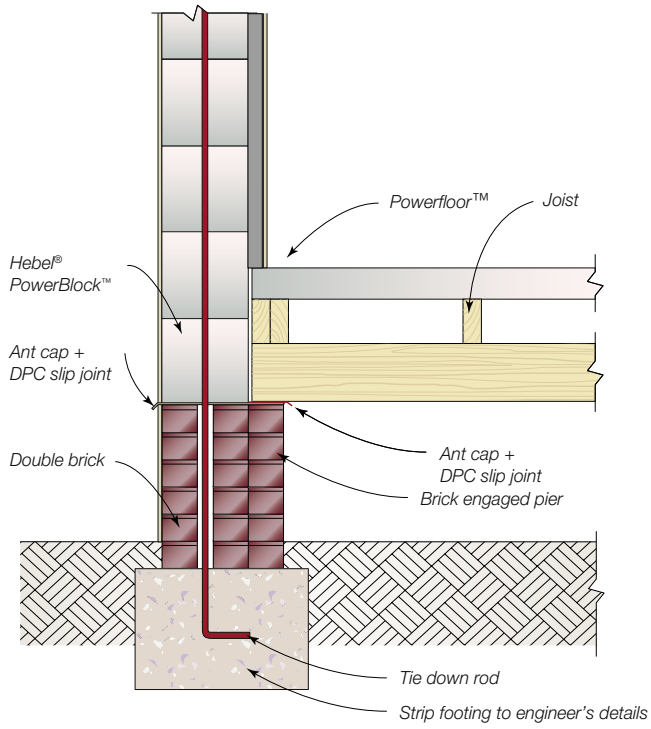
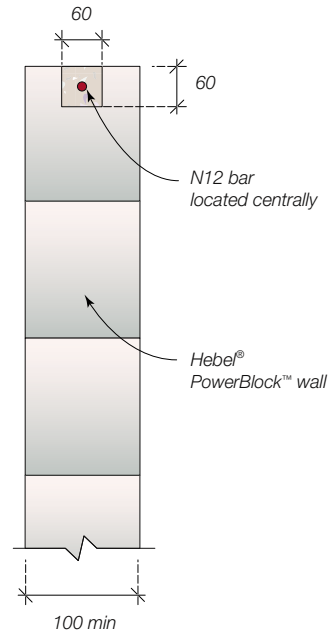
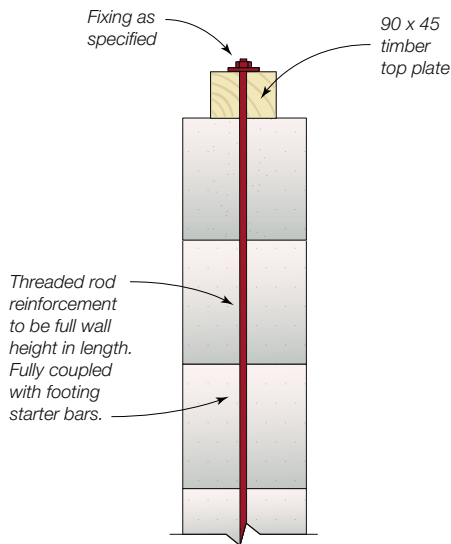


Fig 15.9 Ring Beam Internal Non-Loadbearing Wall (elevation) (No tie down - as specified by design engineer)



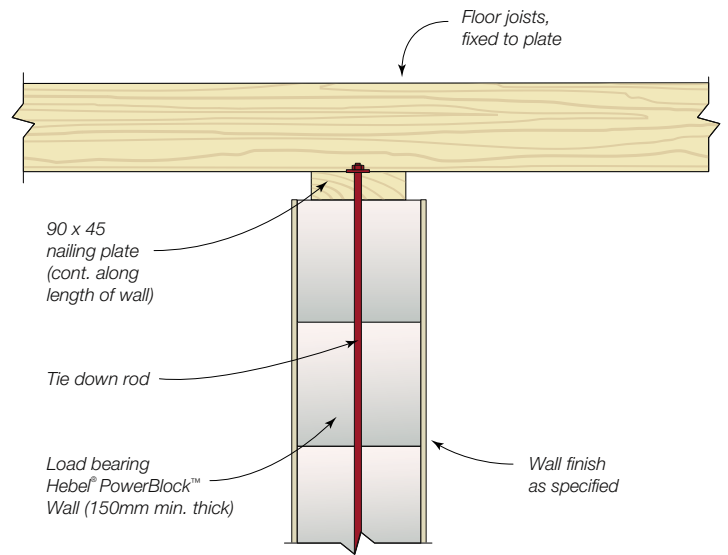
Top of Wall

Fig 15.10 Roof Top Plate Fixing to Hebel® Wall - Tie-Down Rod (elevation)



Note: Fixing, rod size & spacing as detailed by engineer

Fig 15.11 Internal Hebel® Load Bearing Wall and Timber Floor Frame Junction (elevation)



Wall Junctions

Fig 15.12 External Wall and Internal Partition Wall Junction (plan)

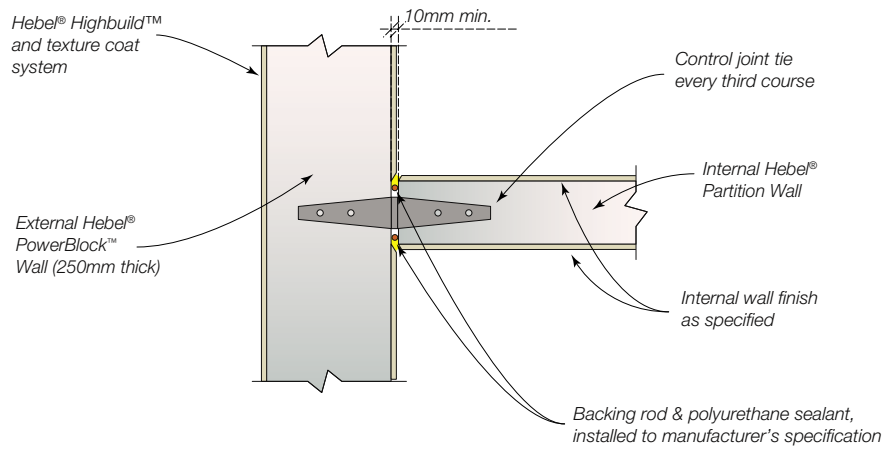
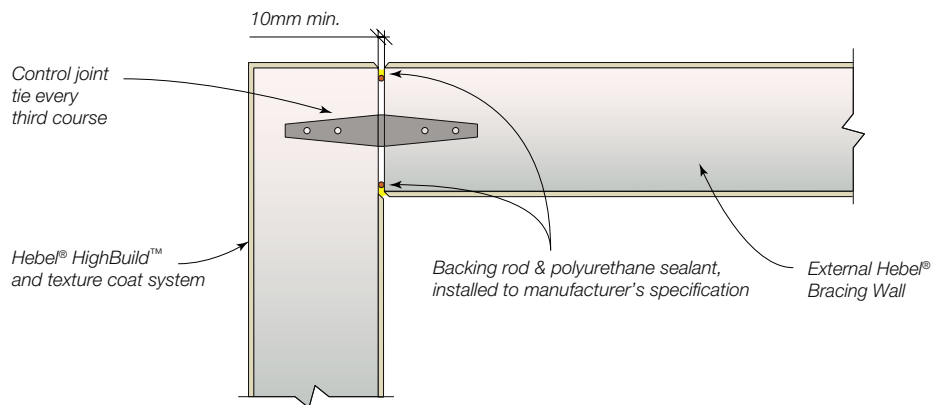


Fig 15.13 External Corner with Control Joint (plan)



Control Joints

Fig 15.14 Control Joint detail (elevation)

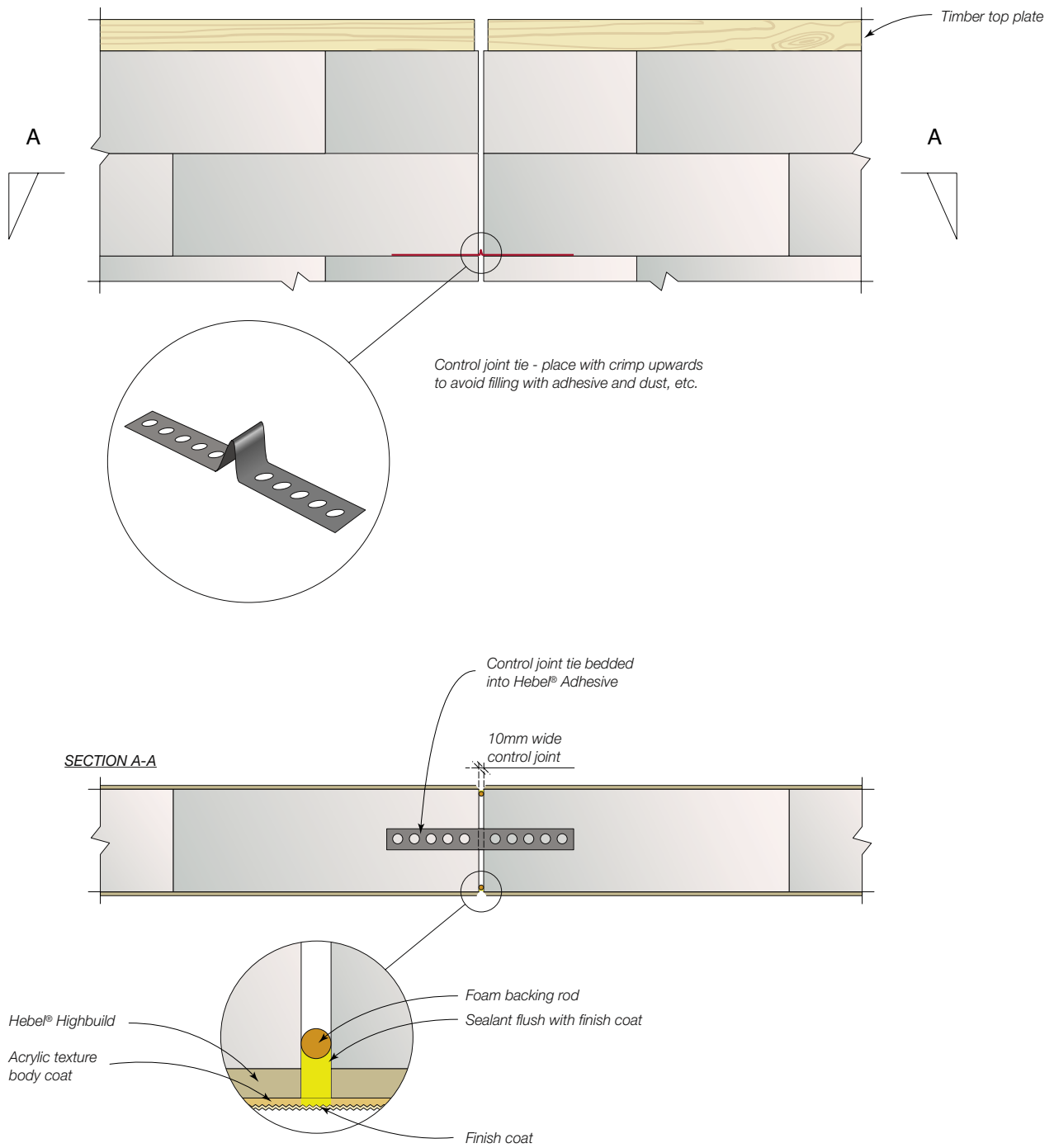


Fig 15.15 Typical Bond Beam Control Joint - elevation
 (Location where no tie down required - as specified by engineer)

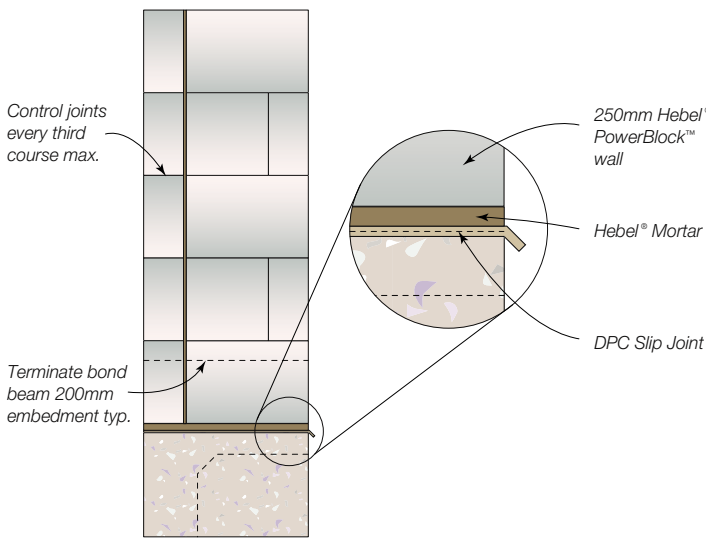


Fig 15.16 Typical Ring Beam Control Joint - elevation
 (Location where no tie down required - as specified by engineer)

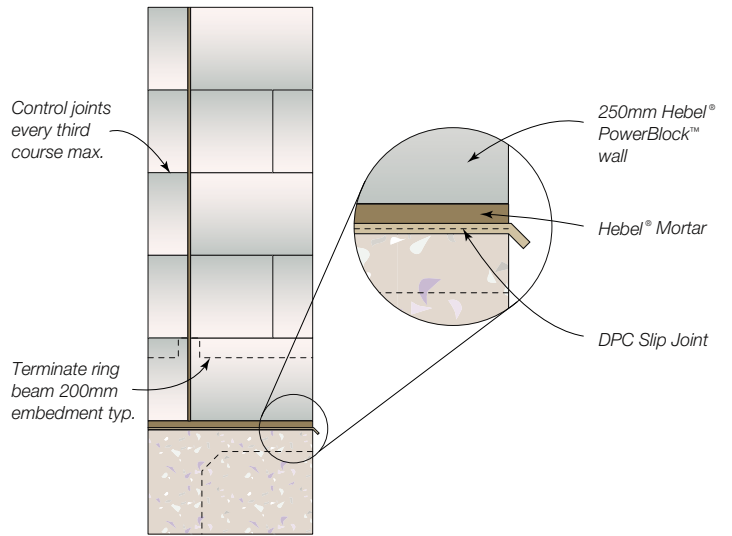


Fig 15.17 Typical Control Joint - plan

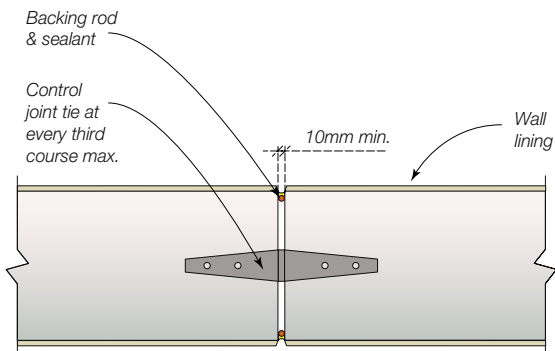


Fig 15.18 Hebel® PowerBlock +™ work Typical Movement Joint Detail (elevation)

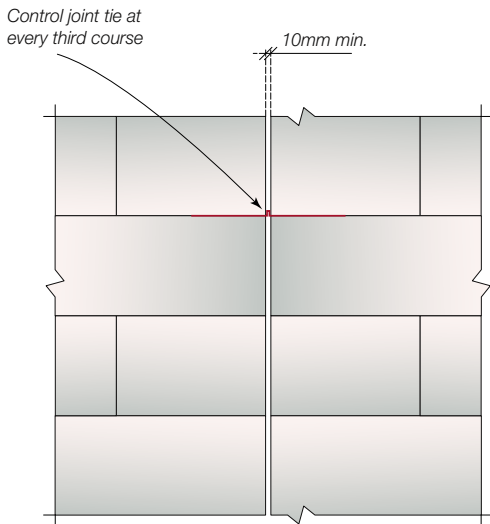


Fig 15.19 Hebel® PowerBlock +™ work Typical Movement Joint Detail (plan)

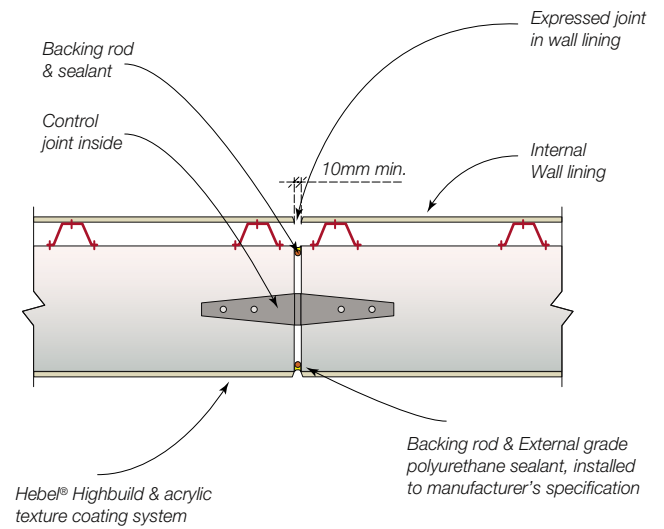


Fig 15.20 Built-in Column Detail (plan)

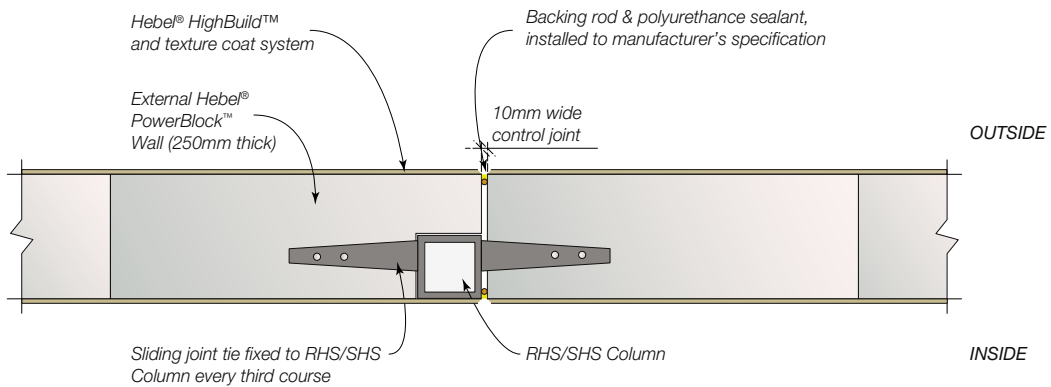
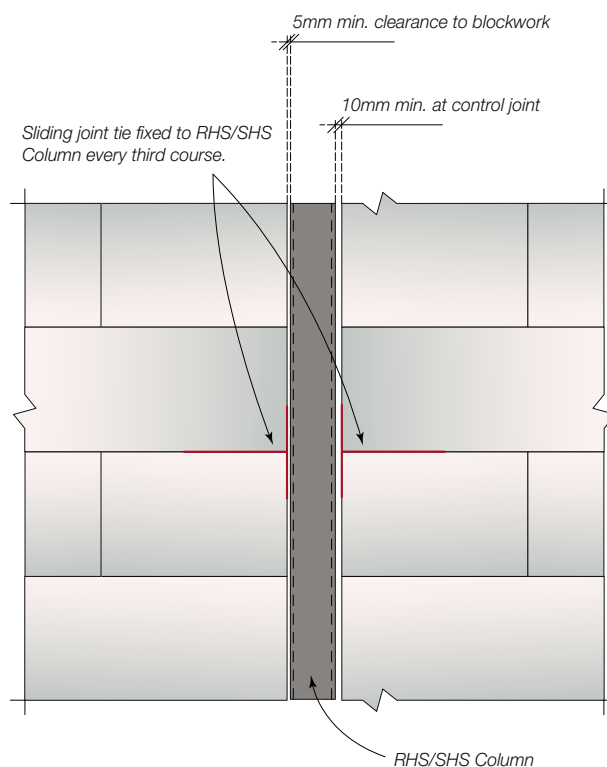


Fig 15.21 Built-in Column Detail (elevation)



PLEASE NOTE:

For all other design details (eg. door, window, floor panels) please follow the previous construction details in Section 14.0)

Appendix A - Carpet Installation

Panel Surface Preparation

Sweep the floor surface to remove debris and loose particles. Expose all surface blemishes such as chips, cracks, gaps, ridges or the like. Fill all unacceptable locations with an appropriate and compatible patching compound such as Hebel® Patch or levelling compound as required. Ensure panels are then dry.



Carpet Smooth Edge Installation

Installation of Carpet Smooth Edge (Gripper) is to be in accordance with AS/NZS 2455.1:1995.

Installation of carpet gripper prior to laying carpet requires the use of specifically selected nails or course threaded screws. Standard fixings supplied with the carpet gripper are not suitable for fixing to Hebel® PowerFloor™ panels. Carpet gripper strips are available without factory supplied nails. For carpet gripper installation near the panel edge, only glue is recommended. If relying on glue only, the carpet can not be stretched until the glue is set after approximately 24 hours.

Table A.1 - Carpet Smooth Edge Fixings

Fixing Type	Description	Application Method	Installation Notes
Twist Nails	51mm dome head twist nail	Coil Nail Gun (Refer to Fig A.1)	The head of the twist nail should finish flush with the surface of the gripper strip
Screws	Type 17 point - course thread No. 8g x 50mm - Countersinking screw	Makita 6834 Auto Feed Screwdriver (Refer to Fig A.2)	The head of the twist nail should finish flush with the surface of the carpet gripper strip
Screws	Type 17 point-Trimhead deck Screw. 4.2 x 50mm 4.2 x 65mm	Quickdrive auto feed	The head of the screw should be flush with the smooth edge

Fig A.1



Fig A.2



Underlay Installation

Minimum medium duty underlay is to be used. No other special requirements.

Carpet Installation

As per carpet manufacturer's guidelines. No other special requirements.



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1300 369 448

Health & Safety

Information on any known health risks of our products and how to handle them safely is on their packaging and/or the documentation accompanying them. Additional information is listed in the Material Safety Data Sheet (MSDS). To obtain a copy of a MSDS, telephone 1800 807 668 or download from www.hebelaustralia.com.au > Resources > MSDS. Contractors are required by law to perform their own risk assessments before undertaking work. Hebel® has sample Safe Work Method Statements (SWMS) to assist in this. To obtain a sample SWMS, refer also to the above sources.

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