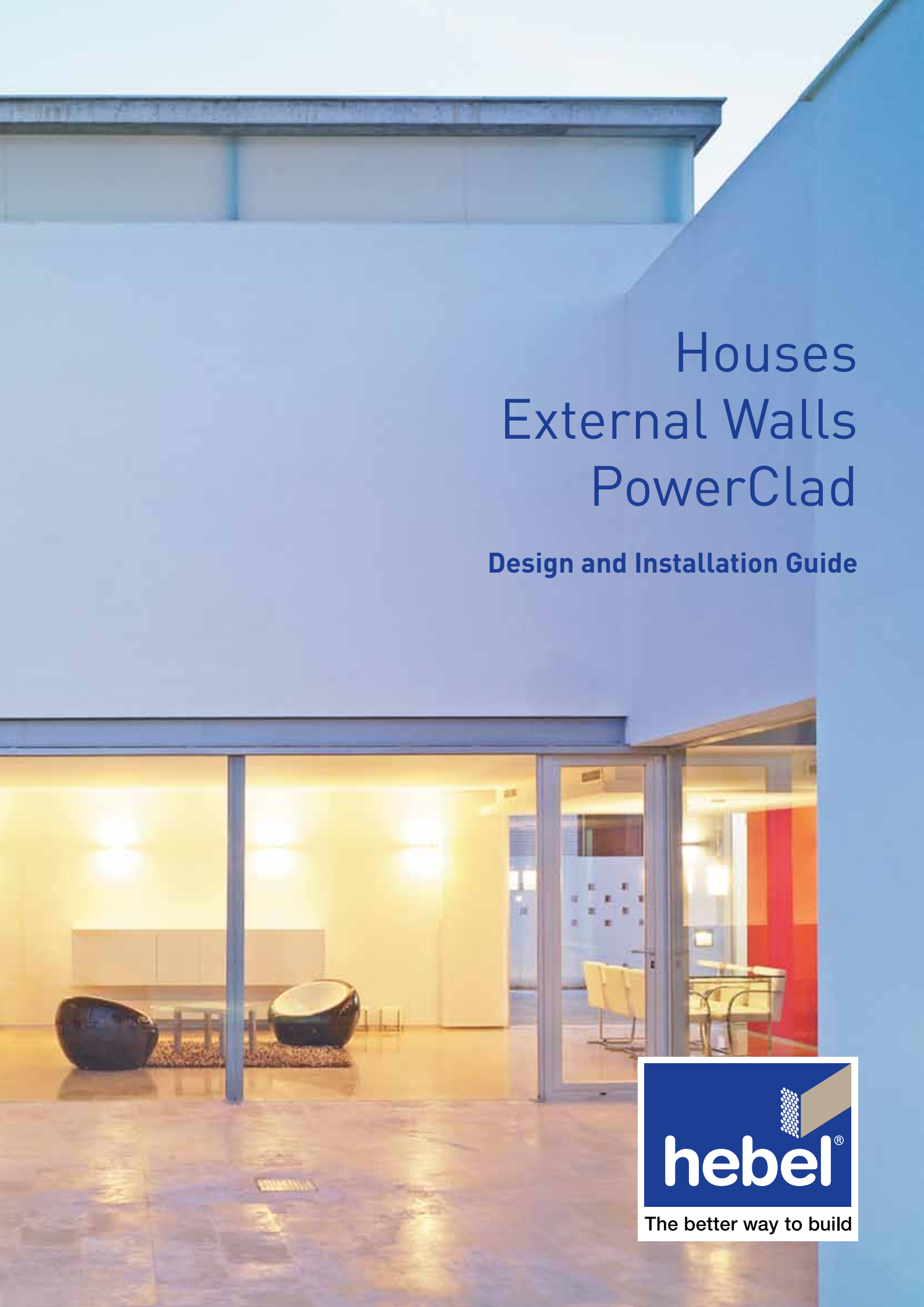
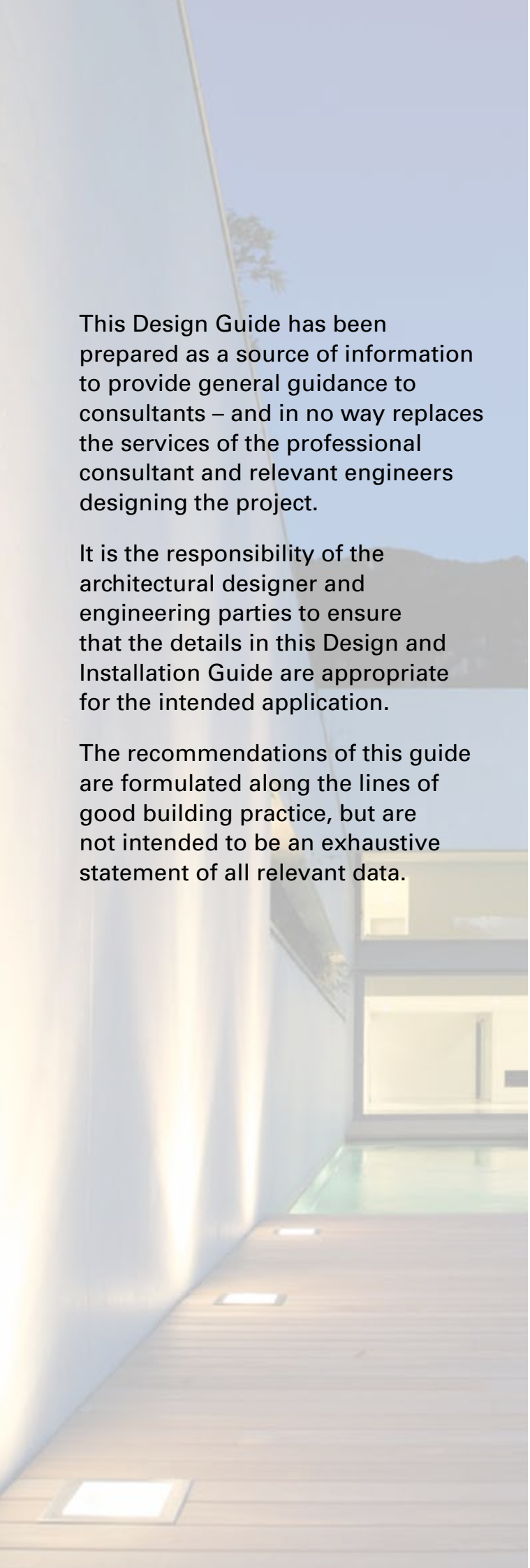
Houses
External Walls
PowerClad

Design and Installation Guide



hebel®

The better way to build



This Design Guide has been prepared as a source of information to provide general guidance to consultants – and in no way replaces the services of the professional consultant and relevant engineers designing the project.

It is the responsibility of the architectural designer and engineering parties to ensure that the details in this Design and Installation Guide are 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.

Contents

Better homes are built with Hebel

hebel®
The better way to build

Hebel is a lightweight steel-reinforced Autoclave Aerated Concrete (AAC) that has been used in Europe for over 70 years and here in Australia for over 20 years.

Hebel reduces your total cost to build

The unique Hebel System is a high performance masonry product that makes good business sense because it is fast to construct and easy to install.

The unique Hebel system does away with the need for costly and sometimes unreliable bricklayers and requires fewer skilled trades-people on site.

Desired by homeowners for its design and sustainability

Hebel PowerClad provides an attractive, modern exterior that can be completed in individual finishes and colours to provide a wide range of contemporary and aspirational looks that appeal to many new homebuyers.

Hebel is also highly fire resistant, boasts high acoustic absorbing properties and, because Hebel is a masonry product with in-built insulation, it assists in improving energy ratings (and reducing costly energy bills for cooling and heating).

Hebel has attained endorsement for using 61% and 64% less embodied energy than the comparative products Concrete and Brick and 64% and 55% less Greenhouse gas emissions than the comparative products Concrete and Brick (GECA Report 2006).

Proven in the market and Australian made by CSR

Hebel is 100% manufactured in Australia by CSR Building Products Limited, so you can depend and rely on the product quality, technical expertise, warranty and stock supplies. With CSR you can trust that everything has been proven, tested and continually improved.

ENVIRONMENTAL CHOICE AUSTRALIA

HEB-2006
GECA 08-2005–
Environmentally
Innovative Products

Hebel PowerClad. Better to build

At the heart of the Hebel system is the Hebel PowerClad - a 75mm thick, steel reinforced building panel made from AAC (Autoclaved Aerated Concrete) supplied in lengths up to 1800mm and widths of 600mm.

The unique Hebel attributes are best summarised with the Hebel 'tick' below:

Lightweight yet solid and tough as brick

A standard 1350mm PowerClad panel weighs just 39kg (calculated at 30% moisture content) when delivered – allowing two trades people to position without the need for a crane or other mechanical lifting device using standard tools.

Being a lightweight concrete reinforced with steel, Hebel PowerClad panels pass the critical 'knock test' for consumers. As strong and tough as bricks – independent tests show that a rendered Hebel panel has comparable impact resistance to brick (Report 0164 Orica 06.09.05).

Faster construction period

Hebel PowerClad is the new system that's revolutionising the way builders think about cladding. PowerClad does away with the need for specialist tradies such as bricklayers and can be easily laid by your normal on-site tradesmen such as carpenters.

Installation of PowerClad panels is super fast due to a single 1800mm panel being equivalent in area to 53 bricks, which means a Hebel home allows you to reach lock-up stage sooner.

Building with Hebel means: significantly less labour compared to brick construction; a cleaner, safer work area during construction and less clean-up at completion of building.

with...

A comforting thought for a comfortable living environment

Hebel's unique AAC construction provides superior insulation qualities for a masonry product. The unique combination of thermal resistance along with thermal mass, make building with Hebel a smart choice for meeting Australia's stringent building regulations.

For unit and home owners, the thermal efficiencies of Hebel reduces the reliance on heating and cooling appliances – the combined effects of using a heater less in winter and fans or air conditioning less in summer and warmer months, can have a big impact on rising energy costs.

Highly fire resistant for peace of mind and added security

The Hebel PowerClad panels are non-combustible and renowned for their highly fire resistant properties. The PowerClad System complies with all six Bushfire Attack Level (BAL) requirements and achieves a FRL (Fire Resistance Level) of 90 minutes. Another reason when building with Hebel, you're building with peace-of-mind for your own future as well as the home owners future.

A sound reason for better acoustic qualities

Hebel pioneered the introduction of lightweight wall panels providing acoustic performance levels at or above $R_W + C_{tr} = 50$ in high rise multi-residential buildings.

Sustainability for a better world in the long term starts today

Hebel delivers a diverse number of environmental benefits over brick and concrete. In an independent Life Cycle Assessment (the leading methodology used to quantify the environmental impacts of a product's entire life) undertaken by Good Environment Choice Australia, in accord with international standard ISO 14 024, Hebel was found to have clear environmental benefits across all key environmental criteria.

To be awarded the label, products must have a 30% lower impact than alternatives. Hebel uses 61% and 64% less embodied energy and 64% and 55% less greenhouse gas emissions than the comparative products, concrete and brick veneer respectively.

As environmental consciousness and social responsibility increases, Hebel is striving to exceed further to set new sustainability standards in building materials and residential living.

...for all the best reasons

Hebel PowerClad
a revolutionary way to build

Hebel PowerClad system

Hebel PowerClad is a revolutionary cladding system using 1350mm and 1800mm steel-reinforced panels simply glued and screwed to an adjustable channel system to provide a flat surface for a beautiful render finish.

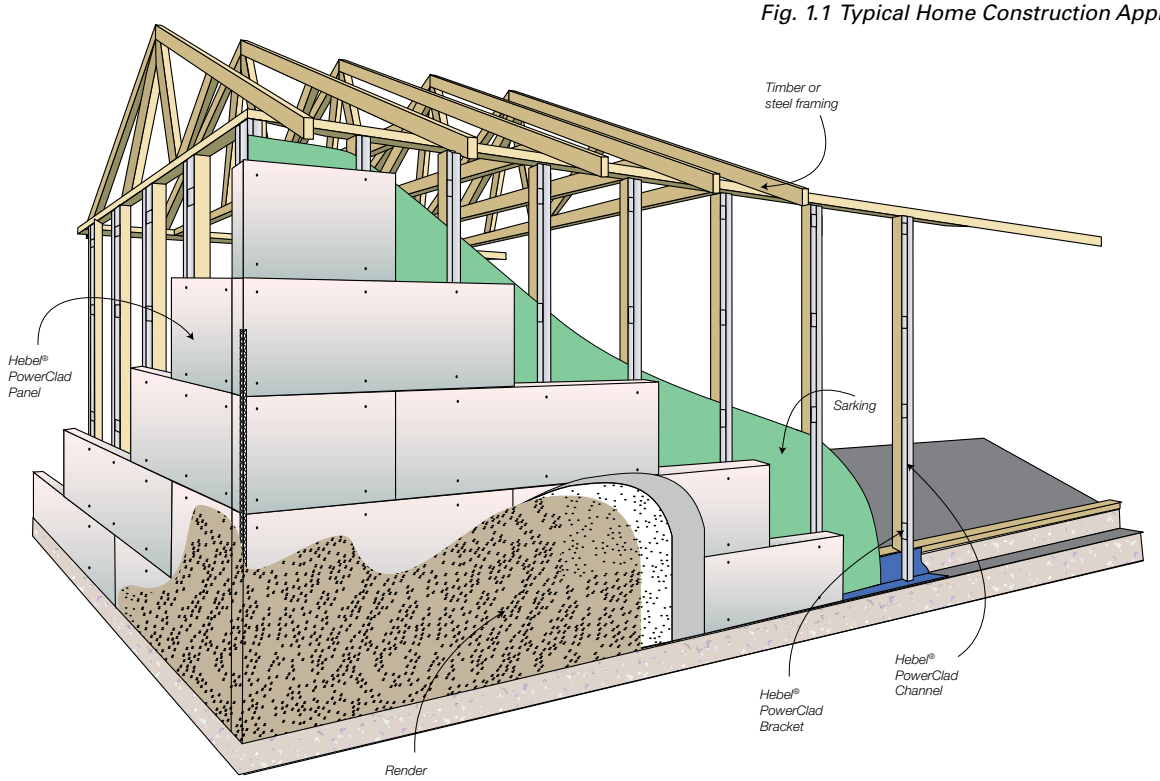
Hebel PowerClad has been designed for homes built using either timber or steel framing and can be used in new dwelling construction, second storey additions, extensions and for re-cladding. The system consists of 75mm thick steel-reinforced Hebel PowerClad Panels, installed horizontally and secured to Hebel PowerClad Channels. The channels are secured to the frame using PowerClad brackets.

PowerClad Panels have been designed so that they can be lifted into place by two men and come in the following dimensions:

- 600mm wide x 1350mm length, weighing 39kgs*
- 600mm wide x 1800mm length, weighing 52kgs*

**calculated at 30% moisture content.*

Fig. 1.1 Typical Home Construction Application



The many applications of other Hebel products

In addition to the widely accepted and in-demand Hebel PowerClad panels, Hebel also manufactures a wide variety of other products including larger vertical PowerPanels for application in the construction of modern, desirable homes.

Hebel also manufactures building systems for floors, fencing and load bearing blocks for external and Internal walls. For further information visit www.hebelaustralia.com.au

1.1 Designing an external wall using Hebel PowerClad

Design Process

This section outlines the design process for determining the adequacy of Hebel PowerClad.

STEP 1: Determine the wind category, soil type and stud framing layout.

STEP 2: Design Criteria. Where required identify the BCA Performance Requirements:

- Fire Resistance Level (FRL).
- Sound insulation performance (R_W values).
- Energy Efficiency (R-Value).

STEP 3: The flowchart below can be used to determine, spacing and quantity of PowerClad brackets, channels and screws to suit project requirements.

STEP 4: Select insulation and/or sarking material to suit energy efficiency requirements.

STEP 5: Check adequacy of sound insulation and fire resistance level.

STEP 6: Complete detailed design and documentation.

Compliance with the Building Code of Australia (BCA)

All building solutions, such as walls, floors, ceilings, etc. must comply with the regulations outlined in the BCA or other authority.

The BCA is a performance based document, and is available in two volumes which align with two groups of 'Class of Building':

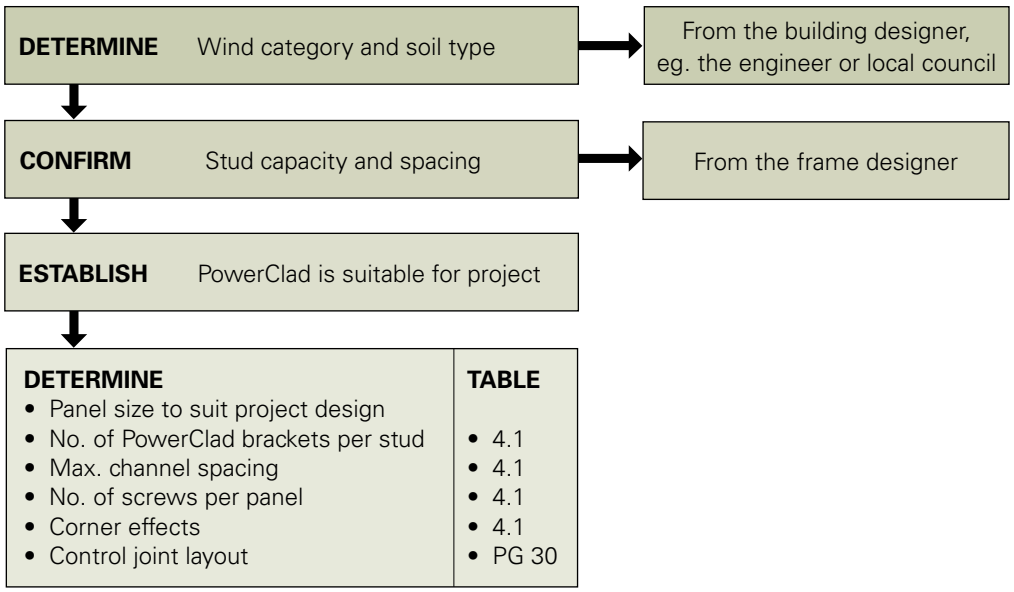
Volume 1 - Class 2 to Class 9 Buildings; and

Volume 2 - Class 1 & Class 10 Buildings - Housing Provisions.

Each volume presents Regulatory Performance Requirements for different Building Solutions for various classes of buildings and performance provisions. These Performance Provisions include: Structure; Fire Resistance; Damp & Weatherproofing; Sound Transmission & Insulation; and Energy Efficiency.

This design guide presents tables, charts and information necessary to assist in the design of a system incorporating Hebel PowerClad that complies with the Performance Requirements of the BCA. The designer must check the adequacy of the building solution for Performance Requirements outlined by the appropriate authority.

Fig. 1.2 Flow Chart for Design Process



1.2 Structural provisions

Overview

The Hebel PowerClad system consists of panels secured to the framing via vertical steel PowerClad Channels. This section provides the basic information on the selection of PowerClad Brackets and PowerClad Channel spacings for a given stud spacing and wind category, as well as considerations to assist the designer in determining the appropriate wall configuration.

The design information presented in Table 1.3 has been determined for the PowerClad Brackets and PowerClad Channels.

IMPORTANT: The design and approval of the structural framing (cold-formed steel or timber) is to be provided by the framing product manufacturer and/or project engineer.

IMPORTANT: Only Hebel PowerClad Brackets and PowerClad Channels may be used.

Principles of Design

The principles on which the design is based include:

a) The lateral wind loads applied to the panels are transferred into the PowerClad framing, then to the stud frame, which should be designed in accordance with the relevant Australian Standards for the imposed loads. The frame should be designed for all bracing and hold-down requirements.

b) The design of the stud frame shall consider the weight of suspended panels.

c) The system is not considered as cavity construction, as the PowerClad Channels clearly bridge the cavity, hence the details show the necessity of sealing the windows and door frames, as well as applying a water resistant external coating.

d) The system specifications vary with wind load. The notation used in AS1684 Residential Timber Framed Construction has been adopted.

e) The localised effects of wind around corners of buildings have been considered in the design and included in the tables. The extent of this effect is discussed towards the end of this section.

Criteria for Corner Panels

Due to the increase of wind load around the corners of buildings, extra brackets, channels and screws may be necessary.

Table 1.3 identifies the installation criteria in these areas, in the column titled 'Corner'.

Cyclonic Rated Areas

For wind categories greater than N3/C1 the PowerClad details within this design and installation guide are not suitable. For wind categories greater than N3/C1 please contact Hebel Technical Services phone: 1300 369 448

Earthquake Loads

Earthquake loading has not been considered in this design guide.

Design Tables

This section presents tables to assist the designer in selecting the number of PowerClad brackets, channels and number of screws for securing the Hebel PowerClad panels to the framing, for a given wind category.

IMPORTANT: The wind category is to be used as a guide. The designer should check the project wind pressure against the values given in the tables.

Stud Frame – Steel or Timber

The stud frame shall be designed by the stud manufacturer or appropriate project engineer. Hebel PowerClad panels are a masonry product and the support structure should be designed to provide sufficient stiffness.

The steel stud frame shall be designed and constructed in accordance with AS3623 and AS/NZS4600 (BCA Performance Requirement). The timber stud frame shall be designed and constructed in accordance with AS1684.

Hebel PowerClad Panels

Design procedures for the verification of wall systems consisting of Hebel autoclaved aerated concrete (AAC) panels generally follow the design principles outlined in Australian Standard AS3600 – Concrete Structures, with the exception of cover requirements for durability and development length for reinforcement.

Fixings

Table 1.5 outlines the connection type and requirements for constructing Hebel PowerClad detailed in this design guide. The project engineer or framing manufacturer is responsible for specification of alternative details. The minimum performance requirement of the screw is:

- Minimum screw coating class in accordance with AS3566: Class 3. (Refer Section 5.0 for Durability).

Table 1.3 PowerClad Design Table

Wall Height	Stud Spacing	Wind Load Category			
		N1/N2		N3/C1	
		Typical	Corner	Typical	Corner
3600	600	600/4/2	600/5/2	-	-
	450	900/5/2	450/4/2	-	-
3300	600	600/4/2	600/5/2	-	-
	450	900/4/2	450/4/2	-	-
3000	600	600/4/2	600/5/2	600/4/2	600/7/3
	450	900/4/2	450/4/2	900/5/2	450/5/2
2700	600	600/3/2	600/4/2	600/4/2	600/6/3
	450	900/4/2	450/4/2	900/5/2	450/5/2
2400	600	600/3/2	600/4/2	600/4/2	600/5/3
	450	900/4/2	450/4/2	900/5/2	450/4/2

KEY
xxx = PowerClad channel spacing (mm), y = No of PowerClad brackets z = No of screws per PowerClad Panel
For example 600/4/2 = 600mm channel spacing; 4 PowerClad brackets; and 2 screws per PowerClad Panel

NOTE 1. For 450mm stud spacing corner location applies to 900mm from external corner.
2. For 600mm stud spacing corner location applies to 1200mm from external corner.

Fig. 1.4 Hebel PowerClad installation

Table 1.5 Screw Types

Type of Screw	Application	Socket Type
12-11x25mm Hex Head Type 17 screw	Fix PowerClad bracket to timber frame	5/16" Hex Mag. Socket
10-16x16mm Hex Head self drilling screw	Fix PowerClad bracket to steel stud frame (1.2mm BMT max.) and fix PowerClad channel to bracket	5/16" Hex Mag. Socket
14-10x100mm MP Bugle Head Type 17 screw	Fix PowerClad Panels to PowerClad channel and fix internal corner angle to PowerClad channel	5mm Hex drive bit
65mm Hex Head self drilling screw	One sided fixing of PowerClad channel to bracket	5/16" Hex Mag. Socket

Structural framing design for two storey construction

The use of Hebel PowerClad in two-storey construction involves a number of design considerations that require attention. In conjunction with the following, refer to the Construction Details in Section 3.29. Note, when PowerClad panels are suspended from the stud frame the project engineer shall design the frame to support the weight of the panels.

Steel Joists or engineered timber joists (≤1% shrinkage)

Note, lower storey panels are to bear on the slab edge and be bedded on mortar. However, consideration should be given to the sectional size of the lintels over openings on the lower storey.

As the details reveal, only a dummy control joint (solid 6-10mm packers, backing rod and polyurethane sealant joint) is required at the horizontal PowerClad panel junction between the upper and lower panels.

The panel support packer should consist of a durable material that will not degrade during the life of the structure.

Timber Frame Construction (>1% shrinkage joist).

Movements in the order of 25mm can occur in a two storey timber frame with a timber first floor. The fixing method used in Hebel PowerClad does not allow for this extent of differential movement between the external skin and the timber frame.

The allowances for shrinkage of timber framing in BCA 2006 Vol. 2, Section 3.3.1.10, by providing gaps between framing and masonry, should be adopted as a minimum.

It is therefore recommended that the upper storey PowerClad Panels be installed 35mm clear of the lower storey panels. During construction a temporary packer is used to separate the panels and is then removed after the panels have been fixed.

The impact of this construction is to load the lower storey frame with the weight of the upper storey panels. In effect, an extra 51kg/m^2 (for the weight of the upper panels) is being added to the load already carried by the timber frame. The load approximates 1.2 kN/m (2.4m wall height).

To simplify the design implications of this extra load, it is recommended to add an extra 1.4m of tributary width for a 90kg/m^2 Tile Roof load (for 2.4m upper wall heights) for the design of the lower storey frame and timber lintels, when using AS1684.

Suspended Panel Applications

The support of the full weight of the suspended PowerClad panels can be adequately supported by the PowerClad framing system. For full design details refer to section 3.2 Construction Details noting two screw requirement for suspended applications.

1.3 Design and detailing considerations

Building Setout

Panel size and orientation

The Hebel PowerClad system utilises 1350x600x75mm and 1800x600x75mm panels installed horizontally and laid in a stretcher bond pattern. The full benefit of saving in time and cost will be fully realized when the construction is designed to suit modules of 300mm in wall length and height.
In principle thoughtful setout on the drawing board will minimize the site cutting and waste of PowerClad panels.

External Wall Height

Typically the external wall height is the distance from the base of the slab step down up to 50mm above the height of the eaves lining. The PowerClad panels should extend 50mm above the eaves lining to ensure weather tightness is maintained.

Window and door heights should also be considered when determining panel layout. Typically a 300mm distance below or above door or window heights is desirable.

Wall length (Horizontal Dimensions)

Although not as critical as the wall height, the wall length designed to 300mm dimensions will help reduce waste.

Wall thicknesses

Hebel PowerClad Wall system uses less width than brick veneer, thereby providing the opportunity to increase the total internal usable floor space.

Table 1.6 Comparative Wall Thicknesses (mm)

Wall System	Wall Element Width			Total Width
	Stud	Cavity	Masonry Leaf	
Brick Veneer	70	40	110	220
Hebel PowerClad	70	35 - 50*	75	180 - 195
Brick Veneer	90	40	110	240
Hebel PowerClad	90	35 - 50*	75	200 - 215

** Note: Depending on frame misalignment*

Windows

The builder should ensure that the reveal size is correct to suit PowerClad: The distance from the frame to the back of the panel (cavity) will range from 35-50mm depending on the frame variation (straightness).

NOTE: The external sealant in the control joints adjacent to windows should be extended to the inside face of the wall, beyond the sealant line of the windows. No gap should exist between both sealants. This sealant configuration is recommended at similar detailing issues.

Installation of services

The installation of services in the building is very similar to the methods currently being used throughout the industry. The gap between the PowerClad panel and the frame, which nominally measures 35-50mm, is quite adequate to allow electrical services to be installed as usual.

The electrical meter box can be face fixed to the outside of the panels, or alternatively, recessed into the stud frame through the panels. In the latter case, appropriate setout of the opening should also suit the 300mm module and all sides of the box should be sealed to the panels with an approved external grade sealant. With regard to plumbing services, the hot and cold water pipes can be externally face fixed between the studs, if necessary. As Hebel PowerClad is not classified as cavity construction, this installation technique is satisfactory. The only difficulty occurs when the pipes are run horizontally. In this case the pipes must be installed through the studs, so as not to foul the vertical installation of the PowerClad Channels. PowerClad Channels are not to be cut to allow clearance for services.

Penetrations through the panel for services should be neatly filled and the joint sealed with an external grade sealant.

Termites

It is the builder's responsibility to ensure that all council and Australian code requirements are fully adhered to in regard to the design of the house for preventing termite attack.

The construction details contained in this guide do not attempt to fully address the issues, due to the variation of requirements from state to state. Hebel PowerClad is ideally suited to the exposed edge method of perimeter protection. BCA 2006 Vol. 2 Part 3.1.3 deals with termite risk management and the reference code is AS3660.

Footings

Footings for Hebel PowerClad should comply with conventional masonry veneer construction as specified in Australian Standard AS 2870. This is a minimum requirement. Local engineering advice should always be sought, especially in areas of highly reactive ground conditions.

Movement 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 support structure movement (lateral sway or vertical deflection), thermal expansion and contraction and differential movements between materials. 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, which could potentially crack the wall, movement joints need to be installed.

- Control Joints are provided to relieve the induced stresses resulting from thermal expansion or contraction of the AAC, or differential movement between the AAC and another material or structure, such as abutting walls or columns of concrete or brickwork. Control joints can delineate coating shrinkage breaks.

Vertical control joints should coincide with control joints in the supporting structure and anywhere that significant structural movement is expected, where the wall abuts a vertical structure, such as an existing building, or adjacent to large openings. Refer to page 30 for control joint requirements.

This design guide proposes minimum widths for the movement joints. The project engineer shall determine if the joints are sufficient to accommodate the movement of the specific project building.

Typically, the vertical joint is nominally 5-10mm wide and filled with an appropriate backing rod and flexible polyurethane sealant

Condensation

Condensation is a complex problem, and can occur under a variety of conditions, not just cold conditions.

Literature on this subject is available from CSIRO/BRANZ/ASHRAE and must be consulted when building in areas where condensation is likely to occur.

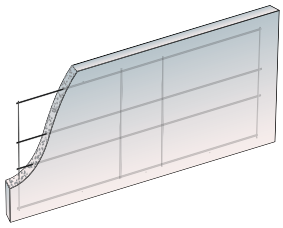
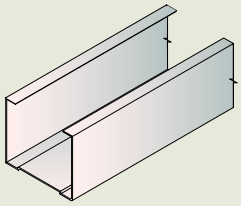
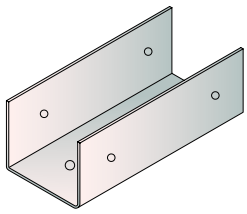
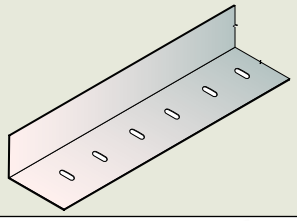
In these cases, the appropriate use of a wall wrap as a vapor barrier or as thermal insulation, or both, can be effective in controlling condensation.

Penetrations

Small service penetrations through the panel of PowerClad should allow for differential movement between the panel and the service. All penetrations are a potential source for water ingress and should be sealed with an appropriate polyurethane sealant.

1.4 System components

PowerClad is a complete system and Hebel stocks many of the products and materials required for your convenience.

Product	Description	Supplied by CSR Hebel	
PowerClad Panel	The core component of the PowerClad system. Available in two standard sizes 1350x600x75mm with an average weight of 39kg* and 1800x600x75 with an average weight of 52kg*. **calculated at 30% moisture content.*	✓	
PowerClad Channel	Used to secure the PowerClad panels. Available in three standard lengths - 2700, 3000 and 3600mm.	✓	
PowerClad Bracket	Fixed to the steel or timber stud frame. Length - 100mm	✓	
Internal Corner Angle	Required to support panels at internal corner locations. Length - 2700mm	✓	
14-10 x 100 Bugle Head Type 17 screw	Fix Panels to PowerClad Channel Fix internal corner angle to PowerClad Channel	✓	
12-11 x 25 Hex Head Type 17	Fix PowerClad Bracket to timber stud frame	✓	
10-16 x 16 Hex Head Teks	Fix PowerClad Bracket to steel stud frame Fix PowerClad Channel to PowerClad Bracket	✓	
65mm Hex Head self drilling screw	Fix PowerClad Channel to bracket from one side	✓	

Note: CSR has engineered and tested the PowerClad system to comply with the Building Code of Australia and relevant Australian Standards. It cannot guarantee products and accessories not specified and sold by CSR will perform to these standards. The Product Guarantee will only apply if all components used in the system are specified and sold by CSR or its agents.

Product	Description	Supplied by CSR Hebel	
Hebel Adhesive	Used for gluing the PowerClad panels together at vertical and horizontal joints (20 kg bag)	✓	
Hebel HighBuild Render	Used to create a level base for an approved acrylic texture system (20 kg bag)	✓	
Hebel Mortar	Used as a thick bed mortar base to provide a level base for the first course of PowerClad panels when supported on a slab edge base (20 kg bag)	✓	
Hebel Patch	Mixed in a ratio of 2:1 Hebel Patch with Hebel Adhesive. Used to patch screw heads, minor chips or damage to panels (11 kg bag)	✓	
Hebel anti-corrosion protection paint	To coat exposed reinforcement during cutting	✓	

Photo courtesy of Porter Davis

2.1 Durability

Overview

Durability means the capability of a building or its parts to perform a function over a specified period of time. It is not an inherent property of a material or component. It is the outcome of complex interactions among a number of factors, including:

- The service conditions.
- Material characteristics.
- Design and detailing.
- Workmanship.
- Maintenance.

The following sub-sections of the durability topic are written in order to provide general guidelines in how best to provide, enhance and maintain adequate durability of Hebel PowerClad.

Maintenance and Enhancement of Durability

The durability of Hebel PowerClad can be enhanced by periodic inspection and maintenance. Inspections should include examination of the coatings, flashings and sealants. Paint finishes must be maintained in accordance with the manufacturer's recommendations. Any cracked and damaged finish or sealants, which would allow water ingress, must be repaired immediately by recoating or resealing the effected area. Any damaged flashings or PowerClad panels must be replaced as for new work.

The durability of the system can also be increased by using Class 4 fixings throughout, additional treatment of steelwork, and by painting all exposed sealants to the sealant manufacturer's recommendations.

Coastal Areas

Hebel PowerClad can be used in coastal areas with additional precautions to ensure salt does not build up on the surface of the wall. For buildings, which are 200m to 1000m from a shoreline or large expanse of salt water, such as, Swan River (west of the Narrows Bridge), Sydney Harbour (east of the Harbour Bridge or Spit Bridge), one of the following is required:

- All horizontal and vertical movement joints must be appropriately caulked; or
- All walls must be sufficiently exposed from above so that rain can perform natural wash-down of the wall; or
- Walls, which are protected by soffits above, must be washed down twice per year, to remove salt and debris build-up, particularly at the joints.
- In all cases, Class 4 or stainless steel screws must be used.
- For buildings less than 200m from the shoreline as defined above, Hebel does not recommend that Hebel PowerClad be used without project specific consultation with Hebel Engineering Services.

Hebel PowerClad Panel

Hebel PowerClad panels have many characteristics which make them a very durable product, including:

- Will not rot or burn.
- Is not a food source for termites.
- Unaffected by sunlight.
- Not adversely affected over normal temperature ranges.
- One quarter the weight of conventional concrete.
- Solid and strong with corrosion protection coated steel reinforcement.

Durability of Components

The PowerClad brackets, PowerClad channels and screws designed and sold by CSR Hebel have the appropriate corrosion protection to maintain their strength and integrity to suit the required design life of the project.

IMPORTANT: Termite treated timber frames (such as LOSP treated frames) may require sarking to prevent corrosion of steel components. Please refer to frame manufacturer for compatibility. CCA treated timber frames have a deleterious effect on the component coatings, which can lead to corrosion. Where timber is CCA treated, provide a barrier such as wall wrap between PowerClad components and timber member.

When assessing durability the following documents can be referred to for guidance:

- ABCB Guideline Document – Durability in buildings: 2003.
- AS/NZS 2312: 2002 – Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings.
- ISO 9223: 1992 – Corrosion of metals and alloys – Corrosivity of atmospheres -Classification.
- AS3566: 2002 – Self drilling screws for the building and construction industries.
- AS2331 Series.

Reference to AS3566 should always be adhered to when selecting the screws corrosion resistance classification.

Wall Frames

Steel Frames

The designer needs to ensure that the steelwork has adequate protective systems to ensure that durability is maintained. The durability of the stud frame can be enhanced by the provision of a membrane, such as wall wrap. The manufacturer of the steel stud frame can provide guidance on the appropriateness of this solution on a project-by-project basis.

IMPORTANT: The steel frame requirements outlined in the BCA Vol. 2, Part 3.4.2 should be considered in conjunction with steel frame design and construction advice from the steel frame manufacturer. These requirements consist of minimum protective surface coatings with restrictions on the location of the building and exposure condition of the steel frame.

Timber Frames

Information on the durability design of timber structures and components can be obtained from documents such as:

- AS 1720.1 Timber Structures, Part 1: Design Methods.
- AS 1684 Timber Framing Code.
- State timber framing manuals.
- AS 4100 Metal Connectors: Corrosion.
- AS 3600 Subterranean Termites.

Photo courtesy of Metricon

2.2 Fire resistance performance

Overview

The Hebel PowerClad System can be subjected to a fire loading as the result of either an external fire source, or an internal fire source. When the wall requires a fire resistance level (FRL) rating, CSR Hebel provides the following guidance.

External Fire Source

For an external fire source, the excellent fire resistance qualities of the Hebel PowerClad panel protects the structural support framing, and provides a high fire resistance level for the Hebel PowerClad System.

NOTE: The FRL rating of the wall can be affected by the penetrations and the method adopted to protect these penetrations. A fire collar with a –/60/60 FRL rating will govern the FRL of the wall, even if the wall configuration has a FRL rating of –/90/90. Where required, the performance of the external coating when subjected to a fire loading shall meet the appropriate performance requirements outlined in the BCA. Joints & gaps need to be appropriately fire rated. Eg. vertical control joint will need fire rated sealant & horizontal joints should be blocked with compressible fire rated material.

Fire Certificates & Reports

Copies of the test reports and/or opinions can be obtained by contacting Hebel Technical Services.

Internal Fire Source

For an internal fire source the studs must be protected by the internal wall linings. Refer to CSR Gyprock Red Book™ for specifications.

External Walls in Fire – BCA Provisions

Where necessary, the designer and builder should ensure the structural support framing, its connections as well as the Hebel PowerClad panel installation are satisfactory when subjected to fire conditions. The BCA Vol 2 (Part 3.7.1) outlines provisions for external walls for fire resistance in a residential building where the external wall is less than 900mm from an allotment boundary or 1.8m from another building on the same allotment. If this occurs an FRL of not less than 60/60/60 is required from the outside.

Fire Performance of Hebel PowerClad

A formal assessment has been performed on the Hebel PowerClad System by Exova Warringtonfire. It is their opinion that the PowerClad System achieves a Fire Resistance Level (FRL) of 90/90/90. The results of this assessment apply to proposed wall constructions exposed to fire on the Hebel panel side only. This excellent result enables Hebel PowerClad to be used as walls on zero line allotment blocks (where access prohibits external fixing contact Hebel Technical Services 1300 369 448).

Bushfire Areas

The introduction of Australian Standard AS 3959 - 2009 - Construction of buildings in bushfire-prone areas, presents new challenges to building designers with differing design requirements across six Bushfire Attack Level (BAL) categories. The PowerClad System complies with all six BAL requirements and achieves a Fire Resistance Level (FRL) of 90/90/90 - exceeding the standards.

Design Considerations

Fire Stop Penetrations

Penetrations through Hebel panel to accommodate pipework, electrical cabling or ductwork will have to be protected (fire stop), to prevent the spread of fire through the penetration. The penetration can be protected with proprietary products, such as:

- Fire rated sealants.
- Fire collars and intumescent wraps.
- Fire rated mortars.
- Fire rated pillows.
- Fire rated switch boxes.

Hebel recommends contacting the manufacturer to obtain the appropriate product/solution and installation method for the application and wall configuration.

Fig. 2.1 Bushfire Area – Both these homes were constructed using Hebel blocks.

2.3 Energy efficiency

Building Code of Australia (BCA)

The BCA is available in two volumes which align with two groups of 'Class of Building':

- Volume 1 - Class 2 to Class 9 Buildings; and
- Volume 2 - Class 1 & Class 10 Buildings - Housing Provisions.

Each volume presents the Performance Requirements for the efficient use of energy for internal heating and cooling in buildings. The majority of changes have been associated with the Housing Provisions.

The Performance Requirements for energy efficiency ratings are dependent upon the form of construction (i.e. walls or floors), Class of Building, and the type of areas being separated. The performance requirement is a value that is the Total R-Value, which is the cumulative total of the individual R-Values of the building system components.

Hebel PowerClad

One of the primary design objectives in planning a building is to provide a cost effective comfortable living/ working environment for the building's inhabitants. Exploiting the inherent thermal mass and insulation qualities of Hebel enables the designer to achieve this objective.

Several international comparative studies have been conducted to investigate the benefits of incorporating AAC walls in place of conventional wall systems. A common trend was the lower heating and cooling energy consumption and smaller mechanical equipment required to maintain a comfortable living environment, especially with regards to regions of mainly cold weather. The excellent performance was the result of the three characteristics – thermal mass, thermal insulation, and the air tightness of the construction.

The level of insulation provided in a wall is determined by the required Total R-Value. The higher the required Total R-Value the greater the insulation provided. Hebel PowerClad incorporating CSR Bradford insulation can provide the R-Value ratings outlined in Table 8.3.

Thermal Insulation

It is recommended that insulation materials be installed to enhance thermal insulation properties and occupant comfort. Insulation also improves the acoustic performance of the wall against outside noise.

The BCA provides Deemed-to-Satisfy Provisions for compliance and installation of the various types of insulation. The insulation should be installed in Hebel PowerClad such that it forms a continuous barrier to contribute to the thermal barrier. All insulation installed in the Hebel PowerClad System must comply with: AS/NZS4859.1; or AS2464.3 for loose fill insulation.

Air Tightness

As outlined in Section 8.1 the thermal performance can be influenced by many factors. Most of these are related to the design decisions and properties of the adopted materials. Construction practices can also significantly affect the performance with poor sealing, resulting in drafts. The tight construction tolerances of AAC provide a wall with low air infiltration rate. Testing at the CSIRO (Test Report DTM327) on Hebel blockwork with thin bed adhesive joints has determined an air infiltration rate of 0.3L/s (0.014% of internal volume). PowerClad has fewer thin bed adhesive joints, a rate less than this could be achieved.

Wall Wrap

As well as controlling condensation and acting as an air barrier, a wall wrap can be used to significantly improve the thermal insulation and energy efficiency performance of a building solution. Layers can alter the performance of the cavity by providing a reflection side. The design of the wall wrap arrangement is complex and should be performed by the appropriate project consultant.

Where the wall wrap provides a weatherproofing function, the wall wrap material must comply with AS/NZS4200 Parts 1 and 2.

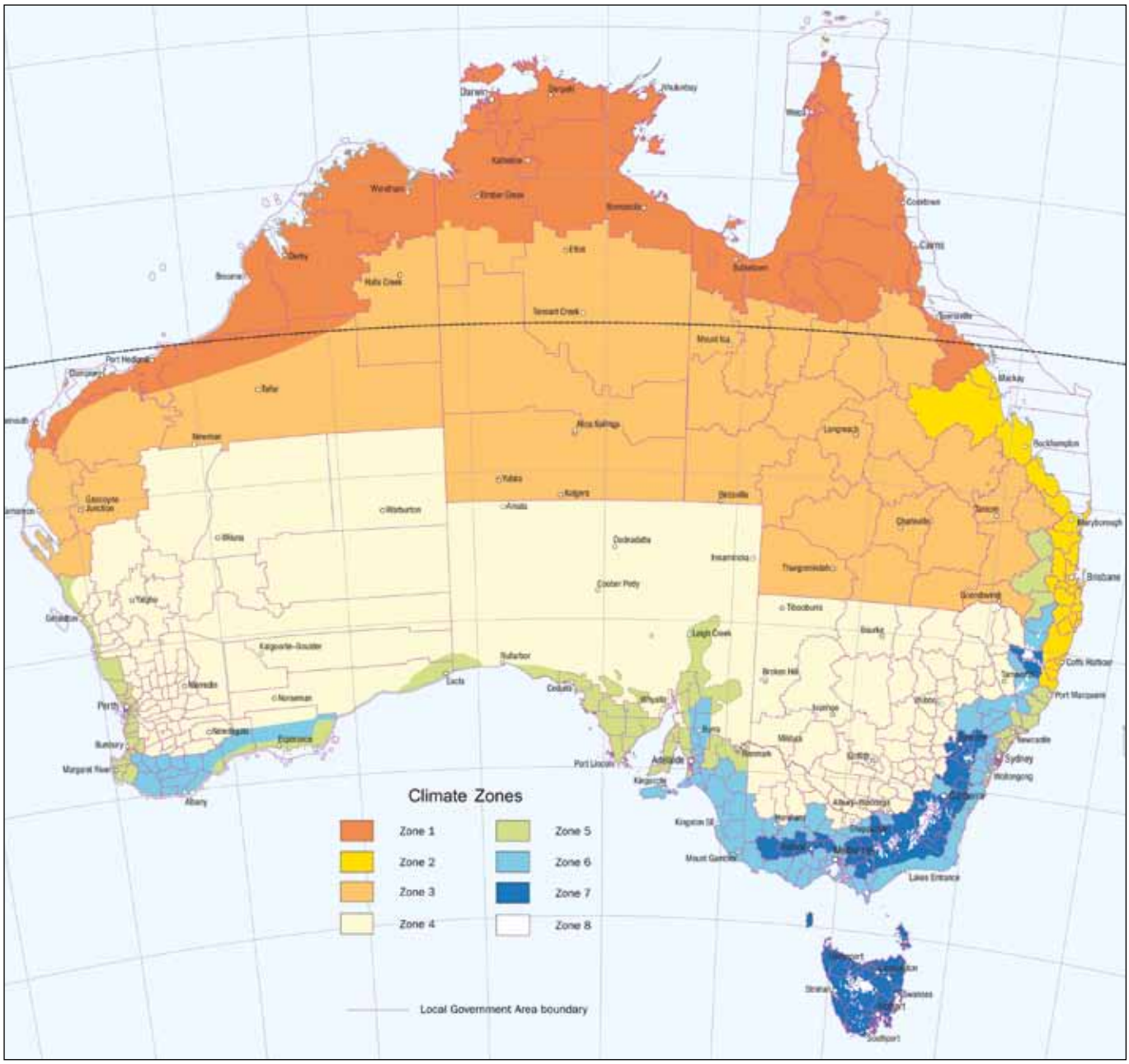
Energy Rating Software

Energy legislation (6 stars) is changing every year and ratings software is changing to keep up. Combine this with all the variable elements in a house such as window sizes, floor space and house orientation and you have a moving landscape.

Hebel provides a great springboard for walls and floors in these rating systems due to its unique thermal properties of insulation AND mass. When rating in FirstRate, AccuRate, BASIX and BERS Pro select AAC as the wall and floor option and see why Hebel is fast becoming the all star performer. Hebel can help your project achieve 6 stars and beyond.

Table 2.2 Energy Efficiency

The following tables show the performance levels required for walls and floors under the BCA and the thermal performance of the Hebel PowerClad system.



STEP 1. Determine which climate zone your project is located in Australia from the map.

STEP 2. From the table, determine the design conditions ('Summer' heat flow in or 'Winter' heat flow out) according to the building class and climate zone for your project. Note: Building classes are defined by the BCA.

STEP 3. Refer to the roof, wall or floor system applicable to your construction type to determine Total R-Value.

Note: Some applications may achieve Total R-Values sufficient to comply with the minimum performance levels of the deemed to satisfy requirements contained in the Energy Efficiency Provision of the BCA

Climate Zone	1	2	3	4	5	6	7	8
	Below 300mm	Above 300mm						
Class 1-10,2,3,4.9c	Summer	Winter						
Class 5,6,7,8,9a,9b	Summer						Winter	
Class 1-10	Summer	Winter						
Class 2,3,4,5,6,7,8,9a,9b,9c	Summer			Winter				

Table 2.3 Energy Efficiency

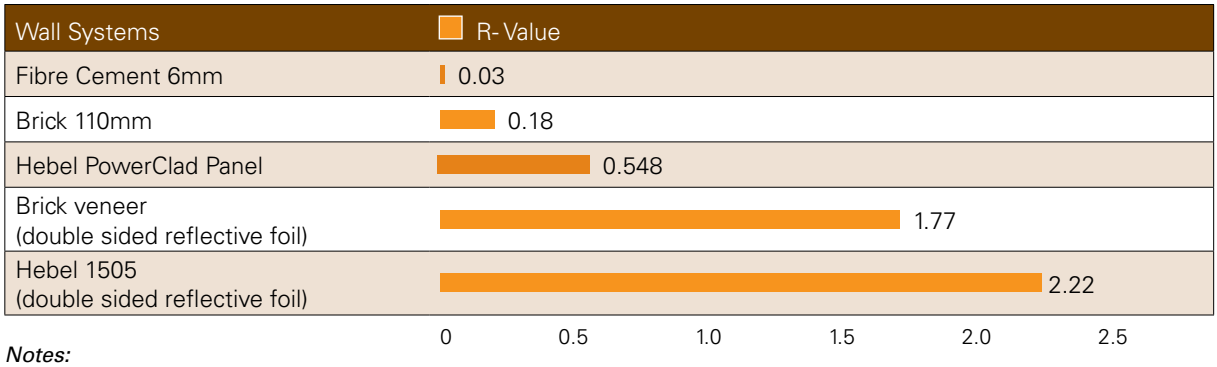
Climate Zone	Options		
1, 2,3,4 and 5	(a)	(i)	Achieve a minimum *Total R-Value* of 2.8.
	(b)	(i)	Achieve a minimum *Total R-Value* of 2.4; and
		(ii)	Shade the external wall of the storey with a verandah, balcony, eaves, carport or the like, which projects at a minimum angle of 15 degrees in accordance with Figure 3.12.1.2. of BCA 2011
6 and 7	Achieve a minimum *Total R-Value* of 2.8.		
8	Achieve a minimum *Total R-Value* of 3.8.		

Table 2.4 Hebel PowerClad Energy Efficiency

Code	Description	Total R, m^2.K/W	
		Winter	Summer
Hebel 1500	Hebel Houses External Wall PowerClad Single Foil, 70mm Stud	R1.71	R1.59
Hebel 1501	Hebel Houses External Wall PowerClad Single Foil, 90mm Stud	R1.75	R1.60
Hebel 1502	Hebel Houses External Wall PowerClad Single Foil + R2.0 Batt, 70mm Stud	R2.84	R2.66
Hebel 1503	Hebel Houses External Wall PowerClad Single Foil + R2.0 Batt, 90mm Stud	R3.13	R2.92
Hebel 1504	Hebel Houses External Wall PowerClad Double Foil, 70mm Stud	R2.17	R1.98
Hebel 1505	Hebel Houses External Wall PowerClad Double Foil, 90mm Stud	R2.22	R2.00
Hebel 1506	Hebel Houses External Wall PowerClad Double Foil + R2.0 Batt, 70mm Stud	R3.28	R3.04
Hebel 1507	Hebel Houses External Wall PowerClad Double Foil + R2.0 Batt, 90mm Stud	R3.57	R3.31
NOTES	Single Foil = Single sided reflective foil Double Foil = Double sided reflective foil		

Notes: • Refer to BCA for state & territory variations. • Refer to BCA for alternative means of satisfying the required performance levels. • Refer to CSR Bradford product literature for design & installation requirements for the nominated reflective foil laminates and insulation.
• Stated R-values in Table 2.4 have been provided by James Fricker calculations 107.312c to 107.343c in report dated June 2010 and have been based on a 40mm cavity.

Table 2.5 Comparison of Thermal Properties



Notes:
• Sarking or insulation to be added to the above values where applicable to comply with BCA climate zone requirements.
• R-Values above (excluding Hebel PowerClad solution) are taken from BCA 2011.
• Refer to Table 2.4 for Hebel PowerClad configuration and thermal insulation options.
• R-Values provided for brick veneer have been provided by James Fricker calculation 107.50 dated July, 2010.

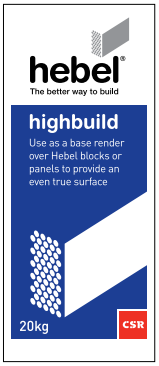
2.4 Coating requirements

Hebel PowerClad requires an appropriate external coating system and sealant detailing to ensure a water resistant and vapor permeable building envelope is achieved.

CSR Hebel has worked with Dulux AcraTex in development of coating systems for Hebel to meet the specific requirements of the Hebel substrate and building systems.

Where alternate coatings systems are considered, Hebel advises that a full comparison of system components and their relevant design intent be verified to provide weather tightness as deemed by the BCA and in relation to long term system durability.

Hebel HighBuild Render



Hebel HighBuild Render is the only cement render base levelling compound recommended by Hebel as part of the PowerClad system. This render is designed for compatibility with the Hebel Substrate.

Typical Cement renders, including some bagged renders may be unsuitable where their compressive and tensile properties are incompatible with the unique properties of the Hebel substrate.

Hebel HighBuild may be applied 4-10mm in thickness in a single application to produce a high quality even, true surface.

Dulux AcraTex AcraPatch High Build (full acrylic levelling coat), is a suitable alternative to Hebel High Build where the Hebel PowerPanel is laid true and flush (<3mm deviation)

Coating System Performance

The following are items to be considered when selecting a suitable coating system over Hebel HighBuild:

Manufacturer approved:

- All coating systems applied to Hebel external walls should be approved by the coating manufacturer as being appropriate for coating an AAC substrate.

Surface adhesion:

- The substrate preparation and coating application should be in accordance with the coating manufacturer's specification.
- Before applying finishes in coastal areas (refer to definition), all PowerClad panels must be thoroughly washed with fresh water to remove any salt residue. Refer to coating manufacturer for additional requirements.

Water resistance:

- The primary objective of the coating system is to prevent water ingress through it, yet allow vapor in and out of the AAC substrate.
- The coating system should comply with the following performance parameter:

Water Transmission rate:

- <10g / m^2 / 24hr / kPa

Water Vapor Permeability

For a coating to allow the "escape" of water vapor, the coating must be vapor permeable.

The coating system should comply with the following performance parameters:

$w \cdot s_d \leq 0.2$ kg / ($m^2 \cdot h^{0.5}$) where,

- Coefficient of Water Absorption $w \leq 0.5$ kg/($m^2 \cdot h^{0.5}$)
- Equivalent Air Layer Thickness of Water Vapor Diffusion $S_d \leq$ 2m.

Notes: A coefficient of water absorption ($w \leq 0.5$) means that minimal dampness is absorbed regardless of the time factor.

A coating with an ($s_d \leq 2$m) has less resistance to water vapor diffusion (escape) than a static 2m thick air layer.

Compatibility:
Ensure the coating system is compatible with the substrate and construction system components. eg. Coatings may not adhere to silicone or other sealants and mastics. Excessive joint adhesive or mortars smears across the panel face may require removal or specific primers.

Durability:
The coating must be durable and not deteriorate with exposure to light (UV) and weather.

Elasticity:
The coating must be able to bridge a 0.5mm minimum crack width. The coating manufacturer can specify the minimum design specification (thickness), so that the coating is serviceable.

IMPORTANT: This list of performance requirements indicates that a specific fit-for-purpose coating system should be adopted, and that a simple paint coating would most likely be an inadequate coating system. Variations to the coating system should be approved by the coating system manufacturer or representative.

Table 2.6 Coating system for Hebel PowerClad

Hebel System	Surface Alignment	Base Render or Levelling Coat	Primer	Acrylic Texture Body Coat	Weatherproofing Finish Coat	Comment
PowerClad	≤ 3mm	Hebel HighBuild (Render) **or** AcraPatch HighBuild (Acrylic Leveller)	AcraTex Green Render Sealer / Self Priming	PowerFinish or Tuscany Coarse or Coventry Coarse	AcraShield Matt or AcraSkin	*AcraSkin recommended for maximum crack bridging system performance.* *Application of Finishcoat in 2 coats (first-coat reduced 10% with water) is recommended to provide best results - relevant to project complexity eg. unbroken broadwall, scaffolding or cutting in detail and coastal areas.*

Notes: PowerClad requires External Corner Angles at all external corners and openings. Hebel recommends installation of 1-2mm Flexible Acrylic Texture plus Weatherproofing Elastomeric Finishcoat providing improved consistency of finish, system flexibility and durability.

2.5 Weatherproofing

Sealant

All control joints must be sealed with a suitable external polyurethane sealant. All gaps between the PowerClad panels and framing around windows must be caulked with an appropriate external grade sealant.

The sealant should be installed in accordance with the sealant manufacturer's specifications.

Wall Flashings

In general, flashings shall be designed and installed in accordance with SAA-HB39 1997 - Installation Code for Metal Roofing and Wall Cladding.

Wall Wrap

For Hebel PowerClad, wall wrap is only required for insulation and condensation control as well as a corrosion barrier over CCA treated timber frames.

Although not a mandatory requirement, the installation of wall wrap is considered good building practice.

Wall wrap must be designed and installed in accordance with AS/NZS4200 Part I – Materials, and Part 2 – Installation.

Photo courtesy of Porter Davis

3.1 Hebel PowerClad installation sequence

1. Install Flashing (Typically DPC) and Wall Wrap (optional)

2. Install PowerClad Brackets

a. Use Design Table on page 8 to determine the correct number of brackets and channels for the particular wind zone, wall height and stud spacing for your project.

b. Secure brackets to frame using two screws per bracket.

3. Install PowerClad Channels within the PowerClad Brackets

a. Two screws per channel – 1 each side.

b. In locations where access to both sides of the channel are not possible, i.e. corner locations, window or door jambs etc, then use 1 long screw through both sides

c. The Bracket and Channel connections allows for approx 15mm tolerance in the stud frame. Install all channels plumb and to a straight line.

Notes:

- *For panels supported on a base – 1 screw per side required.*
- *For suspended panels – 2 screws per side required (base row only).*

4. Install PowerClad Panels

a. When setting out and positioning panels ensure that the wall configuration is considered with respect to the position of all openings. Refer to page 33 for control joint and window panel junctions.

b. If panels are supported on a base, install Hebel Mortar to the base prior to installing the first row of panels - this will ensure even bearing of the panels.

c. Ensure first course of panels is level.

d. Hebel Adhesive is used to bond the panels together. A double bond is required at vertical joint (perpends) while a single bond is sufficient at horizontal joints.

e. Panels should be fixed to two vertical channels. If this is not possible because of wall length or channel spacing then adjoining panels should be back blocked to assist with panel alignment.

f. Panels should be installed in a stretcher bond pattern with a minimum offset bond of 200mm.

For short runs of walls where the length of wall is ≤ your panel length than it is allowed to stack panel on panel without the stretcher bond pattern.

5. Internal Corners will require the installation of an internal corner angle.

a. Fix internal corner angle through the panel and into the PowerClad Channels on the adjacent wall, providing a fixing location for the intersecting wall panels.

6. Once Panel installation is complete, the wall is ready for coating.

a. External angle beads are required at all external corners and openings.

b. Hebel HighBuild must be used as the base render.

c. Primer (relevant to coating manufacturers specification).

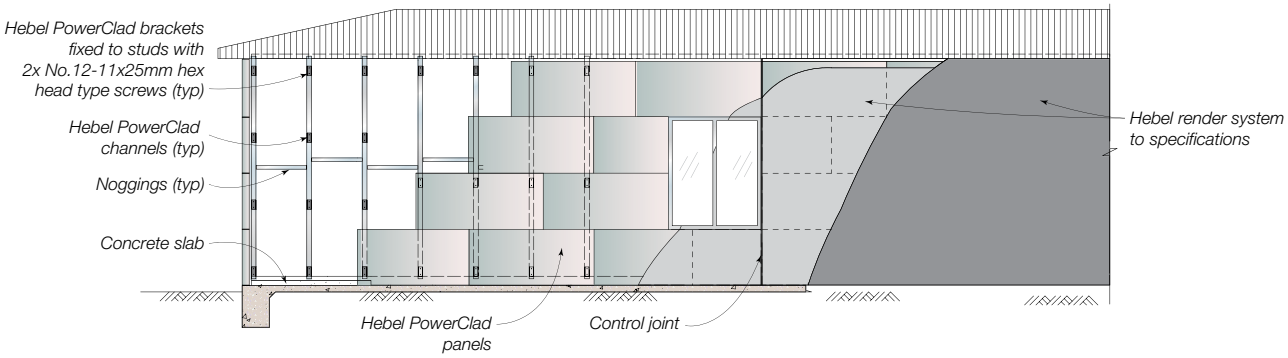
d. Texture Coat.

e. Elastomeric membrane.

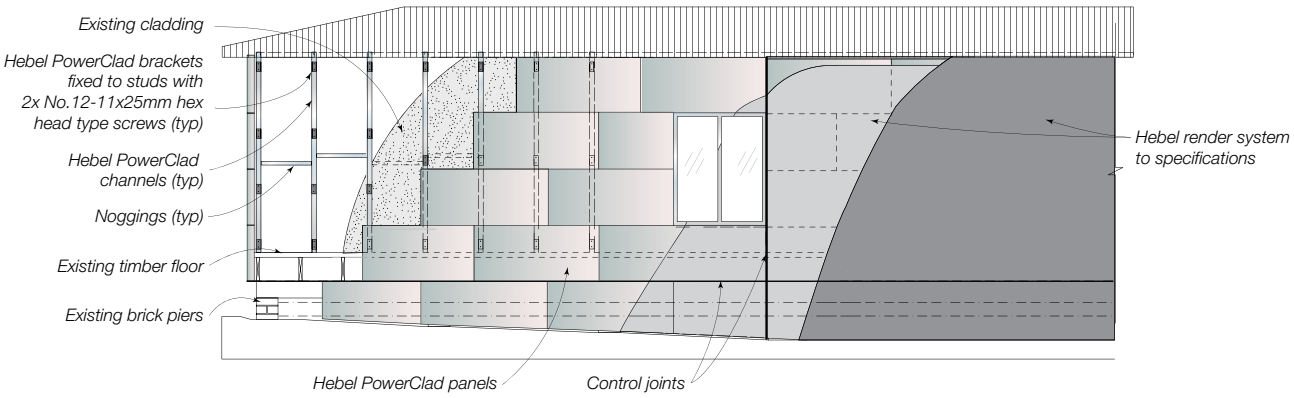
3.2 Hebel PowerClad construction details

Overview

Detail 3.1 New Construction

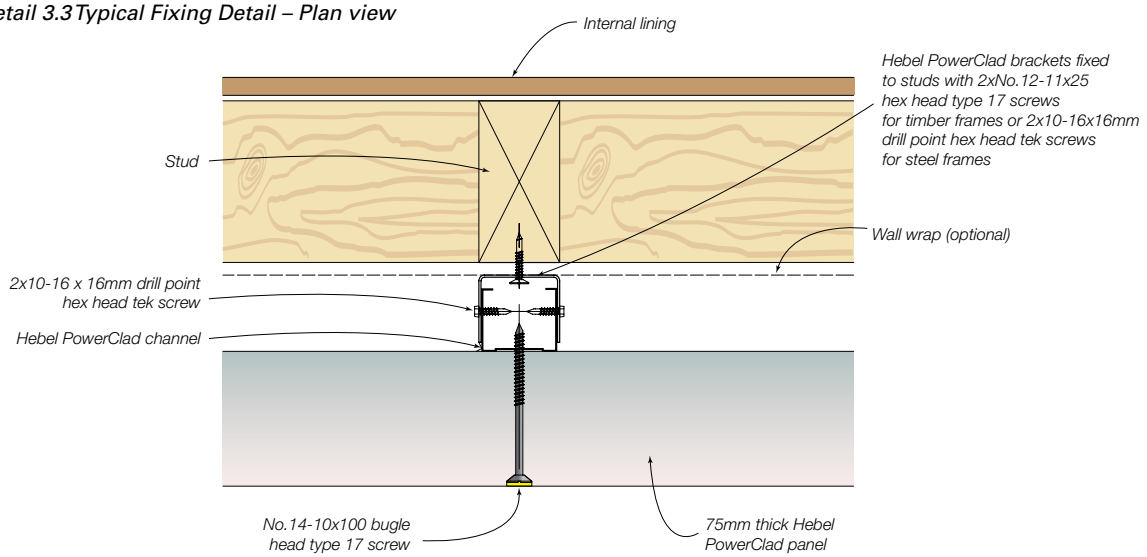


Detail 3.2 Retrofit

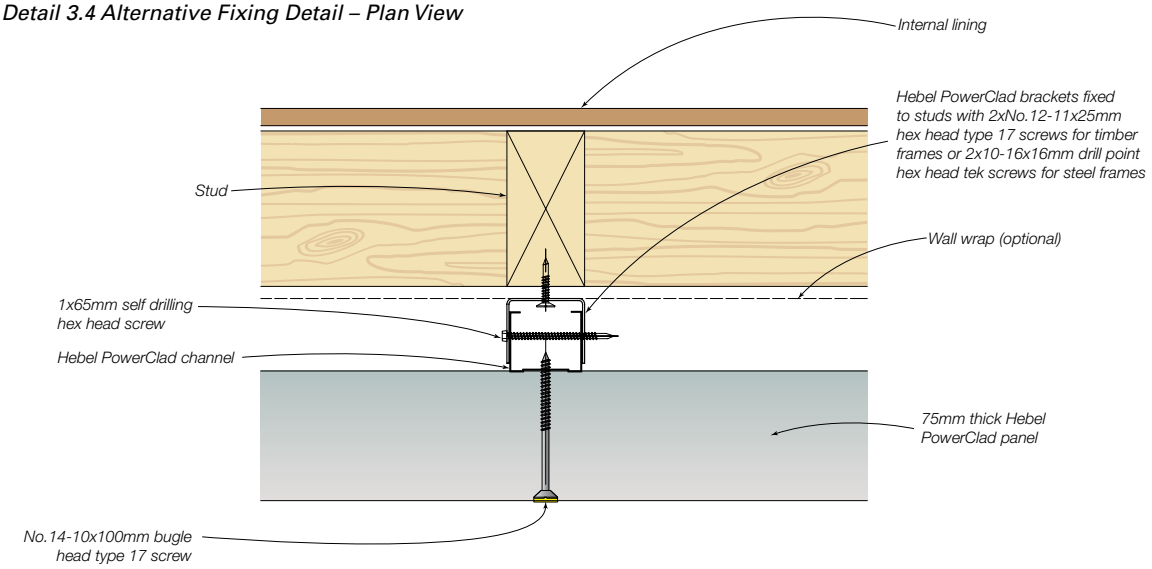


Fixing Detail

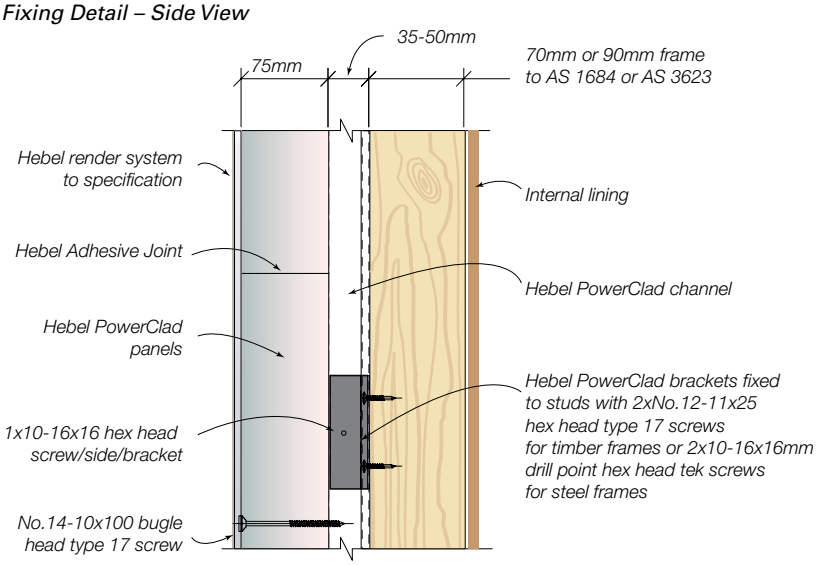
Detail 3.3 Typical Fixing Detail – Plan view



Detail 3.4 Alternative Fixing Detail – Plan View

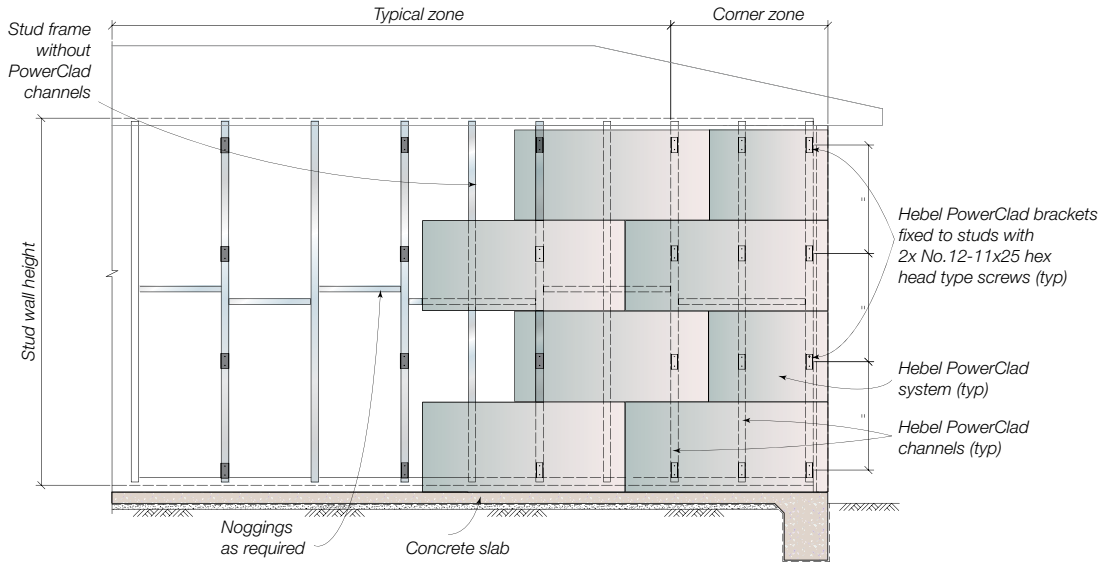


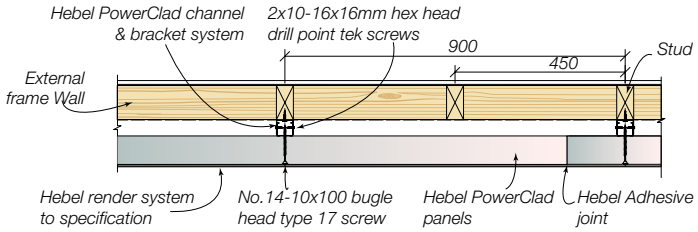
Detail 3.5 Typical Fixing Detail – Side View

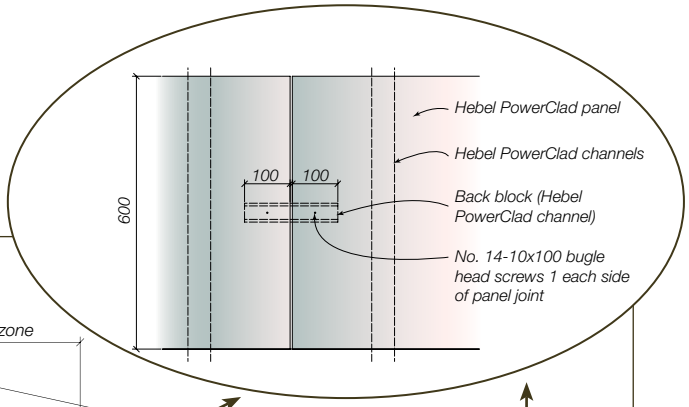


Stud Spacing, Channel & Bracket Layout

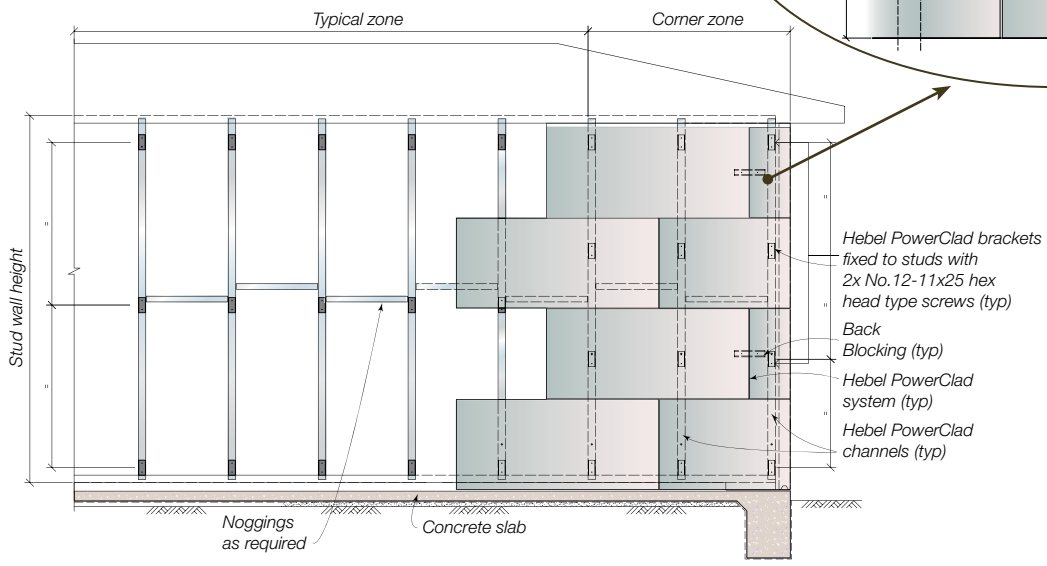
Detail 3.6 Layout Elevation for studs at 450 Centres

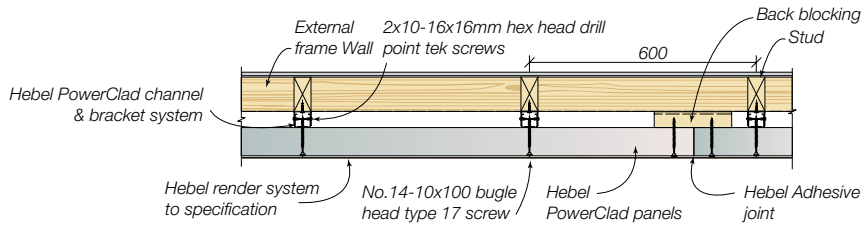






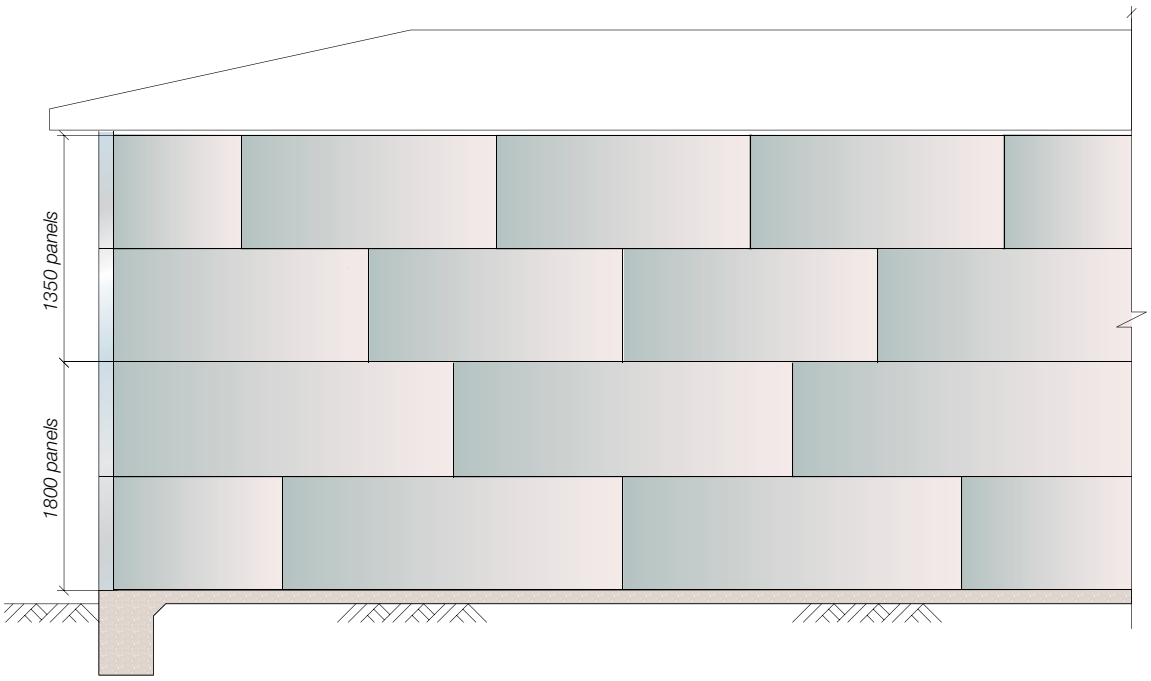
Detail 3.7 Layout Elevation for studs at 600 Centres





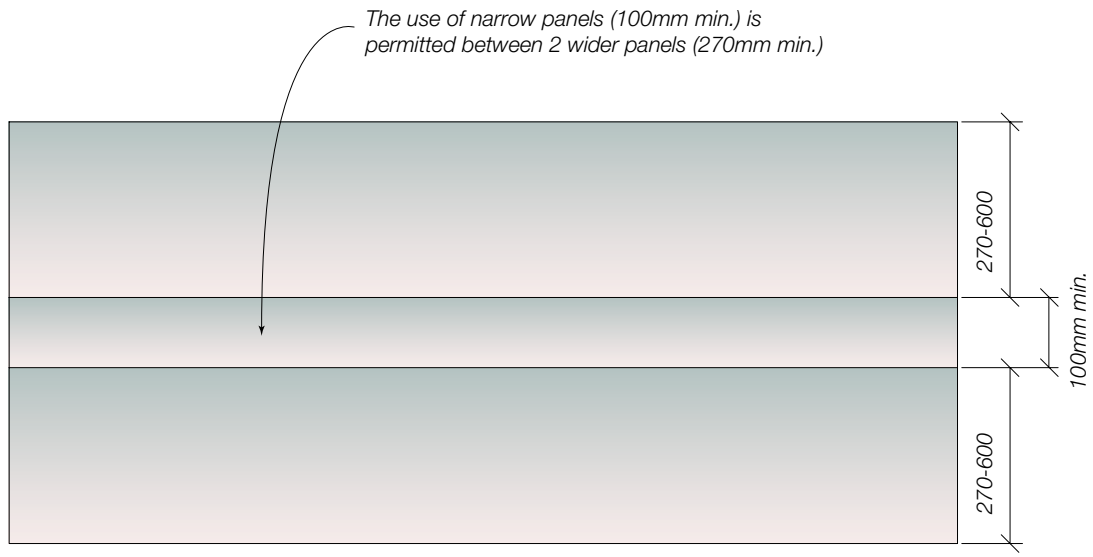
Panel Layout

Detail 3.8 1800mm and 1350mm Panel Layout



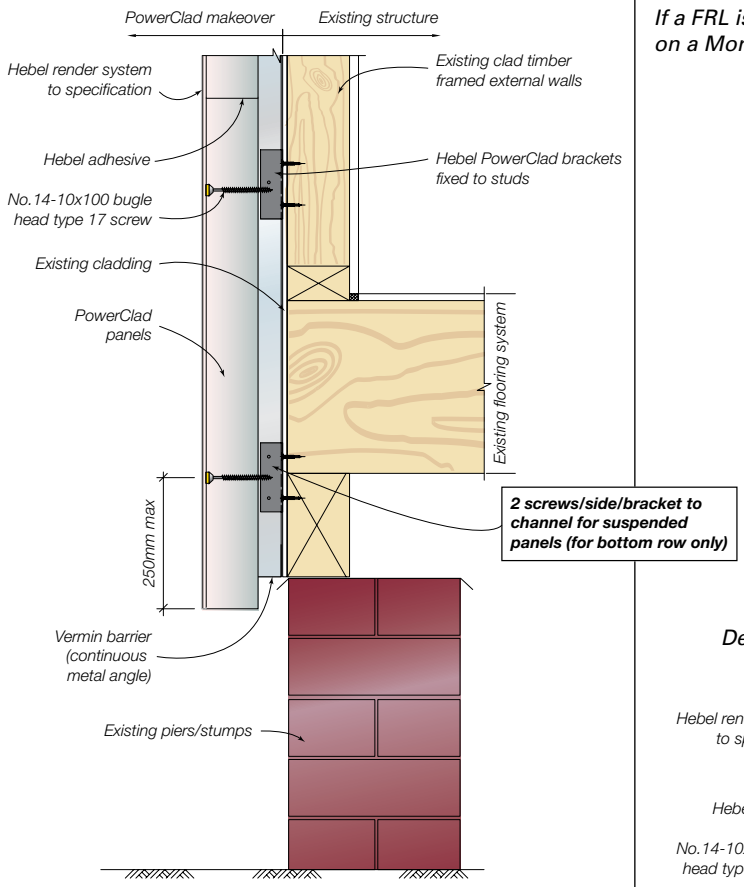
Panel Widths

Detail 3.9 Typical Minimum Panel Width



Base of Wall Detail

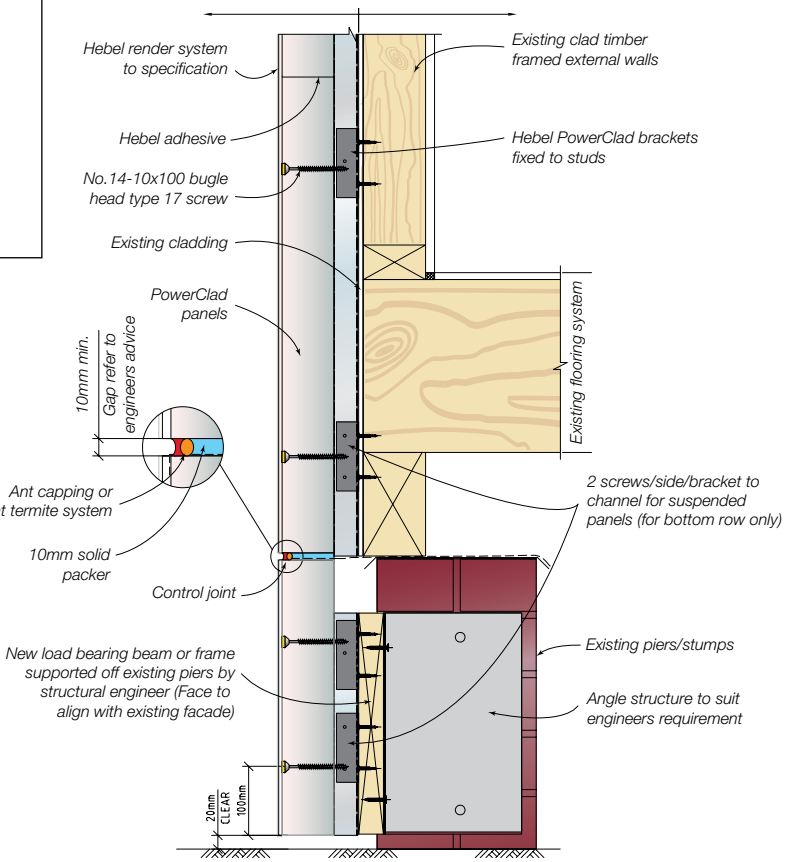
Detail 3.10 Base Detail – Suspended Floor (Exposed Subfloor)



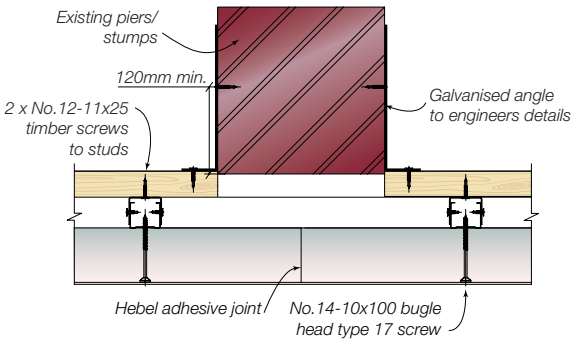
Note: For retrofit scenarios, existing frame and footings must be inspected and approved for PowerClad application by Project Engineer. All frames shall be approved by Project Engineer for suspended PowerClad application.

If a FRL is required, the PowerClad Panel System must rest on a Mortar bed and all joints adequately fire sealed.

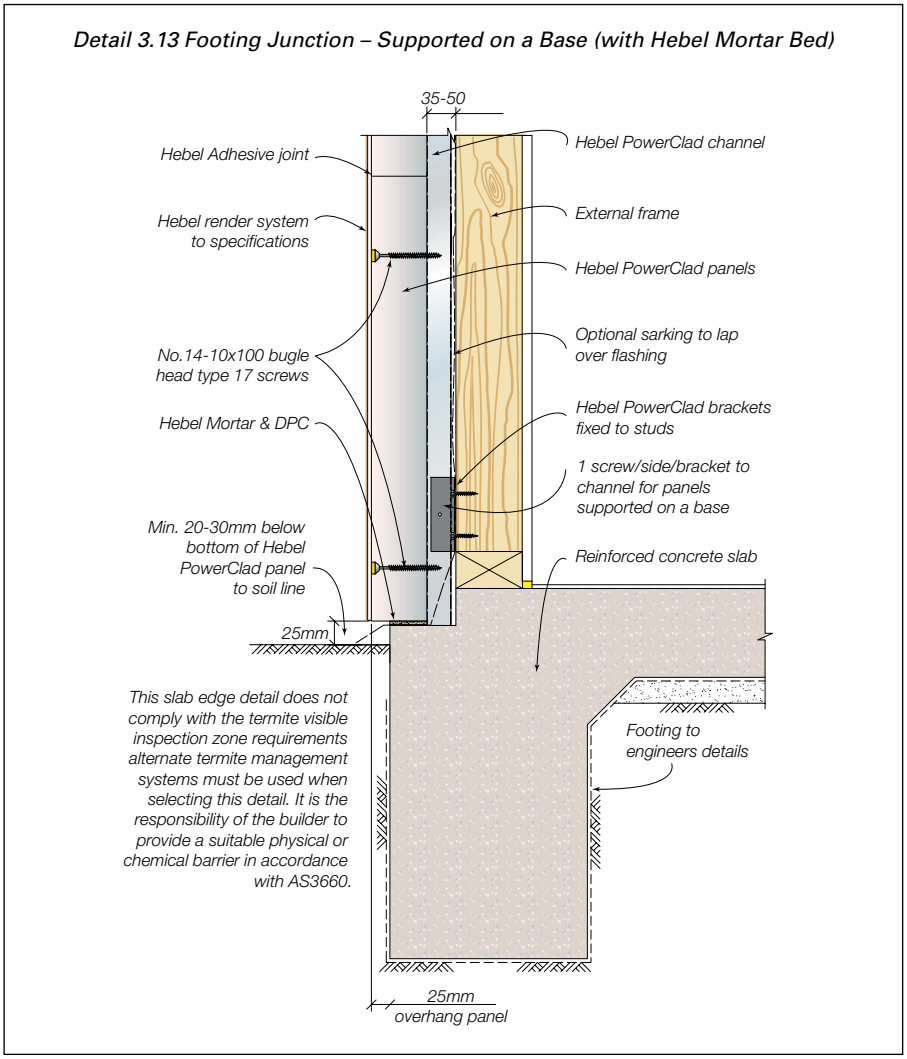
Detail 3.11 Base Detail – Suspended Floor (Hidden Subfloor)



Detail 3.12 Base Detail – Suspended Floor – Pier Connection



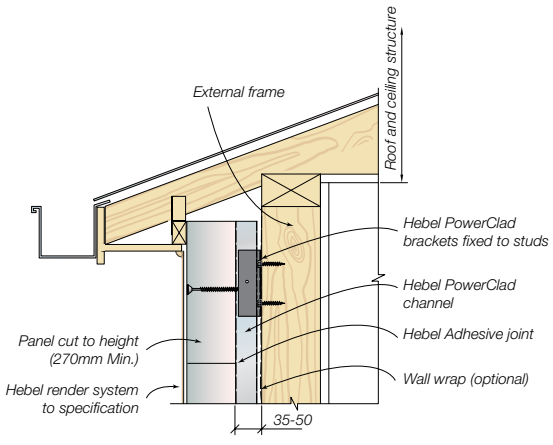
Detail 3.13 Footing Junction – Supported on a Base (with Hebel Mortar Bed)



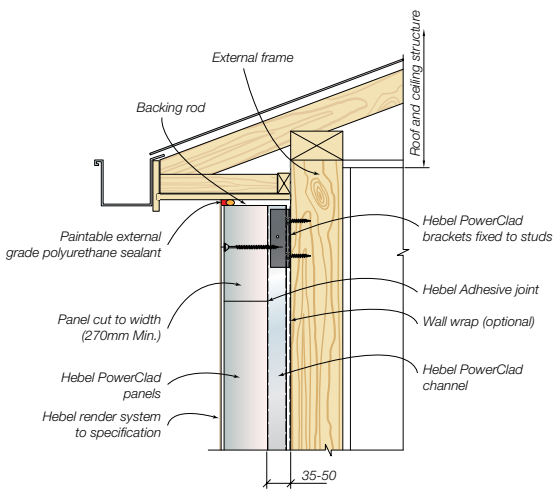
Note: Additional Base details can be found at www.hebelaustralia.com.au.

Eave Details

Detail 3.14 Panel Extended Above Eave



Detail 3.15 Panel at Eave Height



Control Joints

The following information provides the necessary rules for Control Jointing when installing the Hebel PowerClad System:

- Vertical Control Joints required at maximum 6m centres
- Vertical Control Joints required at external and internal corners
- Vertical Control Joints required above and below all doors, including sliding and garage doors
- Horizontal Control Joints Required at every horizontal floor junction
- Horizontal Control Joints required a maximum of 3.6m centres

For openings < 2450mm in width

- Control Joint not required if a Lintel / Stretcher bond Joint is utilised, however if a straight joint extends beyond the height of the window jamb, a control joint or a Glued and Meshed Joint is required.
  Note: The minimum Lintel panel height above windows is 270mm

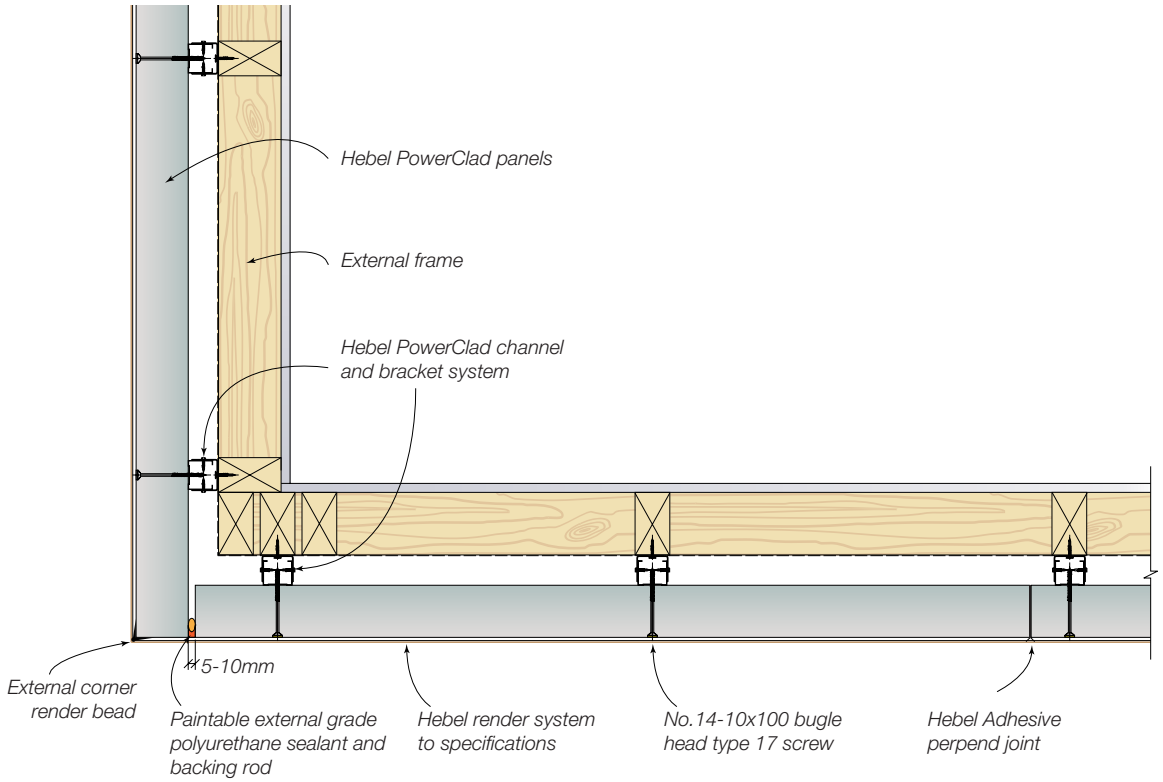
For openings >= 2450mm and < 3600mm wide

- Control Joint required to at least one side of the opening (i.e. above and below the opening) while a Lintel / Stretcher Bond joint or Control Joints or Glued and Meshed Joint required to the opposite side of the opening.
  Note: The minimum Lintel panel height above windows is 270mm

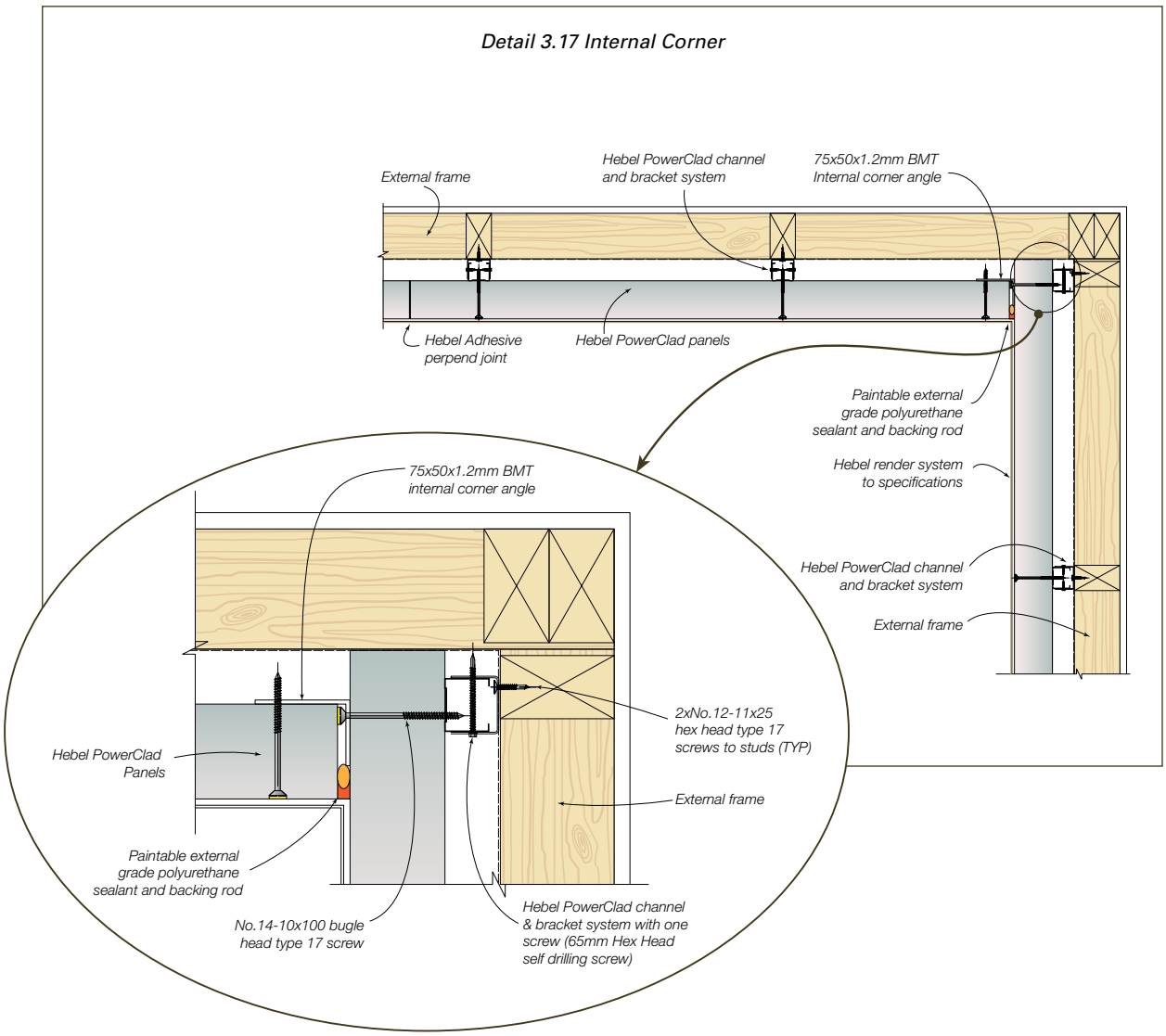
For openings >= 3600mm in width

- Control Joint required to both sides of the opening (i.e. above and below the opening)
  Note: The minimum Lintel panel height above windows is 270mm

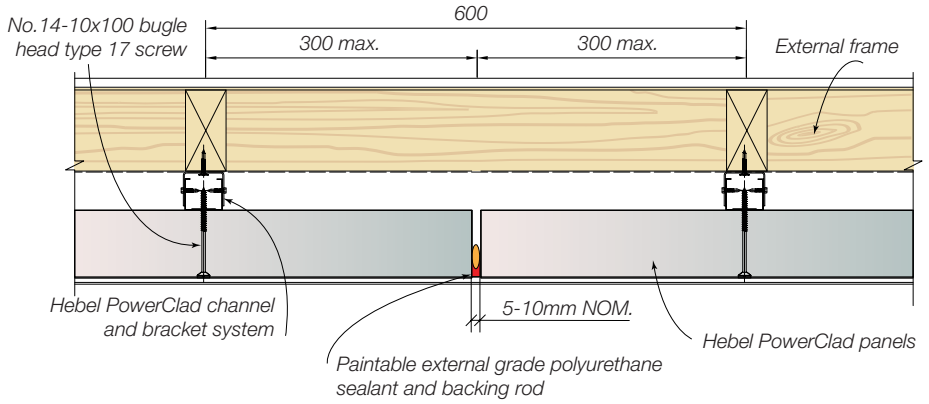
Detail 3.16 External Corner

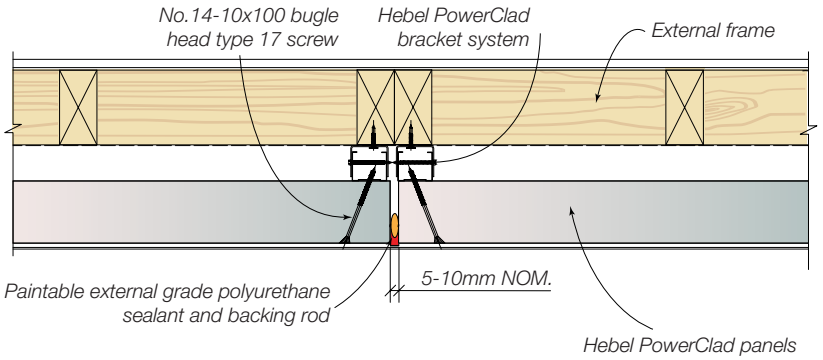


Detail 3.17 Internal Corner

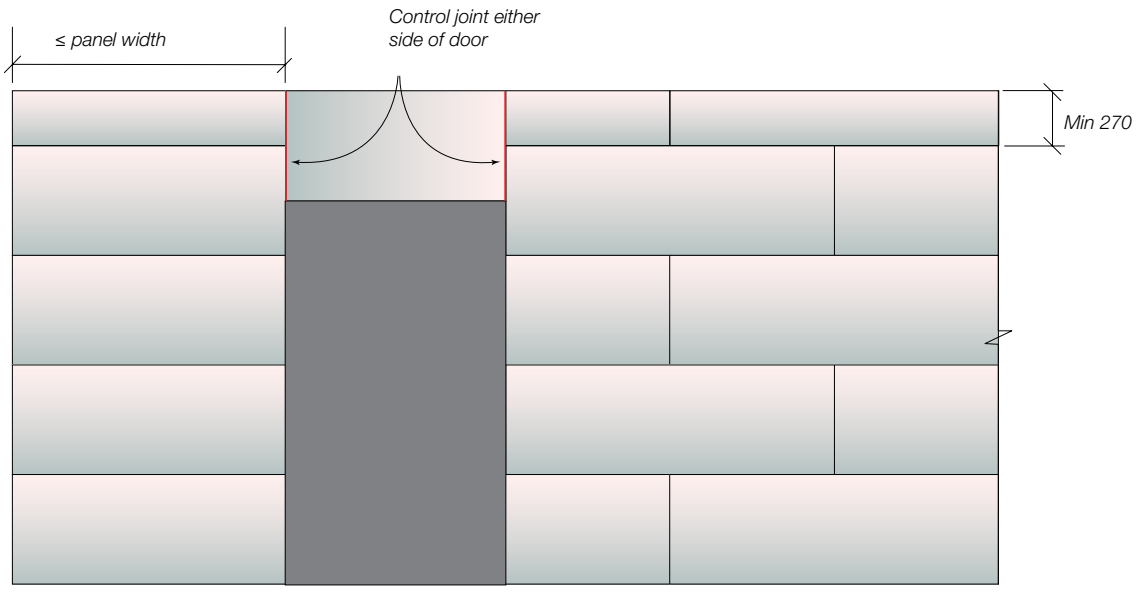


Detail 3.18 Typical Vertical Control Joints

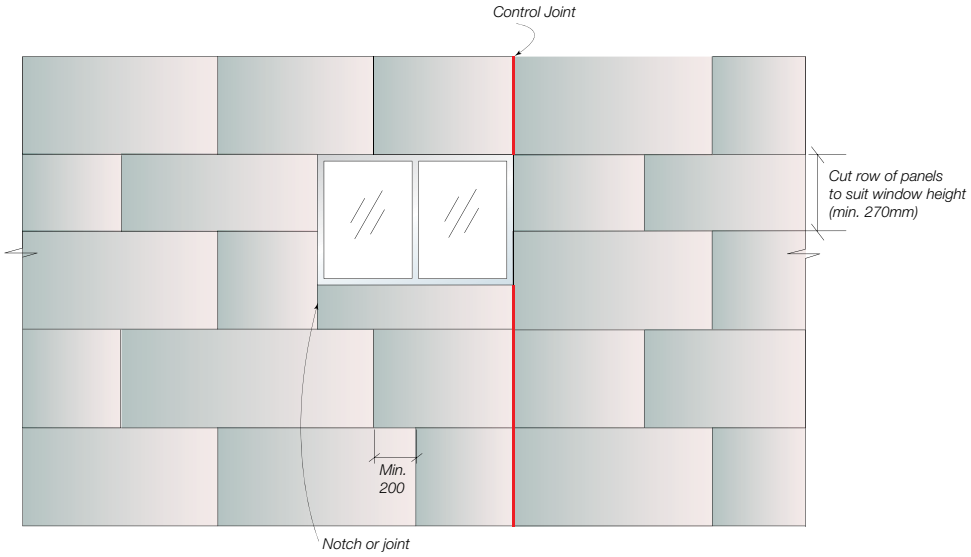




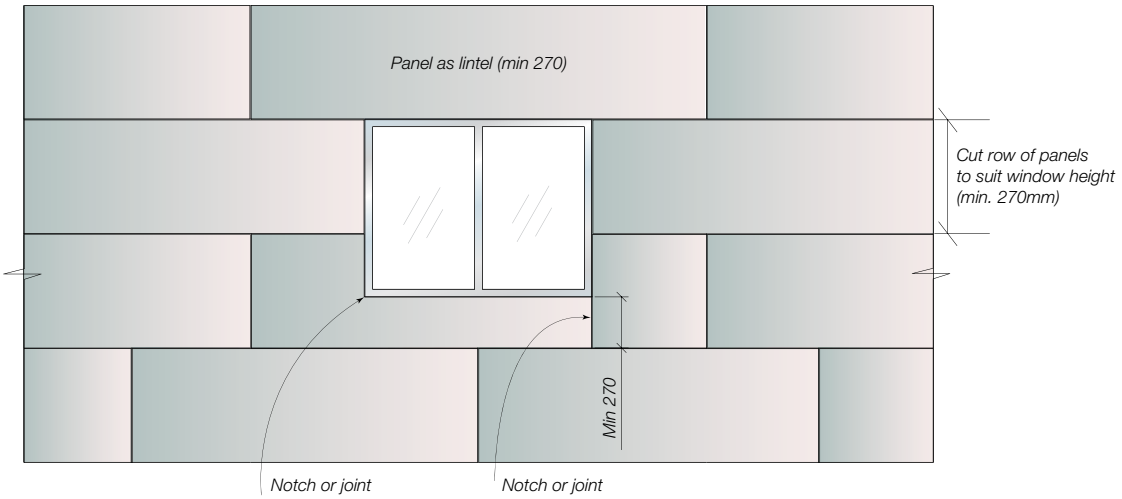
Detail 3.19 Control Joints at Door Openings



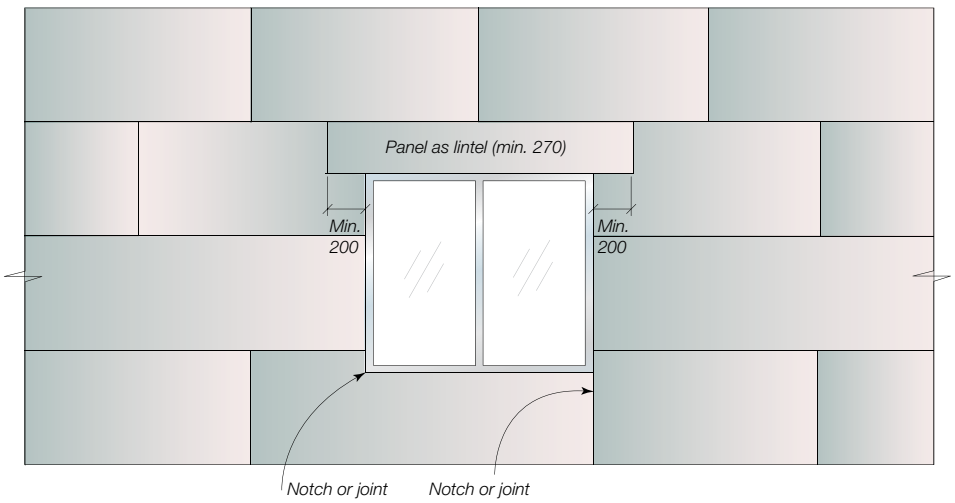
Detail 3.20 Control Joint at Window



Detail 3.21 Panel over Window (Option 1)

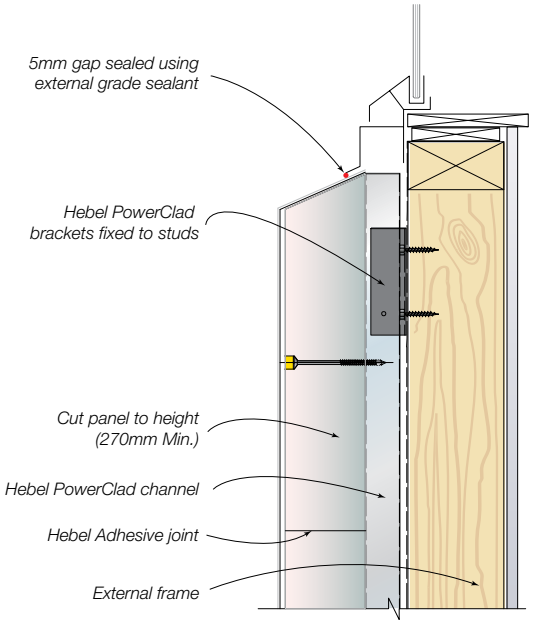


Detail 3.22 Panel over Window (Option 2)

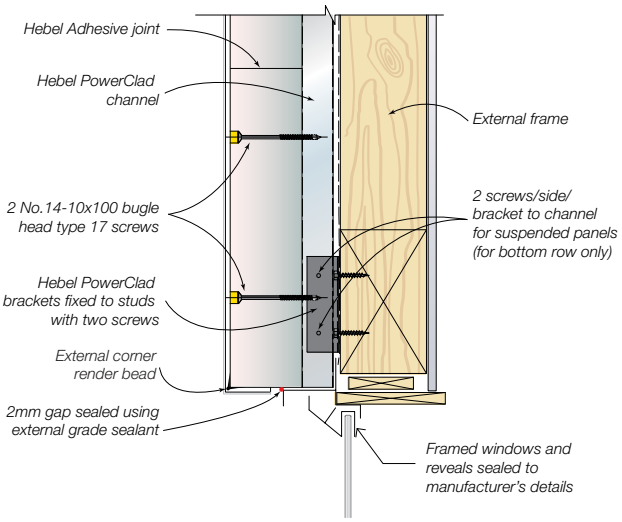


Windows

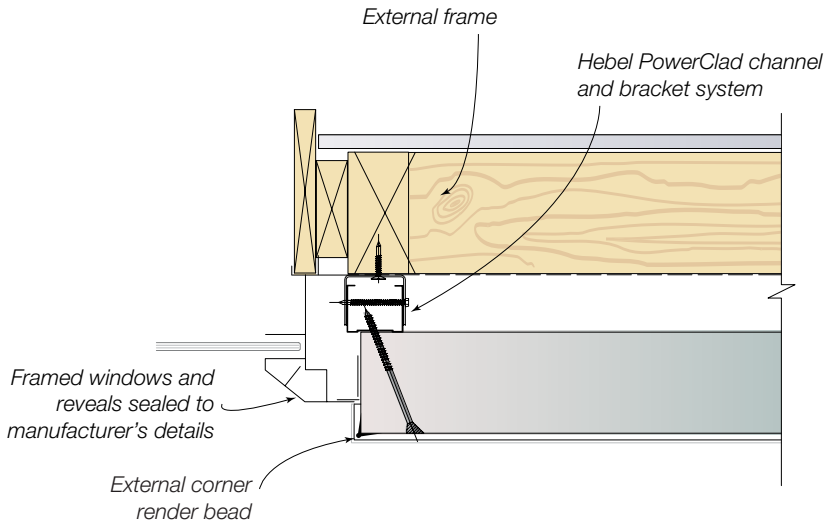
Detail 3.23 Window Sill – Section



Detail 3.24 Window Head – Section

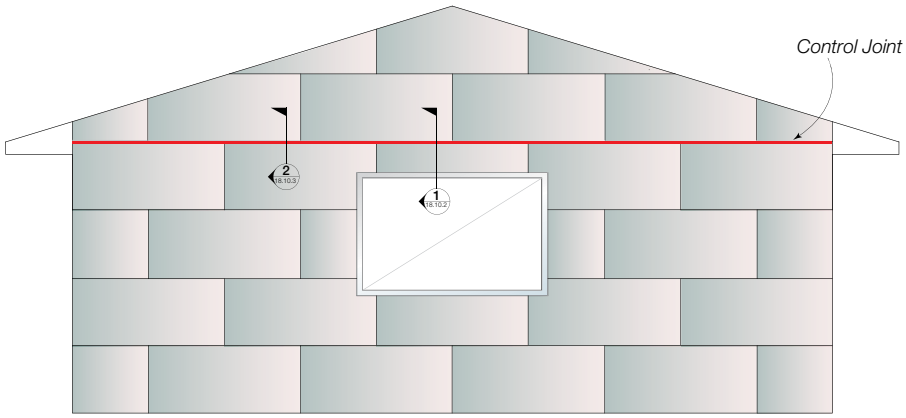


Detail 3.25 Window Jamb – Section

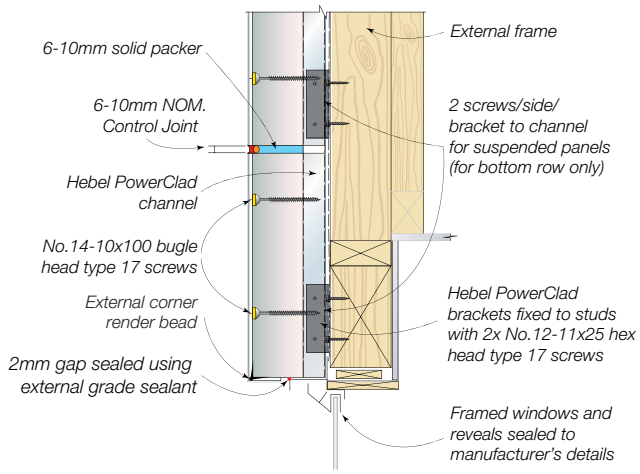


Gable End Details

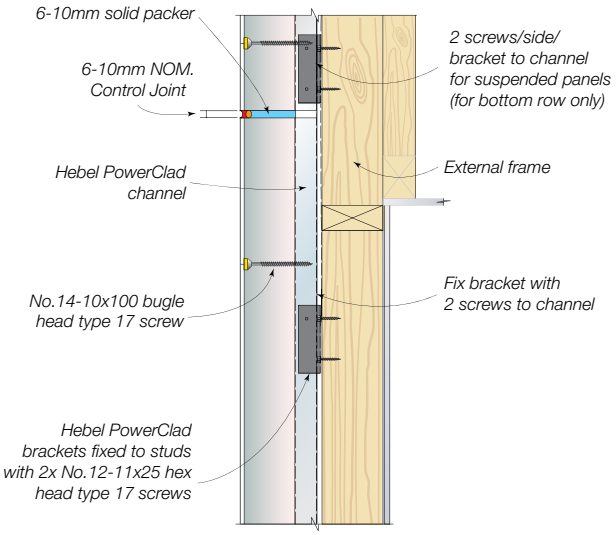
Detail 3.26 Single Storey Construction



Detail 3.27 Section 1

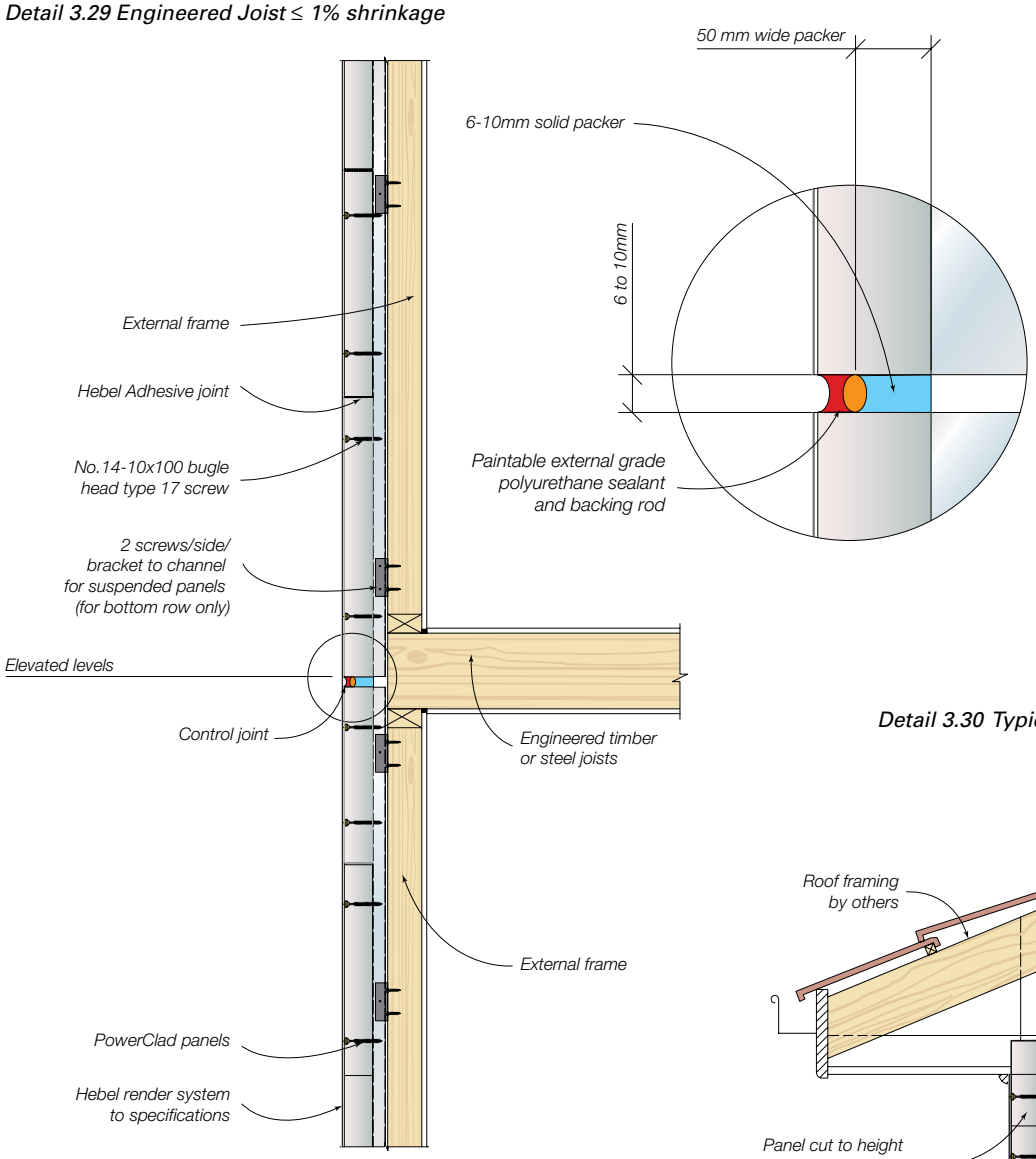


Detail 3.28 Section 2

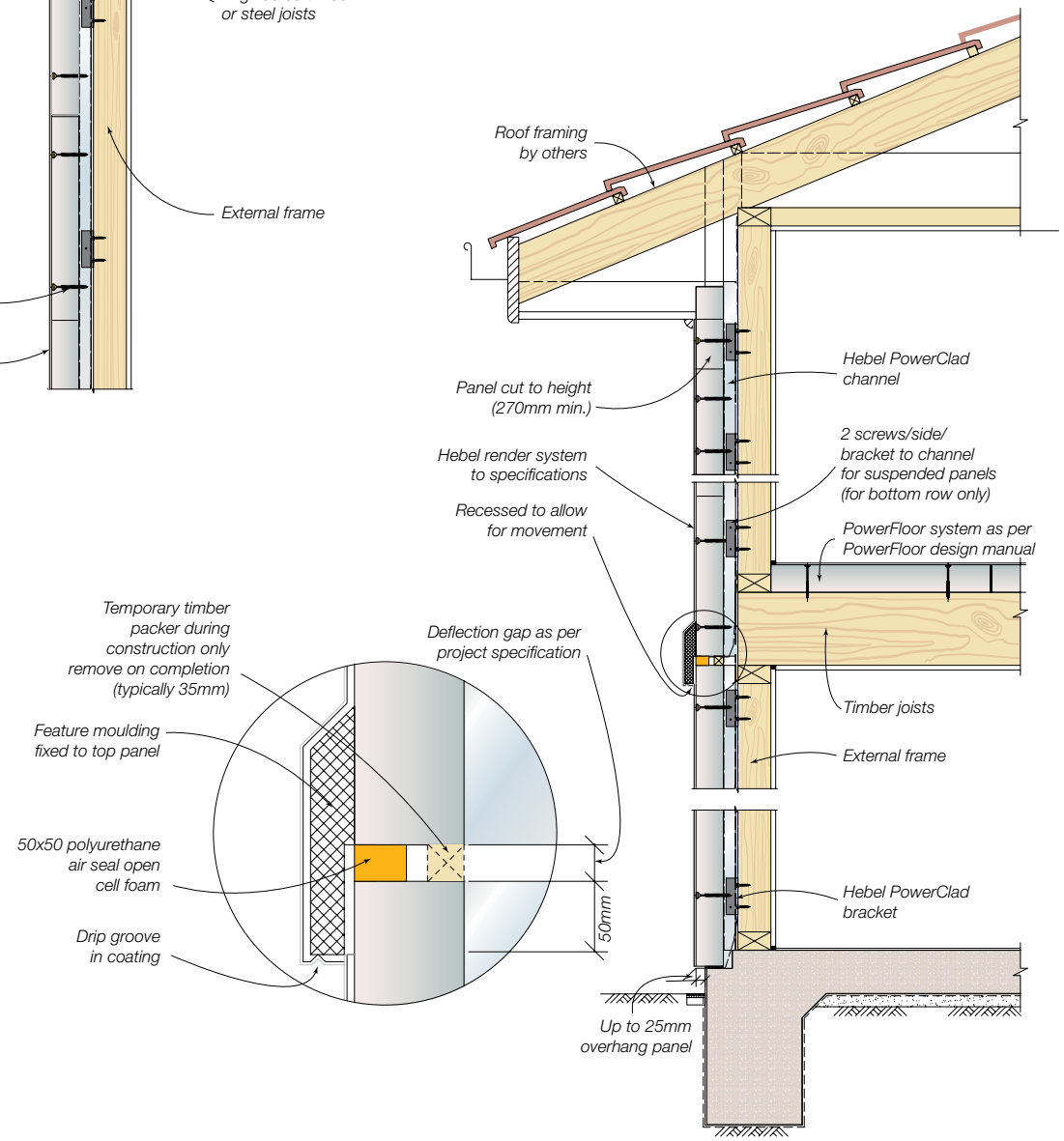


Two Storey Junction (Horizontal Control Joint)

Detail 3.29 Engineered Joist ≤ 1% shrinkage

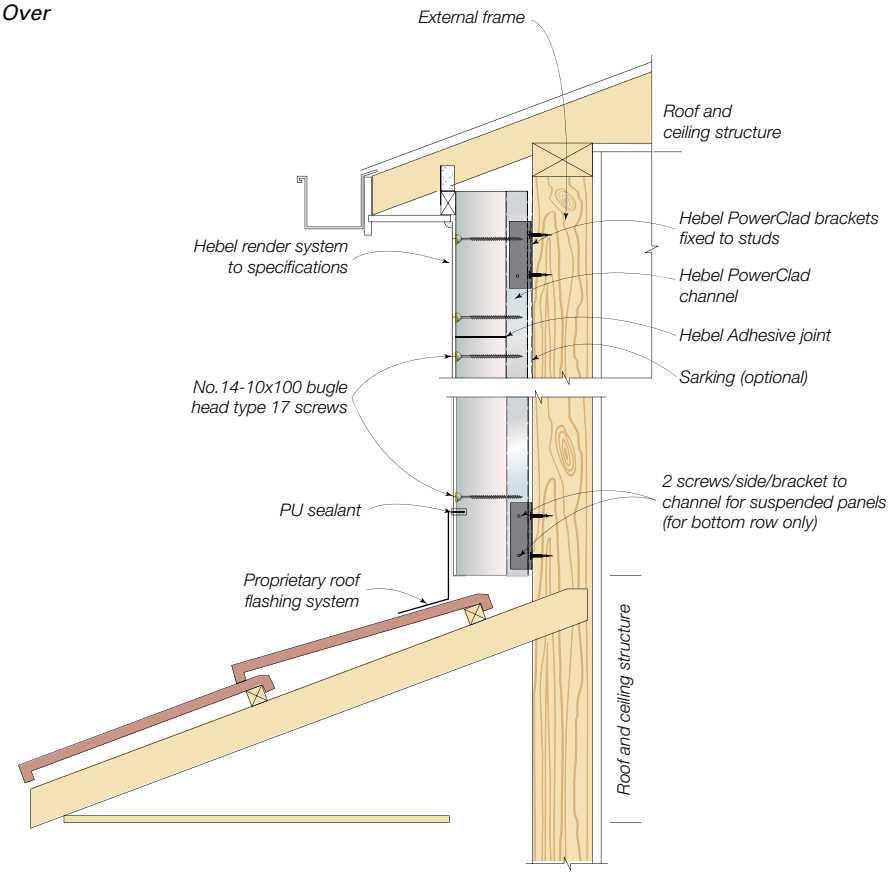


Detail 3.30 Typical Timber Frame > 1% shrinkage

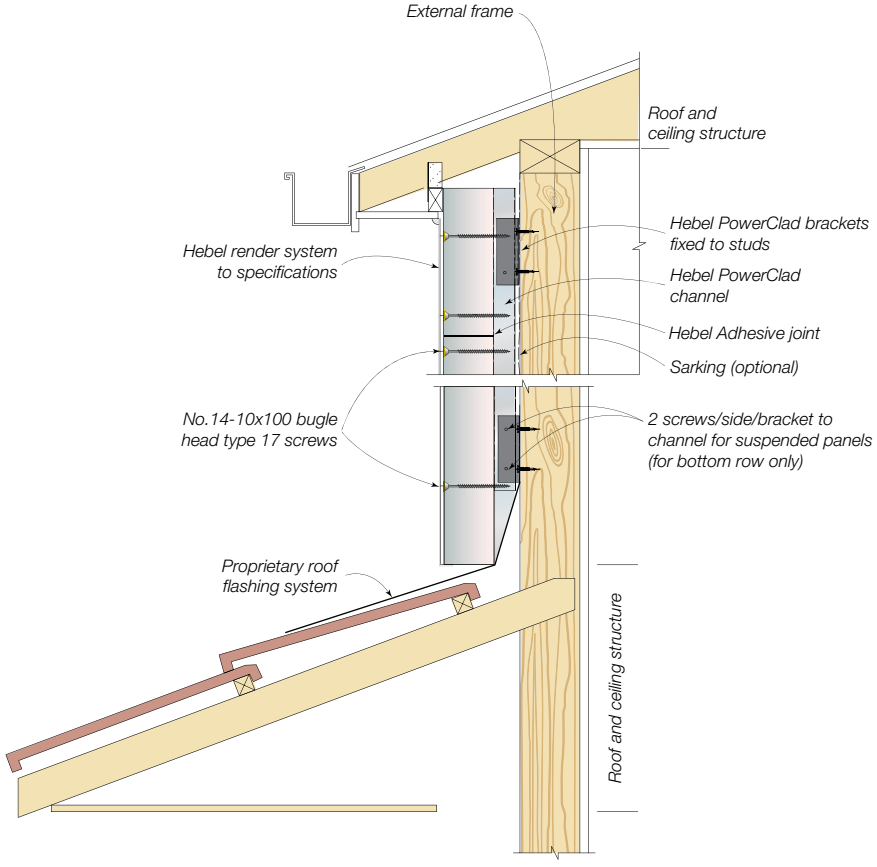


Two Storey Roof Junction

Detail 3.31 Flashing Over



Detail 3.32 Flashing Under



4.1 Delivery and storage

Unloading Panel Packs

Panel packs shall be unloaded and moved with only approved lifting devices. Before use, the lifting devices should be checked for the required lifting tags. Packs should be unloaded as close as possible to the intended installation area. This will increase work efficiency and minimise the need for secondary lifting.

NOTE: Secondary handling increases the risk of panel damage. The repair of damage sustained during lifting and moving is the responsibility of the lifter. Where damage is excessive, PowerClad panels must be replaced.

Storage

All materials must be kept dry and preferably stored undercover. Care should be taken to avoid sagging or damage to ends, edges and surfaces.

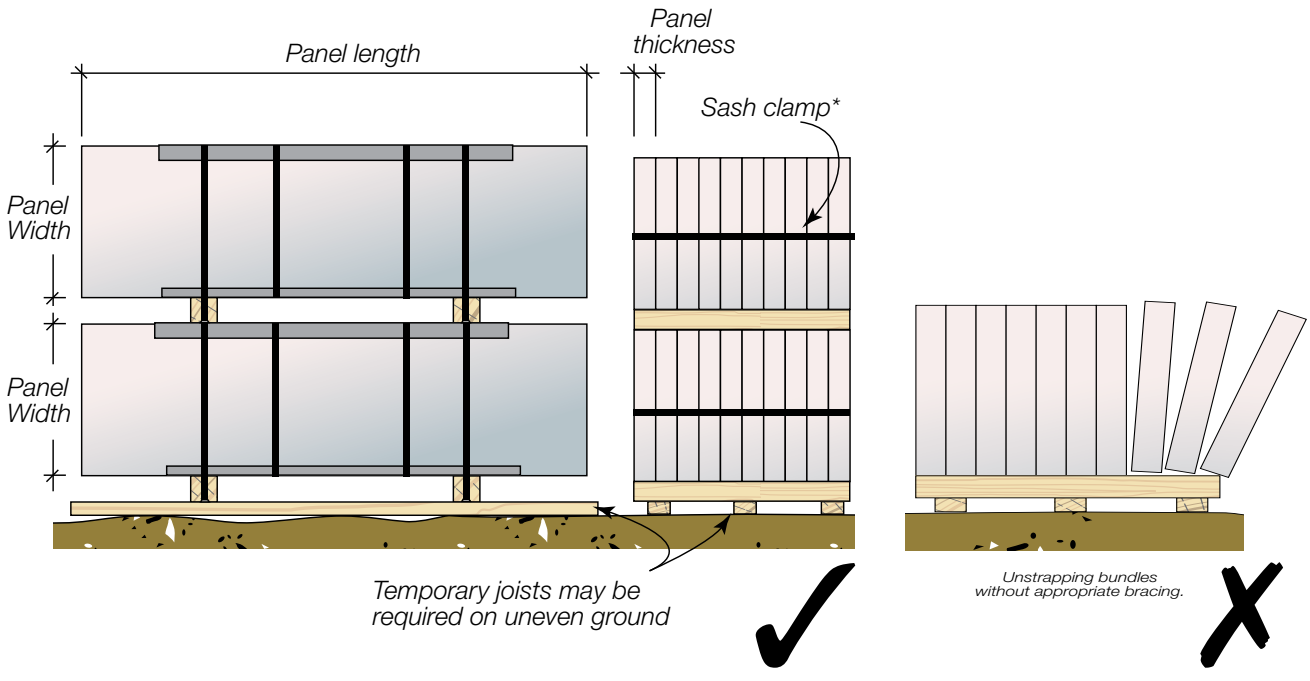
All Hebel products must be stacked on edge and properly supported off the ground, on a level platform. Panel bundles can be stacked two high. The project engineer should be consulted as to the adequacy of the structure to support the stacked bundles.

If outside, Hebel panels must be stored off the ground and protected from the weather. Only single bundles positioned on the ground can be opened. To provide a level surface, we recommend placing temporary joists beneath the supporting cleats.

Unstrapping Packs

Ensure appropriate bracing is installed to packs prior to removal of strapping to prevent panels from falling. Panels can be held together with sash clamps, ratchet, straps or Hebel stabilising bars.

Fig. 4.1 Stacking Packs of Hebel PowerClad



4.2 Panel handling

Manual handling

Hebel recommends two people carry the PowerClad panels around the work site.

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

- 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.
- Train employees in good lifting techniques to minimise the risk of injury.

Health, safety & personal protective equipment (PPE)

Hebel 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 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. Refer to the back of this Design & Installation Guide for further information regarding health and safety.

Cutting

The use of power tools when cutting concrete products may cause dust, which contains respirable crystalline silica, with the potential to cause bronchitis, silicious 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 hearing protection. Refer to the appropriate Hebel MSDS. For further information, contact Hebel or visit the website: www.hebelaustralia.com.au

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

Fig. 4.2 Personal Protective Equipment

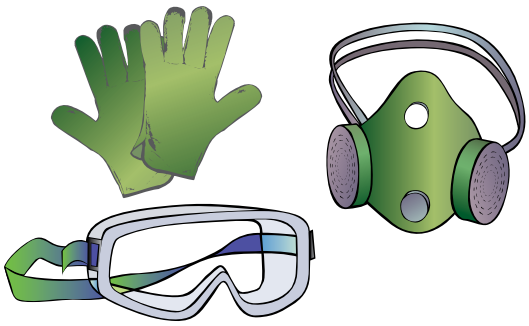


Photo courtesy of Porter Davis

4.3 Tools and equipment for construction

The basic tools required to assist in the installation of the PowerClad System are shown in Figure 14.1. These may be purchased through a Hebel distributor and include:

1. 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.

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

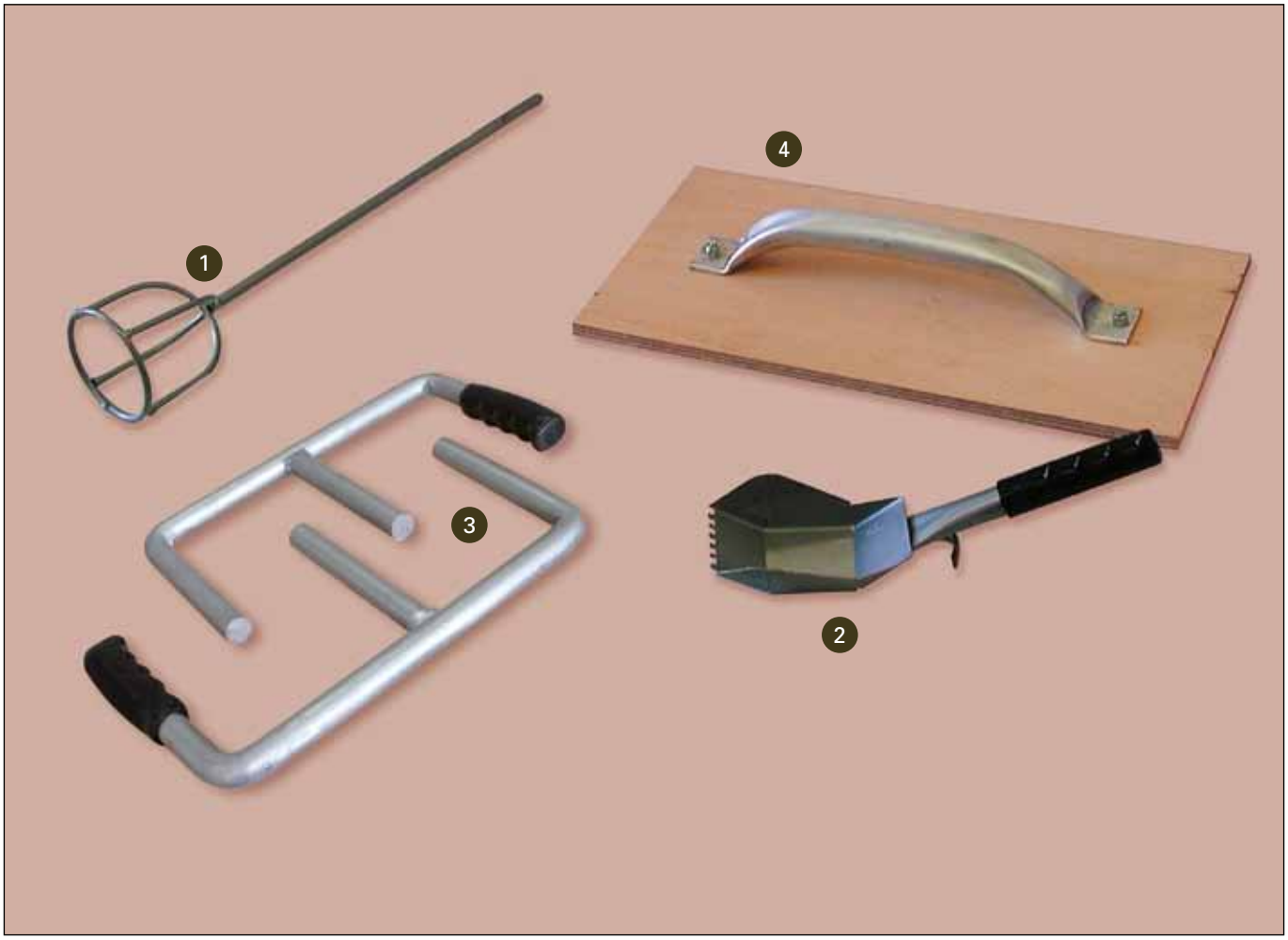
3. Panel lifters (optional) used to carry the panels around the work site.

4. Sand Float – used to remove excess Hebel Adhesive and smooth joints between panels.

Extra equipment will also be required and includes the following:

- Power drill (clutch driven).
- Power saw with metal or diamond tipped cutting blades.
- Dust extraction system.
- Sockets for screws.
- Personal Protective Equipment (PPE) such as goggles, ear muffs/plugs and face mask, used when site cutting the PowerClad panels.

Fig. 4.3 Hebel Tools



4.4 Design, detailing and performance responsibilities

Hebel engages independent testing laboratories to test and report on the performance of a wall in accordance with the relevant Australian Standards. Consultants use these reports as the basis for opinions (estimates of laboratory performance) they issue for variations or different arrangements to the tested system, and also to design and specify walls that meet appropriate criteria for a particular project. Using their experience, the consultant will make judgement about on-site installed performance of various walls. The performance levels of walls documented in this design guide are either what is reported in a test or the documented opinion of consultants. Performance in projects is typically the responsibility of:

Project Consultants (Structural, Fire, Acoustic, etc.)

These consultants are typically responsible for the following:

- Opinions on expected laboratory performance of wall configurations that vary from actual test configuration, such as substitution products and components.
- Judgements about expected field performance using laboratory test reports and practical experience.
- Design, specification and certification of structural, fire, acoustic, durability, weather tightness and any other required performance criteria for individual projects.

  This involves the design and selection of building elements, such as wall and floors and their integration into the building considering the following:

  - Interface of different building elements and to the structure/ substrate.
  - Wall and floor junctions.
  - Penetrations.
  - Flashing issues.
  - Room/building geometry.
  - Acoustic and water penetration field-testing.

Project Certifier and/or Builder

These professionals are typically responsible for:

- Identifying the performance requirements for the project in accordance with the Building Code of Australia and clearly communicating this to the relevant parties.
- Applicability of any performance characteristics supplied by Hebel including test and opinions for the project.
- The project consultant's responsibilities detailed above if one is not engaged in the project.

Hebel does not provide consulting services. Hebel only provides information that has been prepared by others and therefore shall not be considered experts in the field.

Any party using the information contained in this design guide or supplied by Hebel in the course of a project must satisfy themselves that it is true, current and appropriate for the application, consequently accepting responsibility for its use.

It is the responsibility of the architectural designer and engineering parties to ensure that the details in this design guide are appropriate for the intended application.

The recommendations in this design guide are formulated along the lines of good building practice, but are not intended to be an exhaustive statement of all relevant data.

Hebel is not responsible for the performance of constructed walls, including field performance, and does not interpret or make judgements about performance requirements in the BCA.

Appendix A:

Hebel PowerClad panel material properties

A.1 Manufacturing Tolerances

Length	±5mm
Width	±1.5mm
Thickness	±1.5mm
Diagonals (Max.)	5mm
Edge Straightness Deviation (Max.)	1.5mm

A.2 PowerClad Physical Properties

- Hebel PowerClad dimensions are
  - 600mm wide x 1350mm length
  - 600mm wide x 1800mm length.
- Panel reinforcement is a single layer of steel mesh with 4 longitudinal wires of 4mm diameter.
- Nominal dry density = 470 kg/m^3.
- Average working density = 611 kg/m^3 at 30% moisture content.
- Average service life density = 517 kg/m^3 at 10% moisture content.

A.3 PowerClad Strength Properties

- Characteristic Compressive Strength or AAC, f 'm= 2.8 MPa.
- Average Compressive Strength of AAC = 4.0 MPa.
- Characteristic Modulus of Rupture, f 'ut = 0.60 MPa.

A.4 PowerClad Thermal Properties

- R-Value of PowerClad with no plasterboard or other lining = 0.548 m^2.K/W (4% moisture content).

A.5 Fire Hazard Indices

Hebel products have BCA Group Number 1 and also the following early fire hazard indices, determined in accordance with AS1530.3:1990:

Ignitability Index	0
Spread of Flame Index	0
Heat Development Index	0
Smoke Development Index	0-1

A.6 Fire Resistance Level (FRL) Ratings

Hebel PowerClad achieves an FRL of 90/90/90.

Appendix B:

Architectural specifications

This specification should be adopted as a guide only, and shall be superseded by the contract specifications of the project.

* Insert or select appropriate..... specifications.

This information can be downloaded from the Hebel Website - **www.hebelaustralia.com.au**

Scope
The installer shall furnish all material and equipment required to satisfactorily complete the installation and jointing of Hebel PowerClad where indicated in the specification and/or on the layout drawings.

Materials
All AAC material shall be Hebel PowerClad panel as manufactured by CSR Building Products. Screws for fixing Hebel PowerClad panels shall be supplied, manufactured or approved by Hebel .

Timber or steel frame components shall be those as specified and designed by the project engineer or building designer.

All lining materials, fixings and finishing products shall be those manufactured and/or supplied by CSR Gyprock (or products of equivalent or better performance). Plasterboard shall be manufactured to meet the dimensional requirements of AS/NZS2588 'Gypsum Plasterboard'.

All infill material shall be, those manufactured and/or supplied by CSR Bradford (or products of equivalent or better performance).

Hebel PowerClad
The installer shall supply and install the Hebel PowerClad system as detailed in the project drawings and or specifications, in accordance with Hebel PowerClad Design & Installation Guide.

Hebel PowerClad framing, fixing and joints shall be designed and installed to comply with the requirements for an Ultimate Design Wind Pressure of *..... kPa maximum/minimum.

The wall shall have a Fire Resistance Level rating of *FRL ..... / ..... / ..... for an external fire source, and/ or *FRL ..... / ..... / ..... for an internal fire source, in accordance with the requirements of AS1530.4.

All control joints shall be caulked with * ..... backing rod and *..... ..... polyurethane external grade sealant installed in accordance with the sealant manufacturer's recommendations.

Wall Framing
Refer to project engineer or building designer documentation for the frame design.

Fixings
Screws to fix the Hebel PowerClad panel to the Hebel PowerClad Channel shall be *..... and *class..... Screws to fix the PowerClad Brackets to the stud framing shall be *..... and * Class ..... .

Wall Wrap
The wall wrap shall be *..... .... material. Fixing, jointing and sealing shall be designed and installed in accordance with the manufacturer's instructions, to comply with the requirements for an Ultimate Design Wind Pressure of *.....kPa maximum/minimum.

Internal Plasterboard Lining
For non fire-rated wall systems, the framing shall be lined on the internal side with one layer of *.....mm Gyprock® * ..... plasterboard,

OR

For fire-rated wall systems, the framing shall be lined on the internal side with one layer of *.....mm Gyprock® * ..... plasterboard, * followed by a second layer of .....mm Gyprock® .... plasterboard.

All layers shall be fixed and caulked as specified for the relevant system in the Gyprock® Steel Frame Wall System Installation Guide, NoGYP544, other relevant CSR Gyprock Technical Literature, and Rondo Building Services literature or appropriate steel frame manufacturer's literature.

Levels of Finish – Internal
All framing, plasterboard lining, jointing and finishing shall be carried out to *Level ..... Level of Finish, in accordance with Gyprock® Residential Installation Guide, NoGYP547 and/or AS/NZS2589.1 'Gypsum Linings in Residential and Light Commercial Construction - Application and Finishing'.

Hebel PowerClad Finishing
Hebel PowerClad shall be externally coated with Hebel HighBuild render and *..... .....coating system, which shall be installed to the manufacturer's recommendations.

All screw heads in the Hebel PowerClad panel shall be covered with a 2:1 ratio of Hebel Patch: Hebel Adhesive and shall be sanded flush with the PowerClad panel surface.

Caulking
All abutment joints shall be caulked with a *..... paintable external grade sealant installed in accordance with the sealant manufacturer's recommendations.

Appendix C:

Designer, Builder, Installer and Coatings Applicator Checklists

Checklist-Designer	
Slab	1. Design slab stepdown: 95mm wide (allows for 15mm min. panel overhang), typical depth 150mm (min. 20mm). 2. A level rebate base is desirable to avoid visible stepdown in panels. Note: backfilling against panels is prohibited. 3. Adjust engineering drawings and advise concretor. 4. Ensure termite protection is nominated.
Frame	1. Nominal total wall thickness 180mm (70mm stud) or 200mm (90mm stud). 2. Adjust documentation to suit PowerClad system: - with openings dimensioned, - distance between openings ≥ 270mm wide, - distance from openings to corners ≥ 270mm wide 3. Ensure structural design of frame allows for the additional weight of the suspended PowerClad panels
Windows	1. Windows to be ordered with correct reveal size
Features	1. Design and document any special features on the drawing, such as quoins, corbels, sills, trims, etc.
Coatings	1. Specify Hebel HighBuild as the base render 2. Specify external angles to all external corners and around all openings 3. Select colour and texture prior to PowerClad installation. 4. Select colour for special features, if necessary

Note: Consider PowerClad panel dimensions when designing to minimize waste and reduce overall install cost (600mm x 1350mm & 600mm x 1800mm).

Checklist-Builder	
Slab	1. Ensure slab rebate formed correctly and flattened with a wood float, adjust if necessary. 2. Ensure slab edge does not protrude further than 95mm from the frame and the vertical edge of the rebate does not proceed further than 20mm from the frame, adjust if necessary.
Frame	1. Ensure frame is complete, level, plumb and installed where required for the installation of the PowerClad brackets, channels and panels. 2. Install DPC 3. Install wall wrap (optional) 4. Retrofit application – install termite protection and sub frame
Services	1. Ensure services have been installed with all vertical runs located between the studs. For services that run horizontally they must be installed through the frame and not on the external face of the frame.
Windows	1. Ensure windows have been supplied with the correct reveal size and installed correctly.

Checklist-Installer	
Tools and Equipment	1. Power supply. 2. Hebel tools. 3. Power drill with clutch control. 4. Circular saw with metal cutting or diamond tipped blade. 5. Panel lifters. 6. Sockets for screws. 7. Safety equipment.
Documentation	1. Architectural drawings from builder. 2. Hebel PowerClad External Wall Design and Installation Guide. 3. Wind category to be specified by designer, engineer or council 4. Soil type to be specified by designer, engineer or council
Installation of PowerClad Panels	1. No. of PowerClad Brackets required (refer Table 1.3. Note typical and corner zones). 2. PowerClad Brackets screwed to stud with 2 screws per bracket. 3. No. of PowerClad Channels required, maximum 900mm spacings (refer Table 1.3.) 4. PowerClad Channels screwed to PowerClad Brackets. When fixing to both sides of the PowerClad Bracket is unachievable (eg. Internal corner) a long screw is fixed from one side of the bracket. 5. Extra bracket required around window openings. 6. Identify PowerClad panel support – resting on a base or suspended. a. Resting on a base requires Hebel Mortar for first course. b. All upper or suspended panels require 2 screws per bracket per side (base row only). 7. Plan for optimum panel layout. 8. All PowerClad Panels must be fixed to a minimum of 2 vertical PowerClad Channels. In instances where this is not practical then back blocking is required. 9. Vertical joints require Hebel Adhesive to be applied to both sides of the panel while horizontal joints may be single bonded. 10. Plan vertical control joint locations. 11. Horizontal control joints required at floor levels and gable ends. 12. Patching of screw heads using 2:1 mix of Hebel Patch and Hebel Adhesive. 13. Remove excess Hebel Adhesive and sand if required. 14. Internal Angle required for all internal corners. 15. Exposed reinforcement coated with Hebel anti-corrosion protection paint. 16. Complete sill detail.

Checklist-Coatings Applicator	
Pre-coating checklist	1. Ensure the wall has been completed by the installer including patching of screw heads and repairing of minor chips and damage 2. Excess Hebel Adhesive has been removed or sanded back if required.
Coating	1. Install backing rods and PU sealant at all control joints. 2. Apply external grade sealant around all openings 3. Install external angles at all external corners and around openings 4. Apply Hebel HighBuild at a minimum of 4mm to a maximum of 10mm following instructions on the packaging. The coating should be floated to a smooth flat finish. 5. Once render has cured >24 hours, cut 3-6mm wide recess through render back to the movement joint, clean recess. 6. Apply primer (relevant to coating manufacturers recommendations). 7. Apply a 6mm masking tape over PU filled expansion joints. 8. Apply texture coat according to manufacturers specifications 9. Remove 6mm tape from movement joint. 10. Apply elastomeric membrane coating to a minimum of 150 microns DFT in accordance with manufacturers specifications.

Appendix D:

PowerClad Quantity Guide

Quantities Based on the Following Assumptions:

- N2 Wind Zone
- 600mm Channel Centres
- 65 lineal meters of wall
- 40m² of openings

Components	Average Wall Height				
	3600	3300	3000	2700	2400
PowerClad Channels / m²	0.5	0.5	0.6	0.7	0.8
PowerClad Brackets / m²	2.3	2.6	2.9	2.5	2.9
Screws / m² - Bracket to Frame	4.6	5.2	5.8	5.0	5.9
16mm Screws / m² - Channel to Bracket	5.2	5.8	6.5	5.8	6.8
100mm Panel Screws / m²	5.6	5.6	5.6	5.6	5.6
Number of 1350mm PowerClad Panels	Nett Wall Area / 1350mm Panel Area (0.81m²) x % of 1350mm Panels Required				
Number of 1800mm PowerClad Panels	Nett Wall Area / 1800mm Panel Area (1.08m²) x % of 1800mm Panels Required				
Bags of Hebel Adhesive	1 x 20 kg Bag of Hebel Adhesive per 20m² of wall				
Bags of Hebel Mortar	1 x 20 kg Bag of Hebel Mortar per 20 lineal m of wall				

Notes:
• Allow approx 25% less components for 900mm Channel Spacings.
• For accurate calculations refer to PowerClad Quantity Take Off Spreadsheet at www.hebelaustralia.com.au

Appendix E:

PowerClad system descriptions

Code	Description
Hebel 1500	Hebel Houses External Wall PowerClad Single Foil, 70mm Stud
Hebel 1501	Hebel Houses External Wall PowerClad Single Foil, 90mm Stud
Hebel 1502	Hebel Houses External Wall PowerClad Single Foil + R2.0 Batt, 70mm Stud
Hebel 1503	Hebel Houses External Wall PowerClad Single Foil + R2.0 Batt, 90mm Stud
Hebel 1504	Hebel Houses External Wall PowerClad Double Foil, 70mm Stud
Hebel 1505	Hebel Houses External Wall PowerClad Double Foil, 90mm Stud
Hebel 1506	Hebel Houses External Wall PowerClad Double Foil + R2.0 Batt, 70mm Stud
Hebel 1507	Hebel Houses External Wall PowerClad Double Foil + R2.0 Batt, 90mm Stud
NOTES	Single Foil = Single sided reflective foil Double Foil = Double sided reflective foil

The better way to build

CSR HEBEL
112 Wisemans Ferry Road
Somersby NSW 2250
Fax (02) 4340 3300

The better way to build

Hebel is a quality building product, and is backed by CSR Building Products Limited.

Further details on engineering and building with Hebel systems are available in the Hebel Design Guides and Technical Manual. To obtain a copy, or for further sales or technical assistance, please visit our website.

Hebel website:
www.hebelaustralia.com.au

For sales enquiries or further information, please telephone us from anywhere in Australia:

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. 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.

Performance & Certification

Hebel® products are manufactured in Australia by CSR Building Products.

A.B.N. 55 008 631 356. It is a manufacturer and supplier of Hebel Autoclaved Aerated Concrete (AAC) products. Because it is a manufacturer and supplier only, CSR does not employ people qualified as Accredited or Principal Certifiers. CSR is therefore unable to provide Construction Compliance Certificates or Statements of Compliance. CSR conducts appropriate testing of its products and systems to determine performance levels. These include structural, fire and acoustic tests. Testing is conducted and certified by appropriate specialists in these fields. When using Hebel products and systems in specific projects, such specialists should be consulted to ensure compliance with the Building Code of Australia and relevant Australian Standards.

Other

The design of a wall, floor or fence system requires the services of professional consultants. This design guide has been prepared as a source of information to provide general guidance to those consultants – and in no way replaces the services of the professional consultant and relevant engineers designing the project.

No liability can therefore be accepted by CSR or other parties for the use of this design guide. Hebel products and systems undergo constant research and development to integrate new technology and reflect ongoing performance enhancement.

Hebel systems are also constantly reviewed so as to reflect any changes in legislative building requirements and or general developments in common building practice. Due to our commitment to continual development and improving our building systems,

We advise that all users of this manual: HEB1270 August 2011 should regularly check that this manual is current, and they are applying our latest design information.

The latest editions of our design guides and supplementary diagrams and technical data are always available on our website: www.hebelaustralia.com.au

Guarantee

Hebel guarantees the products manufactured by itself and the systems described in Hebel literature for 7 years, subject to the terms and conditions of the Hebel Guarantee which can be inspected in the Hebel website at www.hebelaustralia.com.au. Hebel does not however guarantee the components, products or services, such as installation, supplied by others. Hebel recommends that only products, components and systems recommended by it be used.

Disclaimer

The information presented herein is supplied in good faith and to the best of our knowledge was accurate at the time of preparation. The provision of this information should not be construed as a recommendation to use any of our products in violation of any patent rights or in breach of any statute or regulation. Users are advised to make their own determination as to the suitability of this information in relation to their particular purpose or specific circumstances. Since the information contained in this document may be applied under conditions beyond our control, no responsibility can be accepted by Hebel, or its staff for any loss or damage caused by any person acting or refraining from action as a result of misuse of this information.

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