CEMINTEL®

FAÇADES & CLADDING

Design Guide

01

INTRODUCTION

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Introduction

CSR Cemintel® offers a diverse range of external wall cladding systems with a range of installation options. This guide provides important technical information to be considered by the designer for the correct use and design of Cemintel wall systems.

This guide provides supplementary design information for the CSR external wall systems clad with Cemintel Weatherboard and Sheet products and should be read in conjunction with the appropriate Cemintel product design and installation guide.

The design of CSR wall systems clad with the Cemintel ExpressPanel, Barestone, Surround and Territory products is not covered in this guide and we recommend the appropriate design and installation guide of the product.

Cemintel external wall systems use components with one or more layers of Cemintel fibre cement or Gyprock plasterboard linings fixed to one or both sides of steel or timber framed wall construction. These walls can be fire rated or non-fire rated grade applications in non-loadbearing or loadbearing situations and are often used in applications, including commercial, industrial, institutional, residential and high-rise residential construction.

This guide should be read in conjunction with the applicable Cemintel design or installation guides, and the CSR Gyprock® The Red Book™ publications.

About Cemintel®

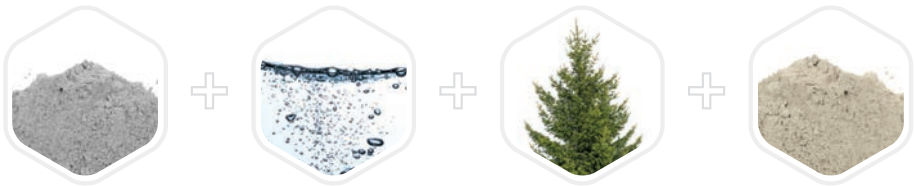
Cemintel is part of the Australian owned icon, CSR Building Products company, manufacturing and supplying cement panels and building systems used for external façades, internal linings, ceilings and flooring which are suitable for use in commercial and residential applications.

Cemintel locally manufactures at Wetherill Park, NSW to AS/NZS 2908.2:2000. The factory utilises a full steel template process to produce a variety of fibre cement products. This method provides a smoother and flatter sheet than non-steels or sheet-on-sheet manufacture process, and sets the Cemintel products apart from others in the market.

The factory at Wetherill Park has a strict testing regime that regularly checks raw materials and finished product to ensure compliance with AS/NZS 2908.2:2000. In addition, products are tested in accordance with asbestos identification to 'AS 4964 – Method for the Qualitative Identification of Asbestos in Bulk Samples'.

Fibre cement products are made from natural ingredients. [Ground Sand (Silica), Cement, Air, Water, Radiata Pine, Additives e.g. sealers]. Fibre cement does not contain magnesium chloride (salt).

Fibre cement products are deemed suitable for use where a non-combustible material is required according to the National Construction Code (NCC) Volume One of NCC 2022 C2D10 [2019: C1.9] and Volume Two of NCC 2022 H3D2 [2019: 3.7.1.1]. Cemintel fibre cement linings have been assessed with reference to AS 3837:1998 as Group 1 materials. Group 1 is the highest rating and allows the material to be used as a wall or ceiling lining in all internal building areas.



Cement Water & Air Radiata Pine Sand

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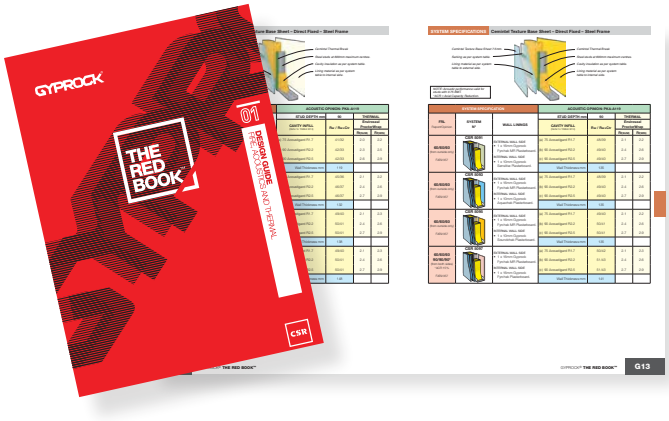
INTRODUCTION

CSR Gyprock® The Red Book™

The Red Book publications showcase the performance of the extensive range of building external wall systems incorporating the Cemintel products and CSR Gyprock® plasterboard. The Cemintel Wall System Solutions are presented in the CSR Gyprock The Red Book 01 - Design Guide.



Building Product and System Conformance and Compliance

There is a high level of regulation within the building industry to help ensure buildings are constructed with compliant and conforming building materials. This has become an extremely important topic in Australia over the past couple of years due to issues with building products with poor fire properties and asbestos contamination in imported products.

Additionally, the building industry has a strict regulatory environment to ensure construction in Australia is safe and meets certain standards. The National Construction Code (NCC) is developed and published by the Australian Building Codes Board (ABCB) and outlines the minimum necessary standards of performance for all buildings in relation to health, safety (including structural and fire safety), amenity and sustainability. The NCC series comprises of three volumes:

- NCC Volume One: technical and construction requirements for buildings and their associated structures, for - all Class 2 to 9 buildings and access requirements in Class 1b and 10a buildings.
- NCC Volume Two: technical and construction requirements for certain residential and non-habitable buildings and structures, for - Class 1 and 10 buildings and structures.
- NCC Volume Three: technical requirements for the design and construction for plumbing and drainage systems in buildings.

Cemintel has undertaken testing and engaged consultants with expertise to provide professional opinion and certification of the performance and/or compliance of Cemintel products and building solution systems. The relevant project designer/engineer can use these opinions and certifications as evidence to prove that the building product and/or system meets the specified performance requirements nominated in the project documentation.

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PRODUCT OVERVIEW

02 PRODUCT OVERVIEW

Cemintel Products and Cladding Systems

The diverse range of Cemintel products can be installed on framed and masonry construction to create a direct fixed cladding system or a cavity fixed cladding wall system to achieve a higher level of weathertightness management. The Cemintel wall systems outlined in this guide are predominantly used in residential and low-rise commercial applications.

Table 2.01 provides an overview of the wall system qualities of Cemintel Weatherboard and Sheet products.

TABLE 2.01 Cemintel Weatherboard and Sheet Product Application

Cemintel Product	Type		Orientation			Product Surface		Joint Appearance			
	Weatherboard	Sheet	Vertical	Horizontal	Diagonal	Pre-Primed/Sealed	Raw/Un-primed	Expressed Joint	Visible	Concealed (minimal visibility)	Monolithic
Headland® Weatherboards	•			•		•				•	
Scarborough® Weatherboards	•			•		•				•	
Balmoral™ Weatherboards	•			•		•				•	
Plank	•			•			•			•	
Aspect Cladding®	•			•		•				•	
Edge™ Cladding		•	•			•				•	
SimpleLine®		•	•	•		•				•	
Mosiac®		•	•	•	•	•		•			
Cladding Sheet		•	•	•			•		•		
Texture Base Sheet		•	•	•		•					•

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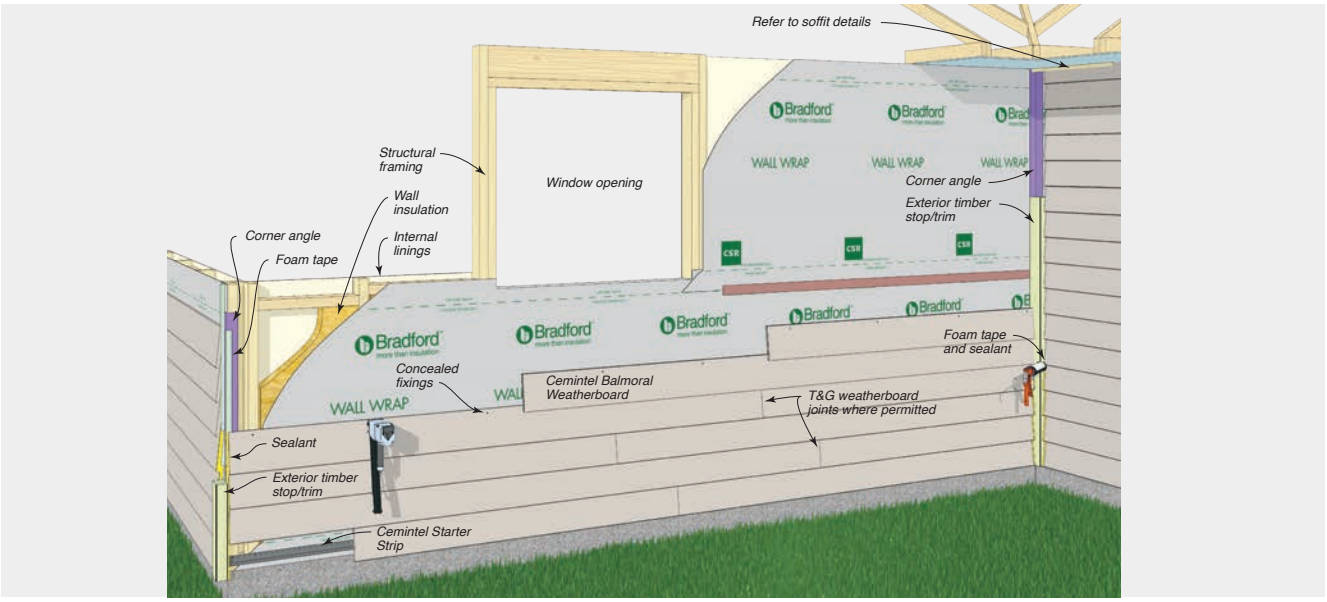
FIGURE 3.01 Typical Balmoral Weatherboard Construction Details



Façade Design

This guide represents good practice, though it is not intended as an exhaustive statement of all relevant information. It remains the responsibility of the architect / building designer to ensure the wall system design conforms to NCC requirements and other relevant building standards that may exist for that location, and is appropriate for the intended application. It is recommended that the architect/building designer assigns the responsibility for the façade design to the project engineer.

The design information has been separated into the following topics:

- **Structural Design** – framing and substrate options, direct fix and cavity fix installation requirements, earthquake loading, wind loading, stud set-out, cyclonic zones, structural bracing, internal linings and curved walls;
- **Weatherproofing** – water ingress management;
- **Moisture Management** – condensation risk, wall wrap/sarking selection and air barriers;
- **Energy Efficiency/Thermal Design** – thermal performance, thermal break requirements, building envelope sealing and thermal bridging;
- **Climates Zones for Thermal Design**;
- **Fire Resistance Performance** – fire rated external wall systems, supplementary fire zone protection, wall framing fire resistance, framing and lining, spread of fire, bushfire prone zones and roof & eaves design;
- **Acoustic Performance**;
- **Extreme Climate Conditions** – coastal areas, corrosive zones/ categories and temperature extremes; and
- **Other Design Considerations** – window selection, services, renovations, termite management, specialist profiles and product limitations.

Design Process

The design process to achieve a specification compliant façade system incorporating the Cemintel weatherboard and sheet products is as follows:

STEP 1 Determine the performance requirements, including structure, fire resistance, damp & weatherproofing, sound transmission & insulation durability, and energy efficiency.

STEP 2 Determine the project requirements, including the facade loadings (i.e., wind, earthquake, etc.) and geometry of the structural supports (i.e., stud framing layout, wall height and penetrations, and differential movement requirements), particular to the project.

STEP 3 Select the Cemintel cladding product, façade system (i.e., direct fix or cavity), wall wrap, air barrier, water barrier and insulation that are appropriate for application.

STEP 4 Check the regulatory performance and project requirements are satisfied.

STEP 5 Use design tables to determine façade framing (i.e., vertical and horizontal top hat spacings) and fastener arrangements to suit the cladding, air barrier layer, connection to structural supports and durability of the project.

STEP 6 Prepare design and specification documentation.

STRUCTURAL DESIGN

Framing and Substrate Options

For timber and steel framing with studs at 600mm centres maximum, the design shall be in accordance with the following standards:

- AS 1684 – Residential Timber-Framed Construction.
- AS 1720 – Timber Structures.
- AS/NZS 4600 – Cold-Formed Steel Structures.
- AS 3623 – Domestic Metal Framing.
- National Construction Code (NCC).

Studs at vertical joints often require a wider minimum face fixing width to provide adequate edge distances for fixings. In these cases, double studs, trimmers and/or wider battens must be provided behind vertical sheet joints. Refer to appropriate construction details for selected system.

Timber must have an equilibrium moisture content of less than 16% at the time cladding is installed. Unseasoned timber prone to shrinkage must not be used as this can cause sheets and frame to move, causing undue stress on sheet joints.

The design and construction of the steel frames should be considered in conjunction with the advice from the manufacturer. In highly corrosive environments, appropriate measures should be taken to protect the frame from corrosion.

For wall systems with rigid joints, CSR recommends following the AS 2870 guidance that support framing be designed for a maximum deflection of **span/400** for articulated construction.

Stud Set-Out

For direct fixed cladding in high wind speed locations, the spacing of the studs supporting the Cemintel cladding will need to be reduced. Span tables for cladding and cavity system framing are provided in the Cemintel product installation guide.

It is recommended that the stud set-out be adopted to align the cladding joints and battens / top hats with the studs of the structural framing. Note: where the expressed joints and supporting battens/top hats mis-align additional structural framing (studs and nogging) will be required. This additional framing will require connection capable of transferring imposed loads to the structural framing with the design provided by others.

Direct Fix Installations

Cemintel cladding must not be fixed directly to hot rolled steel sections or to cold formed sections with base metal thickness (BMT) less than 0.50mm BMT and greater than 1.6mm BMT, in these cases, timber battens or metal top hats should be fixed with appropriate screws.

The appropriate fastener requirements for fixing the cladding of a Cemintel system will be nominated in the relevant Cemintel product installation guide.

Cavity Fix Installations

The cavity systems provide an effective method to manage the migration of water vapour through a stud framed wall system. The cavity is created by fixing vertical battens and/or top hats to the structural framing. The design tables for the cavity system framing are presented in this guide and the product installation guides. The table considers two cavity depths formed by battens or top hats fixed to the structural framing, over an air barrier with the cladding fixed to the face of the battens/top hats. The cavity can be formed with the following batten/top hat components:

- Non-structural – 18mm to 20mm deep/thick Cemintel FC Batten or timber battens with a minimum 70mm face width.
- Structural – 18mm to 50mm deep steel top hats with a 38mm minimum face width, 19mm deep Cemintel FC Batten, or 35mm to 50mm deep timber battens with a minimum 42mm face width.

The non-structural battens and top hats are fixed 'On-stud' to the structural framing and acts as a spacer between the Cemintel cladding and framing. For structural battens and top hats, the Cemintel cladding can be direct fixed to batten or top hats. Note, for steel framed buildings the designer will advise on the thermal break requirements.

Typical batten and top hat fixing arrangements are shown in Figure 3.02 for 'On-stud' and Figure 3.03 for 'Off-stud' arrangements.

FIGURE 3.02 Typical 'On-stud' Arrangement of Cemintel FC Battens

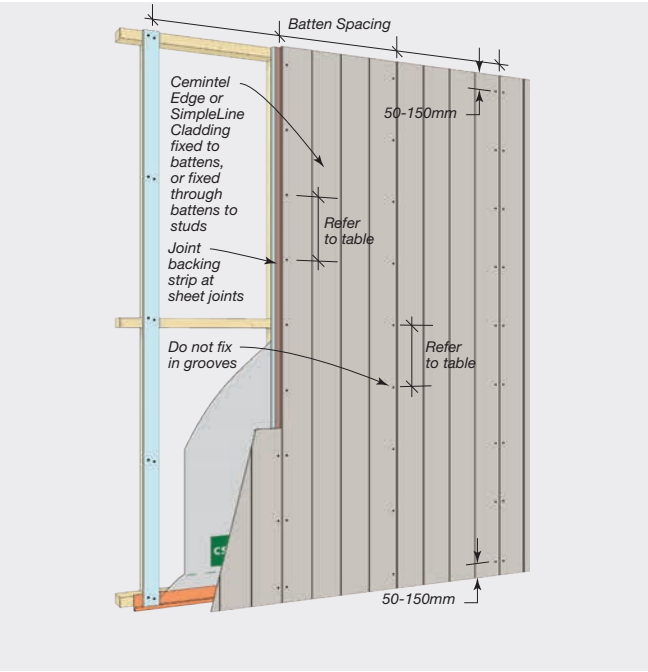


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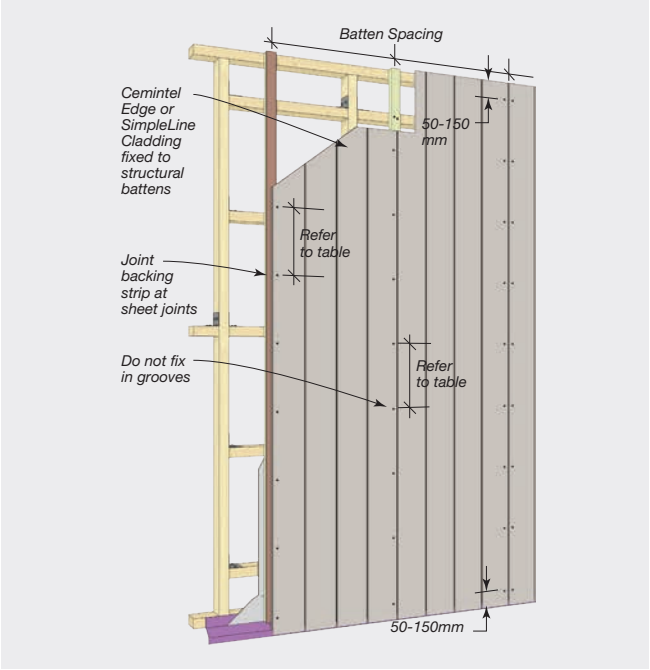
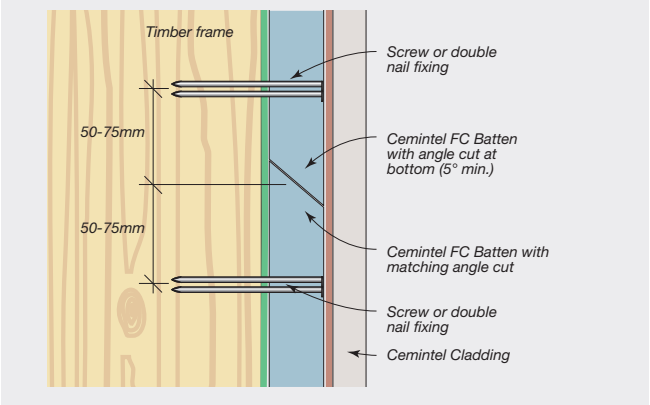
FIGURE 3.03 Typical 'Off-stud' Arrangement of Structural Battens



The timber battens will require a minimum H3 protective treatment. In highly corrosive environments, appropriate measures should be taken to protect the frame and metal components from corrosion. Refer to Corrosive Zones/Categories section. Horizontal surfaces of battens must have a minimum fall of 5° to the horizontal to allow drainage of any moisture, see Figure 3.04.

FIGURE 3.04 Cemintel FC Batten and Timber Batten Joining



The structural battens and top hats can be fixed off-stud to the structural horizontal framing elements. Refer to the project engineer or framing manufacturer for guidance on the horizontal structural framing arrangement and connection details. Refer to the relevant Cemintel product installation guide for advice on the allowable orientations of the cladding.

The fastener requirements for fixing the battens/top hats to the structural framing are nominated in the relevant Cemintel product installation guide.

Earthquake Loading

Due to the lightweight nature of Cemintel cladding, the cladding is suitable for buildings in earthquake regions where the imposed lateral earthquake loading due to the cladding, fire rated linings and support framing is less than design ultimate limit state wind pressure of the system.

For Australian conditions, CSR Cemintel has engaged an independent consultant to assess the imposed earthquake loading of the various claddings and determined the imposed earthquake loading is quite low and typically less than the wind loading.

It is the responsibility of the designer to determine the earthquake loads and effects on the building, and the suitability of the system solutions.

The effects of both building movement and the inertial forces require specific design of the connection of wall and ceiling framing to the structure. This should be considered as part of the building structural design and information sourced from the frame supplier.

Wind Loading

The Cemintel product installation guides provide design tables for the maximum spacing and spans of the Cemintel cladding and the supporting structure (i.e., battens/top hats/framing studs).

For buildings within the geometric limits of AS 4055 "Wind loading for housing", which include a roof height less than 8.5m, eaves height less than 6m, and a building width less than 16m, design tables have been developed for design wind pressures determined in accordance with AS 4055 wind classifications with local pressure factored external pressure coefficient, $k_l.C_{p,e}$ of -1.3 & +0.7.

For other building geometries, design tables have been developed for a range of design ultimate limit state wind pressures.

It is the responsibility of the designer to determine the wind classification and/or design wind pressures of the building, and the suitability of the system solutions.

Cyclonic Zones

Cemintel claddings are suitable for use in cyclonic zones in building that comply with the geometrical limits of the simplified wind code AS 4055. The cladding has not been tested to the cyclic loading regime of AS/NZS 1170.2.

Structural Bracing

Typically, the Cemintel cladding is not intended to provide wall bracing. Refer to the product installation guide for information on the bracing capability of the cladding.

The bracing must be provided in the structural framing in the normal manner by using methods such as strap bracing or sheet bracing. Where sheet bracing is used, the entire wall framing must be sheeted to maintain a uniform fixing plane. Continuous packing strips may be used on studs to match the thickness of other sheet bracing material if required. Note that window set-out will be affected.

Internal Linings

All linings and framing are to be designed for the appropriate design loads due to imposed actions. Contact CSR Gyprock for loads higher than those stated in this guide.

Imposed actions from wind pressure can occur on the internal lining of walls and ceilings that form part of the building perimeter enclosure due to air flow through the facade and/or internal pressures created by openings in the building facade, such as doors and windows, that are left open or are damaged in a wind event. Earthquake loads can be imposed by seismic actions must be considered in accordance with the NCC and determined in accordance with AS/NZS 1170.4.

For CSR Gyprock and Cemintel products, the maximum permitted support framing centres for design loads acting perpendicular to the cladding and a deflection criteria of the minimum of h/240 and 20mm, are shown in Table 3.01.
The plasterboard and fibre cement sheet fixing requirements shall be in accordance with CSR Gyprock® The Red Book and Cemintel publications.

TABLE 3.01 Maximum framing centres for plasterboard and wallboard linings on internal walls

Linings (horizontal or vertical sheet orientation)	**Maximum Stud Spacing (mm)**			
	Design Ultimate Limit State Load (kPa)			
	0.25	**0.50**	**0.75**	**1.00**
10mm Gyprock plasterboards	600	600	450	450
13mm and 16mm Gyprock plasterboards	600	600	600	600
6mm CeminSeal Wallboard	600	600	450	450
9mm CeminSeal Wallboard	600	600	600	600

Note: Contact CSR DesignLINK stud spacing requirements for design wind pressures in excess of 1.0kPa and finishes other than paint, such as tiling.

External Fire-Rated Linings

All external fire-rated linings and framing are to be designed for the appropriate design loads due to imposed actions and FRL rating. The external fire-rated lining shall be a moisture resistance grade plasterboard, such as Gyprock Fyrchek MR, with an exterior layer of appropriate sarking/wall wrap. Contact CSR DesignLink and refer to Gyprock The Red Book and Cemintel design guide publications for installation and fixing requirements. The requirement for closure of the cavity under a fire event to create compartments and prevent fire spread will be determined and nominated by the project engineer. Other considerations are outlined in the ‘Façade Design’ section of this guide.

Imposed actions from wind pressure can occur on the fire rated linings within the façade cross-section due to air flow through the façade and/or internal pressure created by openings in the building façade. Air flow can be the result of external drainage and ventilation openings and/or leakage through the internal linings. Earthquake loads can be imposed by seismic actions must be considered in accordance with the NCC and regulatory requirements and determined in accordance with AS/NZS 1170.4 for Australian applications.

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WEATHERPROOFING

The control of water ingress to a building is the responsibility of the building designer. All framing, wall wrap/sarking, flashings, damp proof courses and sealants must be installed in accordance with this design guide, the relevant product manufacturer's instructions, applicable standards and building codes.

The selection of the appropriate installation system is based on many factors, but particular attention must be paid to weatherproofing to ensure adequate long-term performance. Therefore, an assessment based on NCC Weatherproofing Risk Factors should be undertaken prior to selection of the installation system. Refer to Table 3.02, taken from Volume Two of NCC 2022 Table H2V1a [2019: Table V2.2.1a].

The weatherproofing performance of the Cemintel wall systems detailed in the Cemintel product installation guides, the direct fixed systems, and ventilated and drained cavity systems, have been independently assessed that these systems satisfy the verification methods of Volume One NCC 2022 F3V1 [2019: FV1.1] and Volume Two NCC 2022 H2V1 [2019: V2.2.1].

Cavity Fix systems are ideal solutions for weatherproofing walls and should be considered for high risk designs. Table 3 is part of a method outlined in the NCC to determine a buildings risk. A high-risk design is considered for a Risk Factor score of 13 – 20 for Cemintel sheeting and 'inclined' weatherboard products, and a Risk Factor score of 7-20 for Cemintel 'Un-inclined' weatherboards (i.e., Headland Weatherboards). For Direct Fix systems, the Risk Factor shall be less than 12 maximum or 6 maximum (i.e., un-inclined weatherboards) and no item on the NCC Risk Factor table shall have a ''very-high'' Risk Severity rating.

Important: Windows must be a front draining style and have appropriate flashing to prevent moisture ingress and penetrations should be effectively sealed and allow for differential movement between the air barrier and at the cladding.

TABLE 3.02 Waterproofing Risk Factors

Risk Factor	Category	Risk Severity	Risk Score	My Score
Wind Region	Region A (AS/NZS 1170.2)	Low to Medium	0	
	Region B (AS/NZS 1170.2)			
	Region C (AS/NZS 1170.2)	High	1	
	Region D (AS/NZS 1170.2)	Very High	2	
Number of Storeys	One storey	Low	0	
	Two storeys in part	Medium	1	
	Two storeys	High	2	
	More than two storeys	Very High	4	
Roof/Wall Junctions	Roof-to-wall junctions fully protected	Low	0	
	Roof-to-wall junctions partially exposed	Medium	1	
	Roof-to-wall junctions fully exposed	High	3	
	Roof elements finishing within the boundaries formed by the external walls	Very High	5	
Eaves Width	Greater than 600mm for single storey	Low	0	
	451-600mm for single storey; or	Medium	1	
	greater than 600 mm for two storeys			
	101 - 450 mm for single storey; or	High	2	
	451 mm – 600mm for two storeys; or			
	greater than 600 mm for above two storeys			
	0 - 100 mm for single storey; or	Very High	5	
	0 - 450 mm for two storeys; or			
	less than 600mm for above two storeys			
Envelope Complexity	Simple shape with single cladding type	Low	0	
	Complex shape with no more than two cladding types	Medium	1	
	Complex shape with more than two cladding types	High	3	
	As for high risk but with fully exposed roof-to-wall junctions	Very High	6	
Decks, Porches and Balconies	None; or	Low	0	
	Timber slat deck or porch at ground level			
	Fully covered in plan view by roof; or	Medium	2	
	Timber slat deck attached at first or second floor level			
	Balcony exposed in plan view at first floor level; or	High	4	
	Balcony cantilevered at first floor level			
	Balcony exposed in plan view at second floor level or above; or	Very High	6	
	Balcony cantilevered at second floor level or above			
		Building Total Risk Score:		

Notes:
1. Eaves width is measured horizontally from the external face of any wall cladding to the outer edge of any overhang, including fascia and external gutters.
2. Barriers to prevent falling and parapets are considered as 0mm eaves.

Moisture Management

To ensure occupant health, safety and comfort and to protect the building's water sensitive materials from damage, a condensation management strategy with the following objectives is required:

- Prevent external weather entering the building;
- Mitigate the risks associated with the accumulation of internal moisture in a building; and
- Provide construction systems that have a drainage and drying potential.

The National Construction Code (NCC) volumes cover requirements for weatherproofing, condensation, water vapour, ventilation, air tightness and thermal performance which help manage associated risks and resist ingress of weather and groundwater into a building to minimise the impact on the health of occupants.

CSR provides several product options for thermal and moisture control, and use as air barriers. The project designer, architect or engineer is responsible for determining what is appropriate for the application.

Weatherproofing

The control of water ingress to a building is the responsibility of the building designer. All framing, wall wrap/sarking, flashings, damp proof courses and sealants must be installed in accordance with design and installation guides, the relevant product manufacturer's instructions, applicable standards and building codes. The selection of the appropriate installation system is based on many factors, but particular attention must be paid to weatherproofing to ensure adequate long-term performance.

Important: Windows must be a front draining style and have appropriate flashing to prevent moisture ingress and penetrations should be effectively sealed and allow for differential movement between the air barrier and at the cladding.

Air Barriers

An air barrier behind the cladding is an essential part of the Barestone weatherproofing system. The air barrier is required to reduce air leakage between the external and internal areas of the building. It is important to note that air barriers must be installed correctly as they are an integral element of a pressure equalised self-draining cavity system. The extent of the barrier, including the treatment at corners and at interactions with other facade elements, must be considered by the facade designer. Vertical cavity barriers may be required at some locations to ensure effective positive pressure zones exist within the cavity, typically at building corners.

For conventionally installed wall wrap/vapour control membrane layers, typically the internal plasterboard lining is considered the predominant air barrier in the external wall system. Alternatively, the inner lining of the ventilated and drained cavity (i.e., wall wrap, rigid air barrier, waterproofing layer, backpan) can be the air barrier. The design must ensure the air barrier is structurally adequate to resist the imposed design wind pressures.

Properly designed rigid air barriers including, fibre cement, masonry, concrete, timber and metal sheeting all require respective detailing and sealing to be utilised as an air barrier. Alternatively, various properly designed wall wraps may be utilised. The maximum serviceability limit state wind pressure may be governed by the type of air barrier / air seal selected.

The serviceability wind pressure for the building is used to determine the suitability of a weatherproofing system. However, the design pressure for the air barrier is dependent on factors such as cavity depth, ventilation openings, and any panel gaps. The air barrier should be designed to resist the building ultimate wind pressure unless a lower value is determined by the facade engineer.

The Cemintel Barestone / Commercial ExpressPanel / Surround wall systems with a cavity wall configuration using Cemintel Rigid Air Barrier has been tested and assessed to AS 4284 to withstand water ingress for serviceability limit state wind pressures up to +/- 2.5kPa, and a maximum design ultimate limit state wind pressures up to +/- 7.0kPa. Table 3.06 and Table 3.07 provide the ultimate design pressure capacity of the Cemintel Rigid Air Barrier for different structural framing arrangements and sheet orientations.

Wall wraps can provide a water resistant and air tight barrier when installed appropriately. When installed in accordance with the Soft Air Barrier construction details in this guide, the Bradford Enviroseal CW-IT wall wrap has been assessed as an air barrier for a maximum design ultimate limit state wind pressures up to +/- 2.5kPa. Table 3.05 provides the washer fixing requirements for the CW-IT wall wrap. It is recommended that wall wraps used as an air barrier have an air resistance greater than 0.1 MNs/m^3 when tested to ISO 5636-5. Wall wraps in Table 3.04 meet this air resistance requirement. The construction details for a soft air barrier or rigid air barrier are presented in the 'Bradford Enviroseal CW-IT Wall Wrap Soft Air Barrier' section of this guide and the Cemintel Rigid Air Barrier Design & Installation Guide, respectively.

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TECHNICAL INFORMATION

Condensation

Condensation occurs as warm, moist air cools and contacts cold surfaces that are below the air's dew point. Absorptive materials such as brick, cement sheet and timber are permeable and act as a buffering material until they become saturated, whilst nonabsorptive materials such as steel and glass reach saturation quickly. Water can then accumulate and must be allowed to dry or drain away via a cavity. Moist surfaces and the right environment can lead to mould, creating potential health issues for occupants and lead to degradation of building materials and loss of structural integrity.

The likelihood and severity of condensation is largely a function of:

- Climate (primarily temperature and humidity including seasonal and diurnal variations).
- Occupancy and building use.
- Material properties of the building envelope (including insulation material type and R-Value).
- Passive and mechanical ventilation.
- Air tightness.
- The building envelope's ability to allow or prevent the movement of vapour.
- The building envelope's ability to act as a water barrier behind the primary cladding element.
- The drying potential provided by a building envelope.

CSR recommends that architects/designers undertake a condensation risk analysis prior to selecting vapour control membranes. A rigid air barrier may be required where buildings are subject to higher wind loads, and in some climate zones may require the incorporation of a vapour control membrane in addition to the rigid air barrier. Greater use of insulation, better sealing to restrict air movement, and increased use of air conditioning leads to larger differences between the temperature and water vapour content of indoor environments and adjacent outdoor areas and greatly increases the risk of condensation at surfaces and interstitial spaces.

The Australian Building and Construction Board (ABCB), "Condensation in Buildings Handbook", 3rd Edition 2019, discusses the condensation risks and provides guidance on managing condensation. This guidance includes review of Bureau of Meteorology climate statistics (including maximum and minimum average monthly temperatures together with average monthly dew point temperatures). This highlights the likelihood of condensation which occurs when minimum temperature falls below the dew point, and identifies the daytime drying potential.

Vapour Control/Vapour Permeable Membranes

The fabric of the building separates the interior and exterior environments and is subject to the movement of heat, air, water, and water vapour. Multiple materials are usually required to form effective control layers in the interstitial spaces between the exterior cladding and internal lining of a building.

The appropriate wall wrap for an application will depend on the local climate, building type, service wind pressure, use and orientation, material R-Value of the insulation, as well as the degree and location of ventilation.

Vapour barriers restrict the transmission of water vapour, while vapour permeable membranes allow the transmission of water vapour.

The wall wrap must have a 'water barrier' classification to AS/NZ 4201.4. A non-water barrier classification is not suitable. Wraps included in this manual, and Cemintel Rigid Air Barrier, have achieved the classification water barrier. Wall wraps must meet the requirements of AS/NZS 4200.1: Pliable building membranes and underlays – Materials and be installed in accordance with AS 4200.2 – Pliable building membranes and underlays – Installation requirements.

For conventionally installed wall wraps, the requirement to seal joins and penetrations may vary depending upon NCC, AS 4200.2 and/or state requirements, CSR recommends sealing the external wall wrap/sarking to maintain vapour and wind performance, and draught proofing effectiveness, as well as to ensure water barrier integrity. As there are a number of factors that need to be considered in assessing and managing condensation risk.

Note: The use of a Class 3 membrane such as Cemintel Rigid Air Barrier may not be sufficient in some cold climates. If a Class 4 membrane cannot be used, a solution may include the use of a material to the interior side of the insulation that acts as a vapour barrier, e.g. a Class 1 or 2 membrane or a vapour sealed plasterboard lining coupled with a mechanical ventilation solution. CSR recommends seeking expert advice prior specifying systems for these regions.

Additional literature on this subject is available from CSIRO/BRANZ/ ASHRAE/ABCB and CSR DesignLINK can help with this assessment.

TABLE 3.03 Recommended CSR Products for Moisture Management of Walls

Climate Zone	Guidance on Vapour Control	Performance and Category	Recommended CSR Products[1] (Refer to Table 4.02)
Warm humid, High humidity or Hot-dry (tropical, coastal, inland) climates (Zone 1, 2, 3)	Where vapour flow is typically inward, such as where the building is airconditioned for cooling, the membrane should function as a vapour barrier. Climates with varying diurnal and seasonal temperature changes can affect the direction of the water vapour flow. In most cases a vapour permeable membrane outside the insulation is recommended to avoid creating a moisture trap, allowing drying in either direction.	Vapour Barrier Class 1 or 2 or Vapour Permeable Class 3 or 4	• Bradford Thermoseal Wall Wrap • Bradford Thermoseal Wall Wrap XP • Cemintel Rigid Air Barrier with a vapour barrier membrane • Cemintel Rigid Air Barrier • Bradford Enviroseal RW/CW/CW-IT Wall Wrap
Hot-Dry or Warm Temperate (coastal & inland) climates (Zones 4, 5)	These climates have varying diurnal and seasonal temperature changes that can affect the direction of the water vapour flow. A vapour permeable membrane outside the insulation is required to avoid creating a moisture trap, allowing drying in either direction. Where a high level of thermal insulation is used, a high degree of permeability may be required.	Vapour Permeable Class 3 or 4	• Bradford Enviroseal RW/CW/CW-IT Wall Wrap • Cemintel Rigid Air Barrier
Mild or Cool Temperate, or Cold (alpine) climates (Zones 6, 7, 8)	Where there is a strong tendency for outward migration of vapour and a high risk of condensation, vapour permeable membranes should be installed on the cold, external side of the insulation.	Vapour Permeable Class 4	• Bradford Enviroseal RW/CW/CW-IT Wall Wrap • Cemintel Rigid Air Barrier[2]

(1) Expert guidance based on local experience should be sought.
(2) The use of a Class 3 membrane such as Cemintel Rigid Air Barrier may not be sufficient in some cold climates. If a Class 4 membrane cannot be used, a solution may include the use of a material to the interior side of the insulation that acts as a vapour barrier, e.g. a Class 1 or 2 membrane or a vapour sealed plasterboard lining coupled with a mechanical ventilation solution. CSR recommends seeking expert advice prior specifying systems for these regions.

TABLE 3.04 Vapour Control Properties of CSR Products

Product	Vapour Permeance Class AS/NZS 4200.1	Vapour Permeance ASTM E 96 (µg/N.s)	Weather Exposure Limit Prior to Cladding
Bradford Thermoseal Wall Wrap XP	Class 1	≤ 0.002	4 weeks
Bradford Thermoseal Firespec	Class 2	0.002 to 0.1429	4 weeks
Bradford Thermoseal Wall Wrap	Class 2	0.0022 to 0.1429	4 weeks
Cemintel Rigid Air Barrier	Class 3	0.25	6 months (panel) 2 months (tape)
Bradford Enviroseal CW/CW-IT Wall Wrap	Class 4	> 1.1403	6 weeks
Bradford Enviroseal RW Wall Wrap	Class 4	> 1.1403	6 weeks

03 TECHNICAL INFORMATION

Cemintel Soft Air Barrier

Soft Air Barrier to be installed in the following wind load situations

TABLE 3.05 Wall Wrap and Plasti-Grip spacing requirements for the following wind loads

Stud Spacing (mm)	Maximum Bradford Plasti-Grip Washer Spacing (mm) Ultimate Design Wind Pressure (kPa)								
	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
300	300	300	300	300	300	300	300	300	300
400	300	300	300	300	300	300	250	250	200
450	300	300	300	300	300	250	250	200	200
600	300	300	300	300	250	200	-	-	-

Note: Screw fixings for attaching washers to timber or steel framing shall be a minimum 8g self-drilling screws. Screws into timber shall have a minimum 25mm embedment.

Cemintel Rigid Air Barrier

Cemintal Rigid Air Barrier sheet installed in the vertical direction

TABLE 3.06

Stud Centres (mm)	Maximum Wind Loading (Ultimate) (kPa)
600	1.14
450	2.03
400	2.57
300	4.57

Cemintal Rigid Air Barrier sheet installed in the horizontal direction

TABLE 3.07

Stud Centres (mm)	Maximum Wind Loading (Ultimate) (kPa)
600	1.76
450	3.13
400	3.96
300	7.00

Note: For specific installation information on Rigid Air Barrier, refer to the 'Cemintel Rigid Air Barrier Design and Installation Guide'.

Energy Efficiency & Thermal Design

Energy efficiency requirements for buildings are set out in the NCC, as performance requirements and acceptable construction practices, and are dependent on geographical climate zones. To meet the requirements, it is recommended that insulation be installed in the wall framing and provision of appropriate sealing of the building envelope. Check with local building authorities for minimum insulation requirements. The level of insulation provided by a wall is described by its Total R-Value.

Thermal Performance of Cemintel Wall Systems

The Gyprock The Red Book presents Cemintel external wall systems that include thermal ratings expressed as $R_{t(WINTER)}$ and $R_{t(SUMMER)}$ to represent Total R-values for the winter and summer design conditions as required by AS/NZS 4859.1, which is called upon in the NCC.

The Total R-Values presented in The Red Book are based on assumptions in accordance with the methods of AS/NZS 4859.1 – Thermal insulation materials for buildings - General criteria and technical provisions. Any included bulk insulation is a CSR Bradford product that has a material R-value compliant with the standard, and building elements have thermal values sourced from the AIRAH handbook. Thermal performances quoted are based on an assessment through the insulation path. The contribution to Total R-Values depends on installation, workmanship and environmental conditions and it is assumed that cavities are ventilated.

Thermal Bridging

Thermal bridging is a path of least resistance for heat to travel, which can significantly reduce the effectiveness of insulation. An example is where a steel stud with high thermal conductivity interrupts the insulation layer. This can result in internal heat lose on a cold day and internal heat gain on a hot day. At thermal bridging locations, condensation may occur where warm, moist air contacts a colder surface.

The detrimental impact of a thermal bridge can be diminished with the installation of a thermal break, which increases the resistance for heat to travel at the thermal bridging locations. Typically, the thermal break has low thermal conductivity.

Thermal Break

For some situations, e.g. Class 2 building or Class 4 parts of a building, an envelope consisting of a metal framed wall with and external fibre-cement cladding and an internal lining directly fixed to the frame, NCC 2022 J3D6 (1) [2019: J0.5] requires a thermal break to be installed between all points of contact between the external fibre-cement cladding and the metal frame. The thermal break shall have a minimum R-Value of R0.2.

The Australian Building and Construction Board (ABCB), "Energy efficiency NCC Volume One Handbook", June 2019, advises a thermal break is not needed if a secondary framing member, orientated perpendicular to the metal frame, is installed between the metal frame and lightweight external cladding. This is the case for the ExpressWall framing system, the cladding is indirectly fixed to the structural framing with secondary members (top hats) perpendicular to the structural framing (i.e., studs), therefore no thermal break is required at the connection of the horizontal top hat and the vertical structural stud framing.

The Barestone systems have a 'well ventilated' cavity and the project designer, architect or engineer is responsible for assessing the thermal bridging and determining the thermal break requirements to ensure the wall system provides an adequate Total R-Value inclusive of thermal bridging.

For the Cemintel direct fixed wall systems, the external cladding is in direct contact with the metal framing a thermal break is applied to the face of the frame to meet the deemed to satisfy requirements of the NCC.

NCC Requirements

NCC 2022 includes changes to energy efficiency requirements. These requirements will express the R-Value of the building fabric system as the Total R-Value inclusive of thermal bridging. The Total R-Value will consider the project specific external wall configuration and materials used, so that the detrimental impact of the thermal bridging on the added insulation is captured.

Additional to the effects of thermal bridging through the framing paths of the structure, the designer will need to allow for the following:

- gaps in the bulk insulation layer in the wall system due to structural framing (i.e., studs, noggings, perimeter of wall openings) and services obstructing or limiting wall insulation coverage;
- slab edge insulation;
- wall cavity ventilation; and
- the effects of air leakage due to unsealed architraves, unsealed door jambs, unsealed gaps between windows and the masonry wall or services penetrating the inner leaf.

These effects are to be compensated for as outlined in Section J of the NCC.

For projects conforming to NCC versions prior to the NCC 2022, thermal bridging consideration is not required in the Total R-Value calculation for all building classes, such as:

- Class 1 to Class 10 buildings (all building classes) for NCC 2016 Amdt. 1 Volume One and NCC 2016 Amdt. 1 Volume Two (and earlier).
- Class 1 and Class 10 only for NCC 2019 (incl. Amdt. 1) Volume Two.

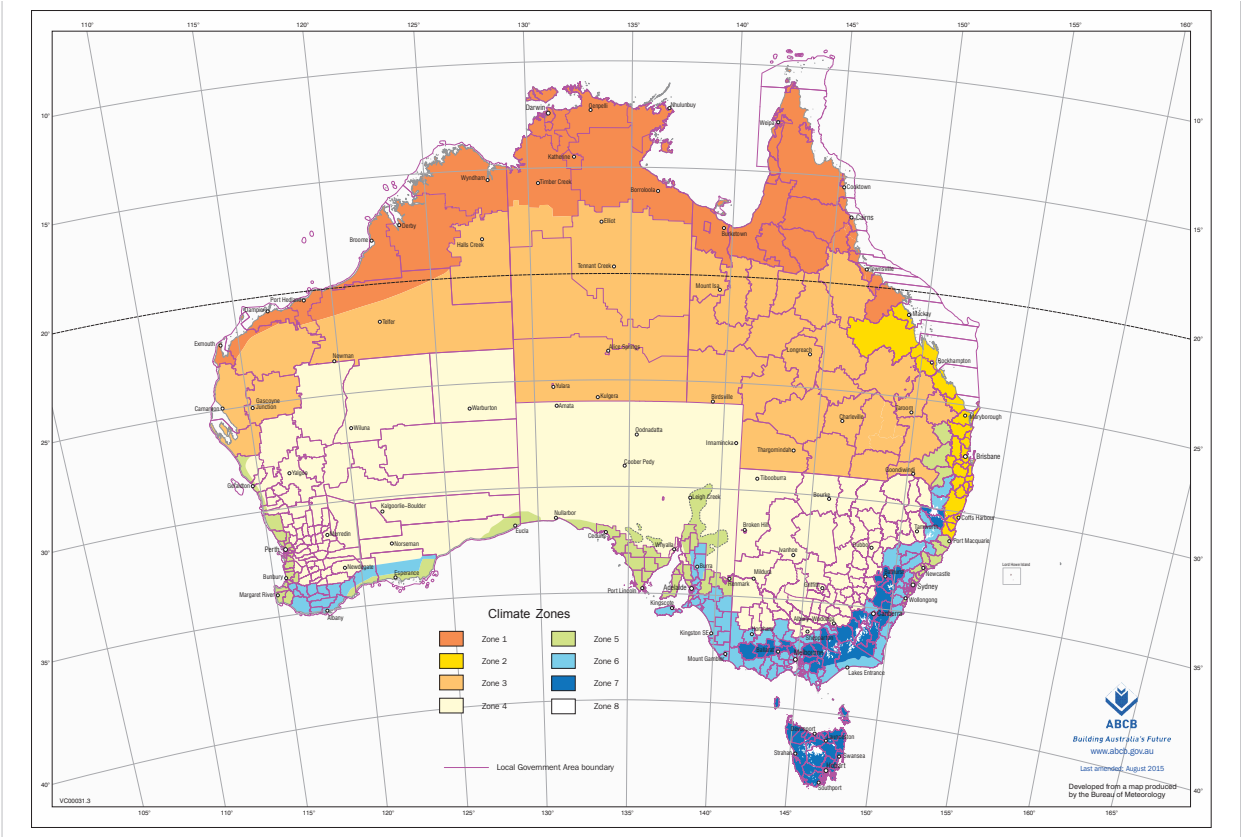
For product information, refer to 'Components' section of this guide. Note, the insulation also improves the acoustic performance of the wall against outside noise.

Building Envelope Sealing

Building envelope sealing is pertinent to the energy efficiency performance of a building. NCC 2022 J1V4 [2019: JV4] outlines a method to verify compliance with the building sealing requirements in NCC 2022 Part J5 [2019: Part J3].

CLIMATE ZONES FOR THERMAL DESIGN

The following map and table show the performance levels required for walls (and floors) under the NCC.



Step 1: Determine which Climate Zone your project is located in Australia from the map above.

Step 2: From Table 3.08, 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, the Building Class descriptions are defined by the NCC.)

Step 3: Refer to The Red Book and wall system applicable to your construction type to determine Total R-Value of the wall system.

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 NCC.

TABLE 3.08 Design Conditions ('Summer' heat flow in or 'Winter' heat flow out). Source: ICANZ Handbook

Climate Zone	1	2		3	4	5	6	7	8
		<300m Altitude	>300m Altitude						
Class 1 & Class 10	Summer		Winter						
Class 2-9	Summer							Winter	

FIRE RESISTANCE PERFORMANCE

Fire Rated External Wall Systems

The Cemintel guides and Gyprock The Red Book publications provide design and installation information on the FRL rating of the Cemintel external wall systems. Along with the Cemintel sheet and weatherboard cladding products, the fire rated wall systems are achieved with the inclusion of other CSR products, such as, Gyprock fire-resistant plasterboard, and Bradford insulation and Bradford sarking/wall wraps.

In accordance with NCC 2022 C2D10 [2019: C1.9] and NCC 2022 H3D2 [2019: 3.7.1.1], the following CSR products are deemed suitable for use wherever a non-combustible material is required:

- Cemintel sheet and weatherboard cladding products are a fibre-reinforced cement sheeting material;
- Gyprock fire-resistant products are a plasterboard material; and
- Bradford Enviroseal and Thermoseal products are sarking-type materials that do not exceed 1mm in thickness and have a Flammability Index ≤ 5.

Design Fire Requirements

The design engineer is responsible for approving and specifying the wall system solution to ensure compliance with applicable NCC provisions, project specification, Australian Standards and any other regulatory requirements. These may include, but not limited to, the following:

- Nominating the length of fasteners to allow for the extra thickness of the fire-rated linings and maintain fastener capacity and minimum embedment;
- Specification of the external fire-resistant lining and fixing requirements; and
- When the internal (room) wall linings that form part of the fire rated wall system, design of the areas where the linings are omitted (such as the junctions of walls, floor and roof framing, in the roof space, and at service penetrations) and determine the necessity of additional treatment such as the provision of Supplementary Fire Zone Protection.

For further information, contact CSR DesignLink and refer to the appropriate Cemintel Design & Installation Guide and Gyprock The Red Book publications.

Supplementary Fire Zone Protection

The treatment options for Supplementary Fire Zone Protection could consist of the following:

- Addition of fire rated layer of Gyprock Fyrchek plasterboard and/or Bradford Fibretex Rockwool products; and
- Additional timber studs and framing to provide sacrificial fire blocking and insulation.

For additional assistance, contact project fire engineer.

Spread of Fire

NCC provisions to protect a building from the Spread of Fire via the façade requires: the external walls and any openings in the external walls be capable of withstanding a nominated heat flux for a duration of time and/or without ignition, while not increasing the risk of fire spread between buildings; and the external walls shall extend to the underside of a non-combustible roof covering or non-combustible eaves lining. For eaves solutions, the Cemintel sheet products are a fibre-cement material and as such, deemed suitable for use wherever a non-combustible material is required.

TABLE 3.09 Bushfire Attack Level (BAL) and Fire Resistance Level (FRL) Ratings for Cemintel External Wall Systems

Cemintel Product	**Cemintel System**	**Bushfire Zone Walls**	**Fire Rated External Wall Systems**		
		Cladding fixed over Sarking + 1x10mm Gyprock Standard Plasterboard to Internal face	Refer to CSR Gyprock The Red Book 01[2]		
	Thickness	**Bushfire Attack Level (BAL)**	**Fire Resistance Level (FRL)**		
Headland® Weatherboards	10	BAL-LOW	BAL-FZ[1] 30/30/30 (from outside only)	60/60/60 (from outside only)	90/90/90 (from outside only)
Scarborborough® Weatherboards	12	BAL-40			
Balmoral™ Weatherboards	16	BAL-40			
Plank	7.5	BAL-29			
Aspect Cladding®	12	BAL-29			
Edge™ Cladding	9	BAL-29			
SimpleLine®	8.5	BAL-29			
Mosaic®	8	BAL-29			
Cladding Sheet	6	BAL-29			
Texture Base Sheet	7.5	BAL-29			

Note: [1] BAL-FZ walls must have a minimum setback distance of 10m from classified vegetation. Also refer to local building regulations.
[2] Requires Gyprock Fyrchek MR Plasterboard layer to exterior of framing.

03 TECHNICAL INFORMATION

Gyprock The Red Book provides wall systems that are adequate for residential buildings and satisfy the Deemed-to-Satisfy Provisions of Type C Construction commercial buildings. Note the Type C Construction limits the maximum rise of storeys depending on the class of the building. Type A and B Construction buildings will require a Cavity Fix wall system with steel top hats and non-combustible components. It is the designer's responsibility to specify the Cemintel wall systems that satisfy the NCC fire safety requirements and include additional items, such as but limited to, the fire-rated linings for FRL rated walls and fire barriers for compartmentation and separation, as required.

Wall Framing Fire Resistance

The wall systems in The Red Book are suitable for the stated FRL when designed in accordance with the structural requirements of this section.

The fire design of timber framing is based on the principle that a particular level of char is acceptable without compromising the performance of the wall. CSR has carried out testing to verify the char limit, and where it is exceeded, the allowable axial capacity of the stud is reduced to account for the loss of section. The systems are noted with an Axial Capacity Reduction (ACR) Group number. In these systems, the designer must increase the applied loads by a percentage, as shown in Table 3.10 to compensate for the axial capacity reduction.

To protect structural steel beams and columns that are entirely within a wall, the FRL of the wall system must be at least equivalent to that required by the structural member. For example, a wall system with FRL 90/90/90 provides FRL 90/–/– for a steel column within the wall.

TABLE 3.10 Axial Capacity Reduction (ACR) due to the effect of timber char

Timber Size	Group1	Group2	Group3
90 x 45	0%	0%	25%
90 x 35	0%	10%	30%
70 x 45	3%	25%	40%
70 x 35	8%	35%	45%

Wall Framing and Lining

Walls required to have an FRL must comply with the following:

- Steel framing must have base metal thickness (BMT) of up to 1.6mm;
- Timber studs must be a minimum 70 x 35mm and be spaced at 600mm maximum centres;
- Wall plates must be fixed to the fire rated support structure with appropriate steel fasteners, as specified by the project engineer and/or wall framing designer;
- Fyrchek and Cemintel fibre cement products must be mechanically fixed only, adhesive is not to be relied on;
- Linings that do not contribute to the system FRL may use adhesive;
- In external areas, Gyprock Fyrchek MR or other Gyprock moisture grade, fire resistant plasterboard must be used in lieu of Gyprock Fyrchek;
- For single fire-rated layer systems and the first layer of multilayer systems, butt joints must be backed by either a stud or nogging;
- For the outer layer of a two layer fire-rated vertically sheeted applications, the outer layer butt joints may be reinforced using laminating screws without the need for framing support;
- All systems require jointing and finishing of the outer layer only. As a minimum, Gyprock paper tape and a single base coat finish may be used. On the external side of wall systems Wet Area Base Coat or Ultra Base MR 60 may be used; and
- Fixing information for the external fire-rated layer systems is outlined in Gyprock The Red Book publications.

For additional information on frame design and detailing, including treatment at junctions, sub-floor and roof areas, cavity barriers and penetrations, contact DesignLINK.

The Fire Resistance Level (FRL) of the systems detailed in the Cemintel product installation guides and Gyprock The Red Book 01 will not be detrimentally affected by:

- Increasing the thickness of the wall;
- Increasing the cross-sectional dimensions of the framing elements;
- Decreasing the stud spacing;
- Decreasing the fixing centres of wall sheet materials;
- The inclusion of bulk cavity insulation materials, such as Glasswool, Rockwool and Polyester;
- Additional layers of plasterboard or Cemintel fibre cement;
- Wall curved in plan with a radius of curvature no less than 3m;
- The attachment of light weight fixtures through to the framing; and
- The addition of timber or fibre cement sheets.

Bushfire Prone Zones

A Bushfire Attack Level (BAL) rating is a means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact. It's measured in increments of radiant heat (expressed in kilowatts/m2). It is the responsibility of the project designer to assess the bushfire adequacy of the wall system and determine any additional details to satisfy the project bushfire requirements (refer to the NCC, AS 3959 and any other relevant regulatory requirements).

Protection against bushfire attack requires a comprehensive and systematic approach to ensure the construction of the whole wall system is considered, that includes the specification of fire-resistant linings, framing, cavity treatment and other materials (e.g., insulation, external wall cladding), and construction details for the external walls and junctions to neighbouring elements (e.g., eaves, roofs, decks and floors). Bushfire zone walls require specific treatments, such as but not limited to, all joints in the external surface material (cladding) of walls shall be covered,

sealed, overlapped, backed or butt-jointed, inclusion of a sarking-type material applied over the frame prior to fixing any external cladding, and at all gaps (e.g., vents and weepholes) in external walls shall be screened with a mesh with a maximum aperture of 2mm, made of corrosion-resistant steel or bronze. Also mesh coverings maybe required at the wall head, base, all gaps, eaves and junctions with roofs, etc., to ensure appropriate protection from fire and ember attack.

A BAL is the basis for establishing the requirements for construction, under the Australian Standard AS 3959-2009 "Construction of buildings in bushfire-prone areas" to improve protection of building elements from bushfire attack. Figure 3.05 shows the various BAL ratings and the radiant heat flux for each rating. The greater the distance from the fire the lower the heat flux and therefore the construction standard is lower.

In accordance with AS 3959, the range of Cemintel sheet and weatherboard products can satisfy the minimum thickness requirements of fibre-cement external cladding and when used in Cemintel external wall systems are suitable for use on buildings constructed according to regulations and AS 3959 requirements, and relevant Cemintel D&I guide. Refer to Table 3.09 for the BAL ratings of the Cemintel external wall systems presented in Gyprock The Red Book 01 – Design Guide.

Cemintel external wall systems can achieve a FRL of 30/30/30 or -/30/30 when tested from the outside with the addition of a suitable Gyprock Fyrchek MR plasterboard lining to the outside of the framing, (refer to Gyprock The Red Book 01 – Design Guide) and installed according to regulations and AS 3959 Section 9 Construction Requirements for Bushfire Attack Level FZ (BAL-FZ) for an external wall. Note that a 10m setback applies from the edge of the classified vegetation to the building.

Roof & Eaves Design

Refer to the Cemintel 'Product Guide for Bushfire-Prone Areas' available at www.cemintel.com.au and the Bradford™ 'Bushfire Roofing Systems Design Guide'... available at www.bradfordinsulation.com.au. It is not recommended that air from the wall cavity be vented into the roof or eaves space without protection against the risk of windblown embers entering the roof and/or eaves space.

FIGURE 3.05 BAL Ratings

BAL-FZ	BAL-40	BAL-29	BAL-19	BAL-12.5	BAL-Low
Direct exposure to flames from the fire front in addition to heat flux of greater than **40kW/m²** and ember attack.	Increasing levels of ember attack and ignition of debris with an increasing heat flux of up to **40kW/m²** and increased likelihood of exposure to flames	Increasing levels of ember attack and ignition of debris with an increasing heat flux of up to **29kW/m²**	Increasing levels of ember attack and ignition of debris with an increasing heat flux of up to **19kW/m²**	Ember attack with heat flux of up to **12.5kW/m²**	There is insufficient risk to warrant specific construction requirements

- BAL – Low: There is insufficient risk to warrant specific construction requirements.
- BAL – 12.5: Ember attack.
- BAL – 19: Increasing levels of ember attack and burning debris ignited by windborne embers, together with increasing heat flux.
- BAL – 29: Increasing levels of ember attack and burning debris ignited by windborne embers, together with increasing heat flux.
- BAL – 40: Increasing levels of ember attack and burning debris ignited by windborne embers, together with increasing heat flux and with the increased likelihood of exposure to flames.
- BAL – FZ: Direct exposure to flames from fire, in addition to heat flux and ember attack.
- BAL ratings for all Cemintel products are available for download at cemintel.com.au/technical
- Also refer to the publication Bushfire Roofing Systems Design Guide for assistance with roofing designs – available at www.bradfordinsulation.com.au.

ACOUSTIC PERFORMANCE

The performance of the as-built system may be affected by sound flanking, the effectiveness of workmanship and caulking, the presence and treatment of penetrations, and the inclusion of structural elements and bridging items. Refer to appropriate information on addressing these issues in Section B and Section J of the CSR Gyprock® The Red Book™ 01 publication.

General Notes:

- The acoustic performance of system solutions may be adversely affected by the use of studs with different BMT, width or closer spacings than those specified, or by the use of additional linings fixed on battens.
- In non-fire rated systems, to attain the stated acoustic performance, use Gyprock® Wet Area Acrylic Sealant or Gyprock® Fire Mastic.
- The acoustic performance of CSR wall systems IS NOT adversely affected by the order of lining sheets that are fixed direct to framing.

Generally, the introduction of a cavity behind the external cladding layer will reduce the sound insulation (R_w & $R_w + C_{tr}$ values) of the wall system. For further information of sound insulation performance of wall systems, contact CSR DesignLINK.

EXTREME CLIMATE CONDITIONS

Coastal Areas

Cemintel Cavity Fix wall system with metal framing may be used in coastal areas – Corrosivity Category C3: Medium – defined as up to 1km from a surf beach, or less than 50m from a shore without breaking surf. Consideration must also be given to local weather and topographical features that can cause an increase in the distance that salt spray can travel, extending these nominal limits.

To resist corrosion in these areas, salt laden air must be excluded from the wall frame cavity, for instance by lapping and sealing the flashing at corners and joins. All walls must be sufficiently exposed from above so that rain can perform natural wash down of the wall. Walls that are protected by soffits above must be washed down twice per year, to remove salt build-up, particularly around window/door openings. Refer to the Cemintel product installation guide for information on the correct fasteners.

Corrosive Zones/Categories

The corrosivity zones must be taken into account. While Cemintel claddings are not subject to corrosion, consideration needs to be made regarding the impact of climate conditions on system components such as fasteners and steel framing.

ISO 9223 has suggested six corrosivity categories based on the first year of corrosion rate of mild steel. Corrosivity categories are detailed in AS 4312 – Atmospheric corrosivity zones in Australia – and are set out in Table 3.11 with some general statements.

It is the responsibility of the architect/building designer to select the appropriate corrosivity category in accordance with the standard and local site conditions and provide the corrosion protection specifications. For Corrosivity Category C4: High – use fibre cement or timber battens or aluminium framing and appropriate fixings.

The durability of the Cemintel wall system can be enhanced by periodic inspection and maintenance. Inspections should include examination of the coatings, flashings and seals. Paint finishes must be maintained in accordance with the manufacturer's recommendations. Any cracked or damaged finish or seals which would allow water ingress, must be repaired immediately by recoating or resealing the affected area, or by removing the panel and replacing. Any damaged flashings or sheets must be replaced as for new work.

The durability of the system can also be increased by the additional treatment of steelwork, and by painting all exposed sealants to the sealant manufacturer's recommendations. Ensure ventilation and drainage gaps between the cladding and flashing are kept clear of any debris. The requirements for corrosive environments are shown in Table 3.12.

Temperature Extremes

Cemintel claddings are not designed to be in contact with snow or ice build-up for extended periods, such as is experienced in alpine areas subject to snow drifts. Cemintel claddings also not warranted for extreme heat conditions (that is above 50°C).

TABLE 3.11

ISO 9223 Category	Corrosivity	Steel Corrosion rate µm/y	Typical environment
C1	Very low	<1.3	Dry indoors
C2	Low (most areas of Australia at least 50km from the coast or at least 1km from sheltered bays would be in this category)	1.3-25	Arid/urban inland
C3	Medium (from 1km to 10-50km from breaking surf – much of metropolitan Wollongong, Sydney, Newcastle and Gold Coast are in this category)	25-50	Coastal or industrial
C4	High (primarily coastal areas - from several hundred metres to about 1km inland from breaking surf or from the shoreline to around 50m for sheltered bays)	50-80	Sea shore (calm)
C5	Very high (industrial or marine) – common offshore and on the beachfront in regions of rough seas and surf beaches – can extend inland for several hundred metres (in some areas of Newcastle extends around 500m)	80-200	Sea shore (surf)
CX	Extreme (industrial or marine) - found on offshore structures and within 50m inland of the shoreline of coasts exposed to surf or very rough seas - can extend 200m under the most severe sea conditions and 100m in tropical locations.	200 - 700	Sea shore (severe surf) of exposed coasts

TABLE 3.12 Requirements for Corrosive Environments

Corrosivity Category (AS 4312)	Fixing	Additional Maintenance
C1: Very Low / C2: Low	Class 3	-
C3: Medium	Class 3	Wash-down
C4: High	Class 4 / Stainless Steel	Wash-down
C5: Very High	Product specific	Periodic wash-down and inspections
CX: Extreme	Product specific	Periodic wash-down and inspections

OTHER DESIGN CONSIDERATIONS

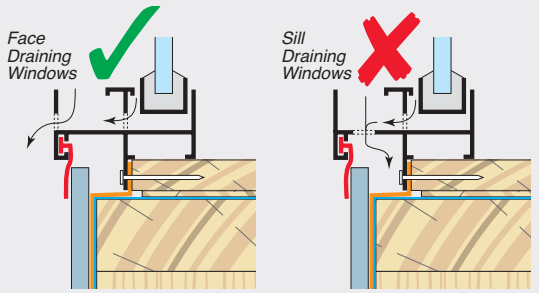
Window Selection

The Cemintel wall systems are designed to accept standard aluminium or timber framed windows. Aluminium windows MUST NOT have sill drain holes which can direct water behind the cladding, unless noted otherwise in the Cemintel product installation guide of the system. Windows with face draining format MUST be used, refer to Figure 3.06. Window reveal sizes should be determined based on the chosen window frame and stud configuration.

Jamb flashing is required in all cases, and for ease of installation, these should be included when ordering windows.

Various window types can be installed in the Cemintel wall systems in a similar manner, by varying the timber reveal depth to suit the overall wall thickness.

FIGURE 3.06 Window Drainage



Termite Management

There is a wide variety of methods for managing termite entry to buildings and selecting the appropriate method for any structure depends on specific risk factors and the form of construction. Measures for termite management have not been addressed in this guide.

Refer to your local pest management service, the NCC, AS 3660 Termite management standards and your local building authorities for more information about the requirements for the design of a suitable termite management system.

Services

Any penetrations formed must be considered in the framing design and must be effectively sealed to maintain the weather resistance of the façade.

For cavity installations, the battens may be locally removed for up to 100mm to allow services to pass outside the frame. Note additional framing for off-stud battens may be required to support the end of the batten.

Renovations

When undertaking building renovations, remove all cladding and wall wrap and insulation from the original wall framing. Ensure the condition of the framing is in accordance with current requirements and is as true and as plumb as possible (within accepted industry tolerances of 5mm over 3000mm).

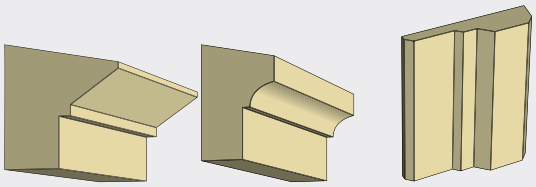
Remediate and/or install additional framing, insulation, air barrier and flashing as required to achieve the equivalent construction details shown in the relevant Cemintel product installation guide.

Specialist Profiles

Preformed architectural profiles, refer Figure 3.07, may be used to create a feature around window openings, doorways and the like. These lightweight shapes can be installed quickly and easily. These profiles should be securely bonded to Cemintel cladding in accordance with the profile manufacturer's instructions.

Where moulds are used to hide movement joints they must be allowed to move over the joint. The mould should be attached to one sheet only. Refer to Cemintel product installation guide for further information and construction details.

FIGURE 3.07 Architectural Profiles



A typical Window Sill profile | A typical Parapet or Stringer profile | A typical Window Moulding profile

Limitations

Cemintel claddings in this guide are unsuitable for the following applications: non-vertical framing (e.g., parapet capping); water features; chimney cladding; water features; and chimney cladding. Also refer to the 'Temperature Extremes', 'Corrosive Zones/Categories' and 'Coastal Areas' sections for further information.

Surface Finish & Joint Solutions

All products should be painted within three months of delivery to site. Cemintel cladding products shall be primed and must be dry before painting. All cut edges should be pre-painted with an exterior paint sealer.

Where Cemintel cladding products are exposed to the elements for more than three months from delivery, CSR recommends the application of a priming coat before applying the decorative paint coatings. Refer to the coating manufacturer's recommendations.

It is important to seek advice from the paint manufacturer to ensure you select the most appropriate products for the Cemintel cladding products. Considerations should include:

- Prior to the application of the exterior paint, walls must be washed down with clean fresh water to remove dust or any salt spray build-up from sheets and fixings. Cemintel cladding products must be allowed to dry before coating. Refer to Section 10 for additional information;
- The straightness of the substrate framing;
- Weatherboard layout around openings to minimise visibility of weatherboard butt jointing;
- Movement joint systems for use with Cemintel cladding products are appropriate for external use, e.g., UV stabilised sealants;
- The durability of the weatherboard system can be improved by periodic inspection and maintenance. Inspections should include examination of the paint, flashings and seals;
- The durability of the system can also be increased by painting all exposed sealants to the sealant manufacturer's recommendations;
- A minimum of a two-coat paint system suitable for use with Cemintel cladding products systems are usually 100% acrylic, exterior grade, high performance, flexible weatherproofing coating;
- Paint finishes must be maintained in accordance with the manufacturer's recommendations. Any cracked or damaged flashings or seals that would allow water ingress must be repaired immediately. Any damaged weatherboards must be replaced;
- Colour – light colours are more forgiving. They also do not absorb as much heat so there is less stress on the jointing system; and
- Level of gloss – spectral reflectivity is lower with matt finishes than gloss finishes. Cemintel recommends low gloss or matt finishes as light is diffused and there is less chance of visual phenomena like patchiness, undulations etc.

Refer to paint manufacturer to determine suitable coatings. It is the responsibility of the applicator to use the appropriate components and compounds sufficient to eliminate cracking under normal building conditions.

Wash Down Process

An external coating system must be applied and maintenance of the coating system shall be in accordance with coating manufacturer's recommendation. The following is recommended as a minimum maintenance regime:

- Where sufficiently exposed, rain can perform a natural wash down of the wall and ongoing maintenance should be limited to occasional rinse down or using a soft cloth or soft brush (like a dust pan brush).
- Walls which are protected by soffits above must be washed down twice per year to remove salt and debris build up particularly at joints.
- Normal dirt can be removed with a soft brush and warm water up to 50 degrees, to which a small amount of dishwashing liquid or soap has been added. The panels should be rinsed with clear water before they dry.
- Calcifications should be removed with a 5% sulfamic acid solution or with a commercial lime remover. The façade should be rinsed with clear water after cleaning.
- Panels discoloured by algal growth should be treated with an algicide without bleaching agents. This application should be allowed to take effect for several days. Afterwards, clean the panels using the 'normal dirt' procedure above.
- When rinsing down panels, use no more than 700 psi (50kg/cm^2) of water pressure at a minimum of 3m to 3.5m distance from the face of the wall. Water pressure should be applied downward to avoid forcing water into joints and gaps.
- Use neutral detergent with a soft cloth or soft brush when removing dirty spots from a panel. When diluting the neutral detergent, follow the manufacturer's instructions and use the weakest solution possible.

Inspection, Repair and Maintenance

The durability of Cemintel wall systems can be enhanced by periodic inspection and maintenance. Inspections should include examination of the coatings, flashings and seals. Any cracked or damaged finish or seals which would allow water ingress must be repaired immediately by resealing the affected area, or by removing the panel and replacing sealant. Any damaged flashings, sheets or sealant must be replaced as for new work.

Regularly inspect panel surfaces and follow washdown procedures when required.

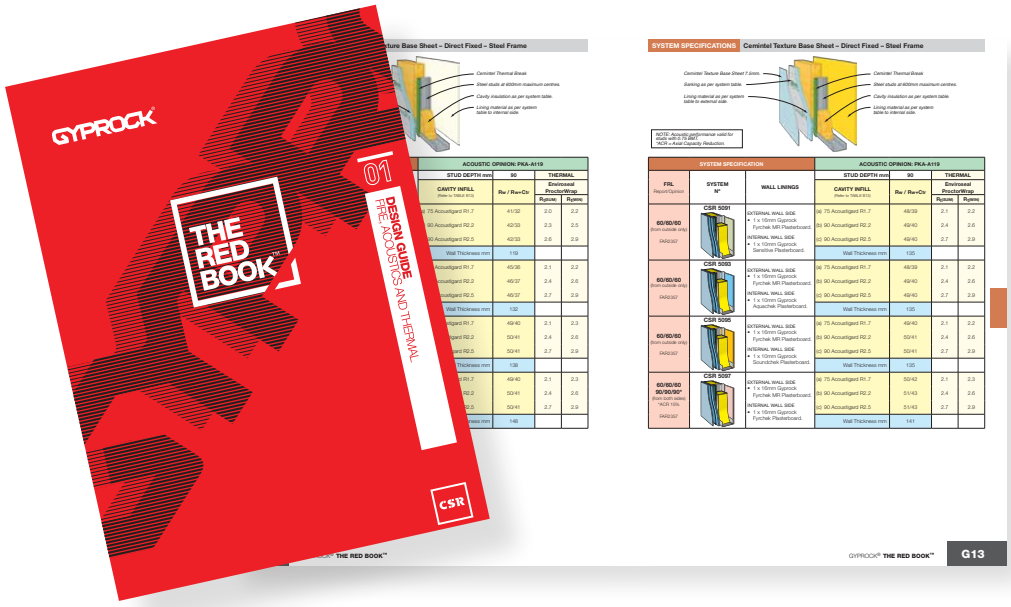
Ensure ventilation and drainage gaps between panels and flashings are clear of any debris.

It is recommended storing additional panels in case any panels are damaged in the future.

04

EXTERNAL WALL SYSTEMS

CEMINTEL EXTERNAL WALL SYSTEMS



The Red Book 01 by Gyprock outlines the extensive range of external wall systems that can be created with the Cemintel sheet and weatherboard cladding and other CSR products, such as Gyprock plasterboard and Bradford insulation.

The Red Book provides pertinent performance information of acoustic insulation, thermal insulation and fire resistance level (FRL) properties to address the NCC performance requirements. For further information on CSR products and building system solutions for projects, contact CSR Technical Services and Designlink, respectively.

Cemintel External Cladding Products
Weatherboard Products
Headland® Weatherboards
Aspect Cladding®
Scarborough® Weatherboards
Balmoral™ Weatherboards
Plank
Sheet Products
Cladding Sheet
Texture Base Sheet
SimpleLine®
Edge™ Cladding
Mosiac®

05

DESIGN TABLES – CAVITY SYSTEM FRAMING

CAVITY FRAMING DESIGN

Cavity System – Cladding Fixed Through Battens to Structural Framing

For cavity systems with the cladding fixed to the structural framing (i.e., studs), the battens act as a spacer to generate the required cavity width with the cladding fixed through the batten and to the structural framing using a nail or screw. These battens are referred to as non-structural battens and include the following types:

- 20mm maximum timber; and
- 19mm Cemintel FC Batten.

The Cemintel FC Batten can be difficult to install a screw and it is recommended pre-drilling the battens for fixing into timber framing and using a 'Wing tek' styled screw for fixing to steel framing. Important: the fastener length shall be increased to accommodate the thicknesses of additional layers and ensure the minimum required fastener embedment depth is achieved.

Cavity System – Cladding Fixed to the Batten Top Hat Framing

For cavity systems with the cladding fixed to the battens/top hats, these systems have a wider cavity behind the external Cemintel cladding. The battens and top hats that support the claddings are referred to as structural battens or structural top hats. The battens and top hats have adequate capacity to support the cladding and are fixed at larger fastener spacing centres than the fastener spacing of cladding over non-structural battens. Important: the designer should ensure the durability is adequate to suit the application.

With the exception of the Mosaic, Edge Cladding and SimpleLine claddings, the Cemintel FC Batten shall not be used as a structural batten.

It is recommended to align the structural studs and battens/top hats. Refer to Stud Set-Out to minimise the additional structural framing and design required to support the structural battens/top hats position Off-Stud.

Typically a minimum timber batten depth of 35mm will be required to provide adequate embedment depth of the cladding fixing. Lengths of fixings need to consider the protruding fixing depth to ensure the wall wrap is not damage by the screw, and the length of the cutting head to ensure sufficient thread engagement of the screw and top hat.

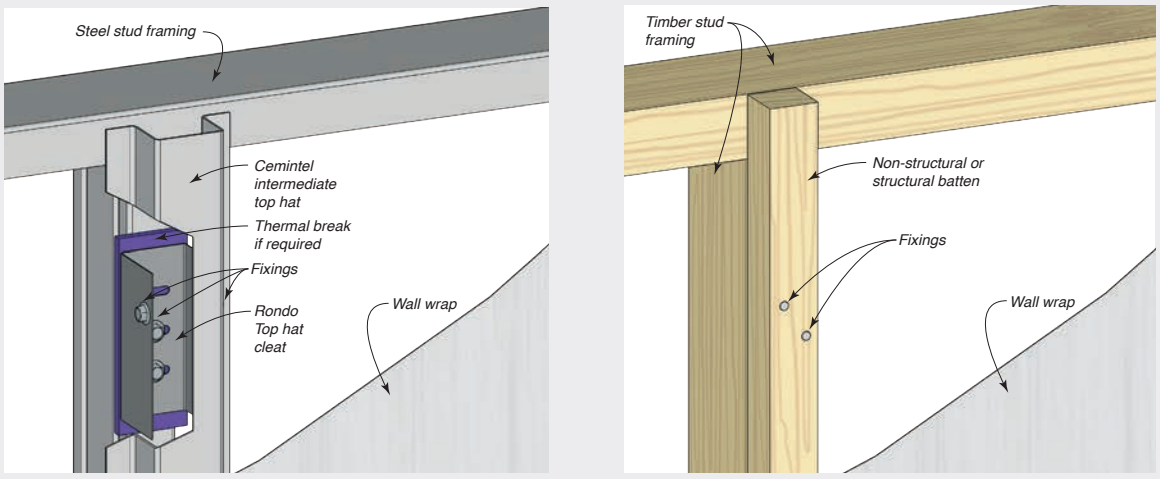
Batten and Top Hat Arrangements

Stud Wall Support Framing – 'On-Stud' Fixing

Structural and non-structural timber battens and top hats may be fixed 'on-stud' to the stud of the structural wall framing designed from MGP10 or higher grade timber framing, or a minimum 0.5mm BMT steel framing depending on wall system, refer to Figure 5.01. The battens and top hats should be arranged to not restrict the structural movement of the wall framing.

The stud frame walls designed to meet the structural requirements of the project, need to be designed to also support the cladding and associated battens and top hats.

FIGURE 5.01 Structural Timber Battens and Steel Top Hats Fixed to Studs of the Structural Framing – 'On-Stud' Fixing



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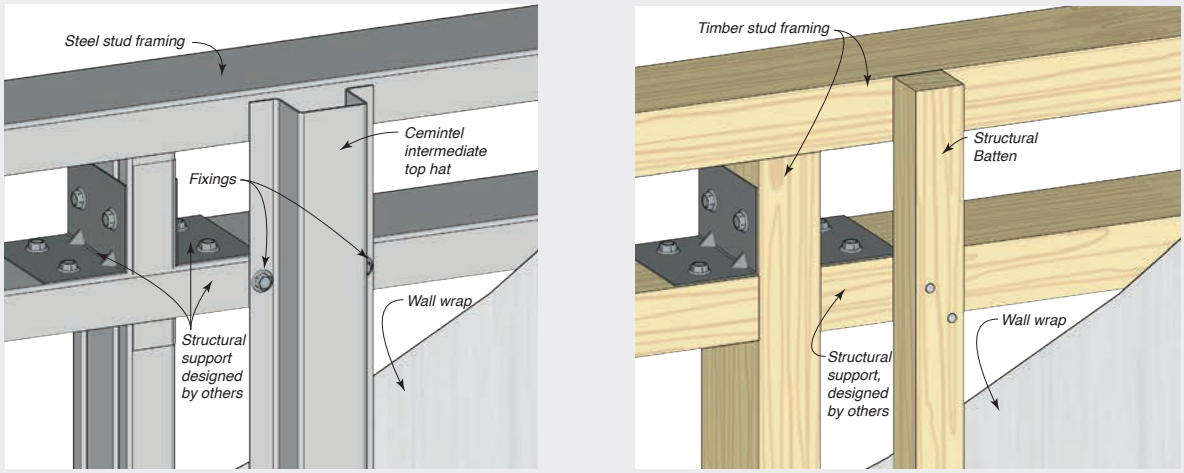
DESIGN TABLES – CAVITY SYSTEM FRAMING

Horizontal Structural Wall Supports – 'Off-Stud' Fixing

Structural timber battens and steel top hats may be fixed 'off-stud' to horizontal structurally designed timber or steel support framing of a minimum 1.15mm BMT, refer to Figure 5.02. It is the responsibility of the project engineer to specify this additional horizontal support structure and connections with an equivalent or better performance than those documented in this guide.

Where the top plates and bottom plates of the structural framing permit movement, such as deflection at an inter-storey junction, the wall framing will require additional horizontal structural supports near the plates for the battens and top hats. Also the battens and top hats will need to be discontinuous with an adequate gap to accommodate the structural movement.

FIGURE 5.02 Structural Timber Battens and Steel Top Hats Fixed to Additional Horizontal Structural Supports – 'Off-Stud' Fixing



Design Tables – Cemintel Sheet Products

FIGURE 5.03 Typical Cemintel FC Batten Installation

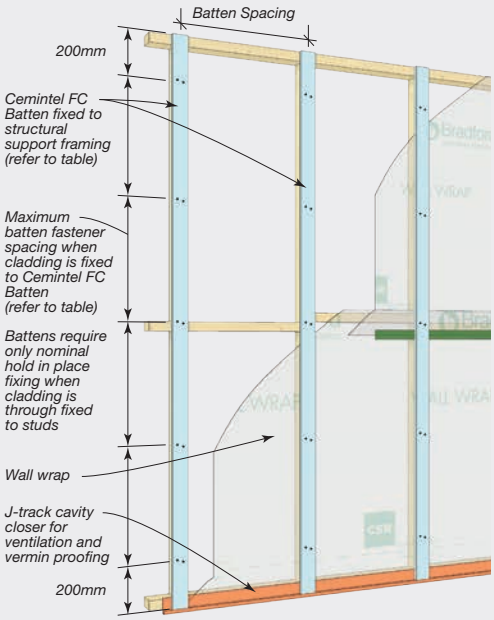


TABLE 5.01 Cemintel Sheet Product Systems – Design Tables for DOUBLE SPAN Cemintel FC Batten Fastener Spacing – RESIDENTIAL (Class 1 and Class 10)

NOTE: This table applies to the fasteners to fix the structural Cemintel FC Batten when used for fixing Mosaic, Edge and SimpleLine claddings to the batten. Provide a double (2) nail or a single screw fixing, U.N.O., at the timber batten connections. The minimum structural grade of the timber framing is MGP10 and the minimum steel framing is 0.50mm BMT. The structural capacity of all support locations to be confirmed by the project engineer.
When cladding is fixed through the battens and into the structural framing, then the battens require nominal fixing to hold in-place during the cladding installation. The maximum span values are applicable in General Zones and Corner Zones. Provide fasteners in accordance with Cemintel product installation guide.

Cemintel FC Batten Spacing (mm)	Wind Classification	Maximum Cemintel FC Batten Fastener Spacing – Double Span (mm)			
		Structural Framing Type			
		Timber*		Steel	
				0.5mm BMT	0.75mm BMT
		Structural Framing Type			
		2 – 2.8mmø x 50mm Nails	1 – 8-10 x 50mm Screw	1 – 10-18 x 30mm FibreTEKS® Screw	1 – 10-18 x 30mm FibreTEKS® Screw
300	N1	800	800	800	800
	N2	800	800	800	800
	N3/C1	600	600	600	600
	N4/C2	500	500	500	500
	N5/C3	350	400	400	400
450	N1	700	700	700	700
	N2	650	650	650	650
	N3/C1	500	500	500	500
	N4/C2	350	400	400	400
	N5/C3	200	350	250	350
600	N1	650	650	650	650
	N2	550	550	550	550
	N3/C1	400	450	450	450
	N4/C2	250	350	300	350
	N5/C3	180	300	200	300

① GENERAL ZONES – Wall areas greater than 1200mm from an External Building Corner for Buildings satisfying the AS 4055 geometry limits.
② CORNER ZONES – Wall areas less than 1200mm from an External Building Corner for Buildings satisfying the AS 4055 geometry limits.
NOTE: Loads based on AS 4055 with Factored external pressure coefficient, kl.Cp,e = -1.3 & ±0.7
* - denotes a 600mm maximum batten span where sheets are to be hand nailed.
U.N.O. – denotes unless noted otherwise.

05 DESIGN TABLES – CAVITY SYSTEM FRAMING

FIGURE 5.04 Typical Timber Batten Installation

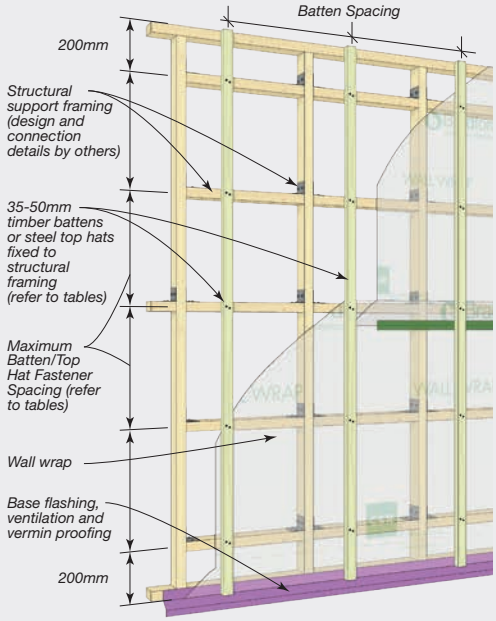


TABLE 5.02 Cemintel SHEET Product Systems – Design Tables for Batten / Top Hat Fastener Spacing – RESIDENTIAL (Class 1 and Class 10)

NOTE: This table applies to structural battens and top hats that support compressed Cemintel products of 9mm maximum thickness and uncompressed Cemintel products of 10mm maximum thickness.

NOTE: This table applies to the fasteners to fix the structural battens (45mm/70mm wide x 35mm thick F5/MGP10 minimum timber battens) and steel top hats (0.75mm BMT) to framing. Provide a double (2) nail or a single screw fixing, U.N.O., at the timber batten connections. The minimum structural grade of the timber framing is MGP10 and the minimum steel framing is 0.50mm BMT. The structural capacity of all support locations to be confirmed by the project engineer. Provide fasteners in accordance with Cemintel product installation guide.

Maximum Batten Spacing (mm)	Wind Classification	Maximum Batten/Top Hat Fastener Spacing (mm)					
		Batten Type and Wind Load Zone					
		Timber Batten* 45mm (w) x 35mm (d)		Timber Batten* 70mm (w) x 35mm (d)		Intermediate Top Hat 35mm (d) x 0.75mm BMT	
		General Zone ①	Corner Zone ②	General Zone ①	Corner Zone ②	General Zone ①	Corner Zone ②
300	N2	1600	1000	1850	1000	2600	1450
	N3/C1	1200	650	1200	650	1700	900
	N4/C2	800	400	800	400	1150	600
	N5/C3	550	250	550	250	750	400
400/450	N2	1250	650	1250	650	1750	950
	N3/C1	800	400	800	400	1150	600
	N4/C2	500	250	500	250	750	400
600	N1	1250	700	1300	700	1850	1000
	N2	900	500	900	500	1350	700
	N3/C1	600	300	600	300	850	450

① GENERAL ZONES – Wall areas greater than 1200mm from an External Building Corner for Buildings satisfying the AS 4055 geometry limits.
② CORNER ZONES – Wall areas less than 1200mm from an External Building Corner for Buildings satisfying the AS 4055 geometry limits.
NOTE: Loads based on AS 4055 with Factored external pressure coefficient, , kl.Cp,e = -1.3 & ±0.7
* - denotes a 600mm maximum batten span where sheets are to be hand nailed.
U.N.O. – denotes unless noted otherwise.

DESIGN TABLES – CAVITY SYSTEM FRAMING

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FIGURE 5.05 Typical Timber Batten Installation

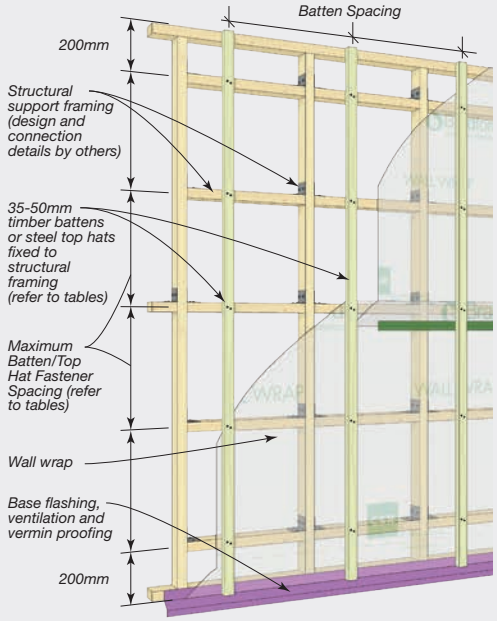

TABLE 5.03 Cemintel SHEET Product Systems – Design Tables for Batten / Top Hat Fastener Spacing – COMMERCIAL (Class 2 to Class 9)

NOTE: This table applies to structural battens and top hats that support compressed Cemintel products of 9mm maximum thickness and uncompressed Cemintel products of 10mm maximum thickness.

NOTE: This table applies to the fasteners to fix the structural battens (45mm/70mm wide x 35mm thick F5/MGP10 minimum timber battens) and steel top hats (0.75mm BMT) to framing. Provide a double (2) nail or a single screw fixing, U.N.O., at the timber batten connections. The minimum structural grade of the timber framing is MGP10 and the minimum steel framing is 0.50mm BMT. The structural capacity of all support locations to be confirmed by the project engineer. Provide fasteners in accordance with Cemintel product installation guide.

Maximum Batten Spacing (mm)	Design Ultimate Limit State Pressure (kPa)	Maximum Batten/Top Hat Fastener Spacing (mm)					
		Batten Type and Support Framing					
		Timber Batten* 45mm (w) x 35mm (d)		Timber Batten* 70mm (w) x 35mm (d)		Intermediate Top Hat 35mm (d) x 0.75mm BMT	
		Timber	Steel	Timber	Steel	Timber	Steel
300	1	1250	1250	1450	1250	2550	2550
	1.5	1100	800	1100	800	1750	1200
	2	800	600	800	600	1550	900
	2.5	650	500	650	500	1350	700
	3	550	400	550	400	1200	600
	3.5	450	350	450	350	1100	500
	4	400	300	400	300	1000	450
	4.5	350	250	350	250	900	400
	5	300	250	300	250	850	350
400/450	1	1100	800	1100	800	2250	2250
	1.5	700	550	700	550	1450	800
	2	550	400	550	400	1200	600
	2.5	400	300	400	300	1050	450
	3	350	250	350	250	900	400
	3.5	300	200	300	200	850	300
600	1	800	600	800	600	2000	1800
	1.5	550	400	550	400	1200	600
	2	400	300	400	300	1000	450

NOTE: Loads based on AS/NZS 1170.2 with Factored external pressure coefficient, $k_l.C_{p,e}$ = -1.3 & ±0.7
* - denotes a 600mm maximum batten span where sheets are to be hand nailed.

05 DESIGN TABLES – CAVITY SYSTEM FRAMING

Design Tables – Cemintel Weatherboard Products

FIGURE 5.06 Typical Timber Batten Installation

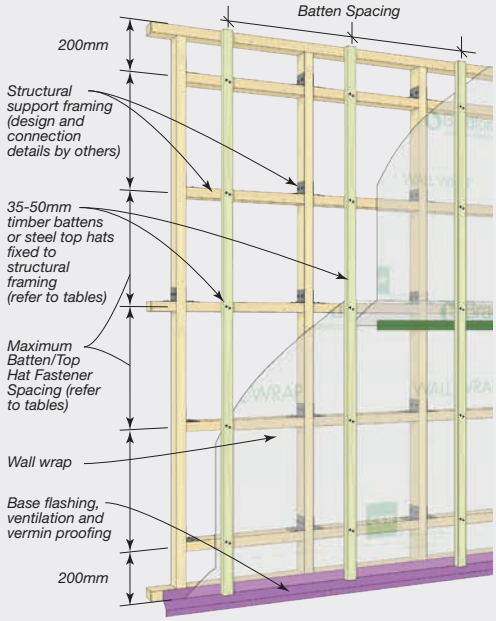

TABLE 5.04 Cemintel SHEET and WEATHERBOARD Product Systems – Design Tables for Batten / Top Hat Fastener Spacing – RESIDENTIAL (Class 1 and Class 10)

NOTE: This table applies to structural battens and top hats that support compressed Cemintel products of 12mm maximum thickness and uncompressed Cemintel products of 16mm maximum thickness.

NOTE: This table applies to the fasteners to fix the structural battens (45mm/70mm wide x 35mm thick F5/MGP10 minimum timber battens) and steel top hats (0.75mm BMT) to framing. Provide a double (2) nail or a single screw fixing, U.N.O., at the timber batten connections. The minimum structural grade of the timber framing is MGP10 and the minimum steel framing is 0.50mm BMT. The structural capacity of all support locations to be confirmed by the project engineer. Provide fasteners in accordance with Cemintel product installation guide.

Maximum Batten Spacing (mm)	Wind Classification	Maximum Batten/Top Hat Fastener Spacing (mm)					
		Batten Type and Wind Load Zone					
		Timber Batten* 45mm (w) x 35mm (d)		Timber Batten* 70mm (w) x 35mm (d)		Intermediate Top Hat 35mm (d) x 0.75mm BMT	
		General Zone ①	Corner Zone ②	General Zone ①	Corner Zone ②	General Zone ①	Corner Zone ②
300	N2	1200	750	1375	750	1950	1075
	N3/C1	900	475	900	475	1275	675
	N4/C2	600	300	600	300	850	450
	N5/C3	400	175	400	175	550	300
400/450	N2	925	475	925	475	1300	700
	N3/C1	600	300	600	300	850	450
	N4/C2	375	175	375	175	550	300
600	N1	925	525	975	525	1375	750
	N2	675	375	675	375	1000	525
	N3/C1	450	225	450	225	625	325

① GENERAL ZONES – Wall areas greater than 1200mm from an External Building Corner for Buildings satisfying the AS 4055 geometry limits.
② CORNER ZONES – Wall areas less than 1200mm from an External Building Corner for Buildings satisfying the AS 4055 geometry limits.
NOTE: Loads based on AS 4055 with Factored external pressure coefficient, kl.Cp,e = -1.3 & ±0.7
* - denotes a 600mm maximum batten span where sheets are to be hand nailed.
U.N.O. – denotes unless noted otherwise.

DESIGN TABLES – CAVITY SYSTEM FRAMING

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FIGURE 5.07 Typical Timber Batten Installation

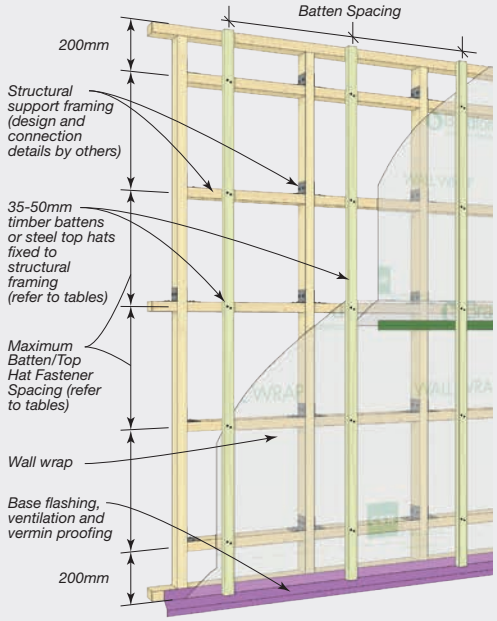


TABLE 5.05 Cemintel SHEET and WEATHERBOARD Product Systems – Design Tables for Batten / Top Hat Fastener Spacing – COMMERCIAL (Class 2 to Class 9)

NOTE: This table applies to structural battens and top hats that support compressed Cemintel products of 12mm maximum thickness and uncompressed Cemintel products of 16mm maximum thickness.

NOTE: This table applies to the fasteners to fix the structural battens (45mm/70mm wide x 35mm thick F5/MGP10 minimum timber battens) and steel top hats (0.75mm BMT) to framing. Provide a double (2) nail or a single screw fixing, U.N.O., at the timber batten connections. The minimum structural grade of the timber framing is MGP10 and the minimum steel framing is 0.50mm BMT. The structural capacity of all support locations to be confirmed by the project engineer. Provide fasteners in accordance with Cemintel product installation guide.

Maximum Batten Spacing (mm)	Design Ultimate Limit State Pressure (kPa)	Maximum Batten/Top Hat Fastener Spacing (mm)					
		Batten Type and Support Framing					
		Timber Batten* 45mm (w) x 35mm (d)		Timber Batten* 70mm (w) x 35mm (d)		Intermediate Top Hat 35mm (d) x 0.75mm BMT	
		Timber	Steel	Timber	Steel	Timber	Steel
300	1	925	925	1075	925	1900	1900
	1.5	825	600	825	600	1300	900
	2	600	450	600	450	1150	675
	2.5	475	375	475	375	1000	525
	3	400	300	400	300	900	450
	3.5	325	250	325	250	825	375
	4	300	225	300	225	750	325
	4.5	250	175	250	175	675	300
	5	225	175	225	175	625	250
400/450	1	825	600	825	600	1675	1675
	1.5	525	400	525	400	1075	600
	2	400	300	400	300	900	450
	2.5	300	225	300	225	775	325
	3	250	175	250	175	675	300
	3.5	225	150	225	150	625	225
600	1	600	450	600	450	1500	1350
	1.5	400	300	400	300	900	450
	2	300	225	300	225	750	325

NOTE: Loads based on AS/NZS 1170.2 with Factored external pressure coefficient, $k_l.C_{p,e}$ = -1.3 & ±0.7
* - denotes a 600mm maximum batten span where sheets are to be hand nailed.

06

BRADFORD ENVIROSEAL CW-IT WALL WRAP SOFT AIR BARRIER

Installation of Soft Air Barriers

Wall wraps intended to be used as air barriers are fixed to timber or steel framing. Enviroseal™ CW-IT has an inbuilt adhesive strip which allows fast, consistent and reliable sealing to adjoining rolls of CW-IT.

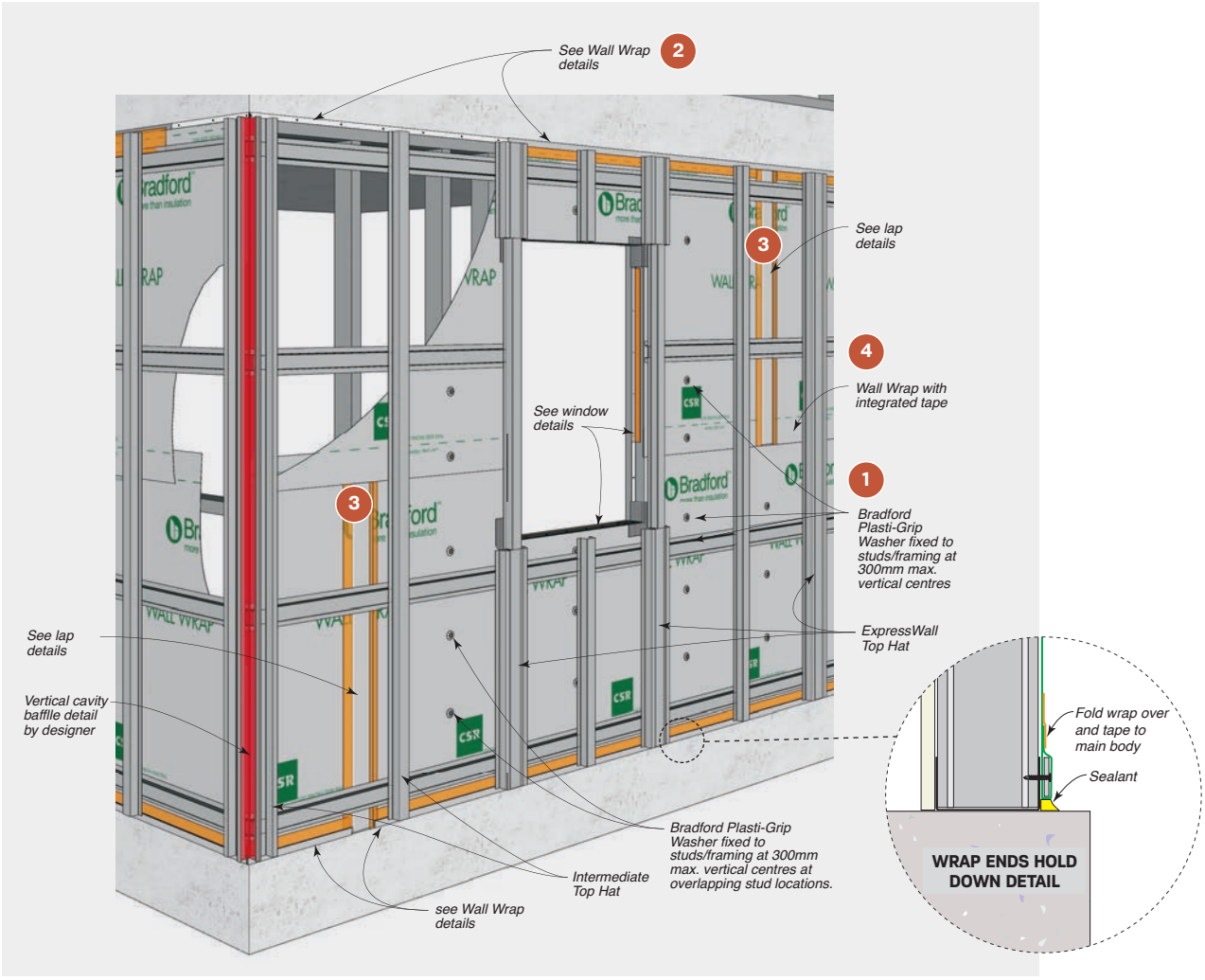
At internal corners, penetrations and perimeters of areas with wall wrap, a metal strip is required to restrain the wall wrap edges. The wall wrap is then folded over and taped to the main body wrap with HighTack Tape. As detailed, sealant or tape is to be applied to maintain an effective air seal.

All flashings should be fixed over the top of the wall wrap and taped.

Procedure for Installation of Soft Air Barriers

1. Install wall wrap to outside face of timber or steel wall framing using Bradford Plasti-Grip Washers. Horizontal laps must be overlapped by 150mm.
2. Install **minimum 20mm x 1.6mm** aluminium strips horizontally at head and base of wall. Pass wall wrap under aluminium strip and fix strip at 100mm max. cts. Then fold wall wrap back over strip and tape with HighTack tape to main body.

FIGURE 6.01 Typical Soft Air Barrier Installation



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BRADFORD ENVIROSEAL CW-IT WALL WRAP SOFT AIR BARRIER

3. Install aluminium strips at vertical joints/ends/ corners (where required). Pass wall wrap under aluminium strip and fix at 100mm max cts. Fold wall wrap back over strip and tape with HighTack tape to main body.

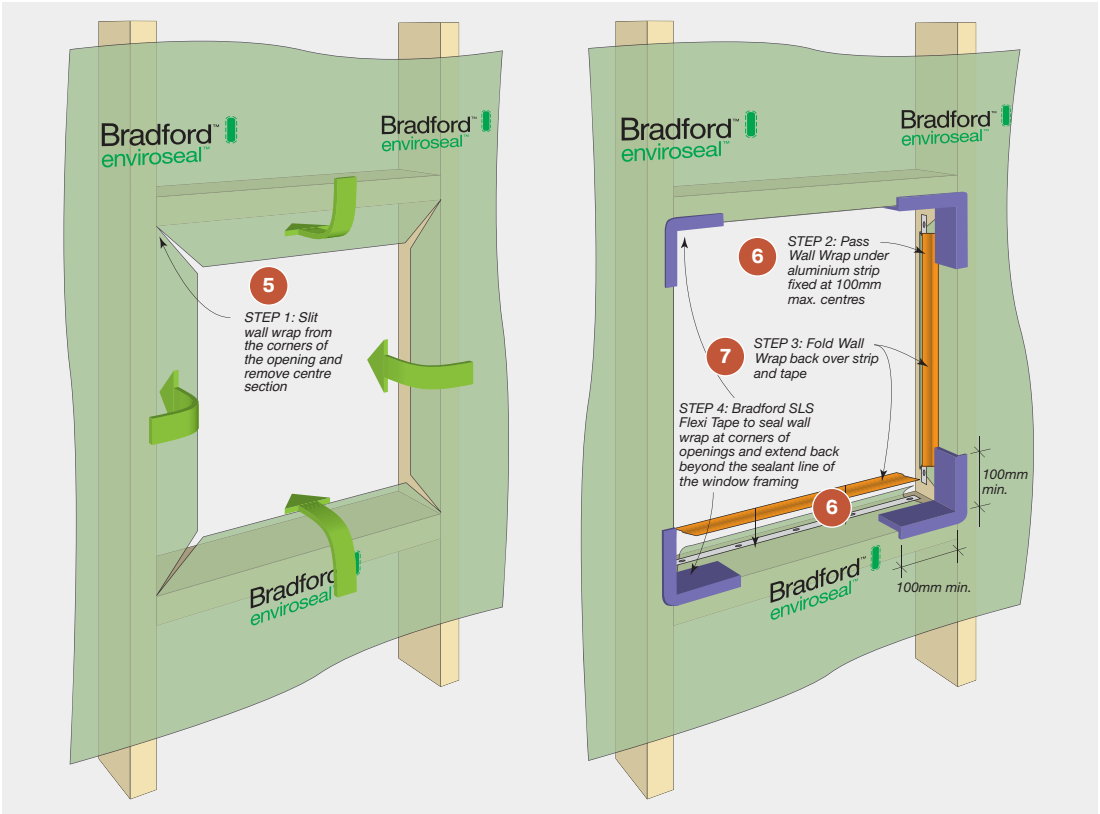
4. Enviroseal™ CW-IT to be overlapped at horizontal joints and taped continuously with in-built adhesive strip. Vertical lap joints to be overlapped across adjoining studs, fixed with Bradford Plasti-Grip Washers, aluminium strips and taped with HighTack tape along overlap joint. (Refer to Table 3.05).

5. At openings, cut the wrap at 45 degrees from each corner to the centre.

6. Pass wall wrap under aluminium strip and fix at 100mm max. cts. Then fold wall wrap back over strip and tape with HighTack tape, cutting away any excess wall wrap.

7. Apply SLS Flexi Tape to the corners of window and door openings. Press tape over the frame edge onto the face of the wall wrap.

FIGURE 6.02 Treatment at Window/Door Openings - Soft Air Barrier



BRADFORD ENVIROSEAL CW-IT WALL WRAP SOFT AIR BARRIER

Note: Drawings are interchangeable for timber or steel substrates with the exception of the fasteners.

Construction Details – Soft Air Barrier – Drawings Index

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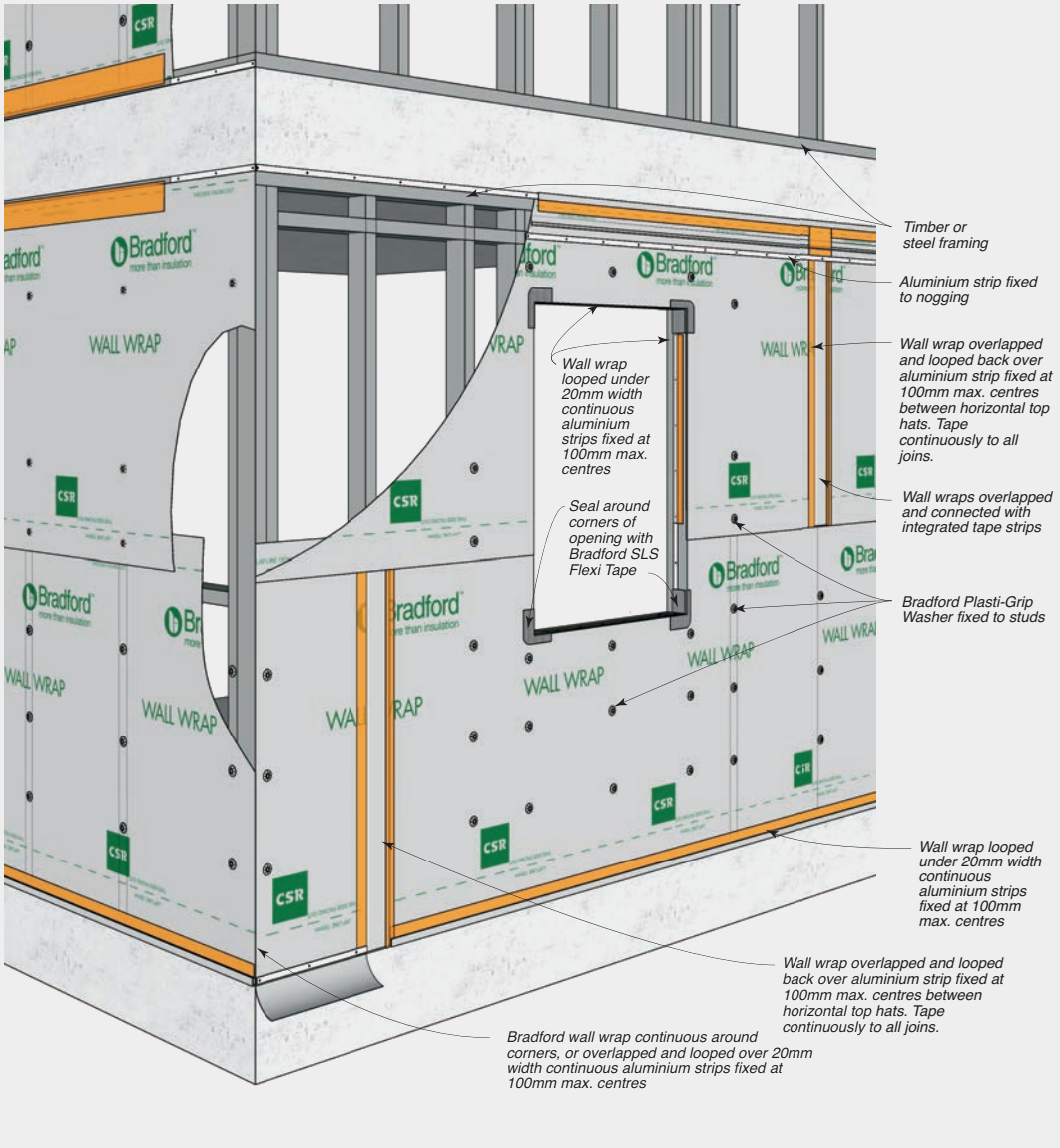
BRADFORD ENVIROSEAL CW-IT WALL WRAP SOFT AIR BARRIER

Note: Drawings are interchangeable for timber or steel substrates with the exception of the fasteners.

Construction Details – Soft Air Barrier

FIGURE 6.03 Typical Installation Overview – Soft Air Barrier



BRADFORD ENVIROSEAL CW-IT WALL WRAP SOFT AIR BARRIER

Note: Drawings are interchangeable for timber or steel substrates with the exception of the fasteners.

Construction Details – Soft Air Barrier

FIGURE 6.04 External Corner – Wall Wrap Continuous

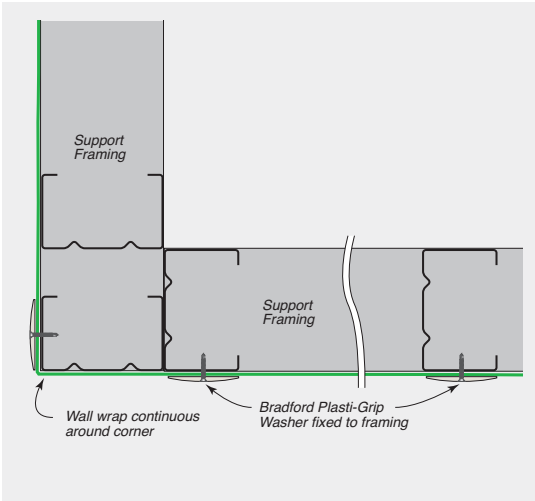


FIGURE 6.05 External Corner – Wall Wrap Overlapped

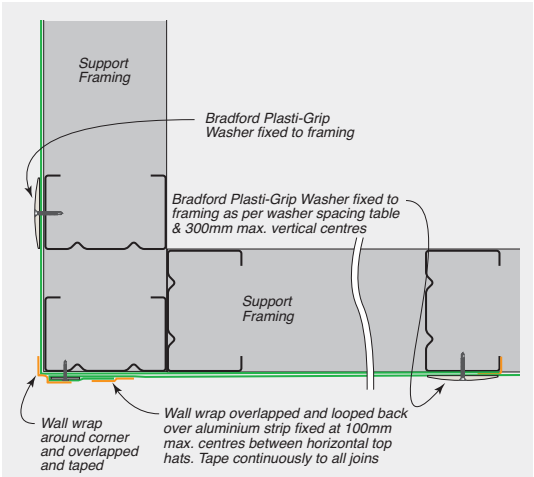


FIGURE 6.06 Internal Corner – Wall Wrap Continuous

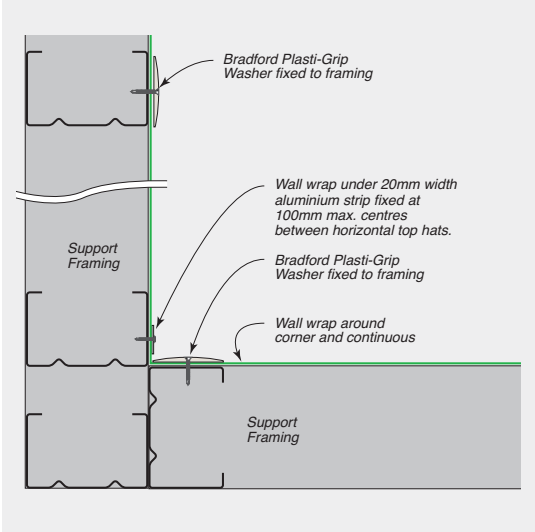


FIGURE 6.07 Internal Corner – Wall Wrap Overlapped

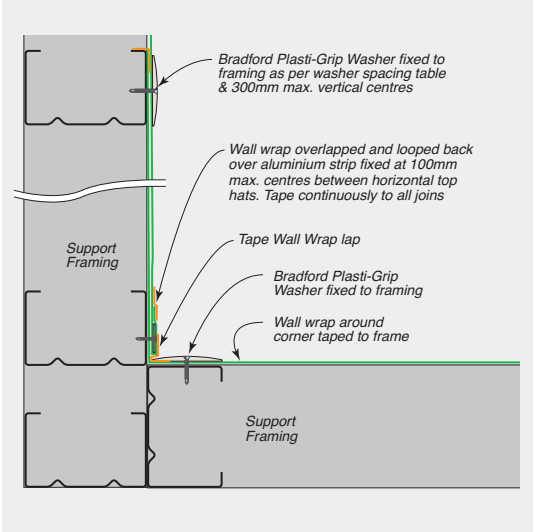
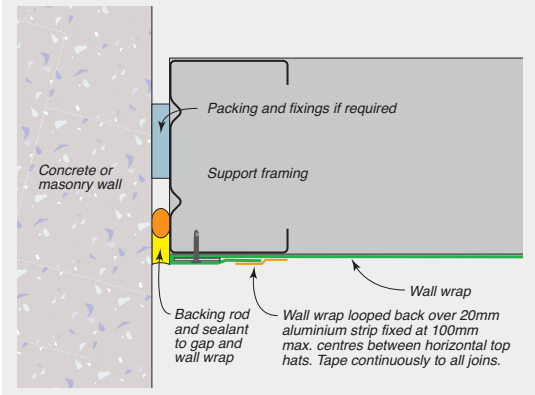


FIGURE 6.08 Abutment to Concrete or Masonry Wall



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BRADFORD ENVIROSEAL CW-IT WALL WRAP SOFT AIR BARRIER

Note: Drawings are interchangeable for timber or steel substrates with the exception of the fasteners.

Construction Details – Soft Air Barrier

FIGURE 6.09 Wall Wrap Installation to Wall, Soffit and Base

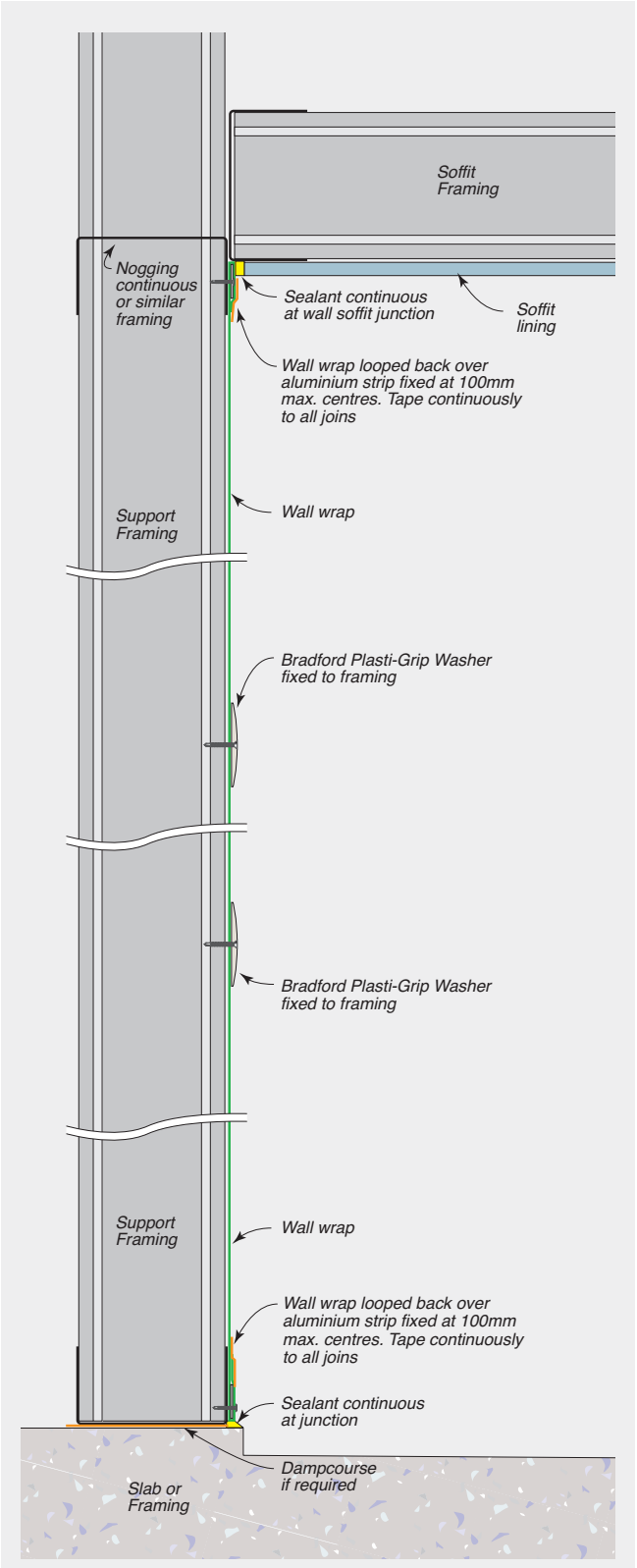
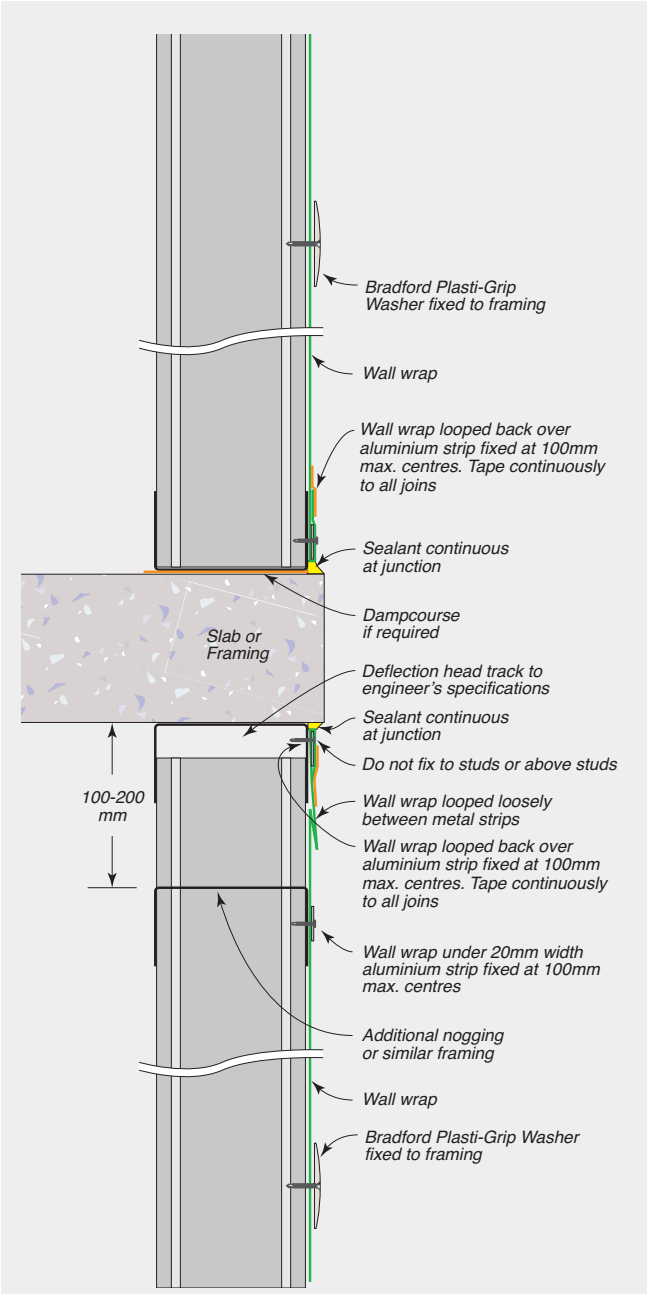


FIGURE 6.10 Wall Wrap Installation at Intermediate Level Junction – Non-loadbearing Steel Framing With Deflection Head



BRADFORD ENVIROSEAL CW-IT WALL WRAP SOFT AIR BARRIER

Note: Drawings are interchangeable for timber or steel substrates with the exception of the fasteners.

Construction Details – Soft Air Barrier

FIGURE 6.11 Vertical Wall Wrap Junction – Overlapped Double Strip Join

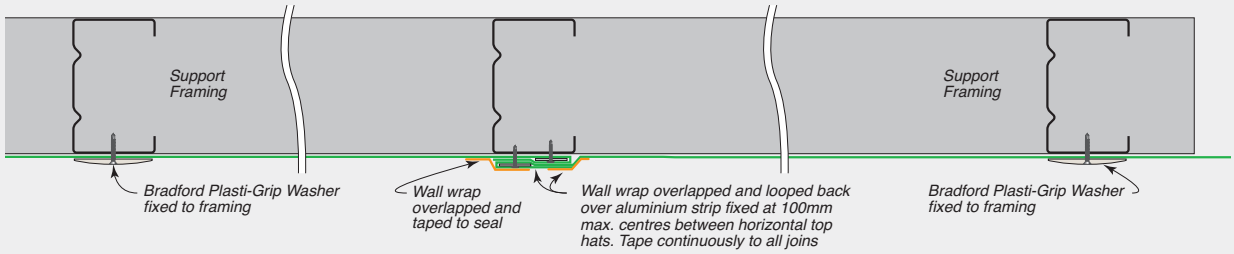


FIGURE 6.12 Vertical Wall Wrap Junction – Overlapped Single Strip Join

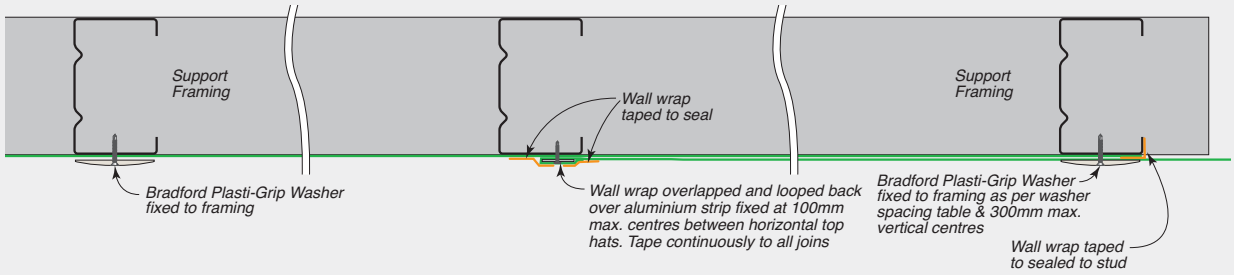


FIGURE 6.13 Vertical Wall Wrap Junction – At Control Joint

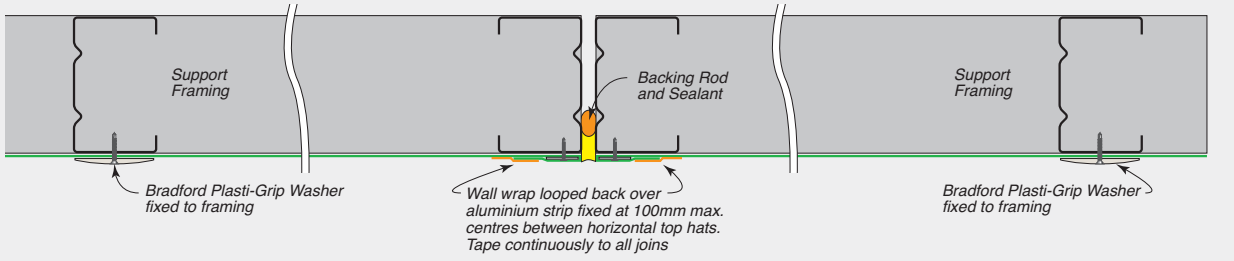
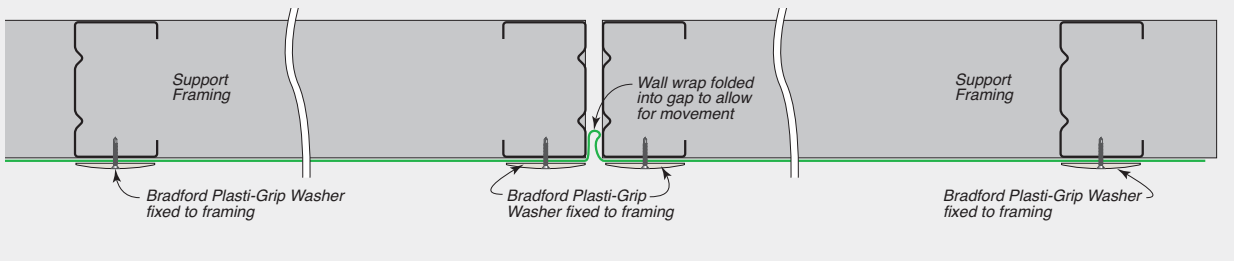


FIGURE 6.14 Vertical Wall Wrap Junction – No Lap Double Washer



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BRADFORD ENVIROSEAL CW-IT WALL WRAP SOFT AIR BARRIER

Note: Drawings are interchangeable for timber or steel substrates with the exception of the fasteners.

Construction Details – Soft Air Barrier

FIGURE 6.15 Wall Wrap Installation at Window/Door Opening

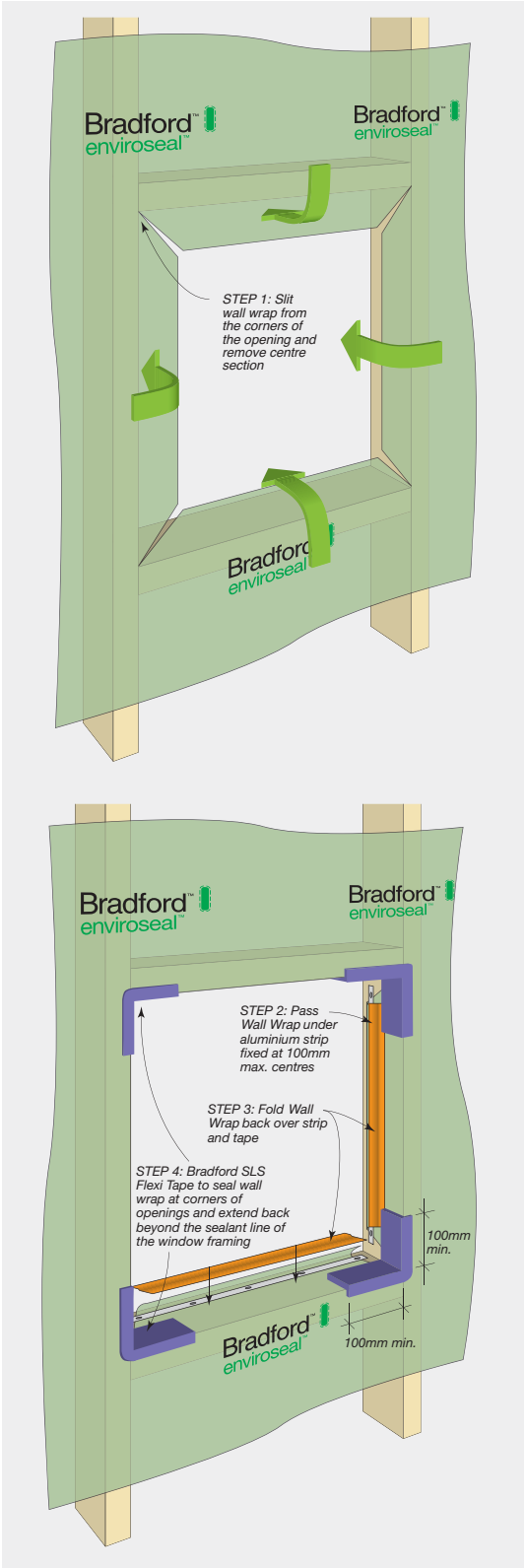
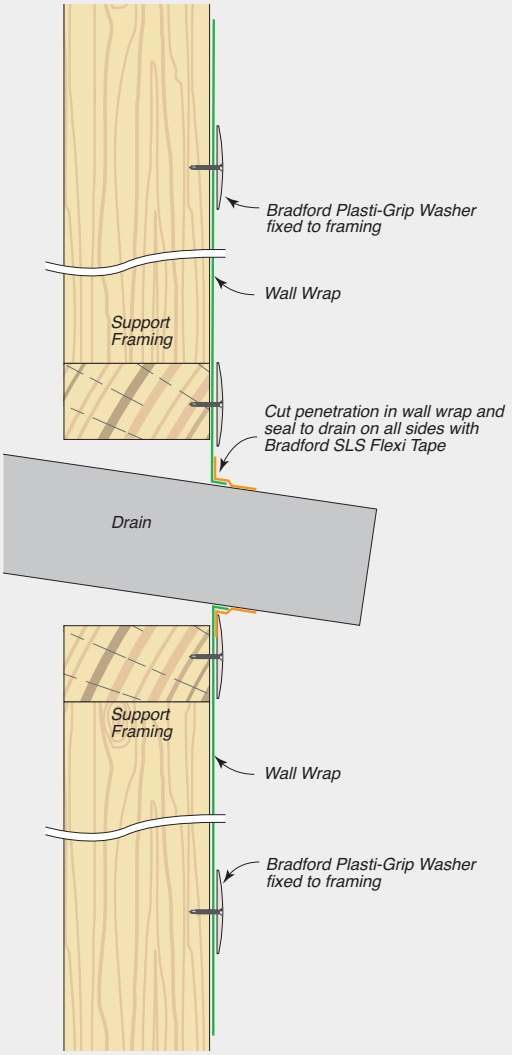


FIGURE 6.16 Wall Wrap Installation at Drain Penetration – Timber or Steel Framing

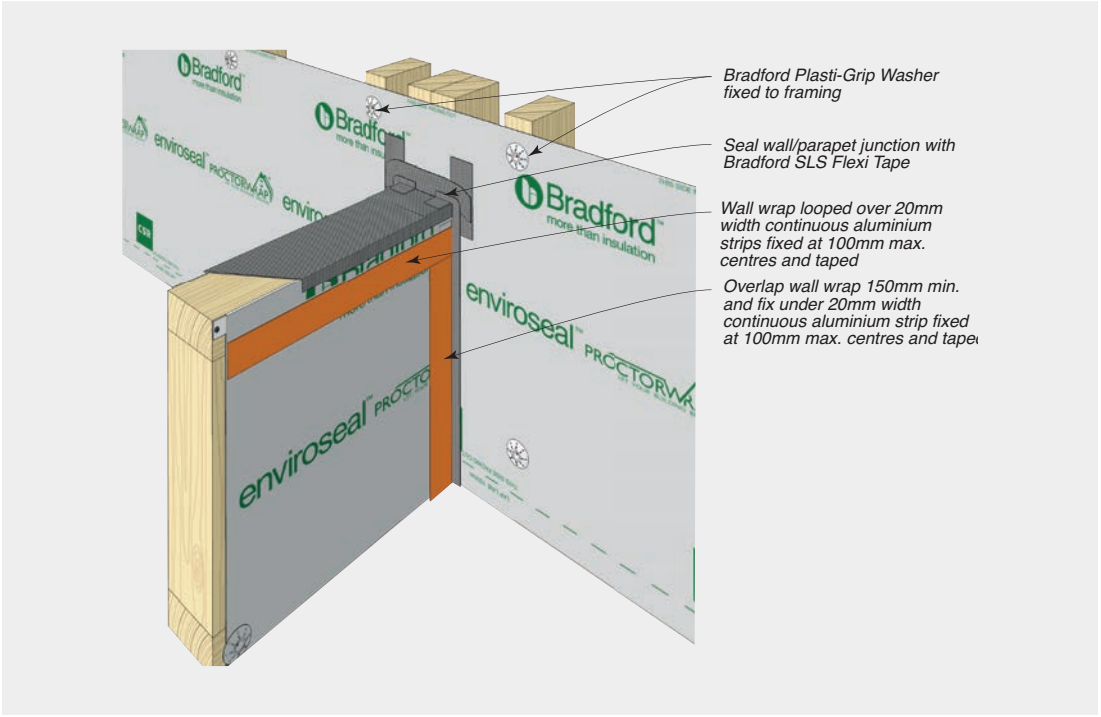


BRADFORD ENVIROSEAL CW-IT WALL WRAP SOFT AIR BARRIER

Note: Drawings are interchangeable for timber or steel substrates with the exception of the fasteners.

Construction Details – Soft Air Barrier

FIGURE 6.17 Wall Wrap Installation at Parapet Junction – Timber or Steel Framing



07

SAFETY, HANDLING, GENERAL CARE + WARRANTY

SAFETY, HANDLING, GENERAL CARE + WARRANTY

07

Health, Safety and Personal Protection Equipment (PPE)

Fibre Cement contain silicas that are harmful if inhaled. Protective clothing and breathing equipment should be worn when cutting products. When cutting, drilling or grinding fibre cement panels using power tools, always ensure the work area is properly ventilated.

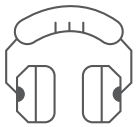
An approved dust mask (AS/NZS 1715 and AS/NZS 1716) and safety glasses (AS/NZS 1337) must be worn. Cemintel recommends that hearing protection also be worn.

Safety Data Sheet information is available at www.cemintel.com.au

Managing Respirable Crystalline Silica Dust

Crystalline Silica is everywhere. It is found naturally in stone, rocks, sand, gravel and clay. Sand is one of the raw materials in Fibre Cement. Respirable Crystalline Silica dust is the fine dust that's created when you use power tools to cut, drill, grind, chip or sand materials and products that contain crystalline silica. This dust is of concern due to its size as it gets caught deep in your lungs and can cause long term damage.

IF YOU USE THE CORRECT SAFETY EQUIPMENT AND PPE, FIBRE CEMENT IS SAFE TO USE.



Cemintel Safety Requirements	
1 - Cut Outdoors*	The ventilation outdoors is greater than that indoors, and therefore should reduce exposure.
2 - Use On-Tool Dust Extraction	Use on-tool dust extraction when using power tools to drill and cut Fibre Cement, with a vacuum that contains a HEPA M Class filter.
3 - Correct Saw and Blade	Use a plunge saw with a specifically designed Fibre Cement blade.
4 - Don't Sweep, Vacuum instead	When completing your work vacuum with a HEPA M Class filter, rather than a broom as sweeping creates more dust.
5 - Use Correct Respirator	Use a half face P1 or P2 respirator. It is essential that the respirators are Fit Tested and workers are cleanly shaven to obtain a good seal.

* Even though not recommended, indoor cutting can be completed when using an onsite cutting room with exhaust ventilation and a M class filter at a minimum, on-tool dust extraction with a vacuum with a HEPA M Class filter, a Full Face P2 respirator and conducting local occupational and static air monitoring to validate effectiveness of control measures.

Safety, Handling, and Maintenance

Storage

All Cemintel panels must be stacked flat, clear of the ground and supported at 300mm-600mm maximum centres on a level platform. Panels must be kept dry, preferably stored inside the building. Panels must be dry prior to fixing, hence if it is necessary to store outside, the product must be protected from the weather.

Handling

Prefinished products and must be treated with care during handling to avoid damage to edges, ends and prefinished surface. Panels should be carried horizontally on edge by at least two people.

Consideration should be given to planning the order of other trades that might stain or damage the panels.

Any splashings of mud, cement, mortar and the like should be removed immediately.

Cutting

Panels should be fully supported and cut from the back using a power saw. Cemintel recommends using the Makita Plunge Cut Saw with guide rail and appropriate blade, together with the appropriate dust extraction system. All exposed cut edges MUST BE SEALED WITH CEMINTEL EDGE SEALER TO PREVENT MOISTURE ABSORPTION.

Mitres

It is not recommended to mitre panel edges as this can cause delamination of the face.

Penetrations

Penetrations in panels may be cut or drilled prior to installation. Cut from the back or drill from the front. Mask, prime and fill gaps with sealant in accordance with recommended methods and products.

Warranty

The product warranty duration is shown in the relevant Cemintel product installation guide. The full product warranty is available for download at **cemintel.com.au**

Our Offices

Sydney
376 Victoria Street
Wetherill Park NSW 2164

Melbourne
277 Whitehall Street
Yarraville VIC 3013

Brisbane
768 Boundary Road
Coopers Plains QLD 4108

Adelaide
Lot 100 Sharp Court
Mawson Lakes SA 5095

Perth
19 Sheffield Road
Welshpool WA 6106

Hobart
11 Farley Street
Derwent Park TAS 7009

Darwin
Cnr Stuart Highway
& Angliss Street
Berrimah NT 0828

cemintel.com.au
1300 236 468

For Design and Technical Support:
DesignLINK – 1800 621 117

11/2023 REV01