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Application Guide

Structural Bracing

Villaboard™ Lining

Versilux™ Lining

HardieFlex™ Sheet

HardiePlank™ Weatherboard

HardieTex™ System

PanelClad™ Sheet

PineRidge™ Lining

Scyon™ Linea™ Weatherboard

EasyLap™ Panel

EXTERIORS

Australia October 2018

Make sure your information is up to date.

When specifying or installing James Hardie™ products, ensure that you have the current technical information and guides. If in doubt, or you need more information, visit www.jameshardie.com.au or Ask James Hardie™ on 13 11 03.

1 INTRODUCTION

1.1 GENERAL

All buildings require bracing against lateral forces due to wind (and in some instances earthquakes). Due to current design trends (open plan spaces, wider window openings etc), the role of bracing is becoming more critical. This is particularly so for houses built on the coastal fringe of Australia north of Latitude 30° (Coffs Harbour in the east, and Green Head in WA) where designs have to cater for cyclonic winds.

This guide describes how to achieve the necessary bracing requirements in timber- and steel-framed houses using various James Hardie™ fibre cement cladding products.

Ensure that this guide is read in conjunction with the relevant technical specification or installation guide for that product.

For ease of use, the core of this guide has been divided into three parts:

- Section 2 explores **AS 1684 'Residential Timber Framed Construction' ('the code')**, and gives fixing details and bracing capacities for James Hardie™ fibre cement cladding products in accordance with the design requirements of this standard;
- Section 3 gives fixing details and bracing capacities for James Hardie™ fibre cement cladding products fixed with **anchor rods** (normally used in high wind and cyclonic areas) to **timber frames**;
- Section 4 provides fixing details and bracing capacities for James Hardie™ fibre cement cladding products fixed to **steel frames**.

Unlike superseded James Hardie™ literature on this subject, this guide does not contain design aids for calculating wind forces and bracing units.

AS 1684 provides adequate information on fixing of bracing panels to the structural frame.

This guide must be used as a guide only to, but not as a substitute for, AS 1684 because it may be subject to regular amendments and individual designs in this guide may vary from these.

All design capacities quoted are Ultimate Limit State (ULS) figures and have been certified by consulting engineers, Cardno (NSW) Pty Ltd. Permissible stress capacity may be obtained by dividing the ULS value by 1.5.

The specifier or other party responsible for the project must ensure the details in this specification are appropriate for the intended application and that additional detailing is performed for specific design or any areas that fall outside the scope and specifications of this guide.

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1.2 BRACING WITH FIBRE CEMENT CLADDING PRODUCTS

Fibre cement (FC) cladding on double-sided or single-sided wall systems can provide resistance against lateral forces or racking shear.

When fixed in accordance with this guide, and properly coated in external applications, thicker cladding products can provide bracing capacity to buildings as well as serving as a wall cladding.

The design tables in this guide provide bracing values for James Hardie™ cladding products of 6mm or greater thickness. These are:

1. 6mm HardieFlex™ sheet;
2. 6mm Villaboard™ and Versilux® linings;
3. 6mm PanelClad™ sheet and PineRidge™ lining;
4. 7.5mm HardieTex™ system;
5. 8.5mm EasyLap™ panel
6. All thicknesses and widths of HardiePlank™ weatherboard and Scyon™ Linea™ weatherboards, provided that fasteners pass through both planks (see note below).

Important Note

For simplicity, items 1 to 5 will be referred to in the design tables as 6mm JHFC sheets and item 6 as JHFC planks and weatherboards.

1.3 CAUTION DURING RENOVATIONS / ALTERATIONS

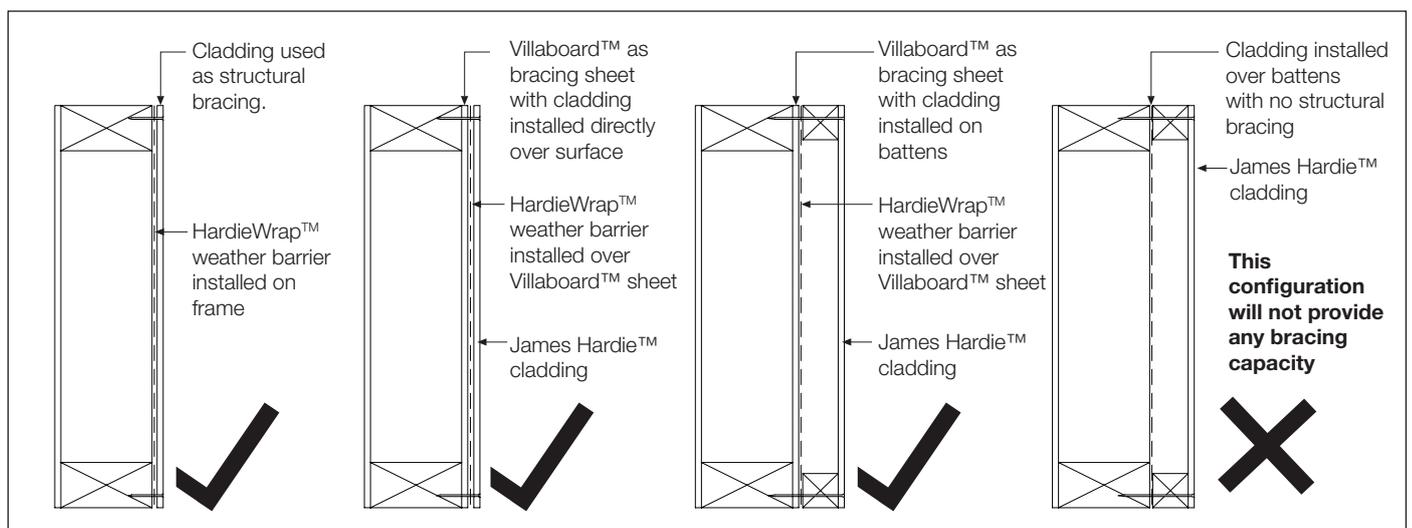
If an existing building is being altered or renovated, the structural design for the bracing resistance must be checked by an engineer.

In minor renovations/alterations, the builder must ensure that the designated bracing panels and/or elements are either not removed or else replaced with elements of equal or greater capacity.

1.4 BRACING CAPACITY FOR FRAMING WITH THERMAL STRIPS OR CAVITY BATTENS

Until such time that this guide is revised to provide specific design information on this matter, it must be assumed that no bracing capacity can be claimed whenever the JHFC cladding is fixed over a thermal break strip in steel framing or a cavity batten in any form of wall construction.

Therefore, in order to achieve the tabulated bracing capacities, the JHFC sheets must be installed under the cavity battens and directly to the face of the framing, on either side.



BRACING EXAMPLES

2 BRACING FOR TIMBER FRAMING IN ACCORDANCE WITH AS 1684

2.1 TIMBER FRAMING CODE

AS 1684 'Residential Timber Framed Construction' ('the code'), is an extensive revision of the earlier code of practice. It was first issued in 1999 in four parts :

Part 1: Design criteria

Part 2: Non-cyclonic areas

Part 3: Cyclonic areas

Part 4: Simplified non-cyclonic areas

Note: Part 1 has been superseded by AS 1720.3:2016 'Design criteria for timber-framed residential buildings'. Parts 2, 3 and 4 were revised in 2010.

The main change in 1999 was the move to Limit State design. With regard to structural bracing, the former Type A and Type B bracing units have been placed into AS 1684.4, the simplified design procedure, which is covered in Clause 2.3 of this guide. In the simplified method, the number of bracing units is determined directly from tables relating to the shape of the building and bracing units are then assigned according to the rules of the code.

Structural bracing using the conventional Limit State design method is covered in Section 8 "Racking and Shear Forces" of both Part 2 and Part 3 of the code. This is covered in Clause 2.4 of this guide. In this method, the total racking force is determined from tabulated data and bracing walls are designed on the basis of their actual kN/m bracing capacity.

Note that throughout the code the wind classifications of AS 4055 'Wind Loads for Housing' have been used:

- In Part 2, the pressures have been tabulated for non-cyclonic wind classifications N1 to N4 (with N5 and N6 ignored);
- In Part 3, the pressures have been tabulated for cyclonic wind classifications C1 to C3 (with C4 ignored).

2.2 TYPES OF BRACING

The code describes two types of bracing against lateral load:

2.2.1 Nominal bracing

Nominal bracing is defined as (a) any wall framing lined with fibre cement sheets (or other materials) not fixed in accordance with this guide, and/or (b) with the frames nominally fixed to the floor and the roof or ceiling frame (ie not tied down in accordance with this guide). The capacity depends on whether the simplified design method (Section 2.3 of this guide) or the conventional design method (Section 2.4 of this guide) is used. For framing, fixing and installation of nominal bracing, refer to Clause 8.1.

2.2.2 Structural bracing

Also known as "designated" bracing, structural bracing is purpose-fitted bracing such as the James Hardie™ systems detailed in this guide. Fixing must be as per the instructions given in this guide.

2.3 SIMPLIFIED DESIGN METHOD

2.3.1 Limitations, procedure and other rules

The simplified method given in AS 1684.4 applies only to Class 1 and Class 10 Buildings as defined by the Building Code of Australia (BCA). Clause 1.4 of AS 1684.4 elaborates these limitations as follows:

- single- and two-storey dwellings only;
- a maximum wind classification of N2 (ie non-cyclonic);
- a maximum width of building of 12m excluding eaves;
- a maximum wall height of 2700mm;
- a maximum rafter overhang of 750mm;
- a maximum roof pitch of 30°;
- a maximum rafter spacing of 900mm for tile roofs and 1200mm for sheet roofs;
- spacing of bracing elements not to exceed 9m;
- there are certain maximum building masses for floor framing, wall framing and roof framing.

This would cover the vast majority of homes in urban areas south of 30° latitude.

The design procedure shall be as follows:

- Determine wind classification using Clause 1.4.2 of AS 1684.4;
- Determine the appropriate house elevation option for single or upper storey or the lower storey of a two-storey building for both wind directions (use the code Figure 8.3);
- Determine the number of bracing units required for each wind direction (use the code Table 8.2);
- Allocate the required number of structural bracing units in conjunction with the amount of nominal bracing if necessary; refer to code clause 8.3.2.3
- Distribute the bracing units evenly (see the code Figures 8.4 and clause 8.3.2.3).

Other rules and allowances that need to be considered include the following (refer to the code Clause 8.3.2.3 for full details):

- Bracing may be a combination of Type A and/or Type B structural bracing units and/or nominal bracing;
- Nominal bracing shall not constitute more than 50% of the required bracing for each wind direction or in each storey;
- Where structural bracing occurs in the same section of wall as nominal bracing, the nominal bracing in that section of wall shall not be considered as contributing to the house bracing requirements;
- Generally a minimum of two structural bracing units (Type A or Type B) shall be provided in each overall length of external wall in each storey, located as closely as possible to the external corners (see the code for rules of exceptions);
- One Type B unit equals two Type A units;
- Bracing units need to be installed at right angles to the wall area of elevation (ie parallel to wind direction) for which the bracing was defined.

Clause 1.5(f) of AS 1684.4 states that the design capacities are 3kN per 900mm for Type A bracing units and 6kN per 900mm for Type B. These are Ultimate Limit State (ULS) figures.

2.3.2 Nominal bracing

Cladding not fixed in accordance with this guide, or wall frames not connected to the structure in accordance with this guide, is nominal bracing. Respectively a 7m length of single-sided nominal bracing or a 4m length of double-sided nominal bracing constitutes one Type A bracing unit.

2.3.3 Structural bracing

Apart from using 6mm Villaboard™ lining as structural bracing as per Clauses 2.3.6 and 2.3.7 below, Type A and B units can also be achieved with minimum 6mm thick JHFC sheets as detailed in Clause 2.3.8 of this guide. In this simplified method, bracing units must not be less than 900mm wide.

2.3.4 Bracing panels wider than 900mm

Bracing units are generally based on a standard width of 900mm. For wider walls than this, the bracing capacity is increased in direct proportion to the installed width divided by 900. For example, a 1200mm wide section is equivalent to 1200/900 or 1.33 times the bracing resistance of the 900mm unit.

2.3.5 Tie-down requirements

In order to provide structural bracing resistance, the bracing panels must be adequately tied-down to the floor system. For tie-down requirements, refer to AS 1684.4 Clause 8.3.2.7 (bottom) and Clause 8.3.2.8 (top).

2.3.6 Type A bracing units

To achieve Type A bracing capacity (3kN/900mm), fix the Villaboard™ lining or any other 6mm JHFC sheet bracing in accordance with Figure 1, Section 8 and Clause 2.3.5 of this guide.

2.3.7 Type B bracing units

To achieve Type B bracing capacity (6kN/900mm), fix the Villaboard™ lining or any other 6mm JHFC sheet bracing in accordance with Figure 2, Section 8 and Clause 2.3.5 of this guide.

The bracing rules and methods of determining the required number of bracing units remains the same as previously described.

2.4 CONVENTIONAL LIMIT STATE DESIGN

2.4.1 Design procedure

For a building outside the scope of the simplified method, use the procedure given in both AS 1684.2 and AS 1684.3. In both parts of the code, Clause 8.3.1 states that bracing shall be designed and provided for each storey of the house (and subfloor where required) in accordance with the following procedure:

- Determine the wind classification (see the code Clause 1.4.2 and AS 1170.2 or AS 4055);
- Determine the wind pressure (see the code Clause 8.3.2);
- Determine the area of elevation (see the code Clause 8.3.3 and Figure 8.2);
- Calculate racking force (see the code Clause 8.3.4);
- Design bracing systems (for walls, see the code Clause 8.3.6 and subfloors see the code Clause 8.3.5);
- Check even distribution and spacing (see the code Clauses 8.3.6.6 and 8.3.6.7 and the code Tables 8.20, 8.21 and 8.22);
- Check connection of bracing to roof/ceilings and floors (see the code Clauses 8.3.6.9 and 8.3.6.10).

Instead of proportioning bracing units required versus those provided, the actual racking shear capacities of the bracing panels are added up and made to exceed the total racking force calculated. All pressures and forces are Ultimate Limit State (ULS) figures.

2.4.2 Nominal bracing

The two categories, structural wall bracing and nominal wall bracing, exist in this method too and the same rules apply in that nominal bracing (as defined at Clause 2.2 of this guide) may provide no more than 50% of the total required bracing capacity.

The ULS capacity of nominal bracing walls is given by the code as 0.45kN/m for single-sided walls and 0.75kN/m for double-sided walls. The minimum length for which nominal bracing capacity may be claimed is 450mm.

For permissible stress capacity divide by 1.5

TABLE 1 ULS DESIGN BRACING CAPACITY OF JAMES HARDIE™ FIBRE CEMENT CLADDING ON TIMBER FRAMES (KN/M)

6mm JHFC sheets, single-sided, fixed vertically as per standard nail pattern (see Figure 1)	3.3
6mm JHFC sheets, single-sided, fixed vertically as per standard nail pattern (see Figure 2)	6.6
6mm JHFC sheets, single-sided, fixed vertically, (see Figure 3, 4 or 5b), or horizontally with set joints (see Figure 5a)	2.8
6mm JHFC sheets double-sided, fixed vertically (see Figure 3, 4 or 5b)	4.0
6mm JHFC sheets double-sided, fixed horizontally with set joints (see Figure 5a)	4.0
6mm JHFC sheets, fixed vertically (see Figure 3, 4 or 5b) or horizontally with joints set (see Figure 5a) + (JHFC planks or weatherboards on other side (see Figures 6 and 7)	3.2
JHFC planks or weatherboards on one side only (see Figures 6 and 7)	2.0
Scyon™ Linea weatherboards on one side of frame only using face fixing method (see Figure 8)	3.4
Scyon™ Linea weatherboards on one side of frame using face fixing method (see Figure 8) + 6mm JHFC sheets, fixed vertically (see Figure 3, 4 or 5b), or horizontally with joints set (see Figure 5a)	4.1

Notes

- If the bracing panel occurs in isolation within a length of wall and is not connected to any cross-wall, then the capacity given in Table 1 must be reduced by 30%.
- For definition of 6mm JHFC sheets see the note at Clause 1.2 of this guide. Thicker sheets are assumed to provide at least the tabulated value.
- If JD5 grade timber is used in the framing, then the capacity given in Table 1 must be reduced by 12.5%.
- Butt joints are permitted in vertical sheets provided that both sheet edges are fixed to a nogging with fasteners at the same spacing as nominated for the top and bottom edges.
- For horizontally fixed sheets, if edges at a butt joint are not fixed to a nogging behind the joint, then the joint needs to be properly tape-set in order to claim the tabulated design bracing capacity.

2.4.3 Structural bracing

Table 1 provides the ULS design capacities for the James Hardie™ fibre cement products that may be used as designated structural bracing in this procedure.

Where greater bracing capacities are required, anchor rods may be used and the values in Table 4 (in Section 3 of this guide) claimed.

2.4.4 Wall height and capacity modification

The capacity of bracing walls is given for a standard wall height of 2700mm and decreases as the height increases. Refer to Clause 8.3.6.4 of both Parts 2 and 3 of the code, interpreted as in Table 2.

Intermediate values may be interpolated.

TABLE 2 REDUCTION FACTORS FOR HEIGHT	
PANEL HEIGHT (mm)	BRACING REDUCTION FACTOR
2700	1.0
3000	0.9
3300	0.8
3600	0.75
3900	0.7
4200	0.64

2.4.5 Panels less than 900mm wide

Generally the minimum length of a designated bracing panel is 900mm, although exceptions are permitted with reference to Clause 8.3.6.5 of both Parts 2 and 3 of the code. This is interpreted in Table 3.

Ensure that an intermediate stud is used for bracing panels over 600mm in width.

TABLE 3 REDUCTION FACTORS FOR LENGTH	
LENGTH OF NARROW BRACING PANEL (mm)	BRACING REDUCTION FACTOR
900	1.0
800	0.83
750	0.75
700	0.66
600	0.50

2.4.6 Location, distribution and spacing of bracing walls

Refer to Clause 8.3.6.6 of both Parts 2 and 3 of the code for required location and distribution and Clause 8.3.6.7 for spacing rules.

2.4.7 Tie-down requirements

In order to achieve structural bracing resistance (as defined at Clause 2.1.2 of this guide) the bracing panel needs to be tied into the structure. For tie-down requirements, refer to Clause 8.3.6.9 (top of wall) and Clause 8.3.6.10 (bottom of wall) in both Parts 2 and 3 of the code.

2.4.8 James Hardie™ cladding products

The 6mm JHFC sheet products (as defined at Clause 1.2 of this guide) as well as the plank and weatherboard range provides structural bracing capacity as given in Table 1. Fixing details for the different products are given below.

(a) HardieFlex™ sheet, PineRidge™ lining and PanelClad™ sheet

- Non-cyclonic areas: sheets fixed vertically in accordance with Figure 3, Section 8 and Clause 2.4.7 of this guide will achieve the bracing capacities stated in Table 1.
- Cyclonic areas: sheets fixed vertically along with anchor rods in accordance with Figure 3, Section 8 and Clause 3.3 of this guide will achieve the values stated in Table 4.

(b) HardieTex™ system

- Non-cyclonic areas: sheets fixed vertically in accordance with Figure 4, Section 8 and Clause 2.4.7 of this guide will achieve the bracing capacities stated in Table 1.
- Cyclonic areas: sheets fixed vertically along with anchor rods in accordance with Figure 4, Section 8 and Clause 3.3 of this guide will achieve the values stated in Table 4.

(c) Villaboard™ and Versilux™ linings

- Non-cyclonic areas: sheets fixed vertically or horizontally in accordance with Figure 5, Section 8 and Clause 2.4.7 of this guide will achieve the bracing capacities stated in Table 1.
- Cyclonic areas: sheets fixed vertically or horizontally along with anchor rods in accordance with Figure 5, Section 8 and Clause 3.3 of this guide will achieve the values stated in Table 4.

(d) Planks and weatherboards external cladding

- Non-cyclonic areas: The bracing capacity stated in Table 1 applies to all JHFC planks and weatherboards, when fixed in accordance with Figure 6, Section 8 and Clause 2.4.7 of this guide.
- Cyclonic areas: The bracing capacity stated in Table 4 applies to all JHFC planks and weatherboards, when fixed along with anchor rods in accordance with Figure 6, Section 8 and Clause 3.3 of this guide.
- In both the above cases, JHFC planks and weatherboards must be fixed at 150mm maximum centres along top and bottom plates as shown in Figure 7. For Linea™ weatherboard however, this figure must be 75mm.
- For Linea™ weatherboard fixing, see Figure 8.

2.4.9 Cavity construction

If the wall cladding is fixed over cavity battens placed onto the timber studs, then no bracing capacity can be claimed. Therefore, in order to achieve the tabulated bracing capacities, the JHFC sheets must be installed under the cavity battens and directly to the face of the framing, on either side. Refer to Section 1.4 for further details.

3 BRACING FOR TIMBER FRAMING WITH ANCHOR RODS

3.1 INTRODUCTION

This section details James Hardie™ fibre cement sheet cladding used for bracing with timber framing and anchor rods, specifically for winds in cyclonic areas. These rods provide resistance against uplift forces and add to the racking capacity of the wall panels.

Bracing capacities quoted in this section were proved by testing in consultation with the James Cook Cyclone Structural Testing Station.

3.2 BRACING RESISTANCE CAPACITIES

Table 4 provides the ULS design bracing capacities of 6mm JHFC sheets, JHFC planks and weatherboards used with anchor rods when fixed in accordance with the relevant parts of this guide.

For permissible stress capacity divide by 1.5

TABLE 4 ULS DESIGN BRACING CAPACITY OF JAMES HARDIE™ FIBRE CEMENT CLADDING ON TIMBER FRAMES (kN/m)	
6mm JHFC sheet fixed with standard nail pattern (see Figure 1)	6.6
6mm JHFC sheet fixed with standard nail pattern (see Figure 1) + 6mm JHFC sheets other side, fixed vertically (see Figure 3, 4 or 5b), or horizontally with set joints (see Figure 5a)	10.0
6mm JHFC sheets, single-sided, fixed vertically (see Figure 3, 4 or 5b) or horizontally with set joints (see Figure 5a)	5.3
6mm JHFC sheets, double-sided, fixed vertically (see Figure 3, 4 or 5b) or horizontally with set joints (see Figure 5a)	7.3
JHFC planks or weatherboards (see Figure 6 and 7) + 6mm JHFC sheets other side, fixed vertically (see Figure 3, 4 or 5b) or horizontally with set joints (see Figure 5a)	6.6
JHFC planks or weatherboards, single-sided (see Figure 6 and Figure 7)	2.4
Scyon™ Linea weatherboards on one side of frame only using face fixing method (see Figure 8)	5.6
Scyon™ Linea weatherboards on one side of frame using 6.8 face fixing method (see Figure 8) + 6mm JHFC sheets, fixed vertically (see Figure 3, 4 or 5b), or horizontally with joints set (see Figure 5a)	6.8

Notes

- For definition of 6mm JHFC sheets see Clause 1.2 of this guide. Thicker sheets are assumed to provide at least the tabulated value.
- The tabulated bracing strengths relate to 600mm maximum stud centres.
- The capacities apply to bracing sheets up to 2700mm high and not less than 900mm wide. If different, refer respectively to Clauses 2.4.4 and 2.4.5 of this guide.
- For horizontally fixed sheets, if edges at a butt joint are not fixed to a nogging, then the joint needs to be properly tape-set in order to claim the tabulated design bracing capacity.

3.3 ANCHOR ROD DETAIL AND TIE-DOWN

Anchor rods must be 12mm diameter, full-length mild steel (M12) rods tying the wall top plate through the frame cavity to the sub-structure.

A standard 38mm diameter flat round washer must be used under each nut.

Anchor rods must be placed at both ends of each section of the bracing wall and at not more than 2.4m centres.

Anchor rods must be located within 100mm of the adjacent face of the stud ends. See Figure 9.

Between anchor rods, one M10 hold-down bolt must be provided at a maximum of 1.2m centres to further fix the bottom plate to the sub-structure.

Fixing of the timber frames into the structure (ie "tie-down") must comply with government building regulations and/or AS 1684.3-1999. Refer to the code Clauses 8.3.6.9 (top) and 8.3.6.10 (bottom).

3.4 CAVITY CONSTRUCTION

If the wall cladding is fixed over cavity battens placed onto the timber studs, then no bracing capacity can be claimed. Therefore, in order to achieve the tabulated bracing capacities, the JHFC sheets must be installed under the cavity battens and directly to the face of the framing, on either side. Refer to Section 1.4 for further details.

4 BRACING FOR STEEL FRAMING

4.1 INTRODUCTION

Extensive testing conducted at the James Hardie R&D laboratory and at the James Cook Cyclone Structural Testing Station has formed the basis of the information and the design capacities quoted in this section.

4.2 BRACING RESISTANCE CAPACITY

Table 5 shows the bracing capacity of James Hardie™ cladding products when fixed to 0.55mm and 0.75mm light gauge steel frames or 1.2mm and 1.6mm medium gauge, welded steel frames.

Note

Only the values tested are shown in Table 5. Other values may, in certain instances, be interpolated with experience and due diligence.

The bracing capacities are achieved by using the fixing methods outlined in Clause 4.4 and Section 8 of this guide.

Design capacities were determined in accordance with AS 3623-1993 for 2700mm high panels unless noted otherwise.

The minimum length of a bracing wall or panel must be 900mm.
The maximum wall length to which the capacities apply is 3600mm.

4.3 FRAMING CONNECTIONS

0.55mm to 0.95mm light gauge steel frames:

The studs need to be fixed to the top and bottom tracks by screws, rivets, bolts or mechanical crimping.

1.0mm to 1.6mm medium gauge steel frames:

The connections may be welded or riveted, noting that the design bracing capacity is 20% lower for the riveted frames.

4.4 TIE-DOWN REQUIREMENTS

0.55mm to 0.95mm light gauge steel frames:

Provide M10 minimum hold-down bolts with 50 x 50 x 3mm distribution washers at the two outside frame studs and M6 minimum hold-down bolts with 32mm diameter 2.5mm thick round washers at the interior studs. All bolts to be placed within 45mm of the stud.

0.95mm to 1.6mm medium gauge steel frames:

Provide M12 minimum hold-down bolts with 75 x 70 x 6mm distribution washers at 900mm centres and within 70mm of the face of studs.

4.5 CAVITY CONSTRUCTION

If the wall cladding is fixed over cavity battens placed onto the steel studs, then no bracing capacity can be claimed. Therefore, in order to achieve the tabulated bracing capacities, the JHFC sheets must be installed under the cavity battens and directly to the face of the framing, on either side.

Notes

1. Bracing capacity can only be claimed for JHFC plank or weatherboard cladding if screws pass through both planks. See Figure 6.
2. For rivetted frames of 1.2 and 1.6mm gauge, the tabulated bracing capacities must be multiplied by a factor of 0.8.
3. For definition of 6mm JHFC sheets see Clause 1.2 of this guide. Thicker sheets are assumed to provide at least the tabulated value.
4. Butt joints are permitted in vertical sheets provided that both sheet edges are fixed to a nogging with fasteners at the same spacing as nominated for the top and bottom edges.
5. For horizontally fixed sheets: if edges at a butt joint are not fixed to a nogging, then the joint needs to be properly tape-set in order to claim the tabulated design bracing capacity.
6. For external sides of walls, 6mm Villaboard™ lining must be replaced by properly coated 6mm HardieFlex™ or 7.5mm HardieTex™ system.
7. No bracing capacity can be claimed if the JHFC sheet and steel frame are not in direct contact e.g. when cavity battens or thermal break strips are used. Refer to Section 1.4 for further details

TABLE 5 ULS BRACING CAPACITY OF JAMES HARDIE FIBRE CEMENT CLADDING ON STEEL FRAMES

MATERIAL	FIXING DETAILS	STUD SPACING (MM)	SCREW SPACING (MM) A/B/C (SEE FIGURE 10)	BRACING CAPACITY (KN/M)			
				Light gauge steel frames		Welded steel frames (see Note 3)	
				0.55mm BMT studs	0.75mm BMT studs	1.2mm BMT studs	1.6mm BMT studs
6mm JHFC sheet bracing	Single-sided, fixed vertically, joints (if any) not set	600	100/100/150	5.4	6.0	-	-
			200/200/200	3.0	3.3	-	-
		450	100/100/150	6.0	6.2	-	8.5
			200/200/200	-	-	5.8	6.0
		300	100/100/150	-	-	-	8.8
			200/200/200	-	-	-	7.5
7.5mm HardieTex™ sheet	Single-sided, fixed vertically, joints (if any) not set	600	200/200/200	3.6	3.8	-	-
		450	200/200/200	-	-	-	5.1
7.5mm JHFC planks or weatherboards	Single-sided	600	See Note 2 and Figures 6 & 7	2.1	2.2	-	-
		450	See Note 2 and Figures 6 & 7	-	-	-	2.4
		300	See Note 2 and Figures 6 & 7	-	-	-	3.6
	Double-sided, internal lining 6mm JHFC sheets (see Note 4), fixed vertically (joints not set, see Note 5) or horizontally (joints tape set, see Note 6)	600	See Note 2 and Figures 6 & 7. For 6mm JHFC sheets: 200/200/200	3.9	4.0	-	-
		450	See Note 2 and Figures 6 & 7. For 6mm JHFC sheets: 200/200/200	-	-	-	6.7
	6mm JHFC sheets (see Note 4) (see Note 7)	Single-sided, fixed horizontally, joints not set	600	200/200/200	2.4	2.7	-
600			200/200/200	4.2	4.5	-	-
Double-sided, fixed vertically, joints (if any) not set		600	200/200/200	5.6	5.7	-	-
		450	200/200/200	-	-	6.0	7.8
		300	200/200/200	-	-	-	11.0
Double-sided, fixed horizontally, joints not set		600	200/200/200	3.8	4.2	-	-
Double-sided, fixed horizontally, joints tape set (see Note 6)	600	200/200/200	5.6	5.6	-	-	
16mm Scyon™ Linea™ weather-board	Single-sided	600	See Note 2 and Figure 8	3.6	3.6	-	-
	Double-sided, internal lining 6mm JHFC sheets (see Note 4), fixed vertically (joints not set, see Note 5) or horizontally (joints tape set, see Note 6)	600	See Note 2 and Figure 8. For 6mm JHFC sheets: 200/200/200	4.5	4.5	-	-

* For 2700mm high frames, this figure is 5.4kN/m

5 SAFE WORKING PRACTICES

WARNING - DO NOT BREATHE DUST AND CUT ONLY IN WELL VENTILATED AREA

James Hardie products contain sand, a source of respirable crystalline silica which is considered by some international authorities to be a cause of cancer from some occupational sources. Breathing excessive amounts of respirable silica dust can also cause a disabling and potentially fatal lung disease called silicosis, and has been linked with other diseases. Some studies suggest smoking may increase these risks. During installation or handling: (1) work in outdoor areas with ample ventilation; (2) minimise dust when cutting by using either 'score and snap' knife, fibre cement shears or, where not feasible, use a HardieBlade™ Saw Blade and dust-reducing circular saw attached to a HEPA vacuum; (3) warn others in the immediate area to avoid breathing dust; (4) wear a properly-fitted, approved dust mask or respirator (e.g. P1 or P2) in accordance with applicable government regulations and manufacturer instructions to further limit respirable silica exposures. During clean-up, use HEPA vacuums or wet cleanup methods - never dry sweep. For further information, refer to our installation instructions and Safety Data Sheets available at www.jameshardie.com.au. FAILURE TO ADHERE TO OUR WARNINGS, SAFETY DATA SHEETS, AND INSTALLATION INSTRUCTIONS MAY LEAD TO SERIOUS PERSONAL INJURY OR DEATH.

JAMES HARDIE® RECOMMENDED SAFE WORKING PRACTICES
<p>CUTTING OUTDOORS</p> <ol style="list-style-type: none"> 1. Position cutting station so wind will blow dust away from the user or others in working area. 2. Use a dust reducing circular saw equipped with HardieBlade™ Saw Blade and HEPA vacuum extraction.
<p>SANDING/DRILLING/OTHER MACHINING</p> <p>When sanding, drilling or machining you should always wear a P1 or P2 dust mask and warn others in the immediate area.</p>
<p>IMPORTANT NOTES</p> <ol style="list-style-type: none"> 1. NEVER use a power saw indoors. 2. NEVER use a circular saw blade that does not carry the HardieBlade™ logo. 3. NEVER dry sweep – Use wet suppression or HEPA vacuum. 4. NEVER use grinders. 5. ALWAYS follow tool manufacturer's safety recommendations.
<p>P1 or P2 respirators should be used in conjunction with above cutting practices to further reduce dust exposures. Additional exposure information is available at www.jameshardie.com.au to help you determine the most appropriate cutting method for your job requirements. If concern still exists about exposure levels or you do not comply with the above practices, you should always consult a qualified industrial hygienist or contact James Hardie for further information.</p>

WORKING INSTRUCTIONS

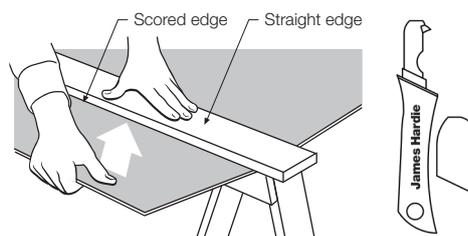
Refer to recommended safe working practices before starting any cutting or machining of product.

Score and snap

Score and snap is a fast and efficient method of cutting James Hardie building products using James Hardie's Villaboard™ Knife.

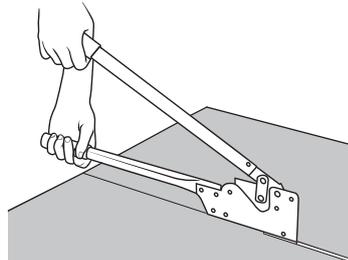
Preferably score on the face side of the product. Score against a straight edge and repeat the action to obtain adequate depth for clean break – normally one third of sheet thickness. Snap upwards to achieve break. Smooth any rough edges with a rasp.

Hand guillotine

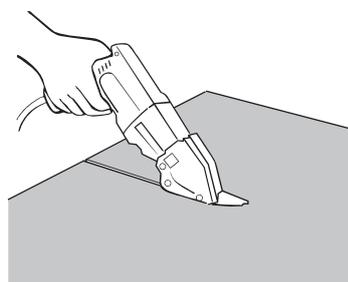


Make guillotine cut on the off-cut side of line to allow for the thickness of the blade.

Fibreshear

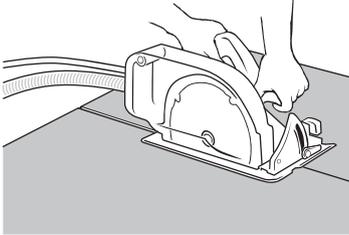


An electrically powered, fast, clean and effortless way of cutting James Hardie™ building products, especially around curves such as archways. Make fibreshear cut on the 'off-cut' side of the line to allow for the thickness of the shear.



HardieBlade™ saw blade

The HardieBlade™ saw blade used with a dust-reducing saw and HEPA vacuum extraction allows for fast, clean cutting of James Hardie™ fibre cement products. A dust-reducing saw uses a dust deflector or a dust collector which can be connected to a vacuum system. When sawing, clamp a straight-edge to the sheet as a guide and run the saw base plate along the straight edge when making the cut.



STORAGE AND HANDLING

To avoid damage, all James Hardie™ building products should be stored with edges and corners of the sheets protected from chipping. James Hardie™ building products must be installed in a dry state and protected from rain during transport and storage. The product must be laid flat under cover on a smooth level surface clear of the ground to avoid exposure to water, moisture, etc.

QUALITY

James Hardie conducts stringent quality checks to ensure any product manufactured falls within our quality spectrum. It is the responsibility of the builder to ensure the product meets aesthetic requirements before installation. James Hardie will not be responsible for rectifying obvious aesthetic surface variations following installation.

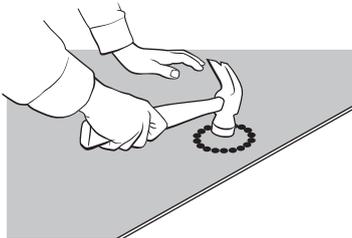
HOLE-FORMING

For smooth clean cut circular holes:

- Mark the centre of the hole on the sheet.
- Pre-drill a pilot hole.
- Using the pilot hole as a guide, cut the hole to the appropriate diameter
- with a hole saw fitted to a heavy duty electric drill.

For irregular holes:

- Small rectangular or circular holes can be cut by drilling a series of small holes around the perimeter of the hole then tapping out the waste piece from the sheet face.
- Tap carefully to avoid damage to sheets, ensuring the sheet edges are properly supported.



6 PRODUCT INFORMATION

6.1 GENERAL

James Hardie™ fibre cement is a cellulose fibre reinforced cement building product. The basic composition is Portland cement, ground sand, cellulose fibre and water.

James Hardie™ fibre cement is manufactured to AS/NZS 2908.2 'Cellulose-Cement Products Part 2: Flat Sheets' (ISO 8336 'Fibre Cement Flat Sheets').

James Hardie™ fibre cement is classified Type A, Category 2 in accordance with AS/NZS 2908.2 'Cellulose-Cement Products'.

For Safety Data Sheets (SDS) visit www.jameshardie.com.au or Ask James Hardie™ on 13 11 03.

6.2 PRODUCT MASS

Refer to the relevant James Hardie Product Installation Guide.

6.3 DURABILITY

6.3.1 Resistance to moisture/rotting

James Hardie™ fibre cement has demonstrated resistance to permanent moisture induced deterioration (rotting) by passing the following tests in accordance with AS/NZS2908.2:

- Water permeability (Clause 8.2.2)
- Warm water (Clause 8.2.4)
- Heat rain (Clause 6.5)
- Soak dry (Clause 8.2.5)

6.3.2 Resistance to fire

James Hardie™ fibre cement is suitable where non-combustible materials are required in accordance with C1.9 of the Building Code of Australia.

James Hardie™ building products have been tested by CSIRO in accordance with AS/NZS 3837 and are classified as conforming to Group 1 material (highest and best result possible), with an average specific extinction area far lower than the permissible 250m²/kg, as referenced in Specification C1.10a of the BCA.

6.3.3 Resistance to termite attack

Based on testing completed by CSIRO Division of Forest Products and Ensis Australia James Hardie™ building products have demonstrated resistance to termite attack.

6.4 ALPINE REGIONS

In regions subject to freeze/thaw conditions, all James Hardie™ fibre cement external cladding must be installed and painted in the warmer months of the year where the temperature does not create freeze and thaw conditions or paint issues. The cladding must be painted immediately after installation. In addition, fibre cement cladding must not be in direct contact with snow and/or ice build up for extended periods, e.g. external walls in alpine regions subject to snow drifts over winter.

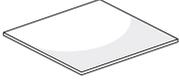
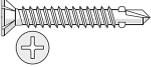
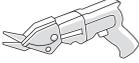
Furthermore, a reputable paint manufacturer must be consulted in regards to a suitable product, specifications and warranty. The paint application must not be carried out if the air temperature or the substrate temperature is outside the paint manufacturer's recommendation including the specified drying temperature range

James Hardie™ external cladding products are tested for resistance to frost in accordance with AS/NZS 2908.2 Clause 8.2.3.

7 COMPONENTS

The following checklist describes the components required to install James Hardie™ fibre cement sheet bracing.

Timber or steel framing may be used, but must comply with relevant building regulations and standards and the requirements of this guide.

JAMES HARDIE™ SHEET BRACING COMPONENTS		
PRODUCT	DESCRIPTION	
	Bracing material JHFC sheets, planks, weatherboards to be used for bracing.	Refer to the relevant Product Installation Guide for available lengths, widths and thickness.
	HardieDrive™ screw. 185mm diameter For light gauge steel frames 0.55mm to 1.6mm thick NOTE: Contact your fastener manufacturer for fasteners with suitable corrosion resistance.	8g x 32mm 8g x 40mm
	HardieBlade™ Saw Blade 185mm poly diamond blade, for fast, clean cutting of James Hardie™ fibre cement.	HardieBlade™ Saw Blade Selling unit: each
	Villaboard™ knife A score and snap knife designed to efficiently cut through fibre cement sheets ≤9mm thick. 12 per box. 305915.	
	Fibreshear Electric cutting tool.	
COMPONENTS NOT SUPPLIED BY JAMES HARDIE®		
Fibre cement nail Galvanised nails for timber		2.8mm x 30mm, 2.8mm x 40mm and 2.8mm x 50mm
Buildex FibreTEKS® For light gauge steel frames 0.55 to 0.75mm thick		Nº 8 x 25mm

8 FRAMING, FIXING AND INSTALLATION DETAILS FOR JHFC SHEET BRACING

8.1 GENERAL

This section sets out the framing, fixing and installation recommendations for JHFC sheet bracing.

For additional framing, fixing and installation recommendations for **James Hardie™ cladding products** mentioned in this guide, refer to the following guide:

PRODUCT	RELEVANT GUIDE
Villaboard™ Lining	Villaboard™ Lining Installation Guide
Versilux™ Lining	Versilux™ Lining Installation Guide
HardieFlex™ Sheet	James Hardie™ External Cladding Installation Guide
HardiePlank™ Weatherboard	James Hardie™ External Cladding Installation Guide
HardieTex™ System	HardieTex™ System Installation Guide
PanelClad™ Sheet	James Hardie™ External Cladding Installation Guide
PineRidge™ Lining	PineRidge™ Lining Installation Guide
Scyon™ Linea™ Weatherboard	Scyon™ Linea™ Weatherboard Installation Guide
EasyLap™ Panel	EasyLap™ Panel Installation Guide

Note

To achieve structural bracing using these products, you must use the fastener spacing and hold-down recommendations of this guide instead of those set out in the individual James Hardie™ Installation Guides

Nail gun manufacturers have supplied the information contained in this table. Should a nail gun model or nail shown in the table not be available, please contact the relevant nail gun manufacturer for advice.

If the nail gun overdrives sheets, contact nail gun manufacturer for advice.

8.2 FRAMING

8.2.1 General

JHFC sheet bracing can be fixed to either timber or domestic steel framing. The framing used must comply with the relevant building regulations and standards and the requirements of this guide.

Frames must be straight and true to provide a flush face to receive the sheeting.

8.2.2 Timber

Use only seasoned timber. Unseasoned timber must not be used as it is prone to shrinkage and can cause sheets to move.

‘Timber used for house construction must have the level of durability appropriate for the relevant climate and expected service life and conditions; that is exposure to insect attack or to moisture, which could cause decay’.

Reference AS1684.2 ‘Residential Timber Framed Construction’.

8.2.3 Steel

The base metal thickness (BMT) of a steel frame must be between 0.55mm and 1.6mm.

TABLE 6 GUN NAILING NOTES

COIL NAILER		NAILS		
Manufacturer	Name	Manufacturer	Name	Size
Hitachi	VH650 coil nailer	Other	Galv. coil nail	38mm x 2.5mm dia. 45mm x 2.2mm dia. 50mm x 2.2mm dia.
Paslode	Impulse compact nailer (B20544)	Paslode	Impulse DekFast® 50mm Value Pack (B20561V)	50mm x 2.87mm dia.
			Impulse DekFast® 50mm Value Pack (B20557)	50mm x 2.87mm dia.
Duo-Fast	KD665A coil nailer (Part No. D40040)	Duo-Fast	C27/32 GD coil nail (D41800)	32mm x 2.7mm dia.
Stanley-Bostitch	N80C coil nailer	Stanley-Bostitch	AC45P250 gal coil nail	45mm x 2.5mm dia.
Senco	SCN-60 coil nailer (fitted with adjustable depth of drive)	Senco	BTN 45 ADB Weatherex Gal and Sencoted	45mm x 2.5mm dia.

Notes

1. Fasteners with equivalent dimensions, (ie head size and shape, shank diameter and length to those above) are acceptable for use.
2. All fasteners are to be galvanised or suitably coated for intended external application.
3. Nailing guns must be fitted with flush drive attachments.
4. Some nailing guns incorporate an adjustable head set to control nail depth (eg Duo-Fast coil nailer and Senco coil nailer.)
5. When gun nailing, apply pressure to the face of the cladding by holding the cladding against the stud to reduce blow out at back of the sheet.

8.3 FIXING

8.3.1 General

You must select a fastener that is suitable for the type of frame you are using.

8.3.2 Fastener corrosion protection

Fasteners must have the appropriate level of durability required for the intended project. This is of particular importance in coastal areas, areas subject to salt spray and other corrosive environments.

Fasteners must be fully compatible with all other material that they are in contact with to ensure the durability and integrity of the assembly.

Contact fastener manufacturers for more information.

Note

Fasteners must be at least Class 3 external grade finish.

8.3.3 Fixing depth

Nail sheets and boards in accordance with the nailing details shown in this guide. Do not overdrive the nails. Proud nailing is desirable, but flush head nailing is acceptable. See Figure 11.

8.3.4 Fastening to timber

Use 2.8 x 30mm hot-dipped galvanised fibre cement nails when hand nailing.

JHFC bracing can be gun-nailed onto timber frames using flat head nails. Suitable combinations are shown in Table 6.

8.3.5 Fastening to steel

For steel framing of thickness 0.55mm to 0.75mm BMT, 25mm Buildex FibreTEKS® self drilling screws.

For steel framing of thickness 0.75mm to 1.6mm. Use 8g - 22mm or 8g - 32mm HardieDrive™ external grade screws.

Fasteners should be screwed as close as possible to the stud corners to avoid deflection of the stud flange. See Figure 12.

8.3.6 Screw gun specification

Use variable speed screw guns with high torque, a maximum speed of 2500rpm, fitted with a depth control attachment.

Set the depth control attachment to avoid overdriving. As the screw thread begins to pull into the steel frame, drop the revs back to bed the head flush with the surface of the sheet.

8.4 INSTALLATION DETAILS

8.4.1 General

JHFC bracing can be used for cavity bracing in brick veneer construction or internally in locations such as behind built-in full-height cupboards or robes.

For fastener spacings and hold-down recommendations, refer in this guide to:

- Clause 2.2 for the simplified design method or Clause 2.3 for the conventional Limit State design method for timber framing;
- Clauses 3.2 and 3.3 for timber framing with cyclone rods;
- Figure 10 and Clause 4.4 for steel framing.

8.4.2 Brick ties

Brick ties can be installed through JHFC bracing. Simply refer to the hole forming recommendations in Section 5. Ensure the hole is not greater than 50mm diameter through the sheet to allow insertion of brick ties. See Figure 13.

9 DETAILS

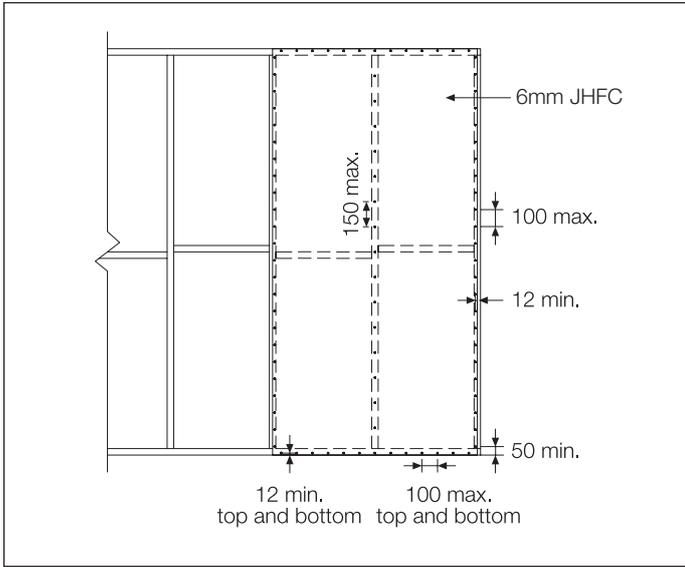


FIGURE 1 TYPE A BRACING NAILING DETAIL

Note
Nails along the top and bottom plates should be 25mm from the edge of the sheet for 50mm thick plates. When 38mm nominal thick plates are used, reduce edge distance to 20mm.

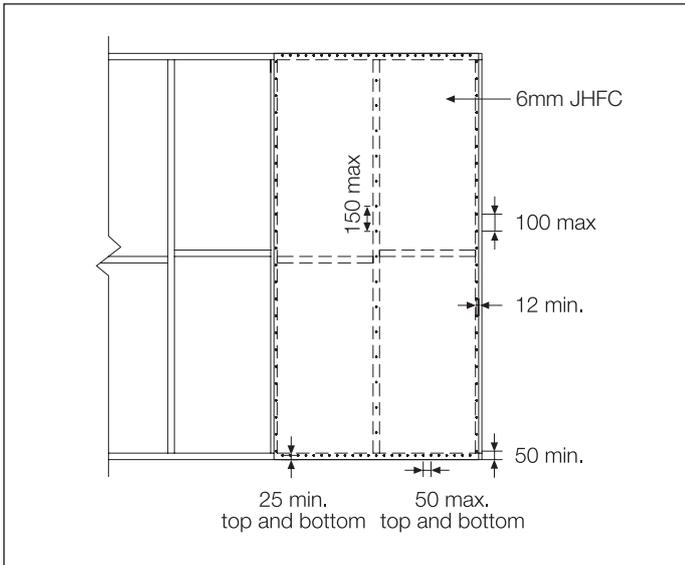


FIGURE 2 TYPE B BRACING NAILING DETAIL

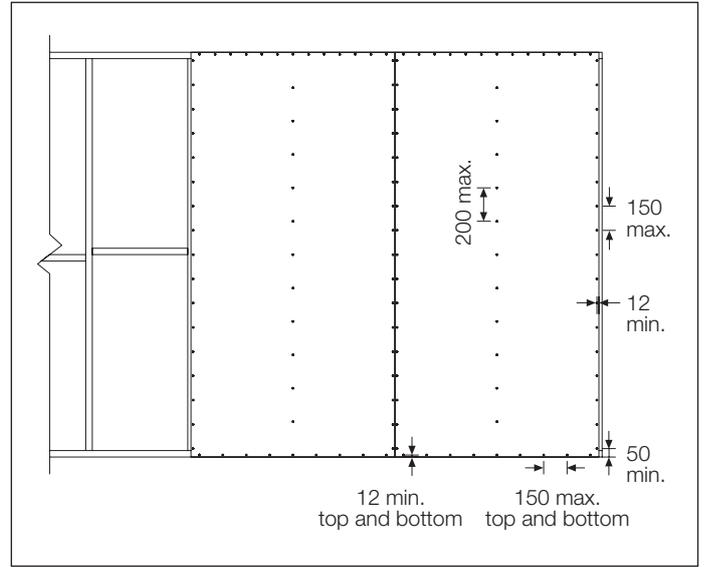


FIGURE 3 NAILING DETAIL FOR HARDIEFLEX™ SHEET, PINERIDGE™ LINING OR PANELCLAD™ SHEET

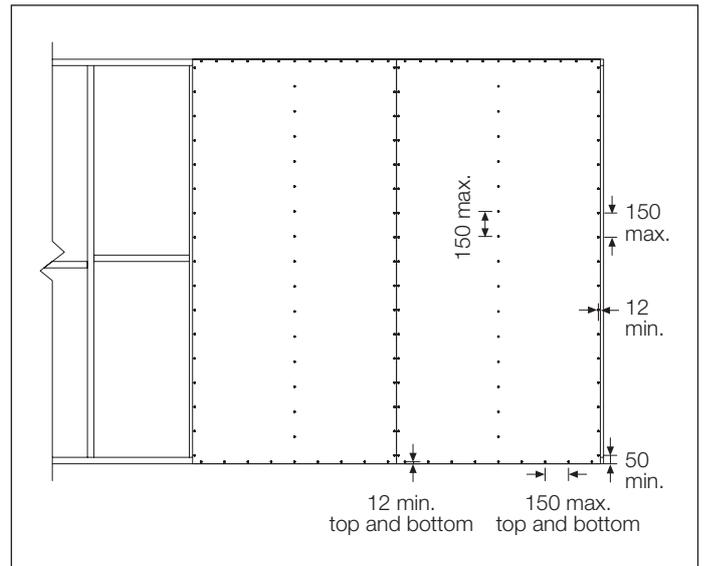


FIGURE 4 NAILING DETAIL FOR HARDIETEX™ SYSTEM

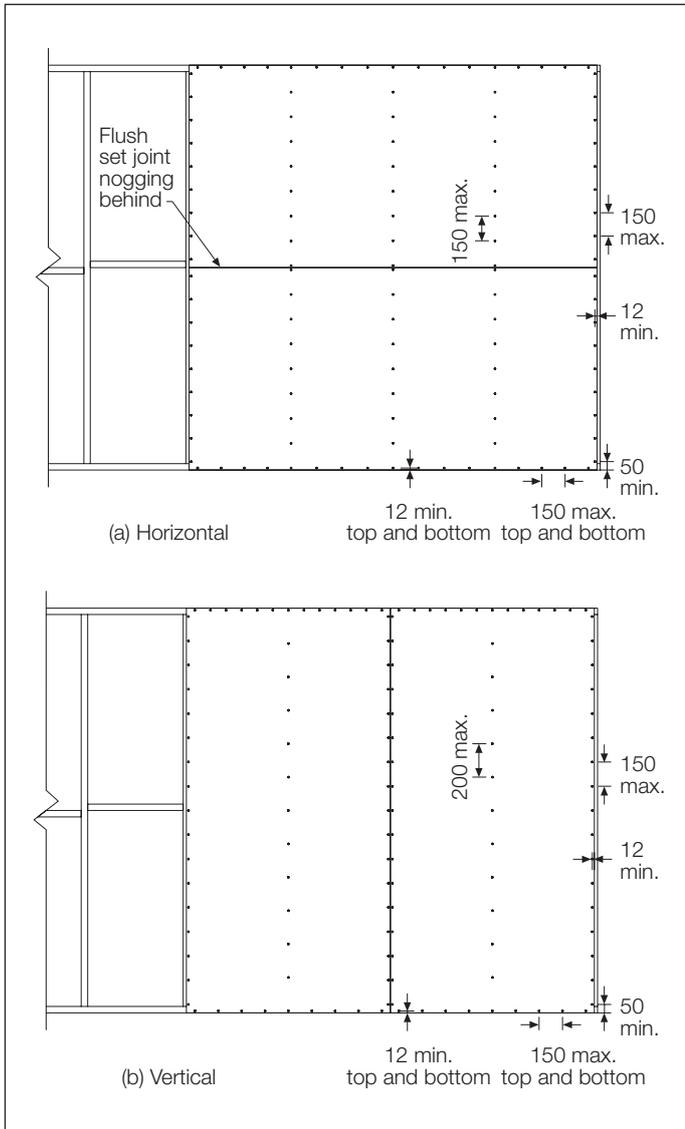


FIGURE 5 NAILING DETAIL FOR VILLABOARD™ SHEETS OR VERSILUX™ LINING

Note

For details of tiling over these Villaboard linings, refer to the James Hardie Villaboard lining Installation Guide.

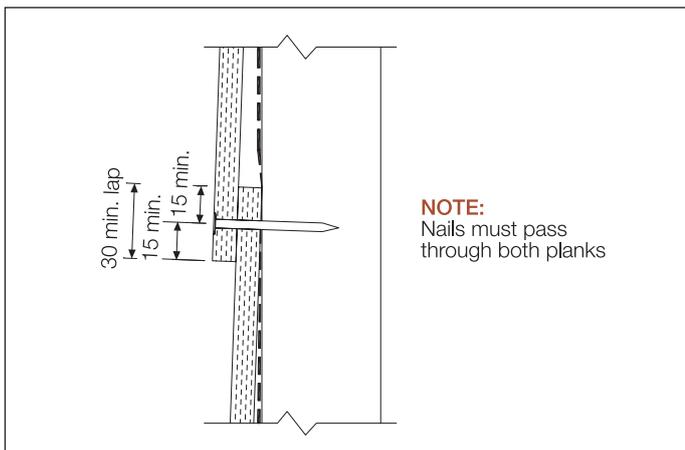


FIGURE 6 NAILING DETAIL FOR HARDIEPLANK™

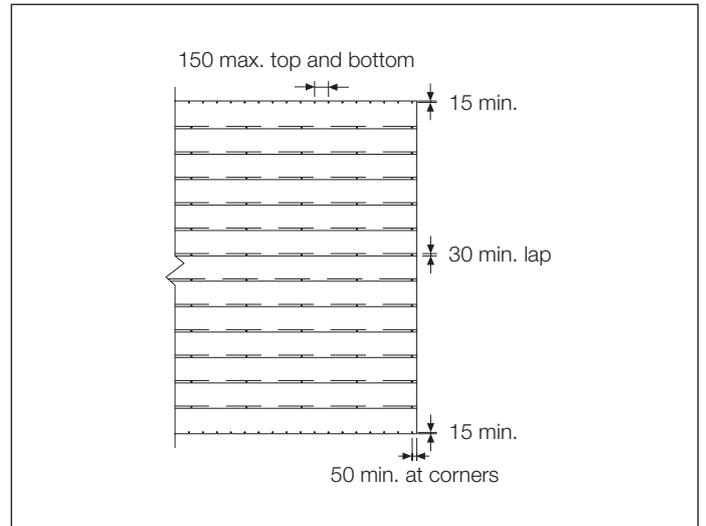


FIGURE 7 NAILING SPACING DETAIL FOR JHFC PLANKS OR WEATHERBOARDS

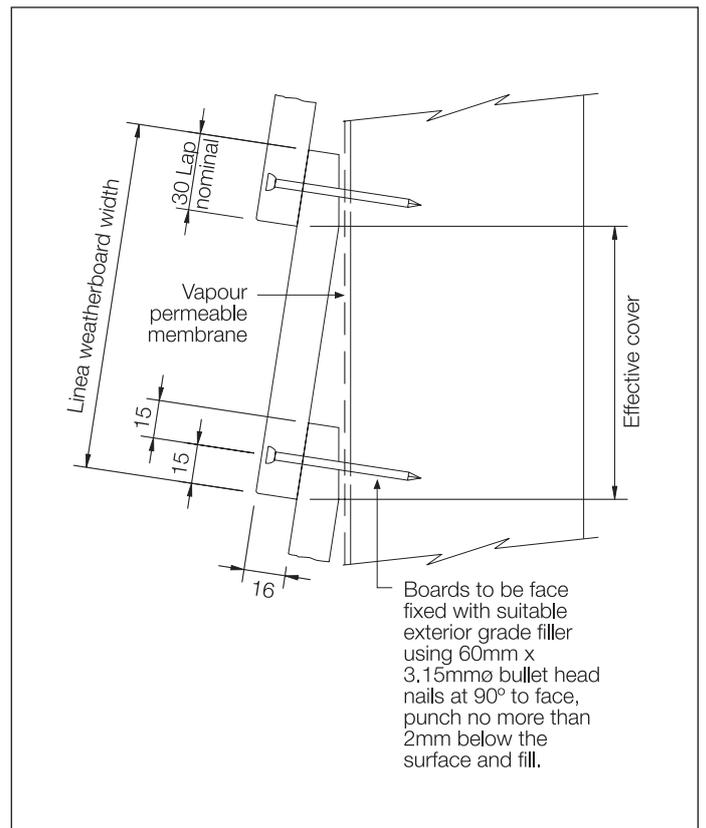


FIGURE 8 NAILING DETAIL FOR LINEA™ WEATHERBOARDS

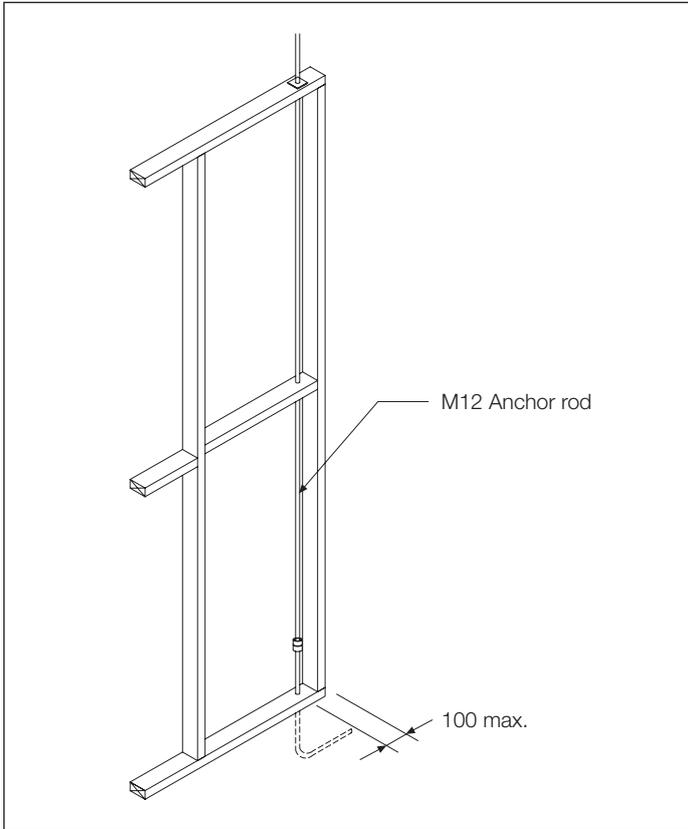


FIGURE 9 ANCHOR ROD DETAIL

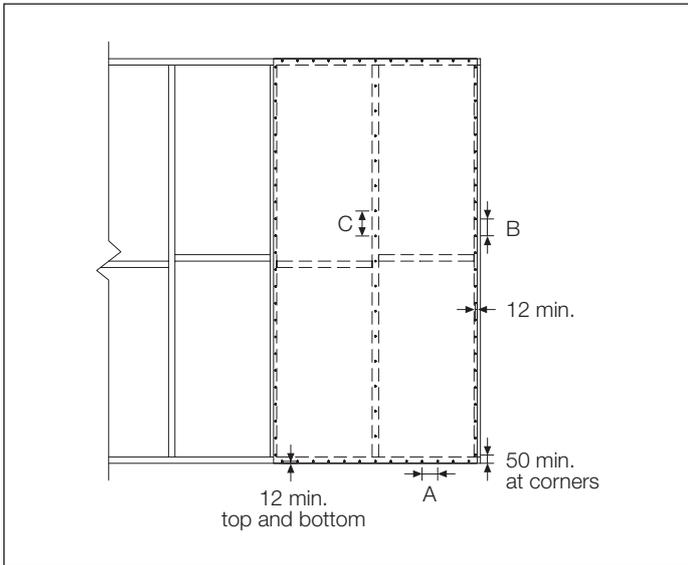


FIGURE 10 SCREW SPACING DETAIL

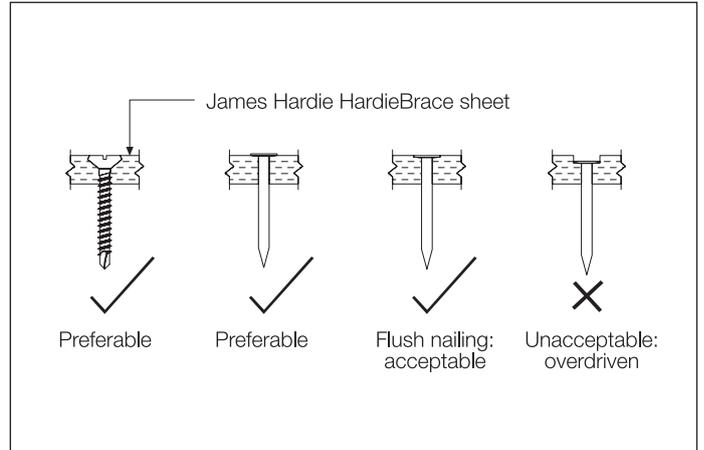


FIGURE 11 NAIL FASTENER DEPTH

Note

JHFC sheet bracing will not straighten excessively warped or distorted frames and any warping may be visible after the internal lining is applied.

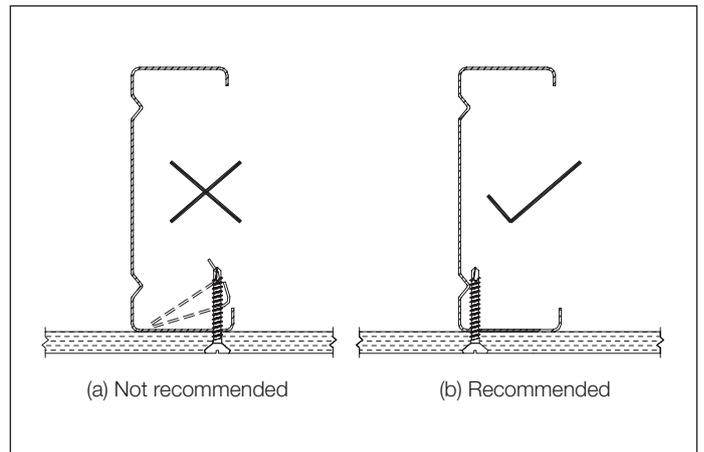


FIGURE 12 SCREW FASTENING TO STEEL FRAME

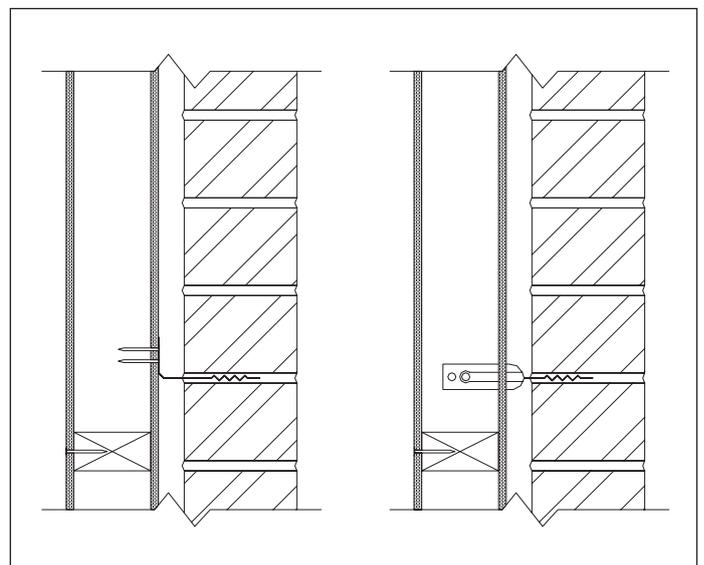


FIGURE 13 BRICK TIES



**For information and advice
call 13 11 03 | jameshardie.com.au**

Australia October 2018