F22 SmartBrace Design Guide

Edition 1

2026

SMARTFRAME® BY TILLING

F22 SmartBrace®

Scope of this Design Guide

This Design Guide assists users to design interpret Table 8.18 within AS 1684.2—2021 to calculate the bracing capacity for F22 SmartBrace brace ply for most of the common structural arrangements in domestic construction.

The SmartFrame software in conjunction with AS 1684 provides tools for calculating the racking forces on buildings.

While specific details are given on suitable methods of developing racking resistance, the methods of providing adequate diaphragm support, overall anchorage against wind uplift and overall structural stability are outside the scope of this publication. Information on the above matters can be obtained from AS 1684 Residential timber-framed construction standard or from a structural engineer experienced in timber construction.

Tilling Timber Pty Ltd has structural engineers on staff who can be contacted for advice on matters concerning the use of its engineered timber products in timber construction on the Techsupport Customer helpline on 1300 668 690 or at techsupport@tilling.com.au.

Basis of stated capacities

The bracing capacities for F22 SmartBrace manufactured for Tilling Timber within this document are interpolated from Table 8.18 of AS 1684.2-2021, and have been confirmed with individual testing to ASTM E72 carried out at Universal Testing Facility Pty Ltd (UTF) in Dandenong South for alternative stud spacing's, where applicable.

AS 1684.2-2021 is a primary reference document in the NCC and is a therefore a “deemed to satisfy” solution.

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F22 SmartBrace properties

F22 SmartBrace brace ply is made from Chain of Custody Certified plantation Eucalypt and mixed specie veneers manufactured exclusively for Tilling Timber Pty Ltd. The manufacturing is carried out under third party audited process control with in-factory production testing in the factory’s laboratory, and further third party testing of the Type A bond quality, F grade and formaldehyde emissions by Shanghai Hongjun Science & Technology Co., Ltd., a family member of ICTT Corp, (International Certificate Testing Technology) headquartered in Florida state of USA.

Compliance with process based quality control requirements is third party audited by BSI and the audits, together with end product testing, is used as the basis for Product Certification BMP 788447 by BSI as a JAS-ANZ accredited Product Certification body.

JAS-ANZ stands for the government established “Joint Accreditation System of Australia and New Zealand” which exists as the peak organisation for accreditation of Product Certification.

Applications

F22 SmartBrace is designed to resist horizontal racking forces applied to buildings such as cavity bracing in external wall frames in brick veneer construction, and to resist uplift in braced walled systems.

Ordering F22 SmartBrace

F22 SmartBrace size		Pieces per pack	Area per pack (m^2)	Weight/ panel (kg)	Weight/ pack (kg)
Length (mm)	Width (mm)				
2440	900	150	329.4	5.5	824
2440	1200	150	439.2	7.3	1098
2745	900	150	370.6	6.2	927
2745	1200	150	495.7	8.3	1236
3050	900	150	144.8	6.9	1029
3050	1200	150	549.0	9.2	1373

Timber framing

Timber wall frames should comply with government building regulations and where applicable AS 1684. Framing members should be minimum F5 stress grade and joint strength group or JD5 (seasoned). Stud spacing's should not exceed 600 mm centres for 1200 mm sheets and 450 mm centres for 900 mm sheets.

The resistance values in the enclosed tables are based upon fixing the sheeting to framing having a minimum joint strength of JD5. Where the timber framing is of joint strength of JD4, racking resistance for the F22 SmartBrace systems in this Design Guide may be increased by 12.5%.

It is essential for the bracing walls to be securely connected to the roof and sub-floor systems. Wind forces acting on the roof must be resisted and transferred to the ceiling diaphragm and through the walls to the sub-floor. The methods of connection are detailed in AS 1684, and include nail fixings, galvanised iron straps, framing anchors and bolts.

Weather Exposure

During normal weather conditions, SmartBrace may be exposed to the weather and subjected to wetting and drying. As the product is supplied in a moisture-conditioned state (seasoned), it is advisable to enclose the building as soon as possible after fixing the sheets. A maximum exposure period of three months is recommended.

SmartBrace is a wood panel product and therefore some dimensional movement may occur during extended periods of extremely high or low relative humidity.

Installation

Before installation SmartBrace panels should be checked for:

1. Correct panel grade and marking
2. Correct panel thickness
3. Any physical damage

F22 SmartBrace should be installed vertically with sheet ends fixed to the top and bottom plates. Support the vertical edges over studs. F22 SmartBrace like all wood based products is hygroscopic, meaning the panel will adjust to the equilibrium moisture content of its environment. To allow for small dimensional movement of the F22 SmartBrace panel, allow a 2 mm gap between sheets and raise the sheets 2 mm from the floor.

Uplift force may require additional fixings at the end of the bracing panel in accordance with AS 1684.

Fix sheets with 2.8 mm Ø x 30 mm flat head galvanised or corrosive resistant nail, the fastener head should NOT be driven into the sheet. When stressing the frame under high loads, the modes of failure are typically nail pull through, failure of the joint between the studs and plates or plate splitting. By staggering the nails, the latter failure is minimised since a common crack line is not induced in the plate.

Simplified bracing for non-cyclonic areas

Bracing walls are set at right angles to the windward walls. In accordance with AS 1684, they should be evenly distributed throughout each storey of the building. Bracing shall initially be placed in external walls, and where possible, at the corners of the building. Where bracing cannot be placed in external walls because of openings or similar situations, a structural diaphragm ceiling may be used to transfer racking forces to bracing walls that can support the loads.

Unless otherwise specified, sheet bracing walls shall be a minimum of 900 mm wide. Clause 8.3.6.5 of AS 1684.2 gives limited exceptions to this, and these exceptions are described as part of the capacity diagrams within this Design Guide.

Total bracing requirements for each 'area of elevation' of the windward walls can be obtained from the SmartFrame software suite or alternatively AS 1684 Table 8.2. Ensure that the minimum bracing unit requirements for the external walls are satisfied. The additional bracing units can then be evenly distributed throughout the external and internal walls.

For the number of F22 SmartBrace sheets, divide the bracing unit requirements by the Design Capacity per sheet width in this Design Guide. Where the building elevation contains combinations of pitched roofs, gable or skillion ends, or upper or lower storeys, the 'area of elevation' of each section should be calculated separately to determine the total bracing unit requirements.

Brick veneer construction

F22 SmartBrace is ideal for use as cavity bracing in brick veneer stud construction. Brick wall ties must be the face-fixed type and comply with AS 2699 - Wall Ties for Masonry Construction. The ties should be nailed through the F22 SmartBrace into the narrow face of the studs.

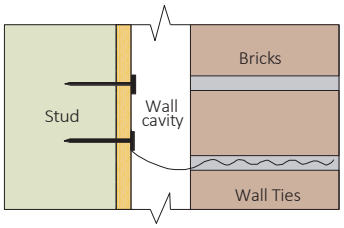
Wall cavities should be kept clear of obstructions and the wall ties sloped downwards, away from the frame and bracing.
When constructing boxed eaves, the inner ends of soffit bearers or sprockets should not penetrate through the structural sheet bracing. Hangers suspended from the top wall plate or rafters may support the ends.

Standard fasteners

The racking capacities of the systems in this Design Guide are based upon hand driven 2.8 Φ x 30 mm flathead structural clouts or connector nail, with alternative power nail* options listed below.

Fastener edge distances along top and bottom plates and edge studs should be a minimum of 15 mm and 7 mm where panels are fixed to internal framing.

The spacing for staples are two thirds (fastener spacing multiplied by 0.66) of those shown for nails or screws.



Nailing F22 SmartBrace

Hand driven nails	Flathead structural clouts or connector nail 2.8 Φ x 30 mm					
Power driven nails *	**Coil Nailer**			**Nails**		
	Brand	**Nailer code**	**Description**	**Nail Code**	**Size**	**Collation**
	BeA	45800-3	567DCWire/plastic nailer 32 mm to 65 mm nails	45041	FAP32 x 2.5 mm Φ EG Helical twist (clout nail)	Plastic
				45144	FAP32 V5 2.9 mm Φ HDG screw (Clout nail)	Plastic
				45042	FAP38 V5 2.5 mm EG Φ Helical twist (clout nail)	Plastic
		43500	ANR60 Air anchor nailer	43506	36.5 x 3.3 mm Φ Anchor nails	Paper
				43512	40x 4.0 mm Φ Anchor nails	Paper
	Paslode	B40001	Impulse CoilMaster IM50S	B40027	32 x 2.7 mm Φ (Hot Dip Galvanised)	0° Coil
		B21094 or B21095	CNW 57 or CNW 70.1 Coil Nailer	B25115	32 x 2.7 mm Φ (Hot Dip Galvanised)	15° Coil
	Bostitch	N80CB-1ML	Coil nailer 80 mm Max	AC45R250-GAL	45 x 2.5 mm Φ galvanised	15° Coil
	DuoFast	D40010 or D40030	CNP 50 or 65.1 Coil Nailer	D41810	32 x 2.7 mm Φ (Hot Dip Galvanised)	0° Coil
	Senco	TBC5700	Aico A57 Coil nailer	AC45R250-GAL	45 x 2.5 mm Φ galvanised	15° Coil
				YA45252R	AC45R250-GAL HDG Ring Shank 45 x 2.5 mm Φ	15° Coil

Notes:

1. The above power driven nail sizes have been provided by the respective manufacturers to Tilling Timber Pty Ltd as offering an equivalent capacity as the hand driven 2.8 Φ x 30 mm Flathead structural clouts or connector nail and while their performance with SmartBrace has not been the subject of individual testing, experience and engineering judgement has been exercised
2. This list is offering advice only, and does not preclude any other fastener being used that can be demonstrated to exhibit equivalent capacity as the 2.8 Φ x 30 mm Flathead structural clouts or connector nail
3. This list was correct at the time of publication, so users may need to refer to the respective manufacturer if the listed option is no longer available.

Wall capacity and height modification

The racking capacities of the systems in this Design Guide are based upon a wall height of 2700. For walls of different heights, the capacity shall be multiplied by the value given below:

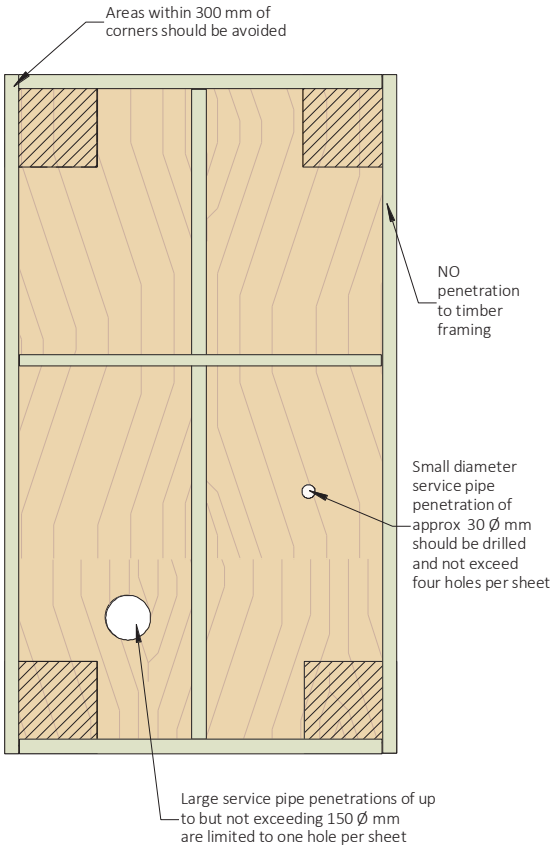
Bracing wall capacity/height modifier

Wall height (mm)	Multiplier
2400	1.12
2700	1.00
3000	0.90
3300	0.80
3600	0.75
3900	0.70
4200	0.64

Penetrations through SmartBrace panels

Should it be necessary to penetrate the F22 SmartBrace for plumbing or electrical installations, keep the penetrations to a minimum and locate them towards the centre of the sheet. Holes should always be neatly cut and the corners rounded.

Areas within 300 mm of corners should be avoided. Large service pipe penetrations of up to but not exceeding 150 mm diameter are limited to one hole per sheet. Small diameter service pipe penetrations of approximately 30 mm diameter should be drilled and not exceed four holes per sheet. Holes should be placed as close as possible to the sheet centre.



Sawing, drilling and shaping

F22 SmartBrace can be sawn and shaped like solid wood in any way with standard wood working tools in a well ventilated open area to avoid breathing wood dust. If hand held equipment without suction is used, a protective face mask should be worn.

It is recommended that carbide tipped tools are used to provide the neatest cut without damaging the edge of the F22 SmartBrace panel. Conventional hand or power drilling tools are suitable for providing penetrations.

Fixing of bottom plates

The lateral force effects due to wind and earthquakes are resisted by bracing walls results in two separate methods of action on bracing elements. The first action is an in-plane sliding force transferred to the bottom plate. Sufficient fixings of the bottom plate to the sub-floor/slab must be designed to resist this in-plane 'shear' force.

The second action induces rotation or overturning effects which tie rods extending from the top plate to the sub-floor and located at each end of bracing wall provide excellent resistance. For bracing elements requiring lower resistance, nominal connection of the bottom plate to the sub-floor/slab can overcome these overturning forces. Nominal fixings (minimum fixings) are defined in clause 9.5 of AS 1684.2 - 2021, but for bottom plates the requirements for nominal fixing is shown below.

Wind classification	Concrete slab subfloor	Bottom plates ≤ 38 mm to joists	Bottom plates 38 to 50 mm to joists
N1, N2, N3, N4 and C1, C2 and C3	75 mm masonry nails, screws or bolts and 1200 mm max centres	2/3.05Ø x 75 mm at a max of 600 mm centres	2/3.05Ø x 90 mm at a max of 600 mm centres

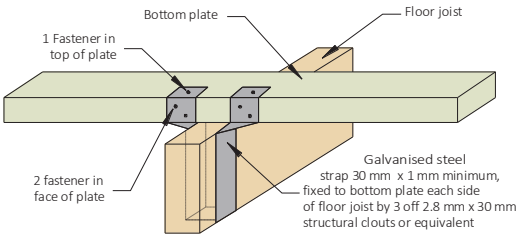
1. Bottom plate fixing up to 3.4 kN/m systems

No additional bottom plate fixing other than nominal bottom plate fixing as specified in AS 1684 is required for bracing systems with resistance less than 3.4 kN/m. However, if the 3.4 kN/m system is used on both sides of a frame to double the bracing capacity in that section of wall, then the bottom plate fixing will need to be upgraded to be equivalent for a 6.4 kN/m system.

2. Bottom plate fixing for 5.3, 6.0 and 6.4 kN/m systems

The minimum fixing requirement for 5.3, 6.0 and 6.4 kN/m bracing capacity systems is 13 kN tie down every 1200 mm along the bottom plate or equivalent.

A looped 30 mm x 1 mm width galvanised looped strap as shown above is equivalent to 13 kN tie down.

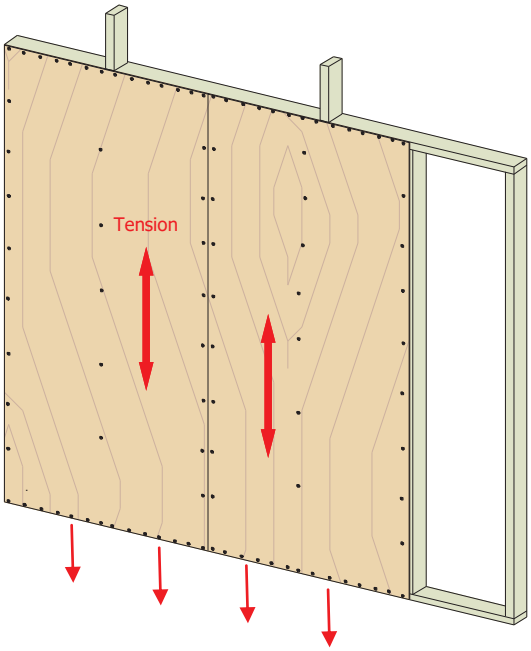


3. Bolt fixing of bottom plates

The tie down capacity of some bolts through a range of timber joint strengths are presented below. If the bolts are used in concrete slabs they must be appropriately embedded. For lower capacity bolted joints the resistance can be obtained by reducing the spacing of the bolts.

Joist strength group	J2	J3	J4	JD4	JD5	JD6
Bolt diameter (mm)	Capacity in kN					
10	18	18	18	15	12	9
12	27	27	26	20	16	12
16	50	50	46	35	28	21

Uplift Capacities



Bottom plate connection to floor substrate as per AS 1684.
Limited examples are included in this Design Guide

Characteristic uplift resistance

Panel type	Uplift per 900 mm panel (kN)
Type (g)	4.0
Type (h) Method B	11.0

Storage and handling

Correct storage and handling of F22 SmartBrace is essential to ensure problem free installation and to guarantee bracing resistance capacities for each panel as specified in this Design Guide.

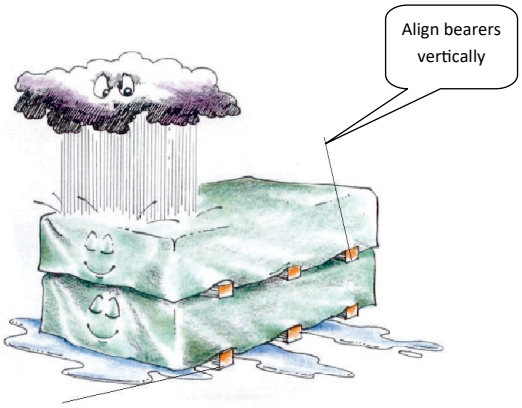
1. Store SmartBrace panels horizontally on squared bearers of even height
2. Should packs be stacked on top of each other, bearers should be aligned vertically

3. Bearer spacing is to be as per the table below.

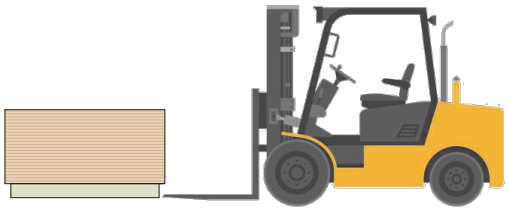
Thickness (mm)	Width (mm)	Length (mm)	No of bearers (pcs)
4	460	2440	5
		2745	5
		3050	6
	900	2440	5
		2745	5
		3050	6
	1200	2440	5
		2745	5
		3050	6

4. SmartBrace should be stored protected from direct exposure to the weather in a well ventilated area

5. SmartBrace panels should not be stored in direct contact with the ground



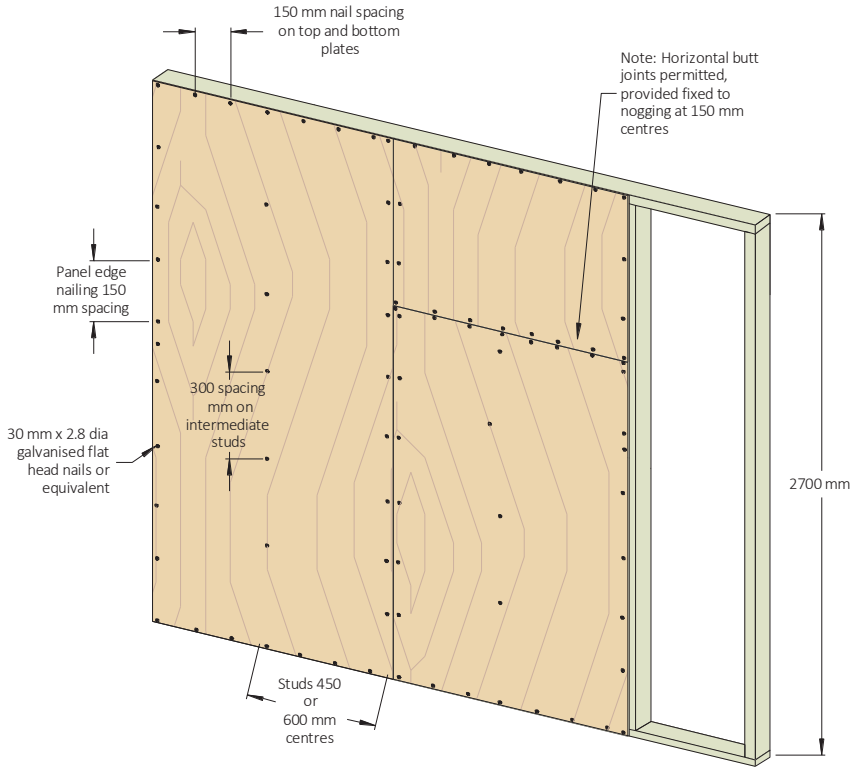
6. If the panels are to be moved by mechanical lifting equipment such as fork lifts, the bearers must be of sufficient height to allow forks to slide under the full pack without causing damage to panels.



F22 SmartBrace Systems

The allowable racking resistance of F22 SmartBrace Systems for frames sheathed on one side only, are as follows. The resistance values may be doubled for frames sheathed on both sides provided that the hold down requirements of the bottom plate are also doubled AND the bottom plate checked to ensure satisfactory bending capacity.

Racking setup - Type (g) Table 8.18 of AS 1684.2

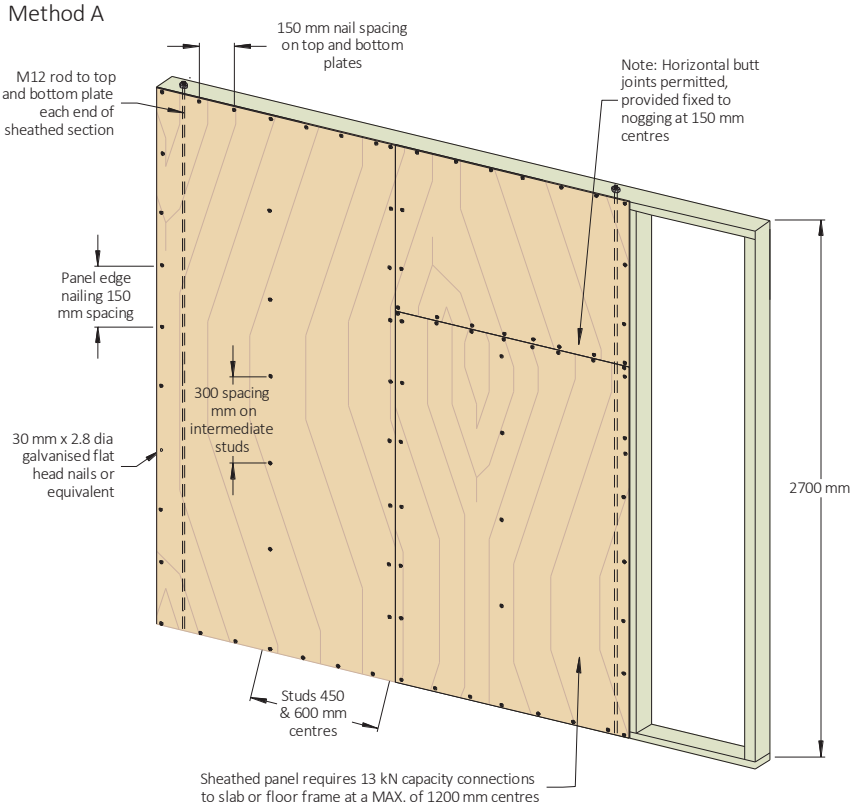


Type (g) system
3.0 kN/m

NOTES:

1. Fastener centres
   - 150 mm for top and bottom plates
   - 150 mm for vertical edges
   - 300 mm for intermediate studs
2. For both 450 and 600 mm stud spacing
3. Minimum section bracing of 900 mm to achieve the above capacity. For panel length of 600 mm, the bracing capacity shall be 50% (½) of that for a 900 mm panel. For panel length between 600 mm and 900 mm, the bracing capacity may be determined by multiplying the above capacity by 0.5 for 600 mm long varying linearly to 1.0 for 900 mm
4. Minimum Joint strength JD5. If JD4 framing is used, increase capacity by 12.5 %
5. Requires a 2 mm expansion gap around perimeter of every panel
6. For wall height greater than 2700 mm, the reduction factor on page 4 of the Design Guide shall be applied.

Racking setup - Type (h) Table 8.18 of AS 1684.2
Method A

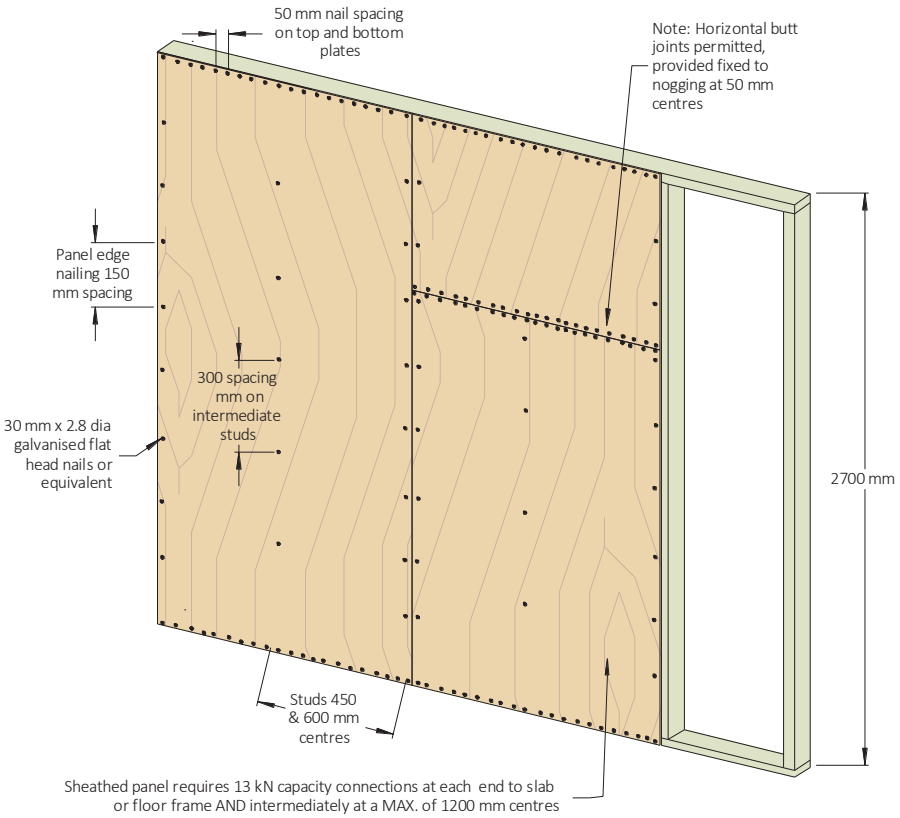


Type (h) system
Method A
5.6 kN/m

NOTES:

1. Fastener centres
   - 150 mm for top and bottom plates
   - 150 mm for vertical edges
   - 300 mm for intermediate studs
2. For both 450 and 600 mm stud spacing
3. Minimum section bracing of 600 mm.
4. Minimum Joint strength JD5. If JD framing is used, increase capacity by 12.5 %
5. Requires a 2 mm expansion gap around perimeter of every panel
6. M12 rods shall be used at each end of the sheathed section top plate to bottom plate /floor frame
7. Requires 13 kN capacity connection at a maximum of 1200 mm centres (see examples methods in this Design Guide)
8. For wall height greater than 2700 mm, the reduction factor on page 4 of the Design Guide shall be applied.

Racking setup - Type (h) Table 8.18 of AS 1684.2 Method B

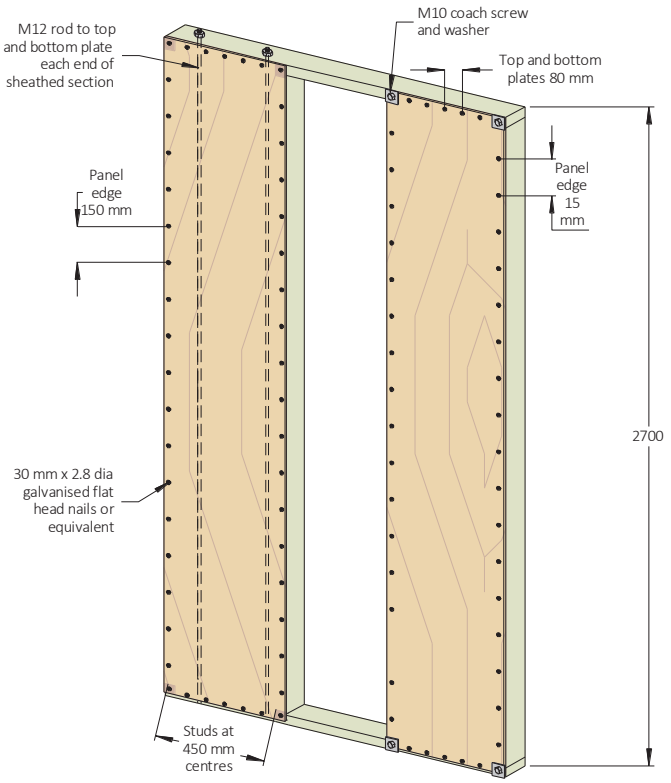


Type (h) system
Method B
5.2 kN/m

NOTES:

1. Fastener centres
   - 50 mm for top and bottom plates and any horizontal butt joints
   - 150 mm for vertical edges
   - 300 mm for intermediate studs
2. For both 450 and 600 mm stud spacing
3. Minimum section bracing of 900 mm.
4. Minimum Joint strength JD5. If JD4 framing is used, increase capacity by 12.5 %
5. Requires a 2 mm expansion gap around perimeter of every panel.
6. Requires 13 kN capacity connection at each end and intermediately at a maximum of 1200 mm centres (see examples methods in this Design Guide)
7. For wall height greater than 2700 mm, the reduction factor on page 4 of the Design Guide shall be applied.

Racking setup - 450 mm wall



450 mm Short Wall
1.7 kN/m

NOTES:

1. Fastener centres
   - 80 mm for top and bottom plates
   - 150 mm for vertical edges
2. For 450 mm stud spacing
3. M10 x 70 coach screws in each corner of sheathed panel

   or

   M12 rod at each end of the

   sheathed section
4. Minimum Joint strength JD5. If JD4 framing is used, increase capacity by 12.5 %
5. Requires a 2 mm expansion gap around perimeter of every panel
6. For wall height greater than 2700 mm, the reduction factor on page 4 of the Design Guide shall be applied

SmartFrame Warranty

All SmartFrame Engineered Wood Products (EWP) are covered by our SmartFrame warranty against material and workmanship defects and are guaranteed to perform as specified when stored, installed, and finished in accordance with SmartFrame installation instructions.

SMARTFRAME BY TILLING

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