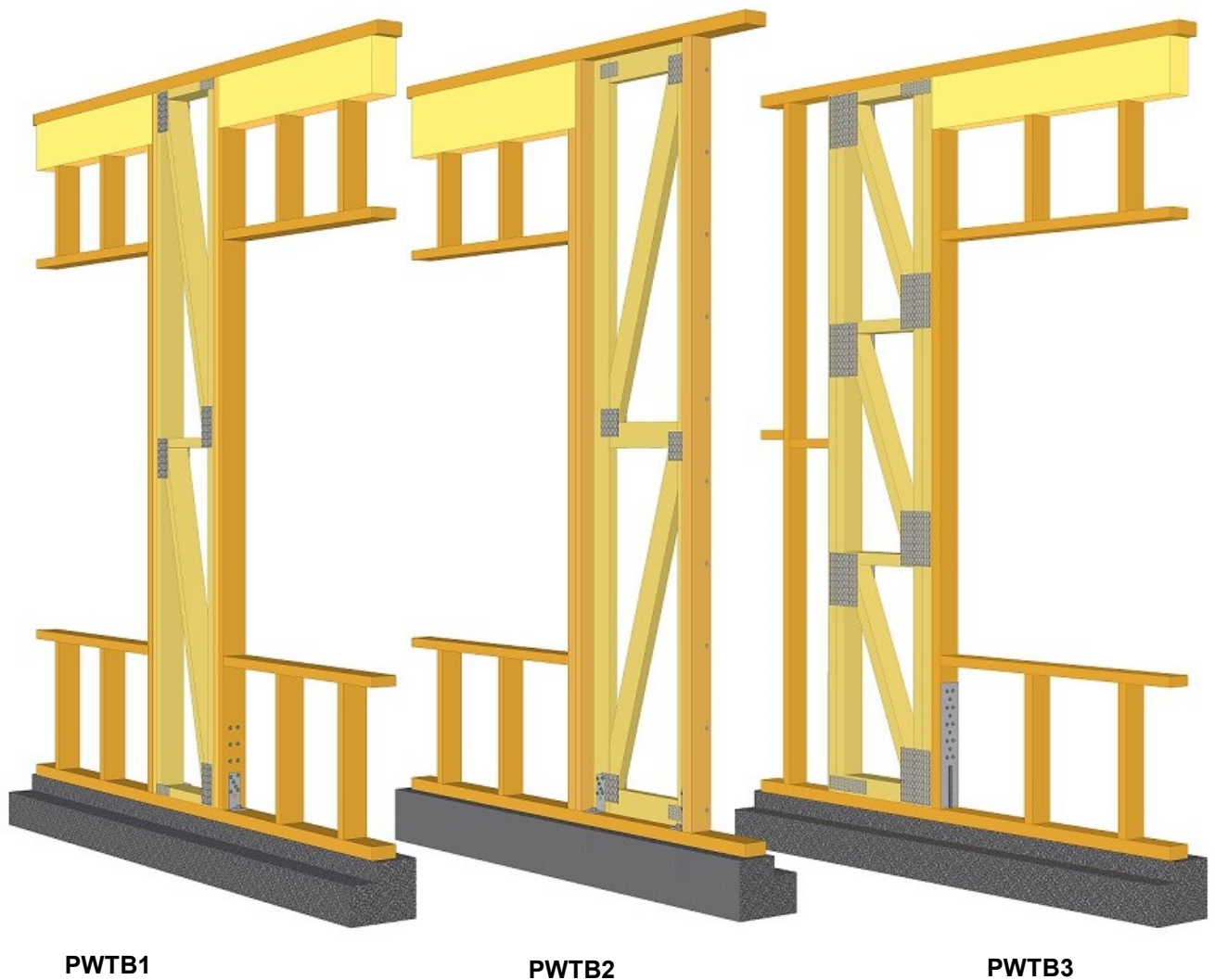


Design Guide

Pryda Wall Truss Brace



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Design Guide for Pryda Wall Truss Brace

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DESIGN GUIDE for PRYDA WALL TRUSS BRACE

1.0 INTRODUCTION

Fewer internal walls and large openings typify domestic housing designs these days. As this trend for open plan housing continues in our market, it is becoming increasingly difficult to achieve bracing adequacy using the traditional units. Short wall lengths are a common place, especially along the front and rear facades of houses.

In the case of two or three storeyed structures, the ground most level is subjected to the largest racking forces but ironically could have the least number of 'brace-able' walls.

Pryda Wall Truss Brace (PWTB) would typically be used in these scenarios, providing better design values for short wall lengths than most sheet bracing units available in the market. As an example, for a 450mm wall length, a heavy-duty 6.0 kN/m sheet bracing unit would give a capacity of 0.60 kN (in JD5 material with nominal tie-down connections). On the other hand, a medium duty PWTB can achieve as much as 2.25 kN for the same wall length, giving almost a four fold capacity benefit.



Fig 1 - Typical examples of front elevations with short walls where a PWTB would be best suited

2.0 PRODUCTS

Pryda offers three types of short wall truss bracing units. PWTB1 and PWTB2 for light to medium duty performance which is ideal for domestic construction and the heavy-duty PWTB3 is more suited for commercial construction having special tie-down connection requirements.

2.1 PWTB1

Using a 'flat' profile (eg: 90mm thick), the PWTB1 has a capacity of 5.0 kN/m, with a tie-down requirement of maximum 13 kN which is easily achievable in standard domestic construction using Ramset Anchorscrews.

Suitable for 300mm to 600mm lengths, the PWTB1 can be used as an isolated wall panel, without the reliance of a wall stud at each end. With the tie-down connectors located outside the truss, the PWTB1 is not ideal at door openings.

For wall heights greater than 2700mm, the capacity shall be reduced by a factor equal to 2700/wall height.

A 70mm thick PWTB1 may be used with a reduced capacity of 4.0 kN/m or 80% of the 90mm value.

Refer to page 4 for detailed specifications.

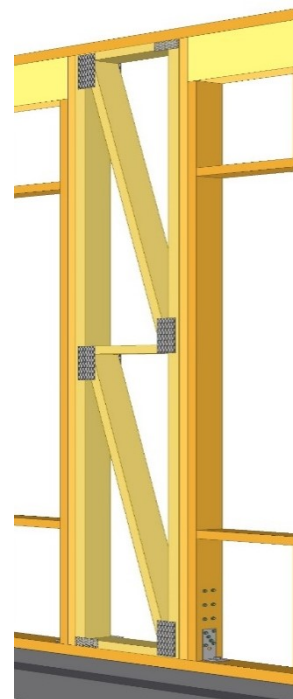


Fig 2.1 – PWTB1

Note: Refer to **Narrow Wall Bracing Unit** design guide for an alternative solution to Pryda Wall Truss Brace

2.2 PWTB2

PWTB2 use an 'edge' profile (35mm thick) and has a capacity of 5.0 kN/m, with a tie-down requirement of maximum 13 kN which is easily achievable in standard domestic construction using Ramset Anchorscrews.

Suitable for 300mm to 600mm lengths, PWTB2 is designed to be sandwiched between studs at each end and is ideal at door openings, where the tie-down connector is required to be located within the truss.

Although the given capacity is valid for wall heights up to 2700mm, PWTB2 can be used for higher walls using a reduction factor.

The specified tie-down connection is not suitable for 70mm wall frames. Contact Pryda Design Team for advice.

Refer to page 5 for detailed specifications.

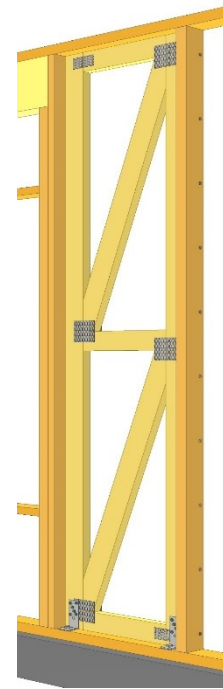


Fig 2.2 – PWTB2

2.3 PWTB3

This is a heavy duty version having a capacity up to 12.0 kN/m and requires special tie-down anchors. The PWTB3 is more suited for commercial or multi-residential construction. Recommended for 450mm to 600mm lengths and the given capacity is valid for wall heights up to 2700mm, unless noted otherwise.

For wall heights not greater than 2400mm, a capacity of 14.0 kN/m may be used. A reduction factor applies for wall heights greater than 2700mm.

Wall length may be extended to 750mm, provided resistance to wind face loads are assessed for adequacy.

An alternative profile using "V" shaped webs may be considered to cater for tie-down connections within the truss. This profile is recommended for wall lengths of 600mm or greater to allow for satisfactory installation of the tie-down connector. Refer section 3.5

Refer to page 6 for detailed specifications

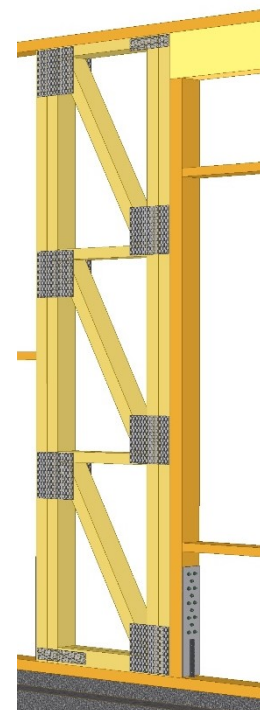


Fig 2.3 – PWTB3

Additional considerations:

- (a) As these bracing units are likely to be located at openings, consideration must be given to the tie-down requirement from the jamb studs, in addition to the PWTB. See Appendix A for guidance.
- (b) The 'chord' members of PWTB1 and PWTB3 could be used as jamb studs at openings. In this case, the timber specifications need assessment based on the width of the opening, wall heights, wind speeds and roof load widths. Refer Section 4.0 for min. timber requirement for the 'chord' members.

PWTB1 – 5.0 kN/m; unit lengths 300 to 600; using ‘flat’ profile (90mm thick)**

**** PWTB1 may be designed as a 70mm thick unit, using a 4.0 kN capacity (i.e a 20% reduction)**

PWTB1 uses a minimum 90x45 MGP10 chords, with 90x35 MGP10 webs. Refer to Section 4.0 for guidance for its use at openings, where the truss chords act as jamb studs

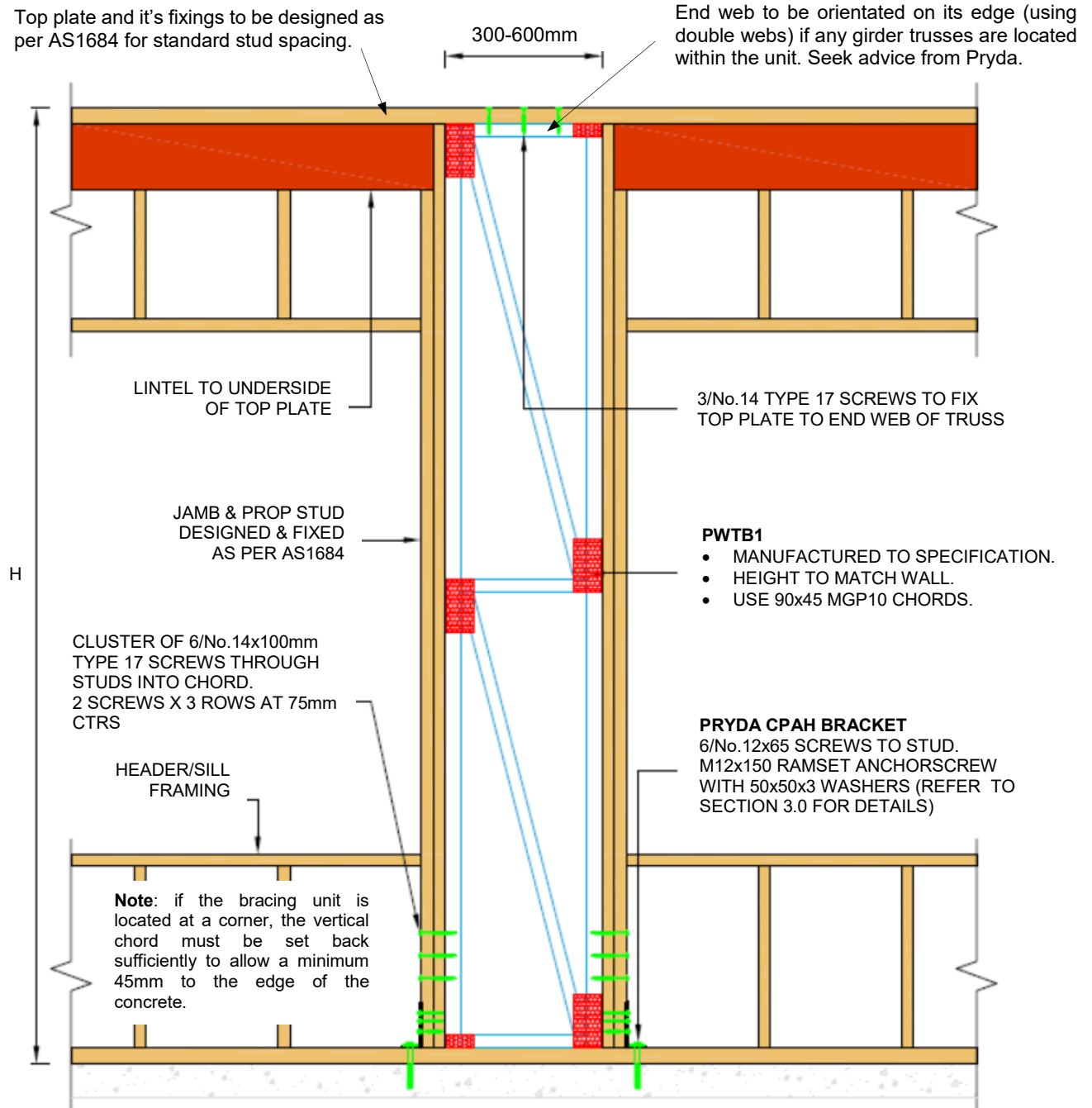


Fig 2.4: Specifications for PWTB1

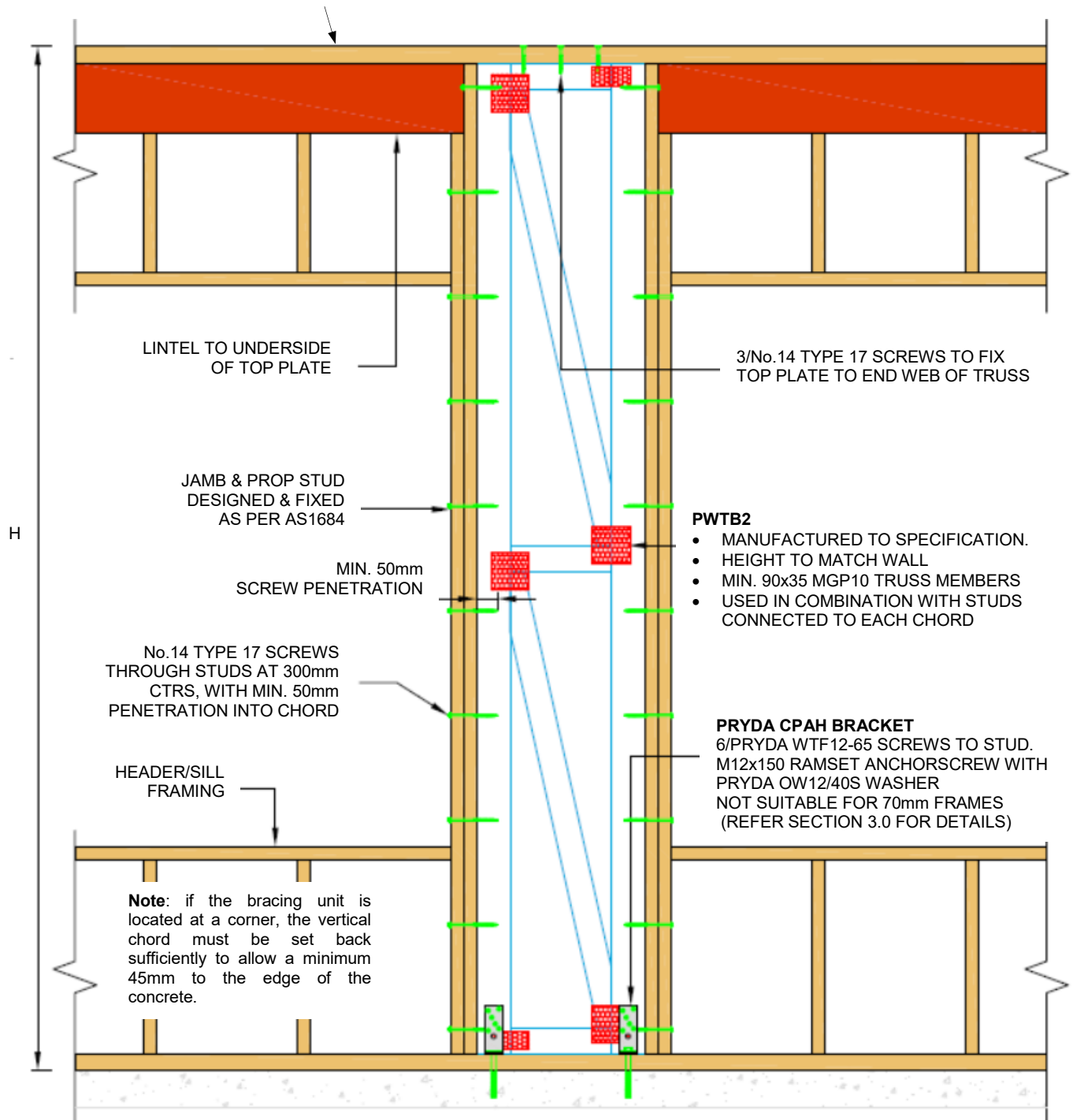
REFER TO **APPENDIX A** FOR ADDITIONAL TIE-DOWN REQUIREMENT FOR JAMB STUDS
A 35mm END WEB SET BACK MAY BE PROVIDED TO FACILITATE THIS.

EFFECT OF WALL HEIGHT:

H = Nominal wall height
For wall heights greater than 2700mm, reduce capacity of 5.0 kN/m by a factor = 2700/H

PWTB2 – 5.0 kN/m; unit lengths 300 to 600; using an ‘edge’ profile (35mm thick)

Top plate and it's fixings to be designed as per AS1684 for standard stud spacing.



REFER TO **APPENDIX A** FOR ADDITIONAL TIE-DOWN REQUIREMENT FOR JAMB STUDS

NOTE: FOR USE IN 70mm FRAMES, CONTACT PRYDA DESIGN OFFICE FOR ALTERNATIVE PROFILE AND TIE-DOWN CONNECTION DETAILS.

EFFECT OF WALL HEIGHT:

H = Nominal wall height

For wall heights greater than 2700mm, reduce capacity of 5.0 kN/m by a factor = $2700/H$

Fig 2.5: Specification for PWTB2

**PWTB3 – 12.0 kN/m (up to 2700 wall heights)
unit lengths 300 to 750; using ‘flat’ profile (90mm thick)**

Top plate & it's fixings to be designed as per AS1684 for standard stud spacing.

300 750mm

End web to be orientated on its edge (using double webs) if any girder trusses are located within the unit. Seek advice from Pryda

PROP STUD MAY BE INCORPORATED AS PART OF THE TRUSS

3/No.14 TYPE 17 SCREWS TO FIX TOP PLATE TO END WEB OF TRUSS UPTO 400mm WALL LENGTHS. USE 4 SCREWS UP TO 500mm AND 5 SCREWS UP TO 600mm WALL LENGTHS.

EFFECT OF WALL HEIGHT:

H = Nominal wall height

For wall heights greater than 2700mm, reduce capacity of 12.0 kN/m by a factor = $2700/H$

REFER SECTION 3.0 FOR DETAILS OF TIE-DOWN CONNECTOR

TIMBER SPECIFICATIONS:
90 x 45 MGP12 FOR CHORDS

Refer to manufacturing details for nailplate sizes

Note: if the bracing unit is located at a corner, the vertical chord must be set back sufficiently to allow a minimum 45mm to the edge of the concrete.

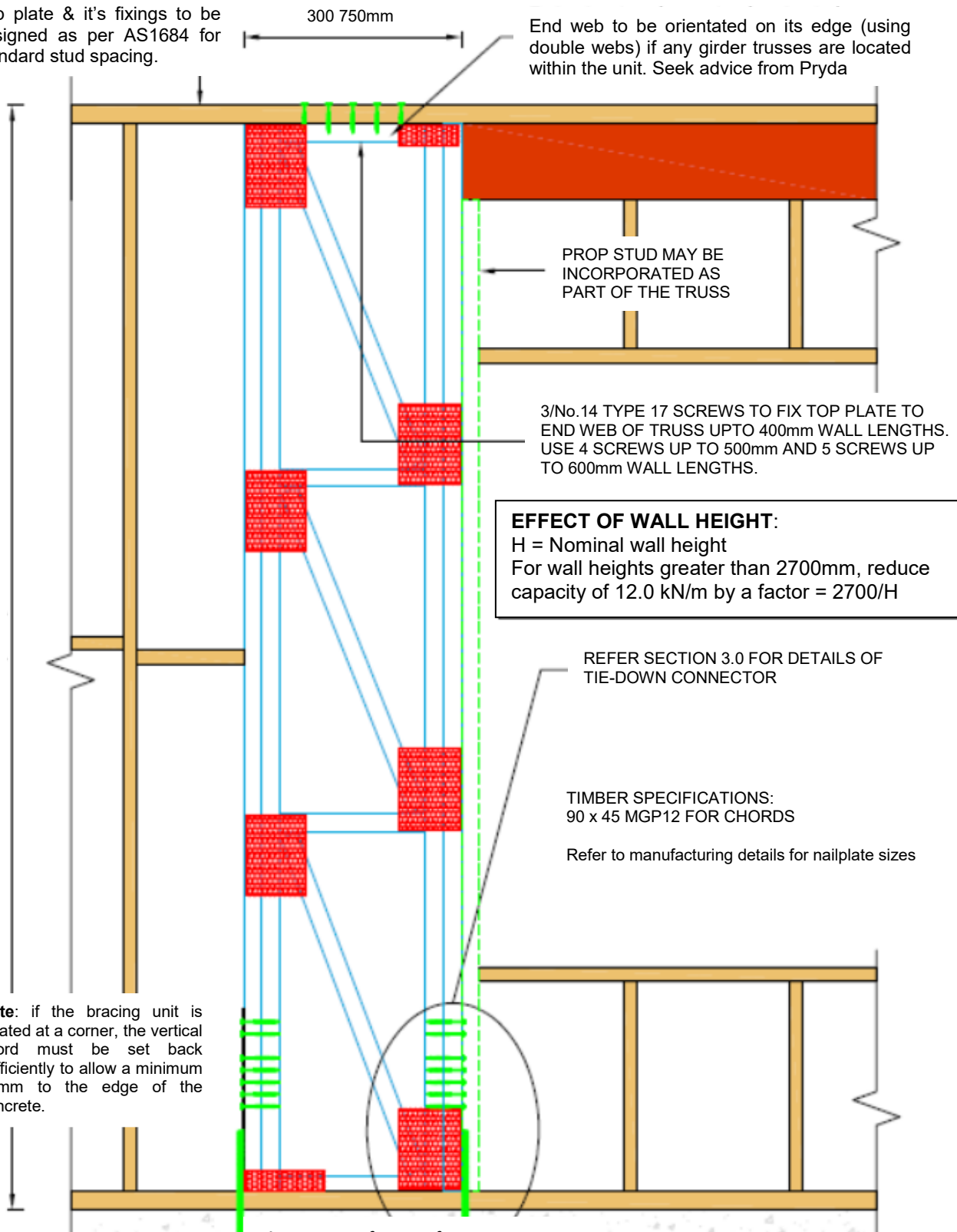


Fig 2.6: Specification for PWTB3

Notes:

- (i) if the 'PWTB3' is to serve as a combined bracing unit and jamb studs, special consideration must be given when selecting timber sizes/grades for the 'chord' member of PWTB3.
- (ii) The 'chord' members of PWTB3 are not designed for face wind loads. The adequacy of common studs shall be checked when unit lengths exceed nominal stud spacing.
- (iii) Refer to Section 4.3 for reduction factors applicable to PWTB3, under specific conditions.

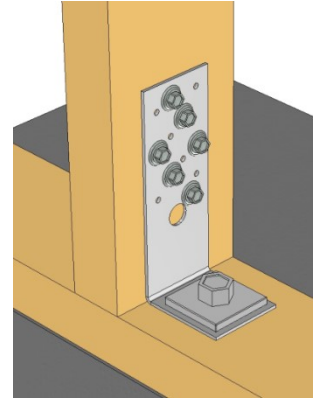
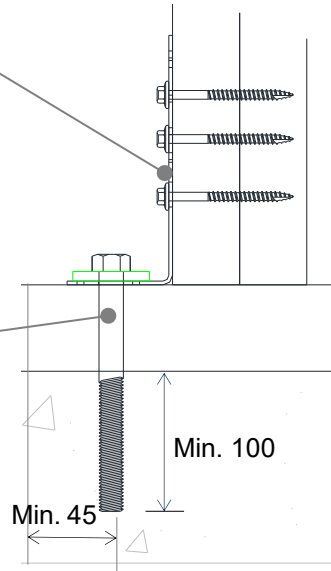
3.0 TIE-DOWN CONNECTIONS

3.1 Tie-down Connection for PWTB1 and PWTB2 units

Adopt **Ramset™ AnkaScrews™ M12 x150 (AS12150H)** to achieve a nominal 13.0 kN tie-down capacity.

Pryda Hold-down Bracket (CPAH) fixed to studs with 6/Pryda WTF12-65 screws.

CPAH tied-down using Ramset™ AnkaScrews™ M12 x150 with Pryda OW12/40S washer (40x40x5). A minimum 100mm anchor depth must be maintained.



Note: if the bracing unit is located at a corner, the vertical chord must be set back sufficiently to allow a minimum 45mm to the edge of the concrete.

Fig 3.1a: Typical tie-down connection for PWTB1

Each stud fixed to 'chord' member using No.14 x 100 Type 17 screws @ 300 c/c.

CPAH tied-down using Ramset™ AnkaScrews™ M12 x150 with Pryda OW12/40S washer (40x40x5). A minimum 100mm anchor depth must be maintained.

Note: a minimum 45mm edge distance is required for the AnkaScrews™,

Not suitable for 70mm wall frames.

Pryda Hold-down Bracket (CPAH) fixed to each truss chord with 6/Pryda WTF12-35 screws.

PWTB2 shall be installed against the outside edge of concrete, when used in external walls, to allow adequate edge distance for the anchors.

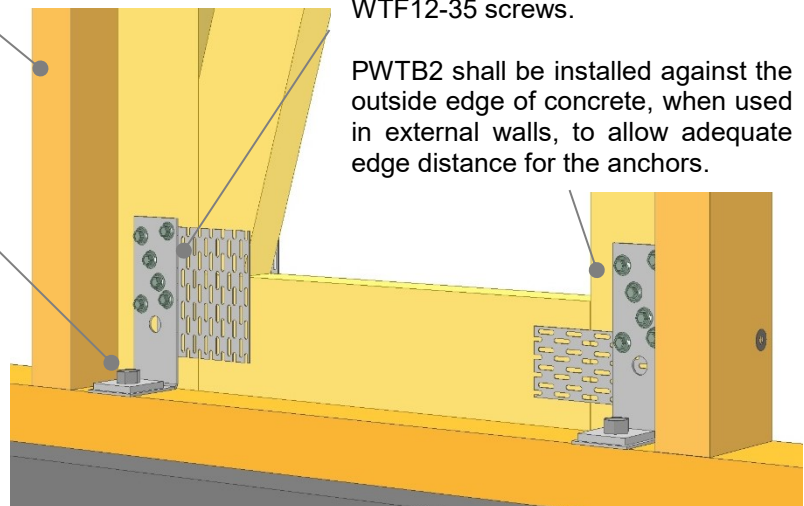


Fig 3.1b: Typical tie-down connection for PWTB2

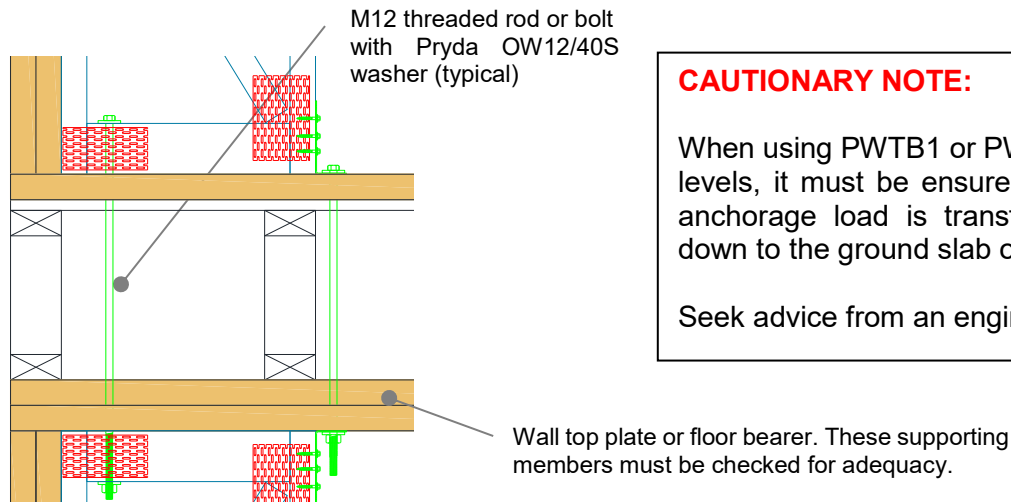
Minimum requirements to achieve the above tie-down capacities:

- Grade 20 concrete
- 45mm edge distance
- Effective anchor depth of 100mm (i.e maximum bottom plate thickness of 45mm)
- 140mm concrete depth.

For complete design capacities and installation instructions on the above anchor, visit Ramset at www.ramset.com.au or contact Ramset direct

3.2 Tie-down Connections to Timber floors

For tie-downs into timber sub-floors (eg: bearers), replace the Ramset™AnkaScrews™ with a M12 threaded rod or bolt, as per AS1684.2 Table 9.18, detail (b).



CAUTIONARY NOTE:

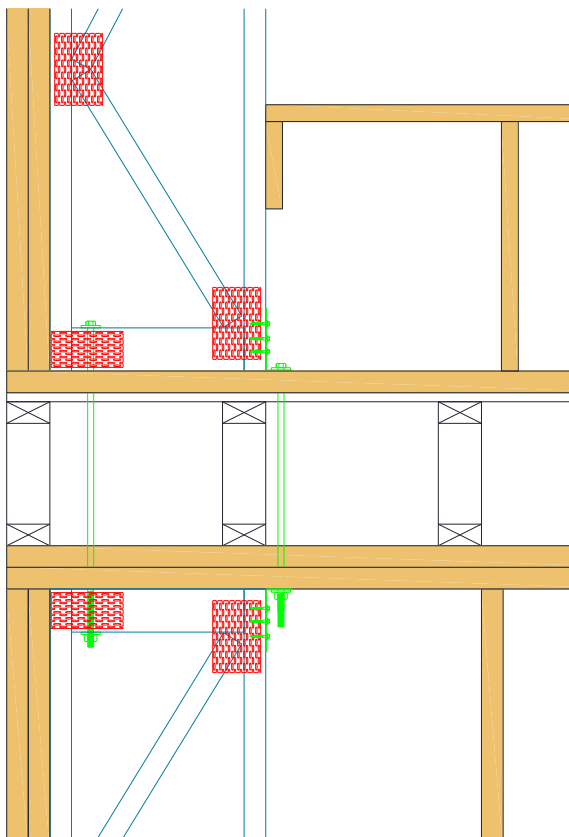


When using PWTB1 or PWTB2 at upper floor levels, it must be ensured that the tie-down anchorage load is transferred satisfactorily down to the ground slab or sub-floor.

Seek advice from an engineer.

Fig 3.2 : Connection details for timber floors

3.3 Tie-down Requirements for stacked units



PWTB units can be arranged in a stacked formation to provide bracing resistance over multiple levels.

A stacked formation will result in an increased demand on tie-down at the lower bracing unit and the bracing capacity may be limited by this connection or the amount of horizontal deflection at the top of the stacked bracing unit.

It is always a good idea to keep the units lined up as close as possible to minimise eccentric effects and to ensure connections between the PWTB's can be achieved without the need to introduce alternative transfer mechanisms. Alternatively, if the wall layout permits, these units could be staggered sufficiently to facilitate independent tie-down connections.

Careful detailing of PWTB will be needed to ensure web profiles are configured to allow tie-down load path without any conflicting members.

If in doubt, seek advice from a Pryda design office.

Fig 3.3 : Connection details for stacked units

3.4 Tie-down connection for PWTB3 units

Use a M12 **Ramset™ ChemSet™ Anchor stud** welded to steel plate and anchored to concrete by setting in epoxy mortar using **Ramset™ ChemSet™ Reo502™** to achieve a nominal 32.0 kN capacity.

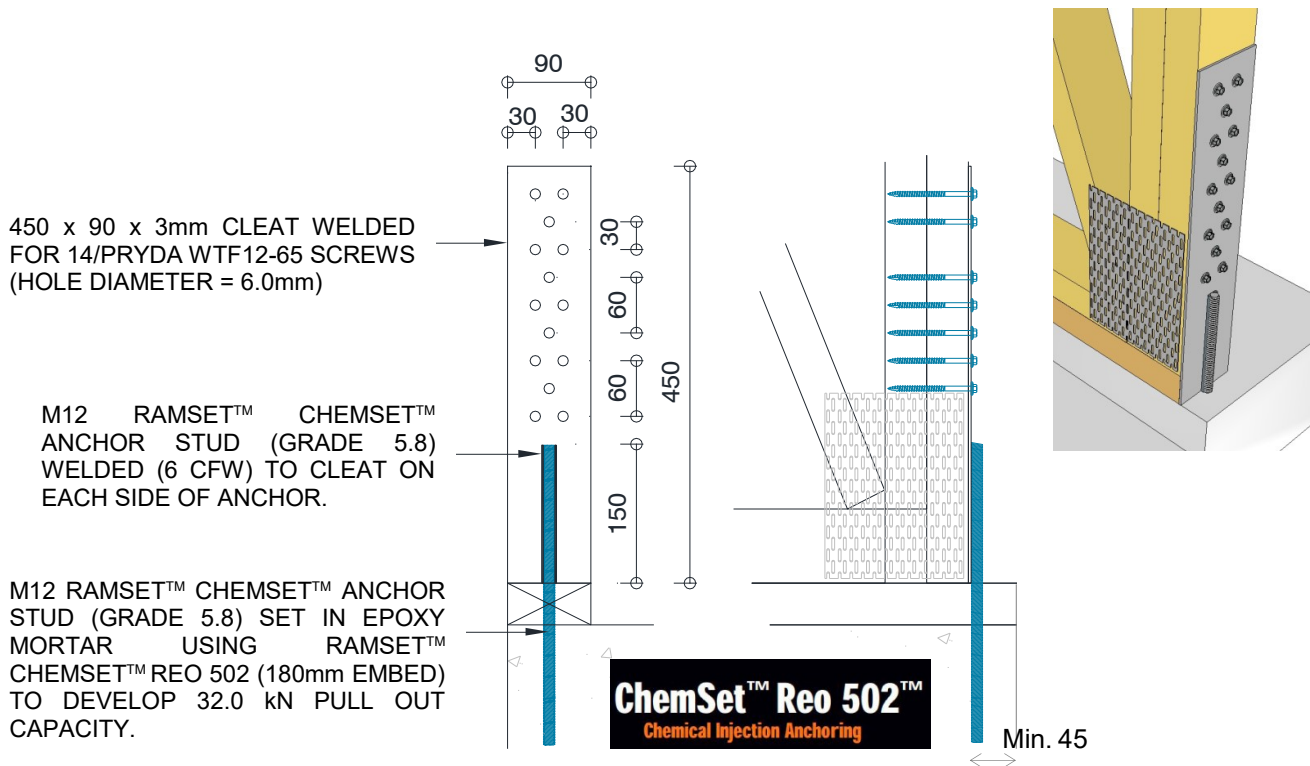


Fig 3.4 : Typical Tie-down Connection for PWTB3

Minimum requirements:

- Grade 20 concrete.
- 35mm edge distance.
- Effective anchor depths:
 - 160mm for minimum 35mm edge distance (i.e 70mm framing) OR
 - 140mm for minimum 45mm edge distance (i.e 90mm framing)
- Concrete thickness to be equal to effective anchor depth + 25mm.
- A standard M16 anchor rod (Grade 4.6) may be used in lieu of M12 Ramset™ ChemSet™ Anchor stud, provided a minimum edge distance of 50mm is available.

Note: if the bracing unit is located at a corner, the vertical chord must be set back sufficiently to allow a minimum 45mm edge distance.



CAUTIONARY NOTE:

When using PWTB3 at upper floor levels, it must be ensured that the tie-down anchorage load is transferred safely down to the ground. Seek advice from an engineer.

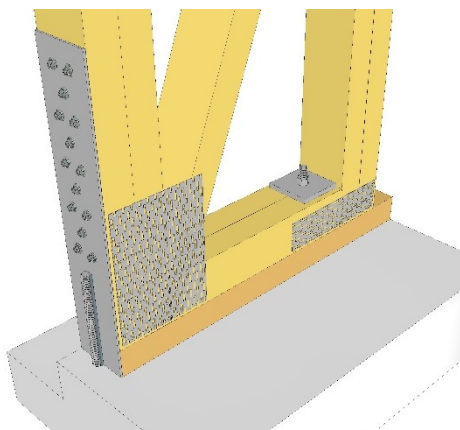
For complete design capacities and installation instructions on the above anchor, visit Ramset at www.ramset.com.au or contact RamsetReid direct.

3.5 Alternative tie-down connection for PWTB3 units

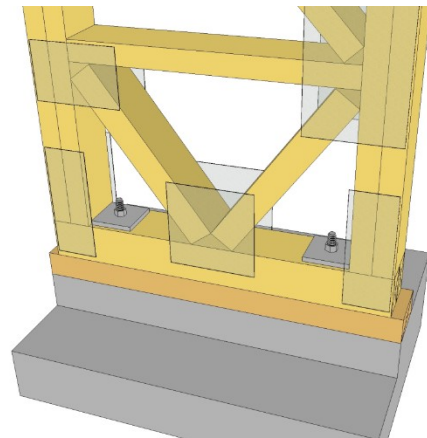
The tie-down connection may not always be suitable for use on the outside faces of PWTB3, especially at full-height openings. In such cases the detail in (2) may be applied without the steel plate, by anchoring the horizontal web at the bottom of PWTB3 directly to concrete with a M12 **Ramset™ ChemSet™ Anchor stud** set in epoxy mortar using **Ramset™ ChemSet™ Reo502™**.

It is however important to give consideration to the following conditions when installing the anchor within the truss:

- (i) The web profile shall be modified to maximise space around the anchor.
- (ii) The length of the unit shall be limited to a minimum 600mm, when both anchors are located within PWTB3 (Case B)
- (iii) The design capacity shall be reduced by a factor ($Kr1$), depending on whether one or both anchors are positioned inside the truss, to ensure the tie-down demand remains unchanged. $Kr1$ is tabulated below for Case A and Case B, for wall lengths of 450mm, 600mm and 750mm. Note: the values may be interpolated for lengths in-between.



Case A:
One Anchor located within PWTB3
Web profile needs minor adjustment



Case B:
Both Anchors located within PWTB3
Web profile needs major adjustment

Fig 3.5a : Alternatives for PWTB3

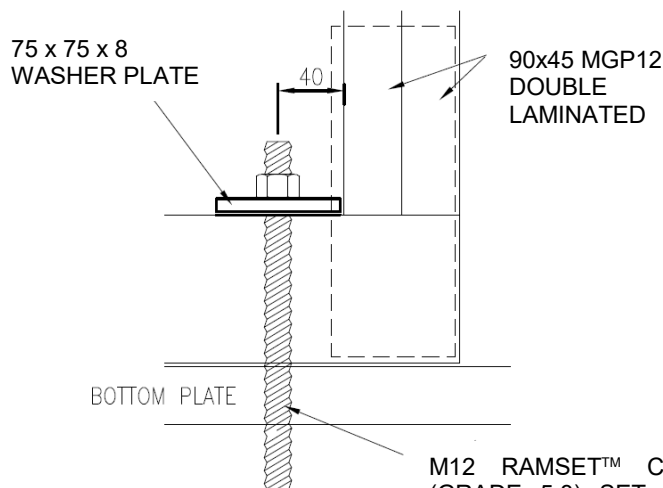


Fig 3.5b Details of Alternative Tie-Down Anchor. Fixing to concrete is similar to previous

M12 **RAMSET™ CHEMSET™ ANCHOR STUD** (GRADE 5.8) SET IN EPOXY MORTAR USING **RAMSET™ CHEMSET™ REO 502** (180mm EMBED) TO DEVELOP 32.0 kN PULL OUT CAPACITY

Wall Length	Anchor Location	
	Case A	Case B
300	0.70	N/S
450	0.80	N/S
600	0.85	0.78
750	0.88	0.82

Capacity Reduction Factor ($Kr1$)
Based on anchor location

4.0 ADDITIONAL CONSIDERATIONS AT OPENINGS

4.1 Alternative PWTB1 at Openings

Top plate and it's fixings to be designed as per AS1684 for standard stud spacing.

300-600mm

End web to be orientated on its edge (using double webs) if any girder trusses are located within the unit. Seek advice from Pryda

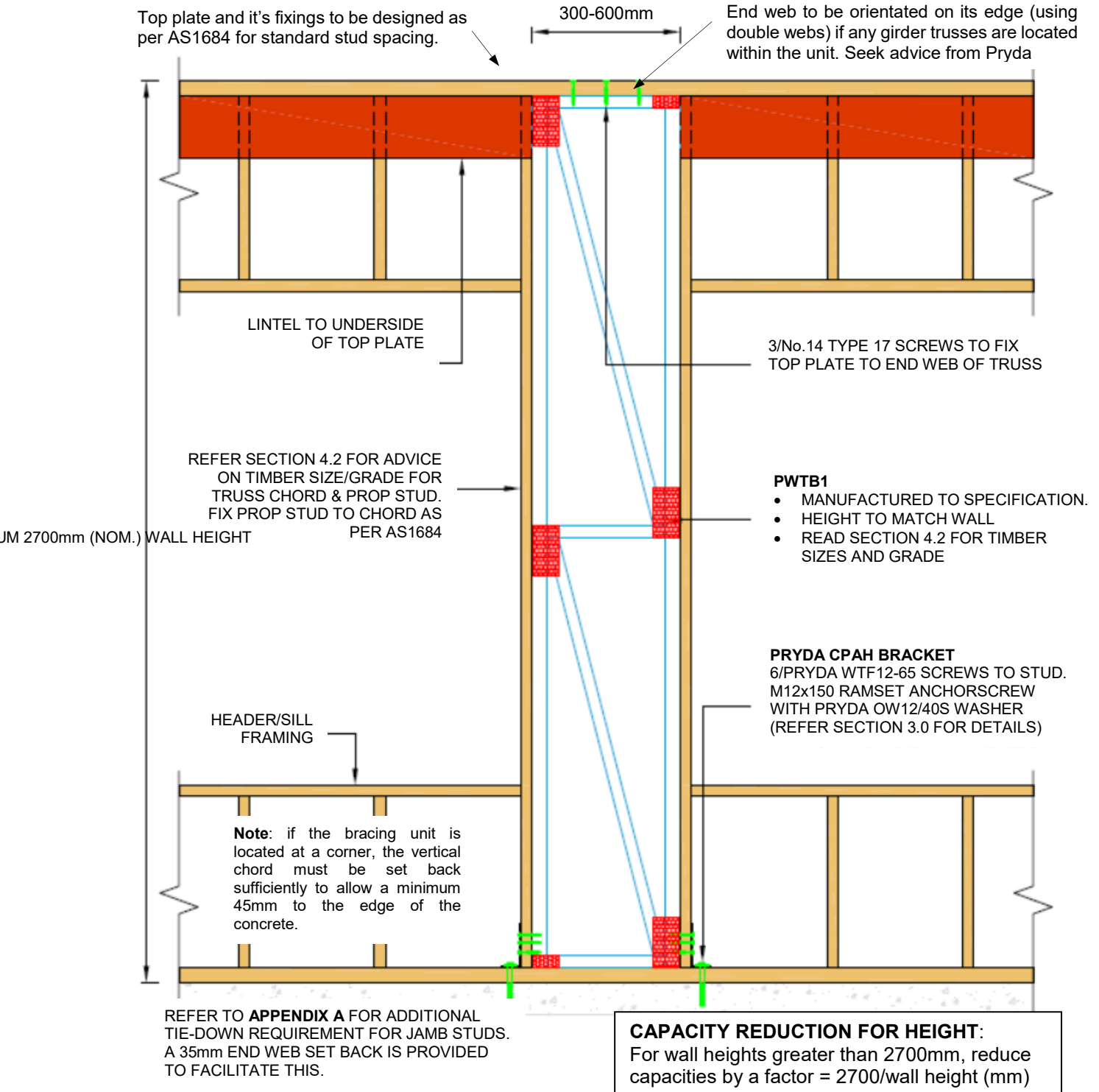


Fig 4.1: Modified Specifications for PWTB1 at openings with incorporated jamb studs

Note for Combined Bracing Unit + Jamb studs:

If PWTB1 is to serve as a bracing unit and as jamb studs, special consideration must be given when selecting timber sizes/grades for the 'chord' members (vertical full-length members). Read **Section 4.2** for further details

Also, additional tie-down connectors may be required based on the demands of the jamb studs. These tie-down connections must be fixed prior to installing PWTB. Read Appendix A for more details.

4.2 Timber Specifications for PWTB1 at Openings

Timber specifications given here are for **PWTB1** units as in Section 4.1, where the truss serves not only as a bracing unit but also forms as part of the jamb stud configuration.

The below timbers are the minimum required for both the 'chord' members of PWTB1 which act as the primary jamb stud (full-length) and the secondary jamb stud (or prop stud).

These specifications are valid for wall heights up to 2700mm.

4.2.1 Concrete tile roofs

Wind classification = N2

Opening width	Roof Load Width		
	3000	5000	7500
1200	90x35 P10	90x35 P10	90x35 P10
1800	90x35 P10	90x35 P10	90x45 P10
2400	90x35 P10	90x45 P10	90x45 P12
3000	90x45 P10	90x45 P12	90x35 LVL*
3600	90x45 P10	90x35 LVL*	90x35 LVL*

Wind classification = N3

Opening width	Roof Load Width		
	3000	5000	7500
1200	90x35 P10	90x45 P10	90x45 P10
1800	90x45 P10	90x45 P10	90x45 P12
2400	90x45 P10	90x45 P12	90x35 LVL*
3000	90x45 P12	90x35 LVL*	90x45 LVL*
3600	90x45 P12	90x45 LVL*	90x45 LVL*

Note: * LVL relates to all brands having a minimum MOE of 13000 MPa

4.2.2 Sheet roofs

Wind classification = N2

Opening width	Roof Load Width		
	3000	5000	7500
1200	90x35 P10	90x35 P10	90x35 P10
1800	90x35 P10	90x35 P10	90x35 P10
2400	90x35 P10	90x35 P10	90x35 P12
3000	90x35 P10	90x35 P12	90x45 P12
3600	90x35 P12	90x45 P12	90x45 P12

Wind classification = N3

Opening width	Roof Load Width		
	3000	5000	7500
1200	90x35 P10	90x35 P10	90x45 P10
1800	90x45 P10	90x45 P10	90x45 P10
2400	90x45 P10	90x35 P12	90x35 LVL*
3000	90x35 P12	90x35 LVL*	90x35 LVL*
3600	90x45 P12	90x35 LVL*	90x45 LVL*

4.3 Reduction Factors for PWTB3 at Openings

If the total tie-down demand at an opening, that involves a PWTB3, is to be limited to a 32.0 kN connector for 12.0 kN/m capacity (or 40.0 kN connector for a 14.0 kN/m), then the design capacity needs to be modified using the below **reduction factors**.

This reduction factor is required for PWTB3 units as it is not practical to enhance the tie-down anchorage.

Sheet roof, Wind Classification = N2 and Tile roof, Wind Classification = N3

Opening width	Roof Load Width		
	3000	5000	7500
1200	1.00	0.99	0.96
1800	1.00	0.97	0.92
2400	0.99	0.94	0.89
3000	0.98	0.92	0.85
3600	0.96	0.90	0.82

Sheet roof, Wind Classification = N3

Opening width	Roof Load Width		
	3000	5000	7500
1200	0.99	0.94	0.89
1800	0.97	0.90	0.83
2400	0.94	0.87	0.77
3000	0.92	0.83	0.71
3600	0.90	0.79	0.66

Note:

- Use Reduction Factor = 1.0 for tile roofs and wind classification = N2
- Seek advice from Pryda for application in cyclonic regions.

APPENDIX A – Typical Jamb Stud Tie-Down Fixing Requirement

1 – Sheet roofs in N2 wind classification (JD5 jamb studs)

	LINTEL OPENING					
RLW	1200	1800	2400	2700	3000	3600
1000	A1	A1	A1	A1	A1	A1
2000	A1	A1	A1	A1	A1	A1
3000	A1	A1	A1	A1	A1	A1
4000	A1	A1	A1	A1	A1	A2
5000	A1	A1	A1	A1	A2	A4
6000	A1	A1	A2	A4	A4	A4
7000	A1	A1	A4	A4	A4	B1
7500	A1	A2	A4	A4	A4	B1

2 – Sheet roofs in N3 wind classification (JD4 jamb studs)

	LINTEL OPENING					
RLW	1200	1800	2400	2700	3000	3600
1000	A1	A1	A1	A1	A1	A1
2000	A1	A1	A1	A1	A1	A2
3000	A1	A1	A2	A2	A4	A4
4000	A1	A2	A4	A4	A4	A4
5000	A1	A4	A4	A4	B1	B1
6000	A2	A4	B1	B1	B1	B2
7000	A4	A4	B1	B1	B1	B2
7500	A4	B1	B1	B1	B2	B2

3 – Tile roofs in N3 wind classification (JD4 jamb studs)

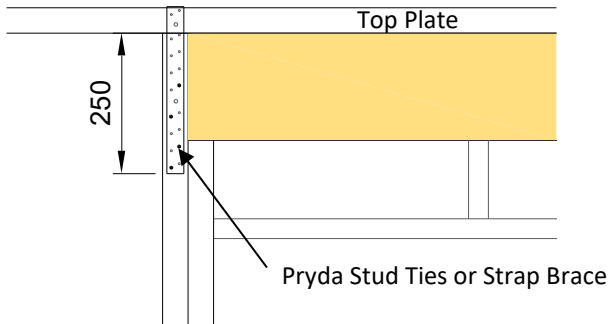
	LINTEL OPENING					
RLW	1200	1800	2400	2700	3000	3600
1000	A1	A1	A1	A1	A1	A1
2000	A1	A1	A1	A1	A1	A1
3000	A1	A1	A1	A1	A1	A1
4000	A1	A1	A1	A1	A2	A2
5000	A1	A1	A2	A2	A4	A4
6000	A1	A1	A4	A4	A4	A4
7000	A1	A2	A4	A4	A4	B1
7500	A1	A2	A4	A4	A4	B1

Notes:

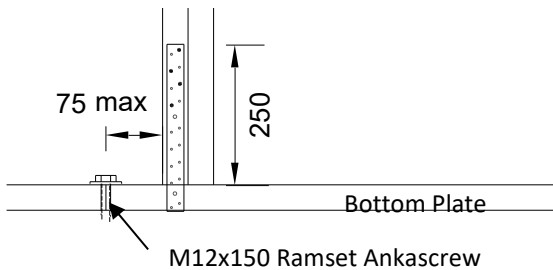
- Details of fixing types (A1 to A4, B1 and B2) are provided on the next page.
- Concrete tile roofs in N1 or N2 wind classifications require only nominal fixings.
- The RLWs assume an overhang of 600mm.
- A minimum joint group of JD5 for N2 and JD4 for N3 is considered in the calculations.
- The above table values are valid only for standard loading. Girder loads on lintel will require a separate assessment.

FIXING TYPES- as referred to in the above tables

Fixing Type A (A1 to A4)

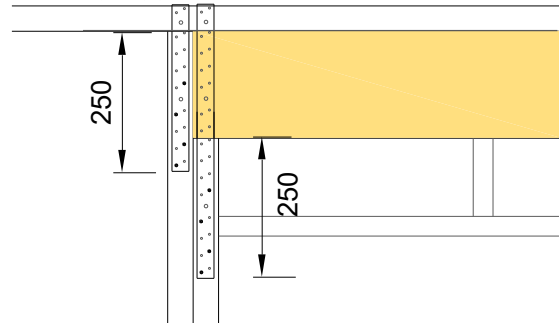


- Type A1 – using Pryda SST or Pryda Screw *
- Type A2 – using Pryda ST4 or Pryda Screw*
- Type A3 – using Pryda SB083 (4 nails/leg) or Pryda Screw*
- Type A4 – using Pryda SB103 (6 nails/leg) or 2/Pryda Screws*

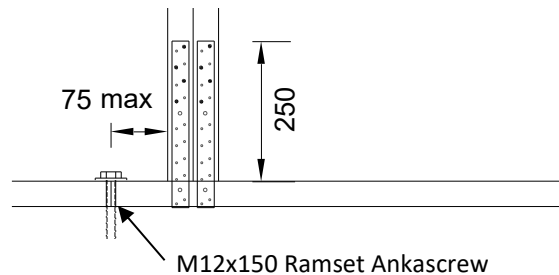


*Pryda screws shall be WM8150PS (M8x150) and require a minimum penetration into stud of 60mm (Types A1 & A4) or 80mm (Types A2, A3 & B1), fixed into both top and bottom plates. However, for Type A1, WM8100PS (M8x100) screws may be used to fix studs into 35mm bottom plates.

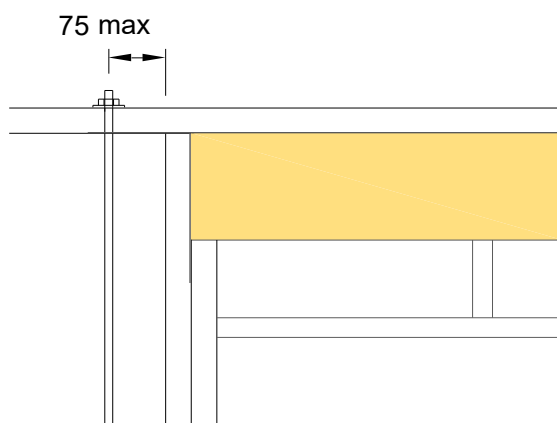
Fixing Type B (B1 & B2)



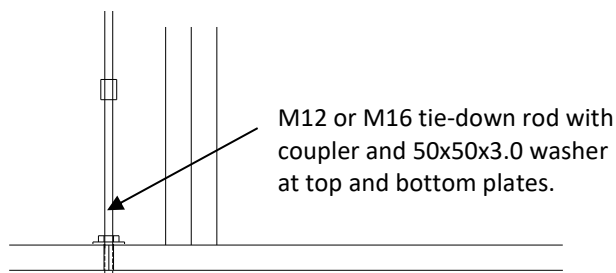
- Type B1 – using double Pryda SB083 (4 nails/leg) or 2/Pryda Screws* on primary jamb stud only (no SB083 on prop stud is required)
- Type B2 – using double Pryda SB103 (6 nails/leg)



Fixing Types C & D



- Type C – M12 rod
- Type D – M16 rod



Notes:

- (i) The joint group refers to the joint group of jamb studs for types A & B or top plate for types C & D.
- (ii) The capacities for types C & D are obtained from Table 9.20 AS1684.2:2010.
- (iii) Ramset™ AnkaScrews™ M12x150 uses a 50x50x3 washer and is based on the following minimum requirements:
 - Grade 20 concrete
 - 45mm edge distance.
 - 100 mm anchor depth (h = 100mm).
 - 140mm concrete depth

