

Pryda Timber Connectors

Bracing Guide



A complete guide to the design, specification and
installation of Pryda Bracing

INTRODUCTION

The information in this Product Guide is provided for use in Australia by architects, engineers, building designers, builders and others. It is based upon the following criteria:

1. **No Substitution:** The products covered by or recommended in this guide must not be substituted with other products.
2. **Design Capacity Basis:** See Codes & Standards following
3. **Supporting Constructions:** Constructions using Pryda products must be built in accordance with the BCA or an appropriate Australian standard. *Note: This includes appropriate corrosion protection- See Corrosion Protection following*
4. **Correct Installation:** Installation of Pryda products must be strictly in accordance with the instructions in this guide
5. **Current Guide Version Used:** The current version of this guide, including any amendments or additions, must be used. Users are advised to check with Pryda for updates at least every three months by telephone, the web site: www.pryda.com.au or by email to: info@pryda.com.au.

CODES & STANDARDS

Product design capacities in this guide have been derived from:
(a) results of laboratory tests carried out by or for Pryda Australia
(b) engineering computations in accordance with the relevant Australian standards, ie:

- * AS1720.1-2010 Timber Structures. Part 1: Design Methods
- * AS/NZS1170 series : 2002 Structural Design Actions
- * AS4055 -2006 Wind Loads for Housing

Reference is also made to AS1684.1-1999 Residential Timber Framed Construction - Part 1: Design Criteria.

Design capacities tabulated in this guide apply directly for **Category 1** joints. For all other joints, reduce design capacities by using the factors as specified in *General Notes* (if applicable). Design capacities are related to the **Joint Group** of the timber as defined in AS1720 and AS1684. If the joint group of timber members joined together varies, the lower group must be assumed for design, eg: JD5 is lower than JD4.

DEFINITIONS

Special terms used in this guide are as defined in Australian standards, including:

Design Capacity: the maximum Limit State Design load (aka "action") which the product can safely support under the specified load condition, eg: 1.2G + 1.5Q (dead+roof live). See *General Notes for details (if applicable)*

Joint Group: classification of a timber according to its fastener-holding capacity. See *General Notes for details (if applicable)*

CORROSION PROTECTION

Most Pryda products are manufactured using Z275 light-gauge steel, having zinc coating of 275 gsm (total weight). This protection is adequate only for INTERNAL applications in most corrosion environments, except areas that are classified as heavy industrial or those subject to high humidity (eg: enclosed swimming pools) etc. Under these circumstances, seek advice from experts as special protection will be required. *Note: INTERNAL areas are those within the building envelope that are kept permanently dry.*

AS1684.2-2010 and AS1684.3-2010- Australian Standards for Residential Timber Frame Construction stipulates a minimum Z275 steel for all sheet metal products used in an internal environment.

In areas outside the building envelope that are exposed to repeated wetting (EXTERNAL areas), Pryda's stainless steel products or equivalent should be considered. Some alternatives include hot dip galvanised or powder coated steel, which are not supplied by Pryda. For more detailed information, read Pryda's Technical Update on *Corrosion Resistance of Pryda Products* or contact a Pryda office.

PRODUCT CERTIFICATION

Pryda Australia warrants:

- * Products in this guide are free from defects in the material or manufacturing
- * Design capacities are in accordance with test results or current, relevant Australian standards and the Building Code of Australia.
- * Pryda products are structurally adequate provided they are designed, installed and used completely in accordance with this guide.

This warranty applies only to:

- * products in this guide
- * products used in the specified applications and not damaged after manufacture and supply
- * joints free from wood splitting, decay or other timber defects within the joint or within 150 mm of the joint.

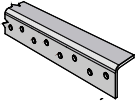
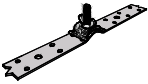

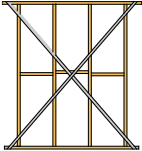
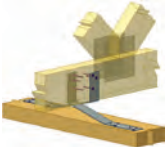

INSTRUCTIONS FOR INSTALLATION

These notes are provided to ensure proper installation.

1. All fasteners used must be manufactured by reputable companies and be of structural quality.
2. Connectors must not be installed on timber which is split before or during installation. If the timber is likely to split as fasteners are driven, fastener holes must be pre-drilled.
3. Do not overload the joints- during construction or in service.
4. Bolt hole diameter must be 0.8 mm to 1.5 mm larger than the bolt diameter and the specified washers must be installed.
5. Use proper safety equipment and due care in installing these connectors
6. Any gaps in joints between the timber members must not exceed 3 mm
7. Do not over-tighten screws.

Pryda Bracing Guide

TABLE OF CONTENTS

	GENERAL NOTES	4
	Useful notes and definitions for effective reading of this guide	
	PRYDA ANGLE BRACE a formed steel section brace in two sizes, ie: Mini Brace and Maxi Brace for use as wall bracing and nogging	5
	PRYDA STRAP BRACE a flat, tensioned steel strap in six section sizes for all bracing uses	6
	PRYDA SPEEDBRACE a formed steel tension brace for roof and other bracing uses	8
	WALL BRACING DETAILS Details of Types A and B bracing units	9
	DESIGN CAPACITIES Tension Capacities for all bracing products	12
	PRYDA SHEAR CONNECTORS Fixed to the top of non-load bearing bracing walls to transfer racking loads from ceiling plane.	14
	RAMSET ANKASCREWS Concrete anchor screws for tie-down of bracing units	16
	APPENDIX Provides information and recommendations on design, construction and engineering matters related to the bracing of walls in timber framed construction	17

Product Information Updates

Information contained in this product guide is subject to change.
The latest updates are available from www.pryda.com.au.

GENERAL

For more than 20 years, Pryda bracing products have been developed to be structurally sound and cost effective for the bracing of roofs, walls, floors and other parts of timber framed buildings. They are designed to meet code bracing requirements and have been laboratory tested to assure their strength, since computations without testing has been shown to be an unreliable basis for assessment of performance.

Specification for Pryda Bracing

All Pryda bracings are manufactured from G300 - Z275 ZincForm® steel or equivalent for high strength and corrosion resistance in normal, interior uses. Powder coating and higher levels of zinc coating are also available to suit use in corrosive environments such as near the sea front.

Product details are tabulated in the **Pryda Price List** and **Pryda Catalogue** publications.

Which Bracing To Use?

Collectively, Pryda bracings are suited to all common bracing uses in timber framing, ie:

Application	Suitable Bracing
Floor joists	Strap Brace
Walls	Angle Brace, Strap Brace, Speedbrace
Roof trusses	Speedbrace*, Strap Brace

*Note: * Especially recommended for this use.*

For bracing of walls in accordance with AS 1684 Residential Timber-framed Construction, see the **Pryda Wall Bracing Unit Construction Guide** available in this document (from page 8 onwards)

A guide to bracing roof trusses is included in AS4440:2004 *Installation of Nailplated Timber Trusses*. Speedbrace is usually preferred to Strap Brace for this use because of its special advantages.

Pryda bracings can also be used for some uncommon applications, depending on the design strength required. For this reason, **Design Capacities** are included in this publication. Except for Angle Brace, all Pryda bracings can be "doubled up" (ie: two braces used together) to provide twice the bracing strength. This is provided there is a sufficient area of timber at both ends of the brace to drive the required number of nails at the required spacings and edge distances.

Pryda Timber Connector Nails

For fixing of all Pryda Bracings, it is essential to use galvanised **Pryda Timber Connector Nails**, ie: the special 35x3.15 mm nails developed by Pryda specifically for fixing of our products. Laboratory strength testing has shown that clouts are not adequate for this purpose as their heads may pop off under less than design load.



Pryda Timber Connector Nails

Machine Driven Nail Use

Where appropriate, 32x2.3 mm Duo-Fast C SHEG (ie: screw hardened electro galvanized) machine driven nails (code D40810) or equivalent may be used instead of the specified 35x3.15 mm Pryda Timber Connector Nails to fix Pryda connectors provided that:

- 20% more nails are used (eg: 5 instead of 4, 4 instead of 3, 3 instead of 2) or alternatively, design capacities are to be reduced by 20% where the same number of nails are used
- machine driven nails are driven at nail spacings and edge distances similar to the hole pattern, ensuring that these nails are not driven into the holes or located not closer than 5mm from the edge of a hole.

Fixing into steel supporting structure

Pryda products can be fixed into steel using Tek screws or similar.

Information on fixing Pryda bracing products to steel framing is available in the publication titled *Design Guide – Pryda Connectors for Steel Framing*.

Material Thickness

All material thicknesses referred to in this guide are the total coated thickness. This includes the zinc coating thickness, which is typically around 0.04mm for Z275 steel.

Installation

Good installation of bracings is most essential. Pryda recommendations as specified in this Guide. Particularly important are:

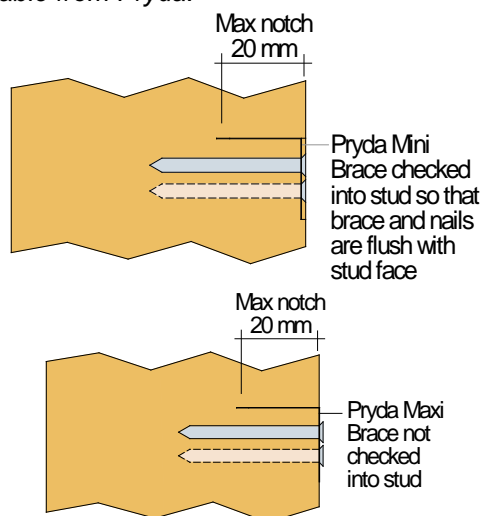
Nailing: Keep the **nails away from ends or edges** of timber to assure good nailholding.

Brace Angle: Install the brace at an angle of between 40 and 50 degrees to the horizontal if possible. Otherwise, the minimum is 30 degrees, maximum 60 degrees.

Strap Tensioning: Ensure each length of Strap Brace has a Pryda Tensioner, properly tightened prior to nailing. Tension Speedbrace by hammering it flat over each stud and wall plate.

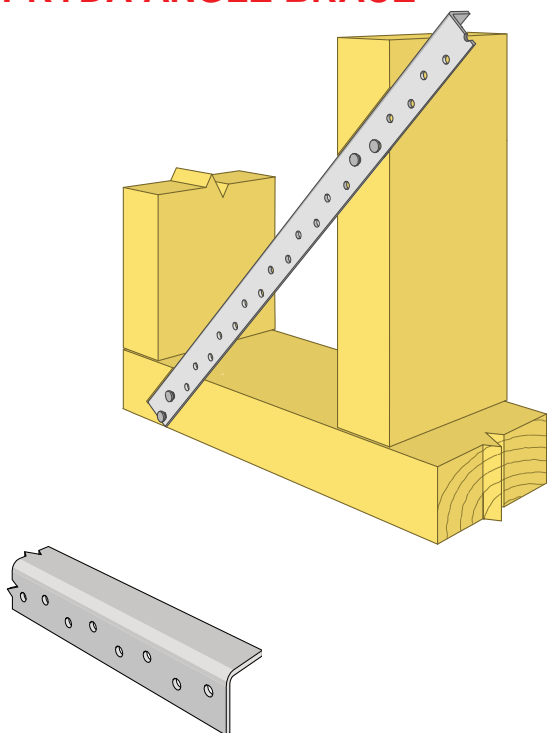
Angle Brace Slots: Don't overcut the slot (notch) for the brace as this will weaken the studs. 20 mm is the required maximum slot depth for both Mini and Maxi Brace. As Mini Brace has a shorter leg (16 mm), the studs can be checked 3 mm so that the brace and nails are installed flush with the stud edge (pictured). Maxi Brace must not be checked (rebated) into the stud edge because the notch depth would then exceed the 20 mm maximum specified in AS1684.

Note: Information about suitable equipment for cutting checks in the studs for Angle Brace is available from Pryda.



See also: **Pryda Installation Guide for Pre-fabricated Walls with Pryda Bracing**

PRYDA ANGLE BRACE



Uses

Pryda Mini Brace and **Maxi Brace** can be used as bracing or nogging of Type A Bracing Units in wall frames in accordance with AS1684-2010 Residential Timber-Framed Construction and the **Wall Bracing Units Construction Guide**

Sizes

Available sizes are:

Pryda Mini Brace 18 x 16 x 1.2 mm

PRODUCT CODE	MB36	MB42	MB48
LENGTH	3.6	4.2	4.8

Tied in bundles of 10 lengths.

Pryda Maxi Brace 20 x 18 x 1.2 mm

PRODUCT CODE	AB36	AB42	AB48
LENGTH	3.6	4.2	4.8

* Tied in bundles of 10 lengths.

Installation

As bracing or nogging, **Pryda Angle Brace** can be installed either sitting on the surface of the timber framing or checked in flush with the surface using a chisel or a checking head on a circular saw. To install Angle Brace:

1. Square up the wall or temporary frame ready for bracing.
2. Use the edge of the brace to draw a straight line where the brace or nog is to go, and cut the slots. Note that the brace angle must be from 30 to 60 degrees to the horizontal and ends of the brace should be 150 mm minimum from the end of the plate.
3. Fit the brace into the slots with the the vertical leg downwards for safety reasons. Fix it with one **Pryda Timber Connector Nail** per stud, and two Pryda Timber Connector Nails per wall plate.

PRYDA STRAP BRACE AND TENSIONERS



Uses & Advantages

Pryda Strap Brace with Tensioner, is an easy-to-use, flat strap, steel bracing for roofs, walls, ceilings and floors. Strap Brace complies with the wall bracing rules of AS1684 Residential Timber-framed Construction and has excellent advantages, including:

- ▶ **Saves on-site labour time** as studs do not have to be notched. The unnotched studs can often be a smaller size and hence cheaper than notched studs
- ▶ Available in long length coils for ease of handling and minimum wastage
- ▶ **Easily and quickly tensioned** using the Strap Brace Tensioner - simply by driving the hex-head screw (nutsert option) or turning the wing nut (wingnut and t-bolt option).

Pryda Strap Brace is ideal for bracing applications where timber braces are not feasible because of their thickness or because timber can't be bent, eg: exposed beams or rafters, or trusses.

Sizes

Available sizes of **Pryda Strap Brace** are:

PRODUCT CODE	ARTICLE & SIZE
SB082/6 **	25 x 0.8 mm x 6 m coil
SB082/15 **	25 x 0.8 mm x 15 m coil
SB082/30 **	25 x 0.8 mm x 30 m coil
SB083/15	30 x 0.8 mm x 15 m coil
SB083/30	30 x 0.8 mm x 30 m coil
SB083/50	30 x 0.8 mm x 50 m coil
SB103/30	30 x 1.0 mm x 30 m coil
SB103/50	30 x 1.0 mm x 50 m coil
SB123/30	32 x 1.2 mm x 30m coil
SB083/3.5	30 x 0.8 mm x 3.5m lengths
SB083/3.5W-500	30 x 0.8 mm x 3.5m lengths
SB083/4.0W-500	30 x 0.8 mm x 4.0m lengths
SB083/4.5	30 x 0.8 mm x 4.5m lengths

** SB082 product is marketed as *Pryda Hoop Iron*

Strap Brace Tensioners:

Two types of **Strap Brace Tensioners** are available; SBT (using a M6x30 T-bolt, washer and a wing nut) and SBT100N (with nutsert and M6x30 hex-head bolt).

SBT100N tensioners are available in cartons of 100, whereas the SBT tensioners are available in 6 per pack x 5 packs (30 in carton)

Structural Performance

Pryda Strap Brace takes load in tension only and must, therefore, be used in pairs, in opposing diagonal directions. It must also be sufficiently tensioned to take the load without distortion of the frame.

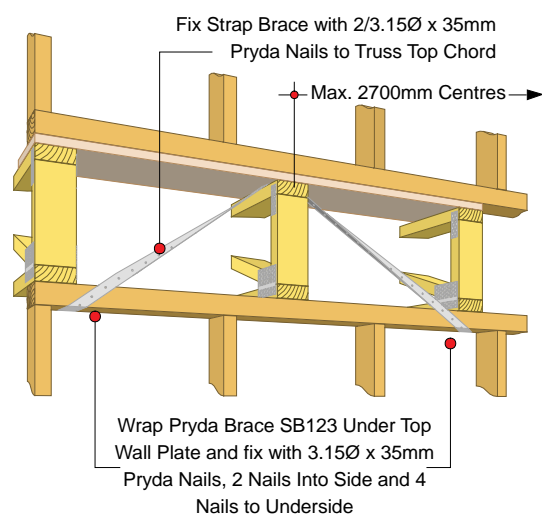
Installation Of Strap Brace

Floor Bracing

Pryda Strap Brace, of any size, can be used as a herring-bone bracing for floor joists - as illustrated. A Tensioner is not required for this use.

1. Fix the ends of both lengths of Strap Brace to the top and bottom of the first joist with two **Pryda Timber Connector Nails** per joint.
2. Pull each length of Strap Brace down from the top edge of the joist or up from the bottom onto the next joist. Tension it using a screw driver or similar tool and fix with one Pryda Timber Connector Nail at each joist.

For floor systems with trusses, I-joists or deep beams, bracing is required for both: (a) stability during construction and (b) wind resistance during the life of the building. The bracing can be Pryda Strap Brace or Unpunched Strapping. It is to be fixed to the floor members and supporting structure with 35x3.15 mm Pryda Timber Connector Nails or power driven 2.5 mm or 2.87 mm nails (as shown opposite).



Floor Bracing At External Wall

Wall Bracing

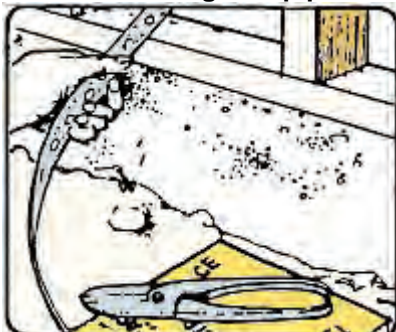
For details of bracing units see pages 9 to 11:

1. Make sure that the wall frame is close to square.
2. For Type B units, wrap the brace over the plate. Nail the end of the Strap Brace to the top plate within 150 mm of a stud using:
 - three Pryda Timber Connector Nails for Type A units and
 - four Pryda Timber Connector Nails for Type B units.
3. Lay the Strap Brace across the frame at an angle of 45 degrees approximately (30 to 60°) and with the unfixed end on the bottom plate at within 150mm of a stud and allowing a length of strap to wrap around the plate. Cut it to length.
4. Straighten and partially tighten the Strap Brace by pulling it down onto the bottom plate. For Type B units, wrap the brace over the plate. Fix the end of the Strap Brace to the plate within 150 mm of a stud using Pryda Timber Connector Nails ie:
 - two nails for Type A units and
 - four nails for Type B units.
5. Fix the second length of Strap Brace in the same manner, diagonally opposing the first length.
6. Fit and tighten the Tensioners on both braces, with the Tensioner facing into the frame. Adjust the Tensioner as required or until the brace is taut. NB: Do not use Strap Brace to plumb the frame.
7. Nail both braces to every stud crossed using ONE Pryda Timber Connector Nail for both Type A and Type B units:

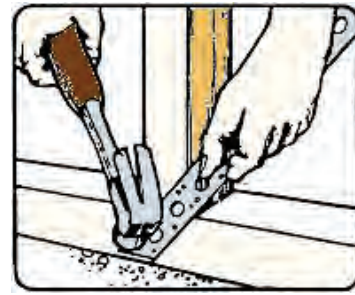
The required minimum number of bracing units is specified in AS1684.



Hammer fixing to top plate



Pulling Out The Brace



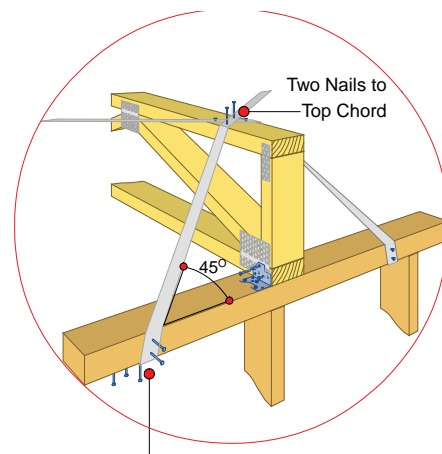
Fixing to bottom plate

Roof Bracing

To brace standard trusses, rafters or roof beams:

1. Use only SB123 Strap Brace (or Speedbrace) for roof bracing. Refer to AS4440-2004 or Pryda Truss Installation Guide to establish whether single or double Strap Brace is required, based on roof span, pitch and wind speed.
2. Lay out diagonal opposing lengths of Strap Brace on top of the roof framing at a maximum angle of 30 degrees (measured on plan) to the ridge line. Braces are required on both sides of the ridge line and at both ends of the roof.
3. Fix Strap Brace at both ends by wrapping one end around the top wall plate and the other end around the rafter, roof beam or top chord of a truss at the ridge, and by nailing each end using the required number of Pryda Timber Connector Nails.
4. Fit and tighten the Tensioners on both braces, with the Tensioner facing down into the roof space. Adjust the Tensioner as required or until the brace is taut. NB: Do not use Strap Brace to plumb the frame.
5. Nail both braces to every truss or rafter crossed using two Pryda Timber Connector Nails per crossing.

For more details of requirements for roof truss bracing refer to the **Pryda's Roof Truss Installation Guide** or to AS4440.

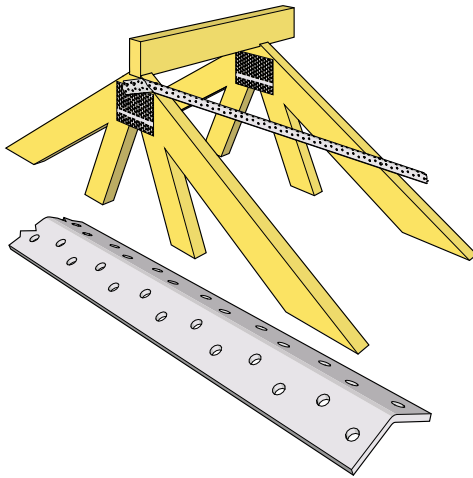


Anchorage Point - Bend Steel Brace to Side of Top Plate And Under Plate. Fix With Five Nails to Top Plate. Nails Shall be no Closer Than 10mm to The Edge of The Timber.

End Fixing detail on Rafter trusses

Refer to AS4440-2004 for other fixing details.

PRYDA SPEEDBRACE



Pryda Speedbrace, used as diagonal roof bracing, provides overall stability to the trussed roof and, in conjunction with the roof battens, prevents lateral buckling of the top chords. **Pryda Speedbrace** is also suitable for use as wall bracing.

Advantages

Pryda Speedbrace is applied on top of the top chord, eliminating the difficulty of applying a brace to the underside of the chord as is necessary with conventional timber braces. The profile of **Speedbrace** allows it to be applied without the need for tensioners as the rib merely needs to be hammered flat where it crosses the timber members.

In addition, **Speedbrace** can be spliced easily and can be wrapped around members to provide a sound and secure anchorage.

Sizes

Available sizes of **Pryda Speedbrace** are:

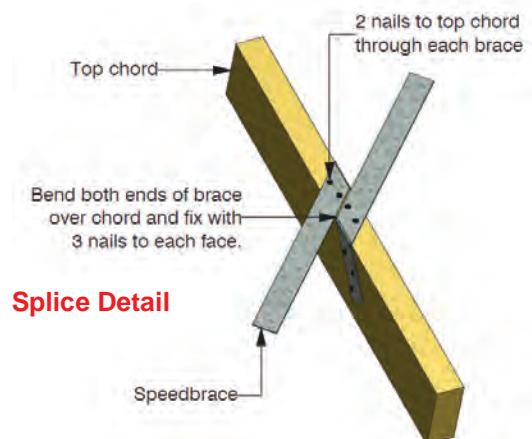
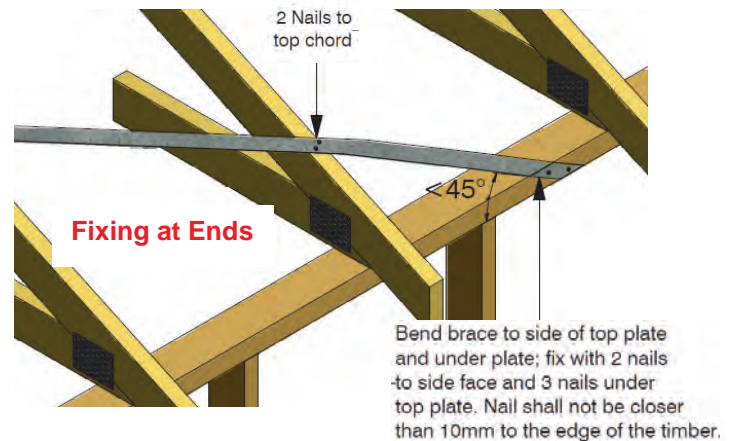
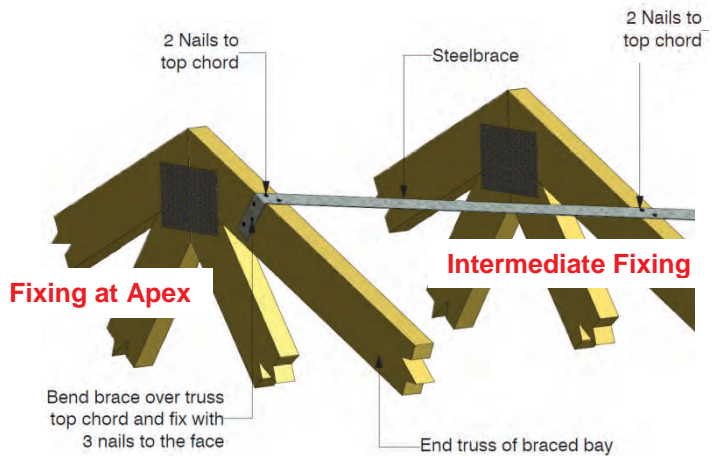
Code	SDB12	SDB36	SDB40	SDB50	SDB60
Length	1.2	3.6	4.0	5.0	6.0

Tied in bundles of 8 lengths.

Roof Bracing

Pryda Speedbrace can be installed as for Strap Brace, where Speedbrace crosses each truss it is hammered flat and nailed with two galvanised **Pryda Timber Connector Nails** at each truss crossed.

Pryda Speedbrace is spliced by overlapping lengths of brace hammering flat and nailing with the same number of galvanised **Pryda Timber Connector Nails** as is required at the top plate (see diagram below).



Refer to AS4440 for all other fixing details.

Wall Bracing

Pryda Speedbrace may also be used to brace wall frames, see:

WALL BRACING UNIT CONSTRUCTION GUIDE

The current, 2010 edition of AS1684 Residential Timber-Framed Construction specifies (in Section 8) methods of determining the required minimum amount of permanent wall bracing, ie:

- ▶ **Simplified method** (Part 4 of AS 1684): The number of Type A bracing units included in each plan direction must comply with Table 8.2- which depends on the overall size of the walls. Details of Type A bracing units are specified in Table 8.3 – and in this document.
- ▶ **Other constructions** (Part 2 or 3): The designer must either:
 - * calculate the design horizontal wind force (“total racking force” -kN) and the total capacity of the bracing included in each plan direction to resist this force, or:
 - * look up the wind force in Appendix G of the code and ensure by calculation that the total capacity of the bracing exceeds this force.

Details of wall bracing units and their capacities (in kN/m) are specified in Table 8.18 – and in this document.

The “Simplified method” applies only to non-cyclonic wind zone N1 (W28) or N2 (W33) and to buildings of limited size- see: Clause 1.6 of Part 4 of the code.

This guide provides full details of how bracing units (or “panels”) can be constructed in accordance with AS 1684 using **Pryda Bracings**, **Stud Ties**, **Strap Nails** and **Pryda Timber Connector Nails**. The details specified in AS1684 are based on the results of test on such units. Bracing capacities are for units with a lining such as plasterboard installed. During construction, additional, temporary bracing may be required until the lining is fully installed. For information on the derivation of unit capacities, contact Standards Australia.

Wall Bracing Units - Details

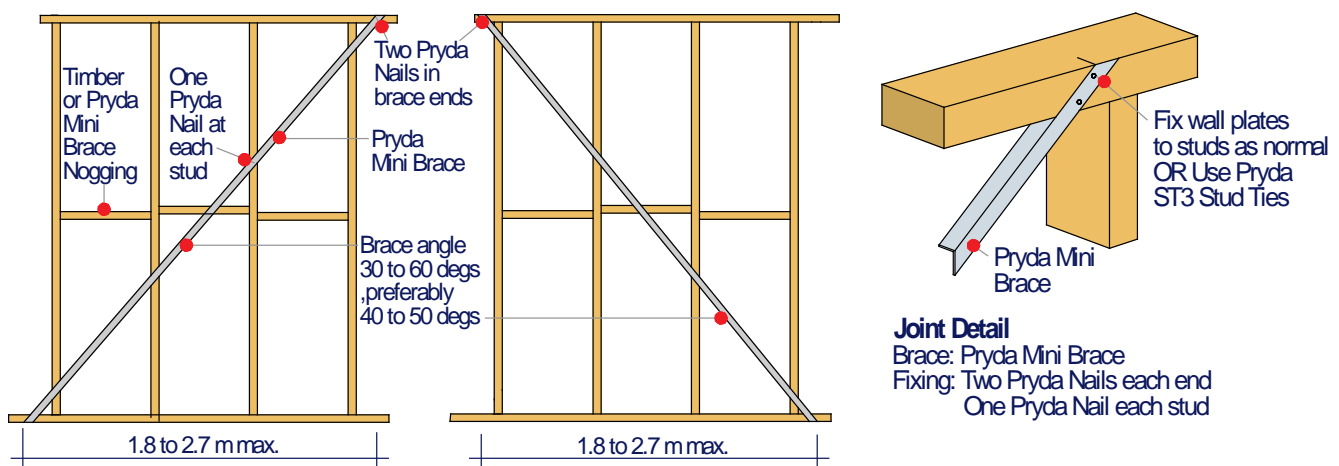
Mini Brace, Two Lengths, Type A Unit

This bracing unit comprises **two sections** of the same wall with **Pryda Mini Brace** braces in opposing diagonals, as shown below. These two wall sections are considered to work together. AS1684 has a maximum wall height of 3.0 m (except at gable or skillion ends). Design capacity of these units is 0.8 kN/m for wall heights up to 2.7 m and and 0.72 kN/m for 3.0 m height. The table values given below are the **total capacity from both wall sections** and assumes that both wall sections are of equal length:

Wall Height (m)	Bracing capacity (kN) for Bracing length of EACH Wall Section (m)									
	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7
2.7	2.7	2.9	3.0	3.2	3.3	3.5	3.6	3.8	3.9	4.1
3.0	2.4	2.6	2.7	2.8	3.0	3.1	3.2	3.4	3.5	3.6

Note: For walls higher than 2.7 m, reduce the bracing unit's capacity in inverse proportion to the wall height, eg: for 3.6 m walls, take $2.7/3.6 = 0.75$ times the capacity for 2.7 m height

The nails used must be galvanised **Pryda Timber Connector Nails**, code OSNG, size 35x3.15 mm.



Note: A minimum 3.6m wall length (i.e using two 1.8m units with Mini Brace as opposing diagonals) will be required to accommodate this type of bracing unit. Accordingly, a minimum 5.4m wall length is required to achieve a maximum capacity of 4.1 kN (see table)

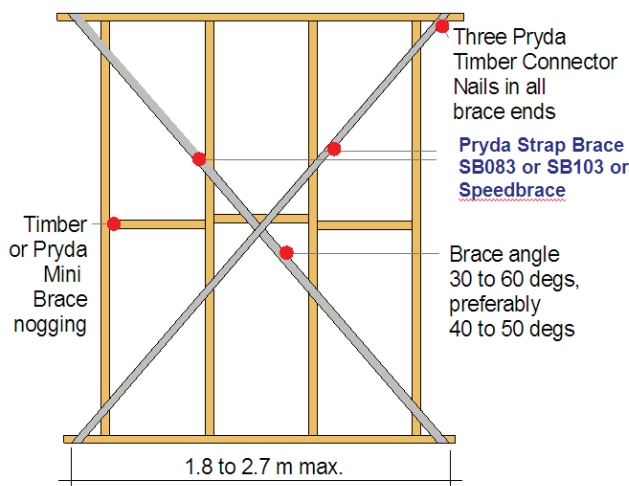
Strap Brace/Speedbrace Type A Unit (Racking Capacity = 1.5 kN/m)

This bracing unit comprises one section of the wall, with cross-over braces of **Pryda Strap Brace** or **Pryda Speedbrace** as shown below. The minimum recommended Strap Brace size (SB083) fully complies with AS1684.2:2010 and AS1684.3:2010 specifications. Maximum wall height in AS1684 is 3.0 m (except at gable or skillion ends). Design capacity is 1.5 kN/m for wall heights up to 2.7 m and 1.35 kN/m for 3.0 m height:

Wall Height (m)	Bracing capacity (kN) for Bracing length (m)									
	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7
2.7	2.7	2.9	3.0	3.2	3.3	3.5	3.6	3.8	3.9	4.1
3.0	2.4	2.6	2.7	2.8	3.0	3.1	3.2	3.4	3.5	3.6

Note: For walls higher than 2.7 m, reduce the bracing unit's capacity in inverse proportion to the wall height, eg: for 3.6 m walls, take $2.7/3.6 = 0.75$ times the capacity for 2.7 m height

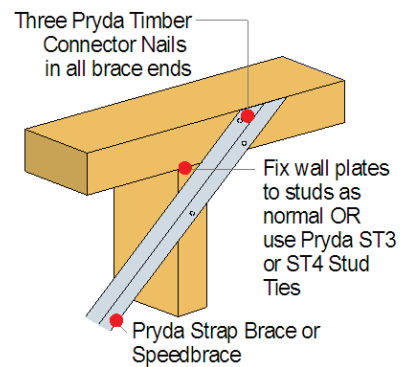
The nails used must be galvanised **Pryda Timber Connector Nails**, code OSNG, size 35x3.15 mm.



Joint Details:

Brace: Pryda Strap Brace SB083 or SB103 or Speedbrace

Fixing: Pryda Timber Connector Nails with 3 nails at each end and 1 nail at each stud.



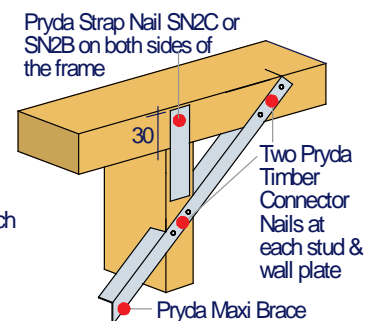
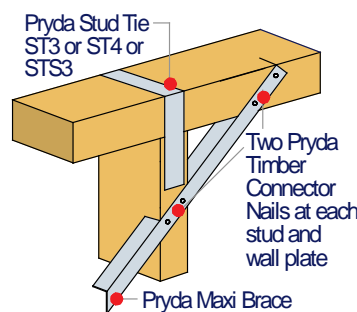
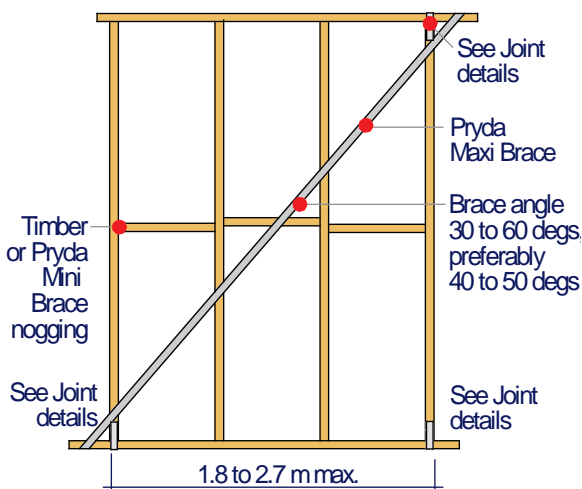
Maxi Brace, One Length, Type A Unit (Racking Capacity = 1.5 kN/m)

This bracing unit comprises one section of the wall, with one brace of **Pryda Maxi Brace**, as shown below. Maximum wall height in AS1684 is 3.0 m (except at gable or skillion ends). Design capacity is 1.5 kN/m for wall heights up to 2.7 m and 1.35 kN/m for 3.0 m height, ie:

Wall Height (m)	Bracing capacity (kN) for Bracing length (m)									
	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7
2.7	2.7	2.9	3.0	3.2	3.3	3.5	3.6	3.8	3.9	4.1
3.0	2.4	2.6	2.7	2.8	3.0	3.1	3.2	3.4	3.5	3.6

Note: For walls higher than 2.7 m, reduce the bracing unit's capacity in inverse proportion to the wall height, eg: for 3.6 m walls, take $2.7/3.6 = 0.75$ times the capacity for 2.7 m height

The nails used must be galvanised **Pryda Timber Connector Nails**, code OSNG, size 35x3.15 mm.



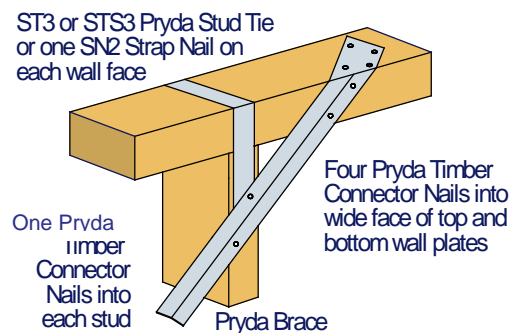
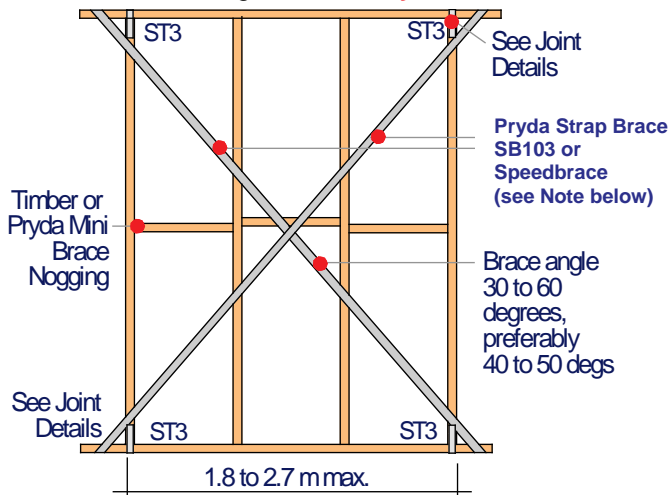
Type B Unit (Racking Capacity = 3.0 kN/m)

This Type B bracing unit uses **Pryda Strap Brace** (SB103) or **Pryda Speedbrace**, a steel brace thicker than the one used for Type A units. *Note: Pryda Strap Brace (SB083) may also be used provided the below table values are reduced by 20%.* Maximum wall height in AS1684 is 3.0 m (except at gable or skillion ends). Design capacity is 3.0 kN/m for wall heights up to 2.7 m and 2.7 kN/m for 3.0 m height, ie:

Wall Height (m)	Bracing capacity (kN) for Bracing length (m)									
	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7
2.7	5.4	5.7	6.0	6.3	6.6	6.9	7.2	7.5	7.8	8.1
3.0	4.9	5.1	5.4	5.7	5.9	6.2	6.5	6.8	7.0	7.3

Note: For walls higher than 2.7 m, reduce the bracing unit's capacity in inverse proportion to the wall height, eg: for 3.6 m walls, take $2.7/3.6 = 0.75$ times the capacity for 2.7 m height

The nails used must be galvanised **Pryda Timber Connector Nails**, code OSNG, size 35x3.15 mm.



Joint Detail

Brace: Pryda Strap Brace SB103 or Speedbrace

Fixing: Pryda Timber Connector Nails with 4 nails at each end and 1 nail at each stud.

Note: Pryda Strap Brace (SB083) may also be used provided the above table values are reduced by 20% or adopting a capacity of 2.5 kN/m.

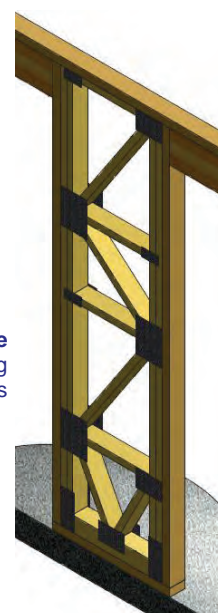
Narrow Bracing Units

Pryda has developed a series of Narrow Bracing Units using Strapbrace/Speedbrace. Details of these units are available in a separate publication titled *Pryda Design Guide for Narrow Wall Bracing Units*.

An alternative to steel cross-brace is the *Pryda Wall Truss Brace (PWTB)*, adopting a similar profile to a floor truss. Information on this can be obtained on request from any Pryda Design Office.



Pryda Wall Truss Brace
for narrow wall bracing applications



CONSTRUCTION & DESIGN DETAILS

Pryda's recommendations for materials, installation and design loads are given in the following topics.

Materials

The Pryda Bracing products included in these units are:

Brace Product	Details	Product Code
Mini Brace	18x16x1.2 mm Angle Brace	MB36, MB42, MB48
Maxi Brace	20x18x1.2 mm Angle Brace	AB36, AB42, AB48
Speedbrace	37x1.0 mm	SDB12, SDB36, SDB40, SDB50, SDB60
Strap Brace	30x0.8 mm, 30x1.0 strap	SB083, SB103

Warning: For the construction of bracing units don't use Hoop Iron and beware of 0.6 mm thickness (or thinner), non-engineered bracing. The latter material may be offcuts of Zincalume or Colorbond which are roofing materials having little or none of the sacrificial protection to cut edges which is a feature of the Galvabond (or equivalent) material used for Pryda products. This protection is required for good corrosion resistance in contact with mortar.

All nails used for bracing units must be galvanised **Pryda Timber Connector Nails** (35x3.15 mm flathead), Code OSNG. Pryda will not support the use of other nails unless it can be shown by testing that the alternative nails have equivalent or better shear and withdrawal strengths. See note on *Use of Machine Driven Nails* for more information on alternative nail usage.

Nail Capacities

The nail capacities tabulated below are for 35x3.15 mm **Pryda Timber Connector Nails**, under wind load. Select capacity according to the code used for computing design actions (loads), ie:

Joint Group	Design Capacity (ΦN_j) (kN)				
	2 Nails	3 Nails	4 Nails	5 Nails	6 Nails
JD3	2.6	3.9	5.3	6.2	7.4
JD4	1.8	2.8	3.8	4.4	5.3
JD5	1.6	2.4	3.2	3.7	4.4
J3	1.8	2.8	3.8	4.2	5.0
J4	1.3	2.0	2.6	3.0	3.5

DESIGN CAPACITIES

Pryda tests and computations have established the following Limit State Design capacities for Pryda bracings under wind load. Usually, the bracing strength is determined by the strength of nails used.

Tenison Capacities:

Code	Cross Section	Design Tension Capacity (ΦN_j) kN
Angle Brace (Mini and Maxi Brace)		
MB	18x16x1.2	7.8
AB	20x18x1.2	9.5
Speedbrace		
SDB	37x1.0	8.7
Strap Brace		
SB082	25x0.8	3.5
SB083	30x0.8	5.2
SB103	30x1.0	6.8
SB123	32x1.2	9.4

Compression Capacities:

Stud Spacing (mm)	Maxi Brace Design Compression Capacity (ΦN_j) (kN) at:	
	Parallel to Brace	45°
450	3.7	2.6
600	2.7	1.9

Fixing at the Top of Internal Bracing Units

At the top of internal bracing units, the wall must be fixed to the roof structure in order to transfer wind load from the roof to the walls- see Clause 8.3.6.9 of AS1684:2010 Part 2. Without this connection, these bracing units cannot act as part of the bracing system. For trussed roofs, the connection must allow a clearance for settlement of the trusses over time. The connection must have a shear capacity at least equivalent to the bracing capacity of the unit. Table 8.22 specifies suitable connections and their shear capacities.

Pryda has introduced a new product **Pryda Shear Connectors (PSC)** to help builders meet the requirements of AS1684. Complete details on the PSC is given in pages 14 and 15.

Fixing at the Bottom of Bracing Units (Tie-downs) - AS1684:2010 Requirements

AS1684-2010 Residential Timber Framed Construction - Parts 2, 3 and 4 specify requirements for bracing of walls (Section 8) which include fixing at the bottom of bracing walls (aka: bracing units, bracing panels).

Fixing Requirements For Bracing Walls- Simplified Interpretation

The following table interprets Clause 8.3.6.10 of AS1684:2010.

Case	Bracing Wall Type	Fixing Requirements- General
1	Nominal bracing	Nominal fixing only – as per Table 9.4
2	Up to 3.4 kN/m capacity, included in Table 8.18	Nominal fixing only – as per Table 9.4 (see note below)
3	3.4 to 6.0 kN/m capacity, included in Table 8.18	As specified in Table 8.18
4	3.4 to 6.0 kN/m capacity, not included in Table 8.18	Determine uplift force from Table 8.23 and fixing detail from Table 8.24 or other tie-down fixing specification- or: - refer Ramset™ AnkaScrews™ capacities in page 15 - or use engineering design
5	6.0 kN/m or greater capacity, included in Table 8.18	As specified in Table 8.18. Where intermediate bottom plate fixings are not specified in Table 8.18, additional intermediate bottom plate fixings of minimum 1 @ M10 bolt or 2 @ No. 14 Type 17 screws at maximum 1200 mm centres are required.
6	6.0 kN/m or greater capacity, not included in Table 8.18	As for case 4 above, with intermediate fixings

Notes:

- Table 8.18 of AS1684.2:2010 nominates that bracing systems with a racking capacity of 3.4 kN/m require only nominal fixing of the bottom plate to the concrete slab/floor joists. This reduced requirement has been established from whole house testing programs, along with post-wind damage assessments of the performance of bracing in housing.
- The nominal fixing requirement for bottom plate to concrete slab as per Table 9.4 is “One 75mm masonry nail (hand-driven at slab edge), screw or bolt at not more than 1200mm centres”

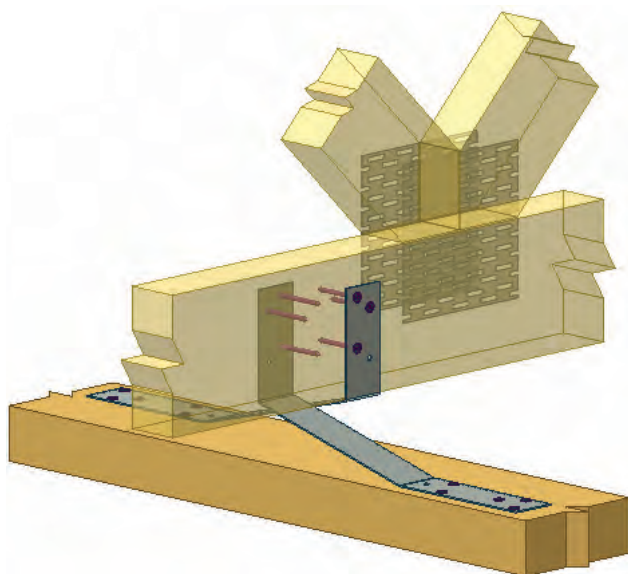
Useful AS1684:2010 Clauses & Tables on Wall Bracing

- Clause 8.3.6.10 Fixing of bottom of bracing walls
- TABLE 8.18 STRUCTURAL WALL BRACING
- TABLE 8.23 UPLIFT FORCE AT ENDS OF BRACING WALLS
- TABLE 8.24 FIXING OF BOTTOM OF BRACING WALLS
- TABLE 9.4 NOMINAL FIXINGS FOR TIMBER MEMBERS

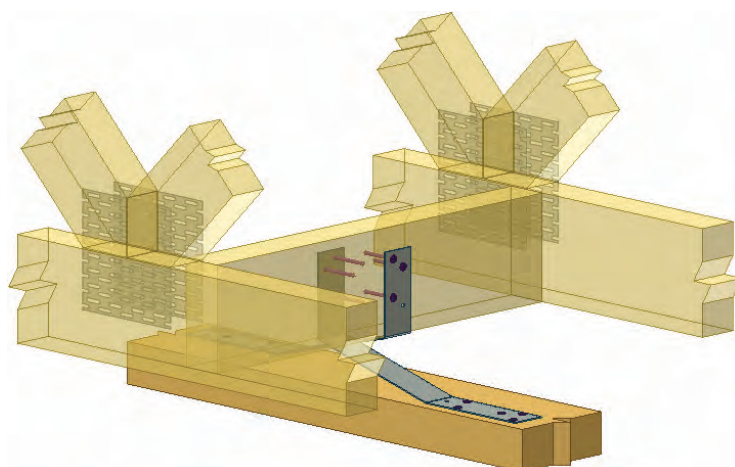
The AS1684 code is subject to amendments from time to time and the fabricators are advised to keep up to speed with them.

PRYDA SHEAR CONNECTORS

Connectors capable of transferring racking loads to bracing walls.



(a) Trusses Perpendicular to wall



(b) Trusses Parallel to wall

Pryda Shear Connector (PSC) in application (always used in pairs)

Application & Features

Pryda Shear Connectors (PSC) are used to transfer racking loads from the ceiling diaphragm to non-load bearing bracing walls.

These connectors allow vertical movement of trusses (to release creep deflection) and ensures that truss camber dissipation is uninhibited by over-driven nails.

PSC are fixed to top of bracing walls and can be used as a direct substitute for a pair of nail fixed timber blocks as specified in Table 8.22 AS 1684.2:2010 and AS1684.3:2010.

Table A provide design information on how PSC may be specified.

PSC should always be used in pairs as illustrated above.

Installation Instructions

1. All trusses are to be installed in accordance with the requirements of AS4440
2. Discard any damaged product.

3. It is preferable (but not essential) to fix the Pryda Shear Connectors (PSC) after the roof cladding has been fixed and prior to the application of the ceiling material.

4. The PSC are to be installed in opposing pairs on the same bottom chord of a truss.

5. Ensure the connectors are located adjacent to each other and directly over the internal, non-load bearing bracing wall to which they are to be fixed.

6. Fix each connector to the truss bottom chord with the specified number of nails so that the connector is flush up against the vertical face and under side of the truss bottom chord.

7. Ensure the long leg of each connector passes under the bottom chord and is located directly over the underlying top plate.

8. Press vertically downwards on the free end of the long leg of the connector until it contacts the top face of the underlying top plate.

9. Fix the long leg down to the underlying top plate with the specified number of nails.

10. Repeat where marked on truss & wall frame layout.

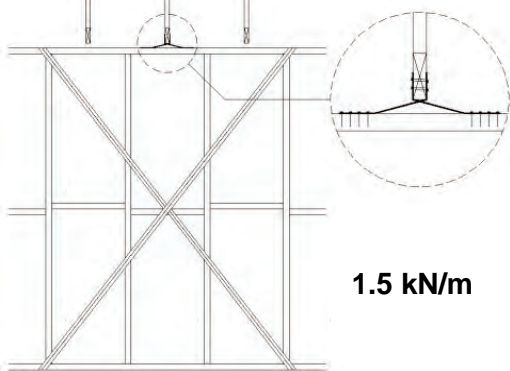
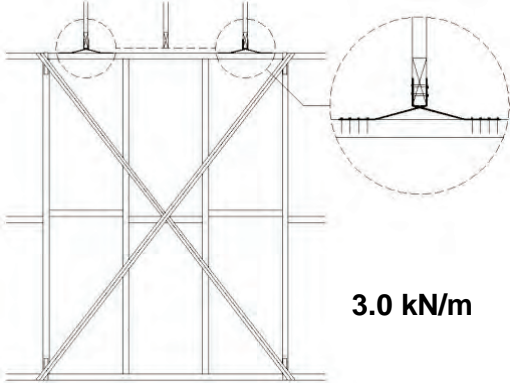
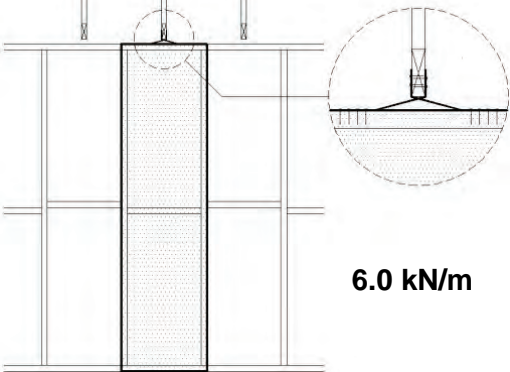
Specification

Steel	1.0 mm G300 –Z275 Galvanised
Dimensions	30 wide x 300 (flat length)
Fixing to Truss	3/3.15 dia. x 35 Pryda Timber Connector nails or equivalent per connector
Fixing to Wall Plate	4 or 5/35 x 3.15 Pryda Timber Connector nails or equivalent per connector

Design Data

Table A provides the number of connections (a pair of PSC) required for standard braced wall lengths

TABLE A – Pryda Shear Connector Selection Chart

BRACING TYPE	Wall Lengths (mm)	No. of pairs of Pryda Shear Connectors	No. of nail fixing onto top plate per connector**
 <p>1.5 kN/m</p>	1800	1	4
	2400	1	4
	2700	1	5
 <p>3.0 kN/m</p>	1800	2	4
	2400	2	4
	2700	2	5
 <p>6.0 kN/m</p>	600	1	4
	900	2	4
	1200	2	4
	1500	2	5

** if nails are to be machine driven using 32 x 2.3 Duo-Fast SHEG or equivalent, provide one additional nail to the table values and ensure nails are driven away from holes.

Note: When specifying requirement for non-standard braced wall lengths, assume a pair of PSC (with 5 nails) is capable of resisting a maximum 2700mm (for 1.5 kN/m capacity) and 1500mm (for 3.0 kN/m capacity) wall lengths.

Tie-down Anchors:

Suitable tie-down anchors for wall bracing units are:

Application	Suitable Anchors
External walls	Ramset™ AnkaScrews™ or equivalent Ramset™ Chemset™ Injection 100 and 800 series or equivalent Ramset™ Chemset™ Spin Capsules or equivalent
Internal walls	Ramset™ AnkaScrews™ and other Chemset™ Anchors as above Ramset™ Dynabolt™ Anchors or equivalent Ramset™ Trubolt™ Anchors or equivalent

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

Ramset™ AnkaScrews™ M12 x100 (AS12100H) is available from Pryda.

Design Capacities of Ramset™ AnkaScrews™

Ramset™ AnkaScrews™ through 35mm thick bottom plates

Part Code	Anchor Size	Effective Anchor Depth For 35mm Bottom Plate	Uplift Capacity (ΦNj) (kN)			Minimum Concrete Thickness (mm)
			External Walls		Internal Walls	
			70 mm	90 mm		
AS12100H	M12 x 100	60	9.1	10.8	11.2	85
AS12150H	M12 x 150	110	22.0	26.1	27.2	135

Ramset™ AnkaScrews™ through 45mm thick bottom plates

Part Code	Anchor Size	Effective Anchor Depth For 45mm Bottom Plate	Uplift Capacity (ΦNj) (kN)			Minimum Concrete Thickness (mm)
			External Walls		Internal Walls	
			70 mm	90 mm		
AS12100H	M12 x 100	50	7.0	8.2	8.5	75
AS12150H	M12 x 150	100	19.2	22.8	23.8	125

Design capacities in the above tables are based on:

- Grade 20 concrete minimum
- Minimum anchor edge distances- external walls of 35 mm for 70 mm wall frames, 45 mm for 90 mm frames
- Minimum anchor edge distances- internal walls = 75 mm
- Washers of sufficient capacity, as tabulated in the following table, must be installed between the anchor head and bottom wall plate.
- **The final tie-down capacity is limited by the minimum of Anchor and the washer capacities.**

Minimum Washer Sizes for Tie-down Anchors

Square Washer Size (mm)	Round Washer Size (mm)	Washer Type and Pryda Code	Capacity (ΦNj) (kN) for Joint Group:	
			JD5	JD4
50 x 50 x 3.0	55 dia x 3.0	Standard OW12/56S	8.4	10.5
65 x 65 x 5.0	75 dia x 5.0	Heavy Duty OW12/65S	20.8	26.1

Fixing Of 6.0 kN/m Bracing Units To Pryda Floor Trusses

The **Guide To Installation of Pryda Floor Truss & Rafter Truss Systems** provides details for fixing to floor trusses bracing units (aka bracing walls) of up to 3.0 kN/m design capacity. Details for fixing higher capacity bracing walls, of up to 6.0 kN/m, are shown on the following page.

APPENDIX

This appendix to the **Pryda Bracing Guide** provides information and recommendations on design, construction and engineering matters related to the bracing of walls in timber framed construction. It has been prepared by Pryda engineers in response to questions from Pryda licensed frame manufacturers.

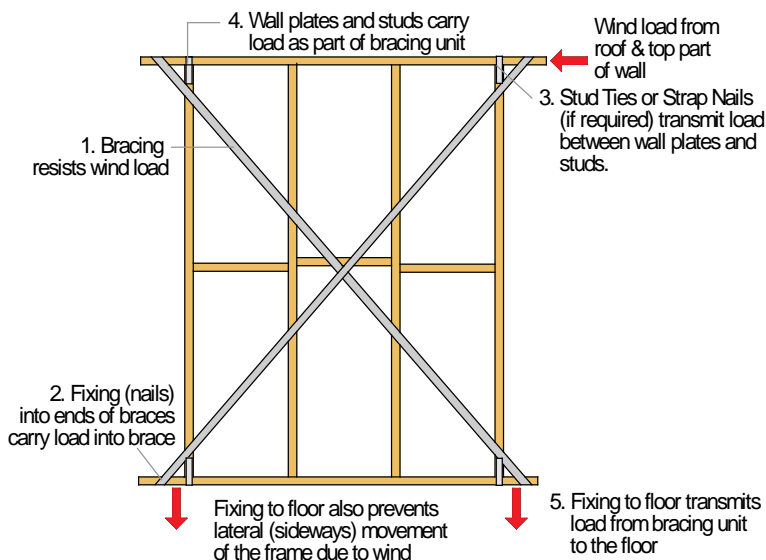
HOW DOES BRACING WORK?

Bracing is an essential part of any building. To design and install bracing that “works” (is effective in resisting the loads caused by the wind), it is essential to understand how bracing works. Otherwise, serious building problems can arise. The following topics are intended to simply explain the basic concepts of bracing systems.

Bracing Is a System

It is most important to realise that Pryda bracings and other types of bracings “work” as part of a bracing **system** which comprises:

1. the bracing
2. the fixing of the bracing to the frame, especially the end fixing (ie: nails)
3. any straps required as part of the bracing unit
4. the parts of the frame to which the bracing is fixed, ie: wall plates, studs, including any joints in the wall plates (see note below).
5. the connection of the braced part of the frame to the supporting structure, eg: fixing of the bracing unit to the floor system



6. the parts of the building which transmit the applied wind load down to the footings and ground.

These elements of the bracing system are like links in a chain and all must be strong enough to take the wind load or the whole system may collapse. For example, if the braces are not adequately fixed or if the bracing unit is not properly tied down, the bracing system can fail.

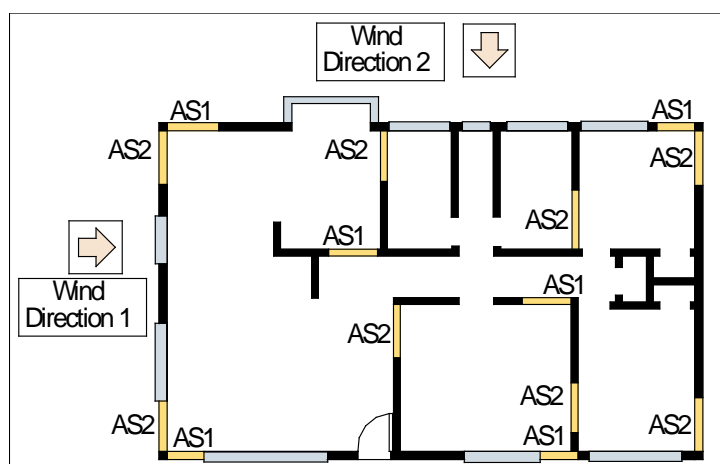
Note: Joints in wall plates can be made with **Pryda Strap Nails** or **Connector Plates**.

Bracing Must Work in All Directions

Because wind can blow in any direction, the bracing system must also be effective in all directions. Therefore, bracing must be installed in walls along the length of the building and walls across the width- as well as in the roof. Also, in any wall, diagonal bracing should be at both diagonals, if possible, to resist the wind in both directions along the wall.

The external corners of the building should be braced to avoid distortion of the building under wind at an angle to wall directions.

Note: As far as is practicable, a unit should be placed at each corner of the exterior walls. The other units are to be distributed fairly evenly throughout the interior walls. AS1684 clause 8.3.6.9 requires that interior bracing walls be fixed to the ceiling or roof frame to transfer shear loads- see Table 8.22 of the code.



Bracing Must Be Spread Throughout the Whole Building

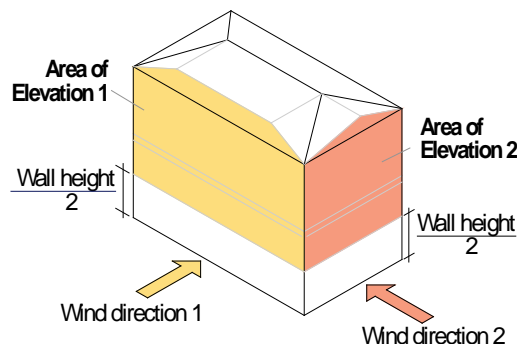
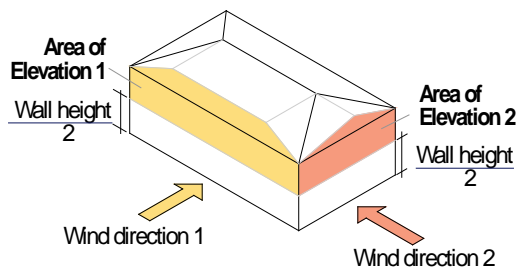
Wind can, of course, blow on any part of the building, including the roof. Bracing must therefore, as much as possible, be installed throughout the whole building to provide adequate wind resistance in all parts of the frame. Bracing in internal walls transfers to the floor structure not only internal wall pressure, but also horizontal wind load on the roof. That is one reason why internal bracing units must be connected to the roof.

The Higher the Building, The Greater the Wind Load

The force in the bracing system for the lower storey of two storey buildings is much greater than in the upper storey or in a single storey building due to:

- * The wind causing the load on the lower storey blows on 1 ½ storeys plus the roof, compared to ½ storey plus the roof
- * The speed of the wind, and therefore its force, increases with height above ground. For example, the wind force at 10 m height is rated as 18% greater than at 4 m.

Therefore, bracing in the lower storey of two storey constructions is required to be about 60% stronger than for the upper storey or single storey. Two storey constructions with a substantial area of exterior windows or doors in the lower storey, especially with open-plan areas, can be impossible to adequately brace by conventional methods; special engineering design and/or changes to the layout may be required.



Single storey or Upper Storey Walls:

Area of Elevation (causing load on bracing) is the vertical area above mid-height of the wall frame.

Lower Storey Walls:

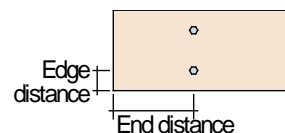
Area of Elevation (causing load on bracing) is the vertical area above mid-height of the lower wall frame.

Bracing Must Be Straight and Not Cut

Bracing must be straight (not bent) and not cut as any bends, kinks or other distortions, or any cutting can weaken the bracing substantially. Do not cross-over Angle Brace (Mini or Maxi Brace).

Keep Nails Away From Edges And Ends Of Timber

Nails driven too close to the edge or ends of studs or wall plates can cause splitting of the timber and, therefore, a substantial loss of strength in the joints. Ideally, maintain the recommended minimum end and edge distances.



Layout & Spacing of Bracing Units

To locate the wall bracing units:

- ▶ On the building plan drawing, determine the lengths of external and internal walls available for installation of bracing units, ie: 0.6 m minimum lengths without openings.
- ▶ In accordance with AS1684.2:2010:
 - (a) locate a bracing unit near each corner of the building
 - (b) distribute bracing units as evenly as possible throughout the building

Note: Maximum spacing between units is 9.0 m for N1 and N2; see AS1684.2:2010 Cl. 8.3.6.7 otherwise.

Locating a Bracing Unit Near Each Corner of the Plan

Clause 8.3.6.6 *Location and distribution of bracing* of AS1684 Part 2 specifies: “Bracing shall initially be placed in external walls and where possible at the corners of the building.” Figure 1 below is an example of this first step. Note that in the bottom wall, at the right corner, there isn't enough wall length at the corner to fit in a bracing unit. Consequently, a unit is located in the closest available location, to the left.

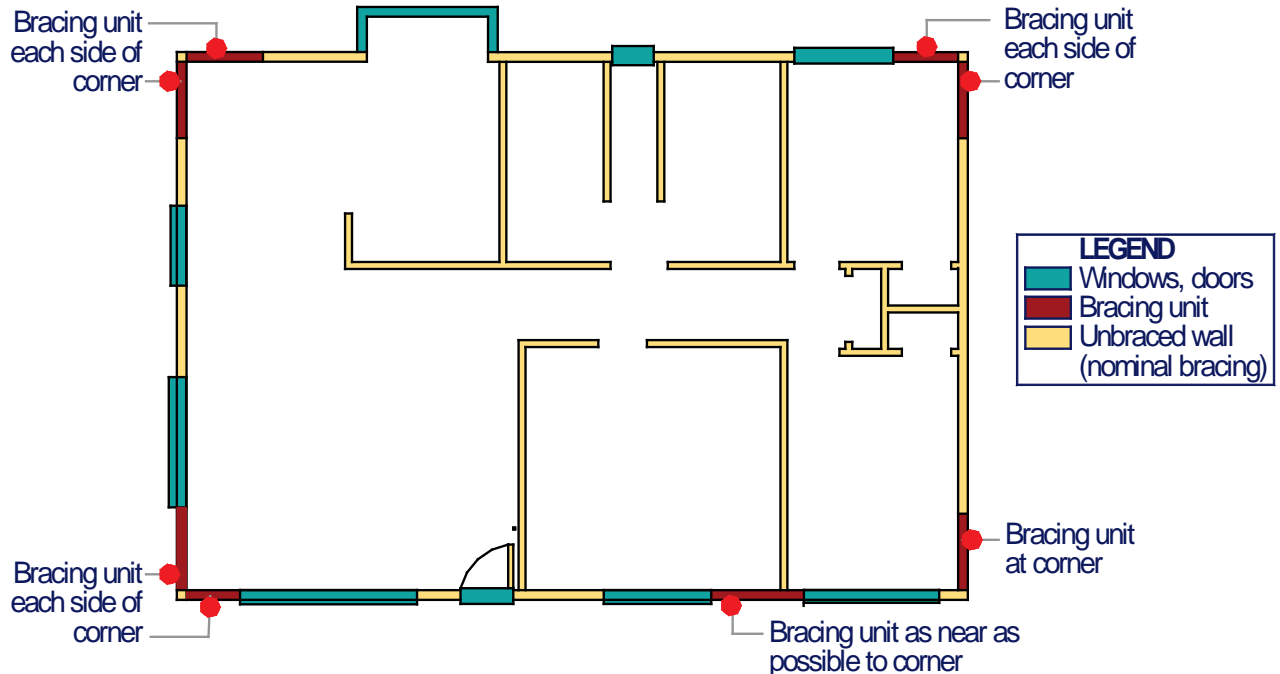


Figure1. Bracing Location- Step 1

Distributing Bracing Units As Evenly As Possible Throughout the Building

Clause 8.3.6.6 of AS1684 Part 2 also specifies: *Bracing shall be approximately evenly distributed and shall be provided in both directions..* . Figure 2 below shows even distribution of bracing units throughout the internal walls, in both directions.

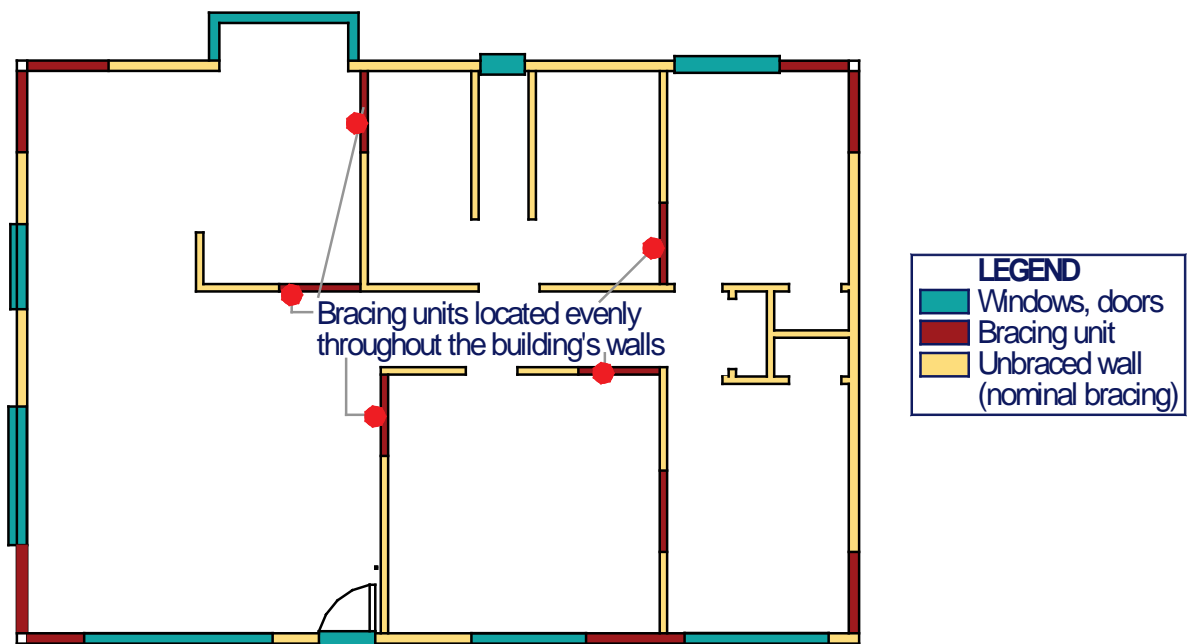


Figure1. Bracing Location- Final Step

Design of “Difficult” Buildings

Some timber framed buildings are “difficult” to adequately brace because:

1. they do not have enough braceable wall lengths to include all the required bracing units.
Note: This is due to the presence of many window or door openings and particularly common in two-storeyed houses with large open areas in the ground floor.
2. the spacing between braceable wall lengths is greater than the specified maximum.

For such buildings, Clause 8.3.6.7 of AS1684 Part 2 specifies: *Where bracing cannot be placed in external walls because of openings or the like, a structural diaphragm ceiling may be used to transfer racking forces to bracing walls that can support the loads. Parallel chord trusses installed in the horizontal plane, commonly known as “Wind Trusses” are sometimes adopted to facilitate this. Alternatively, wall frames may be designed for portal action.* Structural ceilings, wind trusses and portal frames require engineering design. Advice can be obtained from Pryda engineers or a consulting engineer.