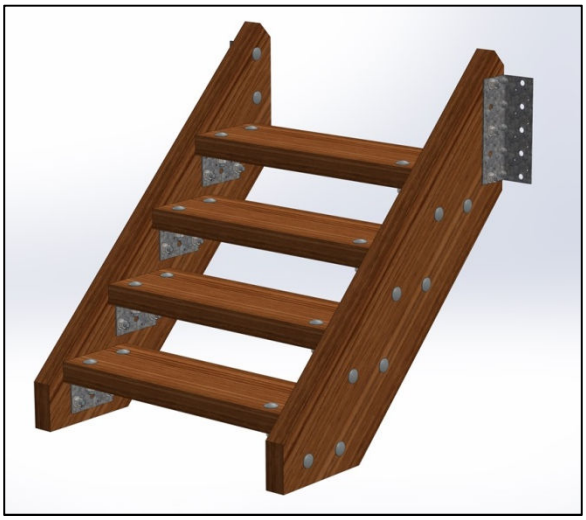
FIXING BRACKET - DESIGN CAPACITIES
COACH SCREW JOINTING

Trussforte Fixing Brackets are based on a general purpose design that can be used in multiple configurations for DIY projects or specifically engineered purposes based on the capacities listed in the accompanying literature.

The Fixing Bracket capacities have been calculated in accordance with the appropriate relevant standards, and have been certified by an external structural engineering company accordingly. The following Australian Standards have been used:



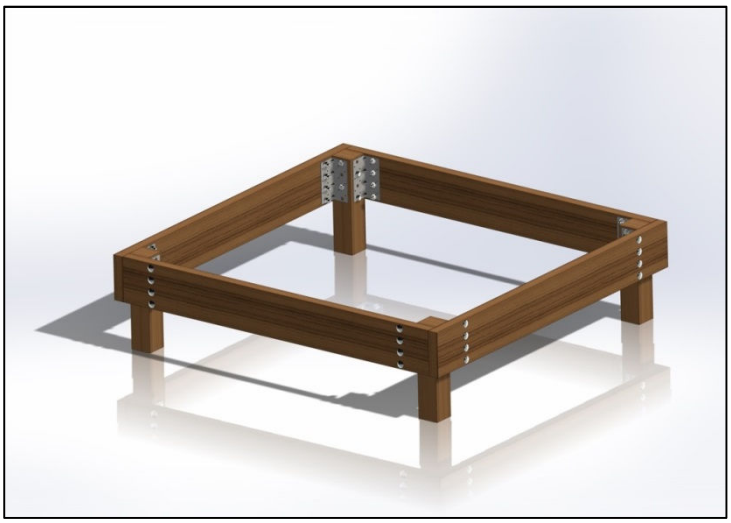
- AS1720.1 Timber structures Part 1: Design methods
- AS4600 Cold-formed steel structures
- AS4100 Steel structures

Additional standards are referenced in the accompanying literature, and are to do with hardware and fasteners that should be used with the fixing brackets for suitable jointing as indicated in the relevant standards.

All steel used for the manufacture of the Fixing Brackets is based on a metallic coated product that is sourced locally from Australia where possible, and meets AS/NZS1365 and AS1397. The metallic coated steel properties have a minimum of 250MPa tensile strength, and also have a zinc coating class of Z275 (which is approximately 40 microns thick (0.04mm) and has a coating mass factor of 290 g/m² as per Bluescope sheet and coil product literature).

Design joint capacities (maximum Limit State Design loads) that are tabulated are for arrangements based on type 1 and type 2 joint groups (single shear loading and axial loading respectively) as per AS1720.1. The capacity per coach screw is listed for the following load arrangements:

- $K_1 = 0.57$ $(1.35G)$ - Permanent Action for Dead load.
- $K_1 = 0.69$ $(1.2G + 1.5Q)$ - Permanent and short term imposed action on Roof and Floor live loads.
- $K_1 = 1.14$ $(1.2G + W_u + \Psi_c Q)$ - Permanent, wind and imposed action load.



Capacities for all Joint Groups (seasoned and unseasoned timbers) have been given, and are all based on category 2 capacity factors as per AS1720.1. For all other category requirements, appropriate factors should be used and applied to the tabulated load capacities.

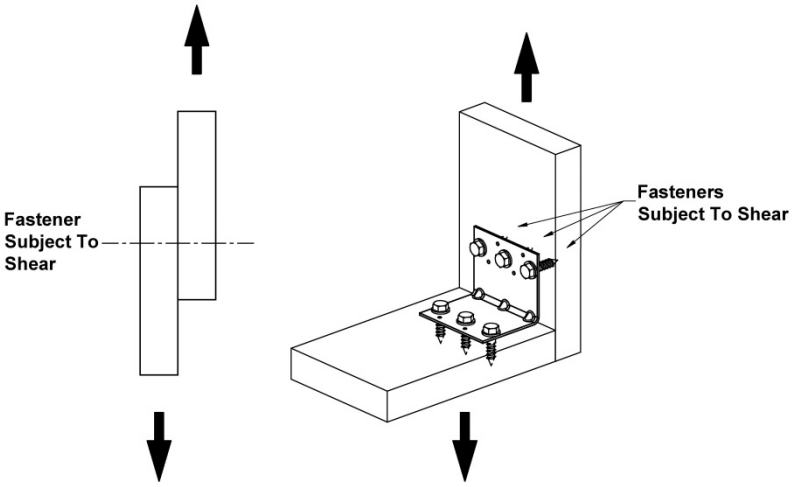
All coach screws must conform to AS/NZS 1393 and be fitted with correctly pre-drilled pilot holes to prevent timber splitting. The diameter of the hole for the threaded portion of the coach screw should not exceed the root diameter of the screw, and the clearance hole for the coach screw shank shall be approximately 10% greater than the coach screw shank itself. Also ensure that all screws are tightened correctly with suitable washers.

16 Gaine Road, Dandenong South, Victoria, Australia, 3175
Phone: +61 3 9799 9122, Fax: +61 3 9799 9800, Email: trussforte@bigpond.com.au, Website: www.trussforte.com.au

Joint Strength - Type 1 Joint (single shear)

Shear joint strength values are listed based on the calculated capacities of loads in both the perpendicular and parallel directions relative to the timber grain direction. The lower of the values for each joint group have been tabulated accordingly.

TrussForte 100mm leg brackets have a 74mm hole centre to fold distance, which complies with the minimum Australian Standard of the joint being 6 bolt diameters (6D) away from the timber edge. (Note 60mm leg brackets provide an edge distance of 2.8 bolt diameters (2.8D) in some bolting arrangements, which will not meet the Australian Standards for shear loads).



Type 1 Joint Arrangement

Joint Group	Capacity (kN) per 12mm Coach Screw† in shear in side grain with suitable washer*					
	$K_1 = 0.57\ (1.35G)$		$K_1 = 0.69\ (1.2G + 1.5Q)$		$K_1 = 1.14\ (1.2G + W_u + \Psi_c Q)$	
	(Permanent Action for Dead load)		(Permanent and short term imposed action on Roof and Floor live loads)		(Permanent, wind and imposed action load)	
	50mm thick Timber embedment	75mm thick Timber embedment	50mm thick Timber embedment	75mm thick Timber embedment	50mm thick Timber embedment	75mm thick Timber embedment
J1	2.38	3.57	2.88	4.32	4.76	7.14
J2	2.17	3.25	2.62	3.93	4.33	6.50
J3	1.50	2.35	1.82	2.84	3.00	4.69
J4	0.78	1.37	0.94	1.66	1.55	2.74
J5	0.43	0.85	0.51	1.02	0.85	1.69
J6	0.22	0.49	0.26	0.59	0.43	0.98
JD1	3.20	4.79	3.87	5.80	6.39	9.58
JD2	2.92	4.39	3.53	5.31	5.84	8.77
JD3	2.66	4.14	3.21	5.01	5.31	8.28
JD4	1.71	3.02	2.07	3.66	3.42	6.04
JD5	0.98	1.94	1.19	2.35	1.96	3.88
JD6	0.56	1.25	0.67	1.51	1.11	2.50

Notes:
G = permanent action (self-weight or 'dead' action).
W_u = ultimate wind action.
Ψ_c = combination factor for imposed action.
Q = imposed action (due to occupancy and use 'live' action).
* Minimum washer size as per AS 1720.1 - 2010.
† M12 Steel coach screws conforming to AS/NZS 1393.
Prebored maximum hole diameter = root diameter of coach screw & clearance hole for shank to be 13.0-13.5mm.
For end grain use - these capacities must be reduced by 40%.

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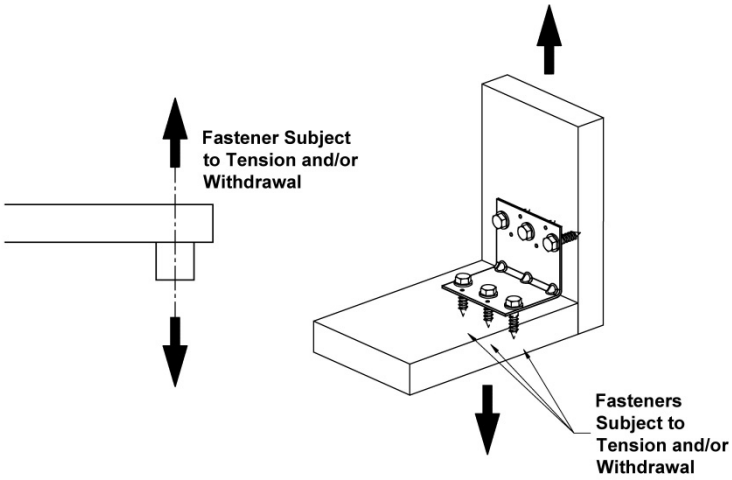
Joint Strength - Type 2 Joint (axial loads)



Type 2 Joint Arrangement

Joint Group	Capacity (kN) per 12mm Coach Screw† in tension in side grain with suitable washer*					
	K_1 = 0.57 (1.35*G*)		K_1 = 0.69 (1.2*G* + 1.5*Q*)		K_1 = 1.14 (1.2*G* + W_u + Ψ_c*Q*)	
	(Permanent Action for Dead load)		(Permanent and short term imposed action on Roof and Floor live loads)		(Permanent, wind and imposed action load)	
	50mm thick Timber embedment	75mm thick Timber embedment	50mm thick Timber embedment	75mm thick Timber embedment	50mm thick Timber embedment	75mm thick Timber embedment
J1	7.52#	7.52#	8.32	9.10#	8.32	12.48
J2	5.99#	5.99#	6.72	7.25#	6.72	10.08
J3	3.76#	3.76#	4.55#	4.55#	4.96	7.44
J4	2.43#	2.43#	2.94#	2.94#	3.32	4.85#
J5	1.61#	1.61#	1.94#	1.94#	2.72	3.21#
J6	0.82#	0.82#	0.99#	0.99#	1.64#	1.64#
JD1	10.09#	10.09#	10.44	12.21#	10.44	15.66
JD2	7.70#	7.70#	8.40	9.32#	8.40	12.60
JD3	5.81#	5.81#	6.16	7.03#	6.16	9.24
JD4	4.16	4.28#	4.16	5.18#	4.16	6.24
JD5	3.08#	3.08#	3.40	3.72#	3.40	5.10
JD6	2.09#	2.09#	2.40	2.52#	2.40	3.60

Notes:
G = permanent action (self-weight or 'dead' action).
W_u = ultimate wind action.
Ψ_c = combination factor for imposed action.
Q = imposed action (due to occupancy and use 'live' action).
* Minimum washer size as per AS 1720.1 - 2010.
# Where crushing under the head poses a limit to the strength.
† M12 Steel coach screws conforming to AS/NZS 1393.
Prebored maximum hole diameter = root diameter of coach screw & clearance hole for shank to be 13.0-13.5mm.
For end grain use - these capacities must be reduced by 40%.

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Bracket Strength Capacity for Coach Screw Joints

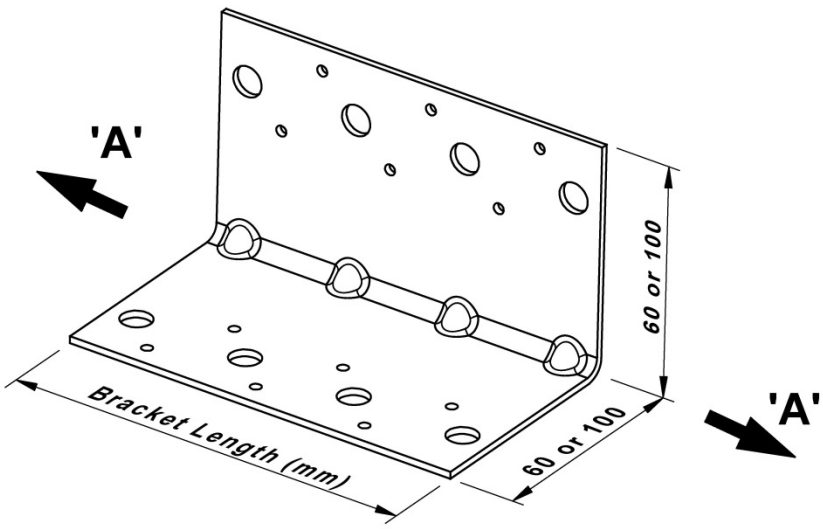
As well as checking the design capacity of the joint arrangement, it is important to verify that the capacity of the bracket also meets the design requirements. It is often overlooked, and can be detrimental to the total joint design. It can sometimes be seen that the joint capacity is the limiting factor (being dependent on the timber materials, embedment depth of the bolts or screws, or number of bolts or screws). Other times it may be found that the bracket itself is the limiting factor in the overall joint arrangement. It is important therefore, to check both the capacity of joints and the bracket strength for each particular arrangement to ensure that the desired strength is obtained.

Loading capacities are tabulated for shear loading in the direction of the bracket length (direction labeled 'A' in the accompanying diagram).

Loading capacities are also tabulated for tensile loading in the direction of pull along the coach screw axis (direction labeled 'F' in the diagram on the next page). Note these values are based on the use of a clamp plate that is placed between the coach screw heads and the fixing bracket.

Loading that is on an angle to any of these directions will have to be calculated accordingly.

Note: Capacities are based on nominal material thicknesses of 1.6mm and 3.0mm metallic coated mild steel for Standard Duty (SD) brackets and Heavy Duty (HD) brackets respectively.



Bracket Loading

Bracket Strength based on Coach Screw connections - Shear Loading (along 'A' direction)

Bracket	Bracket Capacity 'A' (kN) for Bracket Lengths Listed				
	86mm	136mm	186mm	236mm	286mm
FB6060SD	8.96	13.24	13.44	13.24	13.24
FB60100SD	8.96	13.24	13.44	13.24	13.24
FB100100SD	8.96	13.44	17.92	22.40	24.50
FB6060HD	16.80	24.82	24.82	24.82	24.82
FB60100HD	16.80	24.82	24.82	24.82	24.82
FB100100HD	16.80	25.20	33.60	42.00	45.94

Notes:
All available bolt holes are assumed to be used.
M12 steel coach screws conforming to AS/NZS 1393.
Bracket are not to provide rotational restraint in any direction.

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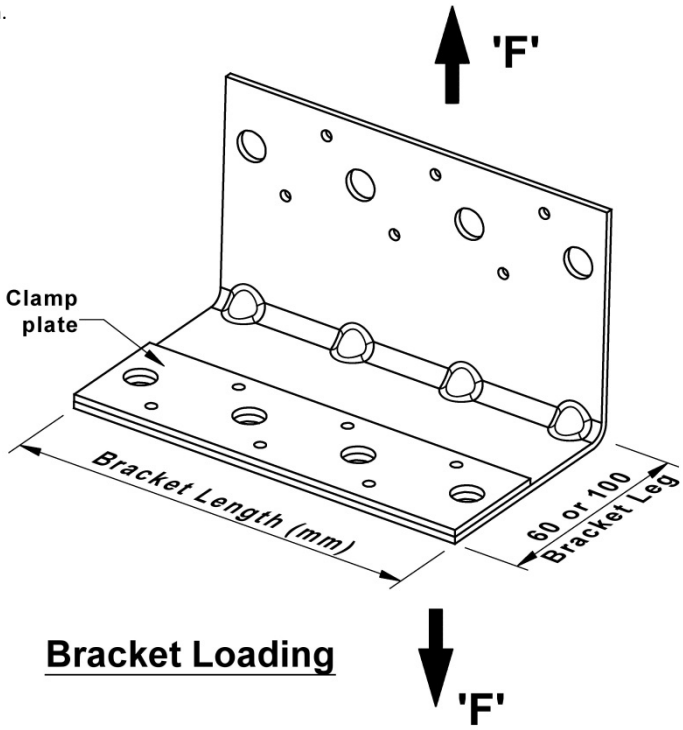
FIXING BRACKET - DESIGN CAPACITIES
COACH SCREW JOINTING

Bracket Strength based on Coach Screw connections - Tensile loading (along 'F' direction)

Bracket	Bracket leg size (mm)	Bracket Capacity 'F' (kN) for Bracket Lengths Listed				
		86mm	136mm	186mm	236mm	286mm
FB6060SD	60	0.85	1.41	1.98	2.54	3.11
FB60100SD	60	0.85	1.41	1.98	2.54	3.11
	100	0.15	0.25	0.35	0.45	0.54
FB100100SD	100	0.15	0.25	0.35	0.45	0.54
FB6060HD	60	1.84	3.07	4.30	5.52	6.75
FB60100HD	60	1.84	3.07	4.30	5.52	6.75
	100	0.52	0.87	1.22	1.57	1.91
FB100100HD	100	0.52	0.87	1.22	1.57	1.91

Notes:
All available bolt holes are assumed to be used.
M12 steel coach screws conforming to AS/NZS 1393.
Clamp plates must be used with brackets in load direction 'F' to provide capacities tabulated.
Brackets are not to provide rotational restraint in any direction.



Available Product Range

(Detailed product drawings can be found on corresponding web pages)

Product Type	Product Description	Leg Lengths (mm)	Material Thickness (mm)	Available Lengths (mm)	Number of Coach Screw Holes per Leg*
FB6060SD	Standard Duty Fixing Bracket	60 x 60	1.6	86, 136, 186, 236, 286	2, 3, 4, 5, 6
FB60100SD	Standard Duty Fixing Bracket	60 x 100	1.6	86, 136, 186, 236, 286	2, 3, 4, 5, 6
FB100100SD	Standard Duty Fixing Bracket	100 x 100	1.6	86, 136, 186, 236, 286	2, 3, 4, 5, 6
FB6060HD	Heavy Duty Fixing Bracket	60 x 60	3.0	86, 136, 186, 236, 286	2, 3, 4, 5, 6
FB60100HD	Heavy Duty Fixing Bracket	60 x 100	3.0	86, 136, 186, 236, 286	2, 3, 4, 5, 6
FB100100HD	Heavy Duty Fixing Bracket	100 x 100	3.0	86, 136, 186, 236, 286	2, 3, 4, 5, 6
FBCP503	Clamp Plate		3.0	86, 136, 186, 236, 286	2, 3, 4, 5, 6

Notes:
* Number of coach screw holes is dependent on bracket/clamp plate length.

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