Type of bracing			Bracing capacity, kN/m
(n) <i>Hardboard Types D and E — Short wall bracing systems</i> — Hardboard shall conform to AS/NZS 1859.4. Hardboard shall be nailed to frame using min. 30 mm × 2.8 mm Ø galvanized flat-head nails or equivalent. Nails shall be located a min. of 10 mm from the vertical edges and 15 mm from the top and bottom edges. Maximum stud spacing shall be 600 mm. Bracing panel min. width shall be 460 mm.	Minimum thicknes	hardboard ss, 4.8 mm	
coach screw with 303 mm × 8 mm Type E only: M12	Ton and	Type D· 80	
80 mm	bottom plates	Туре Е: 40	
	Vertical edges and nogging	150	Type D 2.9
	Fixing of b to floor fr	ottom plate ame or slab	Type E 5.0
At least one side of the bracing wall shall be lined with gypsum plaster board or equivalent	Type D: Fix plate to floo or slab with fixing only <u>Table 9.4</u>) Type E: M1 each end	bottom or frame n nominal (see 2 rods at	
460 mm min. 460 mm min.			
NOTE Bolt/rod washer sizes are set out in <u>Table 9.1</u> .			

Table 8.18(n) — Structural wall bracing (maximum wall height 2.7 m)

8.3.6.4 Wall capacity and height modification

The capacity of bracing walls given in <u>Tables 8.18(a)</u> to <u>8.18(n)</u> is appropriate to wall heights up to and including 2 700 mm. For wall heights greater than 2 700 mm the capacity shall be multiplied by the values given in <u>Table 8.19</u>.

Wall height, mm	Multiplier
3 000	0.9
3 300	0.8
3 600	0.75
3 900	0.7
4 200	0.64

Table 8.19 — Bracing wall capacity/height multiplier

8.3.6.5 Length and capacity for plywood bracing walls

For the bracing capacities given in <u>Tables 8.18(g)</u> to <u>8.18(i)</u> for plywood, the minimum length of the panels shall be 900 mm, except —

- (a) in bracing type given in <u>Table 8.18(h)</u> for Method A only, the minimum length of the panels may be 600 mm; or
- (b) in bracing type given in <u>Table 8.18(g)</u>
 - (i) for panel length of 600 mm, the bracing capacity shall be half of that for 900 mm; and
 - (ii) for panel length between 600 mm and 900 mm, the bracing capacity may be determined by multiplying the respective capacities by 0.5 for 600 mm long varying linearly to 1.0 for 900 mm.

Where plywood fixed to both sides of the wall is used the bracing capacity in <u>Table 8.18(g)</u>, (h) and (i) is double the capacity of a single side. Where plywood fixed to both sides of the wall is used the depth of the bottom plate shall be a minimum of 45 mm and, the tiedown of the bracing wall shall be double as provided in <u>Tables 8.18(g)</u>, (h) and (i) or in accordance with <u>Clause 8.3.6.10</u> for the increased capacity.

8.3.6.6 Location and distribution of bracing

Bracing shall be approximately evenly distributed and provided in both directions, as shown in <u>Figure 8.5</u>.

NOTE See also Examples 1 and 2 given in <u>Appendix D</u>.

Bracing shall initially be placed in external walls and, where possible, at the corners of the building.



(a) Right angles to long side

(b) Right angles to short side

NOTE 1 *A*, *B*, *C* and *D* are the design strengths of individual bracing walls.

NOTE 2 Total bracing strength = A + B + C + D, etc.

Figure 8.5 — Location of bracing

8.3.6.7 Spacing of bracing walls in single storey or upper storey of two storey construction

For single storey or upper storey of two storey construction, the maximum distance between braced walls at right angles to the building length or width shall not exceed the values given in <u>Tables 8.20</u>, <u>8.21</u> and <u>8.22</u> for the relevant wind classification, ceiling depth and roof pitch.

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For the lower storey of a two storey construction, or for subfloors, the spacing of bracing walls (see Figure 8.6) or other bracing systems shall be determined from <u>Clause 8.3.5.9</u>.

NOTE Ceiling depth is measured parallel to the wind direction being considered.

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. Alternatively, wall frames may be designed for portal action.



Figure 8.6 — Spacing of bracing

			M	aximum b	racing wa	ll spacing,	m				
Ceiling denth m	Roof pitch, degrees										
ucptil, ill	0	5	10	15	17.5	20	25	30	35		
≤ 4	5.9	6.6	7.4	7.5	7	6.4	5.1	4.4	4.2		
5	7.4	8.3	9	9	8.6	7.9	6	5	4.7		
6	8.9	9	9	9	9	8.8	6.7	5.6	5.1		
7	9	9	9	9	9	9	7.1	6.1	5.5		
8	9	9	9	9	9	9	7.6	6.7	5.7		
9	9	9	9	9	9	9	7.9	7.2	5.9		
10	9	9	9	9	9	9	8.4	7.9	6.2		
11	9	9	9	9	9	9	8.7	7.9	6.4		
12	9	9	9	9	9	9	9	7.9	6.6		
13	9	9	9	9	9	9	9	8.1	6.6		
14	9	9	9	9	9	9	9	8.3	6.7		
15	9	9	9	9	9	9	9	8.4	6.8		
16	9	9	9	9	9	9	9	8.6	6.9		

Table 8.20 — Maximum spacing of bracing walls — Wind classification C1

			M	aximum b	racing wa	ll spacing,	m				
Ceiling	Roof pitch, degrees										
ueptii, iii	0	5	10	15	17.5	20	25	30	35		
≤ 4	3.9	4.3	4.9	5	4.6	4.2	3.4	2.9	2.8		
5	4.9	5.4	6.1	6.2	5.7	5.2	4	3.3	3.1		
6	5.9	6.6	7.3	7.4	6.5	5.8	4.4	3.7	3.4		
7	6.9	7.9	8.6	8.3	7.2	6.3	4.7	4	3.7		
8	7.9	9	9	9	7.7	6.7	5	4.4	3.8		
9	8.8	9	9	9	8.4	7.1	5.2	4.8	3.9		
10	9	9	9	9	8.9	7.4	5.5	5.2	4.1		
11	9	9	9	9	9	7.7	5.8	5.2	4.2		
12	9	9	9	9	9	7.9	5.9	5.2	4.3		
13	9	9	9	9	9	8.1	6.1	5.3	4.3		
14	9	9	9	9	9	8.2	6.1	5.5	4.4		
15	9	9	9	9	9	8.5	6.3	5.5	4.5		
16	9	9	9	9	9	8.6	6.5	5.7	4.6		

Table 8.21 — Maximum spacing of bracing walls — Wind classification C2

Table 8.22 — Maximum spacing of bracing walls — Wind classification C3

			Ма	ximum br	acing wall	spacing, I	m	1	1
Ceiling depth,				Roof	pitch, degi	rees			
m	0	5	10	15	17.5	20	25	30	35
≤ 4	2.7	3	3.4	3.5	3.2	3	2.3	2	1.9
5	3.4	3.8	4.3	4.4	4	3.6	2.8	2.3	2.2
6	4.1	4.6	5.1	5.1	4.6	4.1	3.1	2.6	2.4
7	4.8	5.5	6	5.8	5	4.4	3.3	2.8	2.6
8	5.5	6.3	6.7	6.5	5.4	4.7	3.5	3.1	2.6
9	6.2	7.1	7.6	7.2	5.9	5	3.7	3.3	2.7
10	6.8	7.9	8.3	7.8	6.2	5.1	3.9	3.6	2.9
11	7.5	8.7	9	8.4	6.5	5.3	4	3.6	2.9
12	8.2	9	9	8.6	6.7	5.5	4.1	3.7	3
13	8.9	9	9	8.9	6.9	5.7	4.3	3.7	3
14	9	9	9	9	7.1	5.7	4.3	3.8	3.1
15	9	9	9	9	7.2	5.9	4.4	3.9	3.1
16	9	9	9	9	7.4	6	4.6	4	3.2

8.3.6.8 External bracing walls under the ends of eaves

External bracing walls under the ends of eaves may be used as bracing walls provided they are suitably connected to the main ceiling diaphragms using connections such as crossed metal bracing straps to rafter overhangs or sheet bracing to rafter overhangs, as shown in Figure 8.7.

Where appropriate, the crossed metal or sheet bracing shall be connected to the bulkhead, to provide continuity of the ceiling diaphragm.

Crossed metal braces in the roofline continue the ceiling diaphragm action to the rafter overhangs.

The same structural requirements that apply to normal external bracing walls shall apply to the external bracing walls under the ends of eaves.

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Bracing wall under eaves

These bracing walls shall be limited to 20 % of the total wall bracing required in each direction.



8.3.6.9 Fixing of top of bracing walls

All internal bracing walls shall be fixed to the floor of lower storey bracing walls, the ceiling or roof frame, and/or the external wall frame, with structural connections of equivalent shear capacity to the bracing capacity of that particular bracing wall.

Nominal and other bracing walls with bracing capacity up to 1.5 kN/m require nominal fixing only, i.e. no additional fixing requirements.

Typical details and shear capacities are specified in Tables 8.23(a) to 8.23(b).

For trussed roofs, where nominal fixings are used, they should permit vertical movement of the trusses, see <u>Tables 8.22(a)</u> and <u>8.22(i)</u>. Where screws or bolts through the top plate are used they shall be placed in holes that permit free vertical movement of the trusses, see <u>Table 8.23(b)</u>.

NOTE 1 The connection required to achieve the necessary shear capacity between bracing walls and the ceiling, roof or external wall frames can be achieved by using individual connections or combinations of connections.

NOTE 2 For an explanation and further information on joint groups (J and JD), as referenced in <u>Tables 8.23(a)</u> to <u>8.23(k)</u>, see <u>Table 9.15</u>, <u>Clause 9.6.5</u> and <u>Appendix G</u>.

				She	ear cap	oacity,	kN	
Rafters, joists or t	russes to bracing wall		Un	seasor timber	ned	Seasoned timber		
			J2	J3	J4	JD4	JD5	JD6
(a)		Nails						
4/Ø75 mm nails	90 × 35 mm F8 or	3.05	3.0	2.1	1.5	2.1	1.8	1.3
as per table or 3/No. 14 type 17	90 x 45 mm F5 trimmer on flat	3.33	3.3	2.4	1.7	2.4	2.0	1.5
screws		Screws	L					
		No 14						
		Туре 17	12	8.3	5.9	8.3	5.9	4.3
2/Ø75 mm	Provide clearance where roof is trussed							
nails each end as per table or 2/75 mm No. 14 type 17 screws	Bracing wall							

Table 8.23(a) — Fixing of top of bracing walls

Table 8.23(b) — Fixing of top of bracing walls

				She	ear cap	oacity, kN			
Rafters, joists or trusse	s to bracing wall		Un	seasor timber	ned	Seasoned timber			
			J2	J3	J4	JD4	JD5	JD6	
(b)		Screws							
Trimmer: One bolt: 90 Ø 35 mm F8	— Framing anchors	1/No.14 Type 17	4.8	3.5	2.5	3.5	2.5	1.8	
Two bolts: 90 Ø 45 mm F5 Two bolts: 90 Ø 35 mm F8 or: 90 Ø 45 mm F8	(legs not bent) — 6/Ø2.8 mm nails each face	2/No.14 Type 17	9.7	6.9	4.9	6.9	4.9	3.6	
		3/No.14 Type 17	13	9.3	6.6	9.8	7.4	5.4	
		Bolts						-	
		M10	6.4	4.1	2.6	4.3	3.0	2.0	
	\mathcal{A}	M12	7.6	4.9	3.1	5.1	3.6	2.5	
		2/M10	12	8.0	5.1	8.4	5.9	4.0	
	Provide	2/M12	13	9.3	6.1	9.8	7.0	4.9	
	clearance where roof is trussed								
Screws or bolts as per table	— Bracing wall								



Table 8.23(c) — Fixing of top of bracing walls

Table 8.23(d) — Fixing of top of bracing walls



			She	ear cap	oacity,	kN	
Rafters, joists or trusses to bracing wall		Un	seasor timber	ned	Seaso	oned ti	mber
		J2	J3	J4	JD4	JD5	JD6
(e)	Nails						
Nailing plates or framing anchor (legs not bent)	4/3.05	5.0	3.6	2.5	3.6	3.0	2.2
to either end of nogging 6/02.8mm nails each face or 2/No. 14 Type 17 batten screws either end	6/3.05	6.6	4.7	3.4	5.0	4.2	3.1
	4/3.33	5.6	4.0	2.8	4.0	3.3	2.5
-90 mm × 35 mm F8 or 90 mm × 45 mm F5	6/3.33	7.4	5.3	3.7	5.5	4.6	3.5
trimmer	Bolts						
	M10	6.4	4.1	2.6	4.3	3.0	2.0
	M12	7.6	4.9	3.1	5.1	3.6	2.5
	2/M10	13	8.0	5.1	8.4	5.9	4.0
	Screws						
Shear blocks nailed, bolted,	2/No.14 Type 17	9.7	6.9	4.9	6.9	4.9	3.6
Gap to truss as per table	3/No.14 Type 17	13	9.2	6.6	9.8	7.4	5.4
Bracing wall							

Table 8.23(e) — Fixing of top of bracing walls

Table 8.23(f) — Fixing of top of bracing walls

			9	Shear caj	oacity, kN	N		
	Rafters, joists or trusses to bracing wall	Unseasoned timber Seasoned timber						
		J2	J3	J4	JD4	JD5	JD6	
(f)		6.5	4.6	3.3	4.9	4	3.1	
	Framing anchor (legs not bent) 6/Ø2.8 mm nails each face Bracing wall	Rafte	rs for ce jc	iling vists				

			Shear capacity, kN						
	Rafters, joists or trusses to bracing wall		Unseasoned timber			Seasoned timber			
			J2	J3	J4	JD4	JD5	JD6	
(g)		Nails							
	Nails or screws	4/3.05	5.0	3.6	2.5	3.6	3.0	2.2	
	as per table	6/3.05	6.6	4.7	3.4	5.0	4.2	3.1	
	Truco	4/3.33	5.6	4.0	2.8	4.0	3.3	2.5	
	inuss	6/3.33	7.4	5.3	3.7	5.5	4.6	3.5	
		Screws							
	Gap Bracing wall	2/No.14 Type 17	9.7	6.9	4.9	6.9	4.9	3.6	
	to truss	3/No.14 Type 17	15	10	7.4	10	7.4	5.4	

Table 8.23(g) — Fixing of top of bracing walls

Table 8.23(h) — Fixing of top of bracing walls

		She	ear capa	city, k	N	
Rafters, joists or trusses to bracing wall	Unseas	soned	timber	Seaso	oned ti	mber
	J2	J3	J4	JD4	JD5	JD6
(h) Truss or rafter Gap to truss Top plate Gap to truss Gap (300 mm × 0.8 mm G.I.) 4/2.8 mm nails each end and to truss	8.7	6.2	4.4	6.6	5.4	4.1

Table 8.23(i) — Fixing of top of bracing walls

			Sh	ear capa	acity, k	:N	
Rafters, joists or trusses to bracing wall		Unseasoned timber		Seasoned timber			
		J2	J3	J4	JD4	JD5	JD6
(i)	Nails						
Rafter or ceiling joist	2/3.05	1.4	1.1	0.77	1.1	0.90	0.66
	2/3.33	1.7	1.2	0.85	1.2	1.0	0.75
2 skew nails per crossing size as per table Bracing wall							

	Rafters, joists or trusses to bracing wall				Shear capacity, kN						
					Unseasoned timber			Seasoned timber			
				J2	J3	J4	JD4	JD5	JD6		
(j)			Nails								
	Blocking pieces	Nails, screws or bolts	4/3.05	5.0	3.6	2.5	3.6	3.0	2.2		
	avoid splitting	be both sides of rafter	6/3.05	6.6	4.7	3.4	5.0	4.2	3.1		
		or bottom chord	4/3.33	5.6	4.0	2.8	4.0	3.3	2.5		
	$\langle \rangle$	\wedge	6/3.33	7.4	5.3	3.7	5.5	4.6	3.5		
		\checkmark	Bolts								
			M10	6.4	4.1	2.6	4.3	3.0	2.0		
			M12	7.6	4.9	3.1	5.1	3.6	2.5		
			2/M10	13	8.0	5.1	8.4	5.9	4.0		
	Bracing wall	Gap between top plate and truss	Screws								
			2/No.14 Type17	9.7	6.9	4.9	6.9	4.9	3.6		
			3/No.14 Type17	15	10	7.4	10	7.4	5.4		

Table 8.23(j) — Fixing of top of bracing walls

Table 8.23(k) — Fixing of top of bracing walls

				Shear capacity, kN						
Rafters, joists or trusses to bracing wall					Unseasoned timber		Seasoned timber			
				J2	J3	J4	JD4	JD5	JD6	
(k)		Straps	Nails							
Internal-	2/30 × 0.8 mm G.I straps	1	4/2.8	4.3	3.1	2.2	3.3	3.0	2.1	
wall	with number of nails each end of straps as per table,		6/2.8	6.5	4.6	3.3	4.9	4.0	3.1	
	or propriety nailing plate	2	4/2.8	8.7	6.2	4.4	6.6	5.4	4.1	
	with equal capacity		6/2.8	13	9.3	6.6	9.8	8.1	6.1	
Top plate	External wall									

8.3.6.10 Fixing of bottom of bracing walls

The bottom plate of timber-framed bracing walls shall be fixed at the ends of the bracing panel and, if required, intermediately to the floor frame or concrete slab with connections determined from Table 8.18.

NOTE <u>Table 8.18</u> nominates that bracing systems with a racking capacity up to 3.0 kN/m only require nominal fixing of the bottom plate to the floor frame or slab. This concession is based on outcomes from whole house testing programs together with post-wind damage assessments of the performance of bracing in housing.

Where bottom plate fixing information is not given in <u>Table 8.18</u>, the bottom plates shall be fixed at the ends of each bracing panel using tie-down fixings determined from <u>Table 8.24</u> and <u>Table 8.25</u>.

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