



Bracing ratings



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RECENT BRANZ TESTING HAS QUANTIFIED THE BRACING RATINGS OF SOME COMMON OLDER GENERIC BRACING SYSTEMS. THESE RATINGS WILL BE USEFUL DURING REPAIRS OR RENOVATIONS OF OLDER BUILDINGS.

FOR NEW HOUSES, manufacturers generally provide wall bracing ratings for their proprietary systems based on results of the BRANZ P21 test method. Designers then ensure that the demand wind or earthquake loads at each level and in each direction are less than the sum of the resistances of the bracing elements.

For renovations or repairs of older buildings, however, the bracing strength of existing construction is often not known. What should be used in the bracing calculations required by building consent authorities?

BRANZ tested older systems

In a Building Research Levy-funded project, BRANZ tested a range of older bracing systems (see Table 3) to provide wall bracing ratings.

In most cases, 2.42 m high timber frames were constructed using 90 × 45 mm kiln-dried MSG 8 radiata pine timber with plates nailed to studs with two 90 × 3.15 mm power-driven glue-shank nails. Although these differ from the original timber and nails, the difference in performance is considered small.

The bottom plates of the walls were fixed to the foundation beam using pairs of 100 × 4 mm hand-driven galvanised nails at 600 mm centres starting 150 mm from the outside stud.

Nogs, where used, were at 800 mm centres except for system Brace 4, where they were at 600 mm centres.

Studs were at 600 mm centres (although in practice they were often at 450 mm centres) except for Lath 1 where they were at 400 mm centres.

Each specimen was subjected to three cycles of in-plane displacement at top plate level to each of +/-8.5 mm, +/-15 mm, +/-22 mm, +/-29 mm, +/-36 mm, +/-43 mm and +/-65 mm.

...and established bracing ratings

The proposed bracing ratings for existing and renovated walls based on the BRANZ testing are in Table 1.



The Brace 3 specimen – double diagonal braces cut between studs.

Budgetary constraints meant that it was not possible to test three replicates of each system but the bracing contributions are generally quite low, meaning that any variations in actual strength compared to the tested strength would not influence the overall resistance of the structure markedly. ◀

For more ▶ BRANZ Study Report SR305 *Bracing ratings for non-proprietary bracing walls* can be downloaded from www.branz.co.nz. ➤

Table 1

SUMMARY OF PROPOSED BRACING RATINGS

NAME	BRACING SYSTEM	STRENGTHENING	FIXING	NOGS	FIXING PATTERN	WALL LENGTH (M)	RECOMMENDED BRACING RATING (BUS)		
							WIND	EARTHQUAKE	
LATH 1	45 × 6 mm lath and plaster wall with no horse hair	None	Type E	No	Type 6	2.4	36	32	per metre
BRACE 1	150 × 25 mm let in brace at 45°	None	Type C	No	Type 2	2.4	48	43	per brace
		Type 1					51	45	per brace
BRACE 2	90 × 45 mm single brace cut between studs	Test set-up did not completely replicate installed conditions so no definitive bracing rating provided.							
BRACE 3	90 × 45 mm double brace cut between studs	None	Type D	No	Type 3	2.4	44	39	per brace pair
		Type 1					70	62	per brace pair
BRACE 4	Dogleg brace	None	Type D	@ 600 mm	Type 3	0.6	16	14	per brace
		Type 1					19	17	per brace
BOARD 1	200 × 10 mm horizontal board	None	Type F	No	Type 7	1.2	23	21	per metre
BOARD 2	140 × 20 mm bevel-back weatherboard	None	Type G	Yes	Type 5	2.4	7	6	per metre
SHEET 1	Standard plasterboard one side only	None	Type A	Yes	Type 1	1.2	20	18	per metre
SHEET 2	Standard plasterboard two sides	None	Type A	Yes	Type 1	1.2	47	41	per metre
SHEET 3	3.2 mm tempered hardboard one side only	None	Type H	Yes	Type 4	1.2	29	26	per metre
		Type 2	Type A	Yes	Type 4	1.2	57	50	per metre
		Type 3	Type A	Yes	Type 4	1.2	99	88	per metre
SHEET 4	Horizontal corrugated steel	None	Type I	Yes	Type 8	2.4	38	34	per metre
SHEET 5	Vertical corrugated steel	None	Type I	Yes	Type 9	2.4	31	28	per metre

Legend

Fixing

- A 30 × 2.5 mm galvanised flathead nails
- C 75 × 3.15 mm galvanised flathead nails
- D 75 × 3.15 mm bright jolthead nails
- E 25 × 2.5 mm galvanised flathead clouts
- F 40 × 2.8 mm galvanised flathead nails
- G 60 × 3.15 mm bright jolthead nails
- H 30 × 1.6 mm electroplated panel pins
- I Leadhead nails with 60 × 3.5 mm bright shanks

Fixing pattern

- 1 A nail at each corner and then at 300 mm centres to all studs and plates
- 2 Two nails brace to each stud and three nails brace to each plate
- 3 Two nails each end of braces
- 4 A nail at each corner and then at 200 mm centres to all studs and plates
- 5 Weatherboards fixed to studs with a single nail at 40 mm from the bottom of each weatherboard
- 6 Laths fixed with a single nail
- 7 Two nails at each board/stud intersection

- 8 Nails used at every second ridge to studs, except third ridge one side of lap
- 9 Nails used at every second ridge to noggs and plates, except third ridge one side of lap

Strengthening

- 1 Strap at brace top between top plate and end stud
- 2 Replace panel pins with 30 × 2.5 mm nails
- 3 Add 100% rocking restraint and 30 × 2.5 mm nails