

3.4 Strength of connection between window and wall framing

The following tests were undertaken:

1. A full scale out-of-plane "suction" pressure test to check the connection between window reveal and window trimmers as described in Section 3.4.2 and window frame and window reveal as described in Section 3.4.1.
2. Elemental tests to determine the design strength of the stapled connection between window frames and liner (reveal) for coated and stainless steel staples and for different reveal material for wind "suction" loading are described in Section 3.4.1. The distribution of staple shear forces is estimated by a structural analysis and the results compared with the calculated staple design strength in Section 3.4.4.
3. Elemental tests to determine the design strength of the nailed connection between window reveals and window trimmers are described in Section 3.4.2. The demand load is compared with the design level connection strength.

3.4.1 Tests measuring the strength of the staple connection between window frame and liner (reveal)

Yolland (2007b) tested the connection strength of staples fixing window frames to reveals for out-of-plane wind "suction" loading. A total of 10 samples was tested for each combination of the following three variables:

1. Two types of staples: 15 x 10 mm staples made of zinc-coated steel and 15 x 8.7 mm stainless steel.
2. Three different reveal materials.
3. Staple direction both parallel and transverse to an aluminium window frame edge.

Only the test results for construction where the staples were transverse to the edge are used here as this is the common practice and causes less timber splitting than placement of staples parallel to the edge. Although the test loading was for the staple in shear, the failure that occurred was actually withdrawal of one staple leg.

The staple characteristic strength, R_{staple} , calculated from Yolland's test results but using the BRANZ EM1 method (BRANZ, 1999), is given in Table 2. Note that any deterioration of staple fixing strength with time, such as corrosion of the staples or decay of the reveal, will reduce these characteristic strengths.

Table 2. Calculation of staple characteristic shear strength R_{staple}

Reveal material	Staple type	Mean load (N)	Standard Deviation (N)	Coefficient of Variation ν	$P_{0.05}$ 5th percentile (N)	R_{staple} Characteristic Strength (N)
Pine	Coated	456	95	0.208	299	246
Rimu	Coated	652	87	0.133	508	451
Dynaboard	Coated	651	88	0.135	506	447
Pine	SS	700	58	0.083	604	562
Rimu	SS	618	30	0.049	569	545
Dynaboard	SS	730	83	0.114	593	535