

DESIGN
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Securing buildings against uplift

The correct fixings are needed at the various junctions of a timber-framed building structure to resist uplift in windy conditions. In this article, we summarise where to find them in NZS 3604:2011 and what is required.

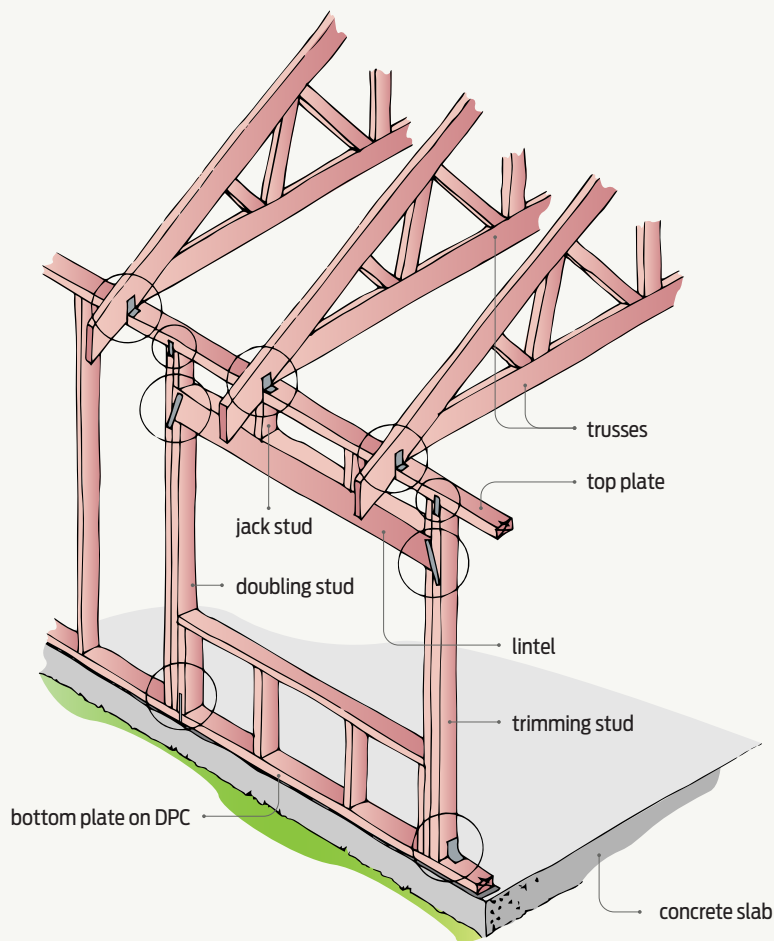


Figure 1 Framing locations requiring securing against uplift (indicated by circles).

IN HIGH WINDS, roofs in timber-framed buildings are subject to uplift forces, so both the roof and roof framing must be securely fixed.

Resistance to the uplift forces must be carried from the roof framing down through the building structure to the foundations.

Figure 1 shows framing locations requiring securing against uplift.

Solutions in NZS 3604:2011

NZS 3604:2011 *Timber-framed buildings* has solutions for resistance to uplift for the different parts of the building by tying the building structure together with strapping fixed with a prescribed number of nail fixings. In each situation, an alternative fixing method defined by a specified fixing capacity is also offered.

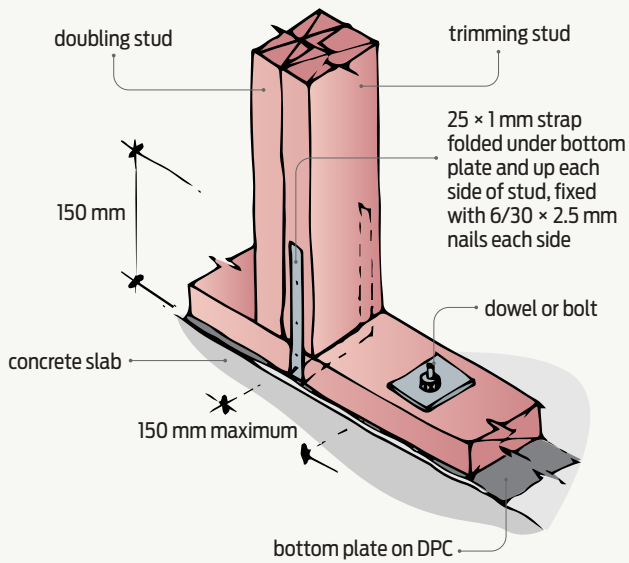


Figure 2a Fixing trimming stud and bottom plate to concrete slab.

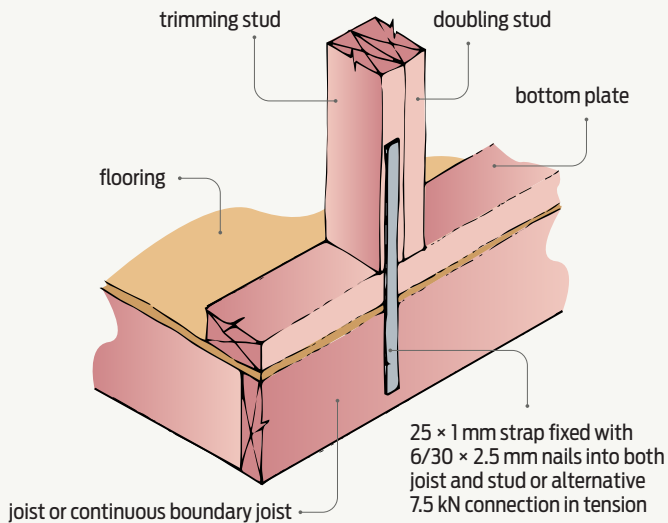


Figure 2b Fixing trimming stud and bottom plate to timber floor framing.

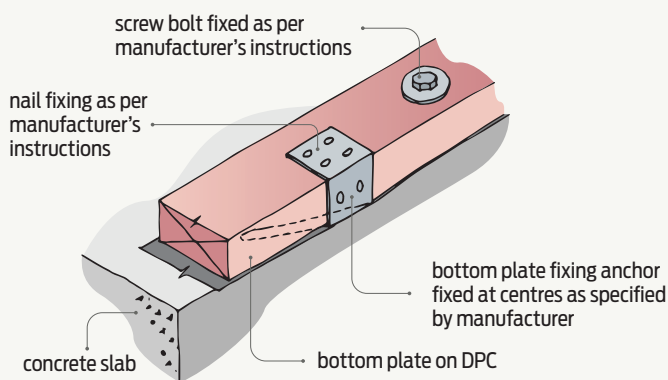


Figure 3 Bottom plate fixing anchor.

In the past, strapping was the commonly used method of tying the building structure together, but now there are proprietary fixing systems available designed to provide specified fixing capacities to meet the requirements of NZS 3604:2011.

What fixings are required where?

Fixing requirements in NZS 3604:2011 for resistance to uplift follow.

Roof framing to top plate fixing

Rafters must be fixed to top plates as per NZS 3604:2011 Table 10.1 and to corresponding rafters (i.e. adjacent rafters that abut over a ridge beam) as per Figures 10.5 or 10.7 (paragraph 10.2.1.3.7 (a) and (b)). Alternative fixing capacities include rafter to top plate connections with a minimum fixing capacity of 7.0 kN and corresponding or adjacent rafter connections with a minimum fixing capacity of 6.0 kN.

Where trusses are installed, fixings should be in accordance with the truss manufacturer's requirements but must have a minimum resistance to uplift as described in NZS 3604:2011 Tables 10.14 and 10.15 (paragraph 10.2.2.6).

Top plate to wall studs or lintels

Top plates supporting roof framing must have fixing to resist uplift in accordance either with the fixing types or the capacity of alternative fixings given in NZS 3604:2011 Table 8.18.

The fixing types and the capacity of alternative fixings are based on roof type, framing spacings and wind zone for the building.

Lintel fixing to resist uplift

A lintel supporting rafters or trusses must be secured against uplift in some situations as set out in NZS 3604:2011 Table 8.14. The two columns in the table describe the situations where fixing against uplift is required and is not required.

Paragraph 8.6.1.8 states that, where fixing to resist uplift is required, the lintel must be secured to the trimming stud at each end with a fixing as shown in Figure 8.12, or an alternative fixing with a minimum 7.5 kN capacity in tension along the line of the trimming stud – that is, vertically – may be used. Where fixings to resist uplift are not required, fixings as per Table 8.19 may be used.

Fixing trimming stud and bottom plate to concrete slab or floor framing

NZS 3604:2011 Figure 8.12 also shows strapping to resist uplift to connect the trimming stud and bottom plate to either floor framing or a concrete floor slab.

A strap fixing the trimming stud and bottom plate to a concrete slab is taken under the plate and up each side of the stud and fixed into each side of the stud with 6/30 x 2.5 mm nails.

A trimming stud supported on timber floor framing at either the ground-floor level or first-floor level is fixed to the floor framing – a joist, a continuous boundary joist or solid blocking. Fixing is with a 25 x 1 mm strap with 6/30 x 2.5 mm nails into both joist or solid blocking and the stud (see Figures 2a and 2b). Alternatively, fixings providing a minimum of 7.5 kN in tension may be used. ➤

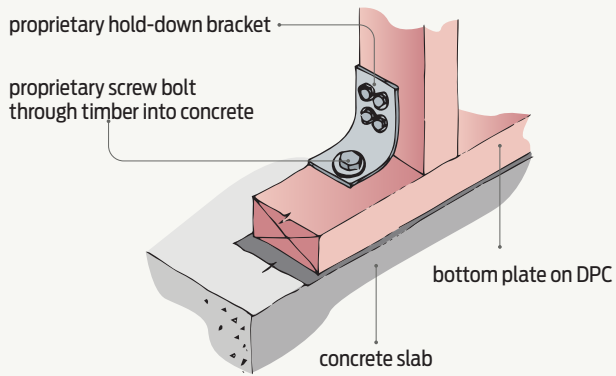


Figure 4 Hold-down bracket.

Proprietary fixings

A variety of proprietary fixings are available for all of the locations requiring securing against uplift under NZS 3604:2011. Options include timber connectors, stud straps, stud anchors, cleats, bottom plate fixing anchors and

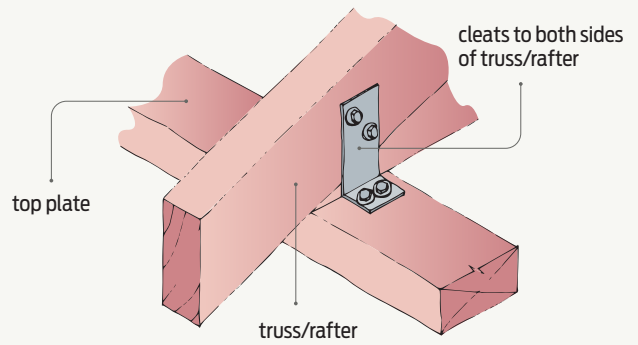


Figure 5 Truss/rafter cleat.

hold-down brackets (where a proprietary screw bolt suitable for both timber and concrete secures the bracket through the timber to the concrete slab). See Figures 3, 4 and 5. ◀