



Industry Bulletin 151

Tie-downs and connections in timber framed walls

This bulletin provides information for those involved in the design, certification and installation of timber framed walls, including builders, building surveyors, structural engineers and suppliers.

This bulletin highlights common construction issues found through Building and Energy's residential timber framing inspections and highlights areas to improve compliance in wall framing connections. These address common issues relating to an insufficient chain of tie-down connection from the roof into and through the wall frames and supporting surface.

Background

Building and Energy has conducted technical inspections of timber framing to Class 1 buildings focusing on timber wall framing. Findings reveal deficiencies with both pre-fabricated and site built timber wall framing.

Timber wall frames are typically designed and documented by the project structural engineer and/or designed with a supplier's proprietary software. Design documents are certified through the Certificate of Design Compliance (CDC) and included in the approved documents associated with a building permit.

Wall frames and their connections form part of the tie-down chain and must be designed and constructed to resist the design wind loads. Buildings with inadequate framing connections are vulnerable to failure.

Timber framed walls can be manufactured in a factory or constructed on site. For either case the types of connectors required (such as framing anchors and fasteners) should be appropriately designed and specified. These details should be provided in the approval documents.

It is the builder's responsibility to ensure that connectors are supplied and installed as specified in the approved documents.

Wall frame tie-down chain

Building and Energy's inspections have identified issues in the wall framing tie-down chain. These issues extend from connection to the wall top and ribbon plates, through to the bracing and from the wall bottom plate into the underlying substrate.

It is important that all connections are completed as per the approved design documents and referenced building standards (such as AS 1684). All connectors are also required to be installed as per the manufacturer's specifications. Failures may occur when connections are not installed as per the approved plans and/or not installed correctly.

Chain of tie-down connections observed by Building and Energy as requiring improvement include:

- hardware - use correct hardware, e.g. where specific connectors are specified they must be used; and
- connector nails - use in the correct amount and locations on pressed galvanised iron (PGI) strap connectors.

Installation of metal connectors

Installation of metal connector inspection points observed by Building and Energy as requiring improvement include:

- connector nails - where hand driven fixings (connector nails) are specified in manufacturer's requirements, they should not be replaced by machine driven nails of lesser capacity;
- number of fixings (nails or screws) – unless otherwise specified fixings in the manufacturer's requirements must be installed;
- fixing spacings - nails must be appropriately spaced i.e. if too close together can cause punch through; and
- connectors - metal connectors must be correctly orientated i.e. vertical rather than horizontal.



Figure 1, inappropriate number of machine driven nails used with insufficient spacings to existing holes.

If the manufacturer's installation instructions regarding metal connectors are being relied upon to meet applicable building standards, any deviation from these may cause a weak point in the chain of tie-down which could lead to a building failure.

Bottom plate connection to the supporting surface

Bottom plate connections observed by Building and Energy as requiring improvement:

- anchor spacings - ensure they are installed to the engineers' requirements
- anchor size - ensure the correct sized anchors are supplied and installed
- washers - ensure the appropriate size washers are supplied and installed

Anchors that are not installed correctly will likely result in connections with a reduced capacity.



Figure 2 above. No nut or washer installed to holding down bolt as required by approved engineering plans.

Tips for improving construction

Tie-down systems should be designed and clearly detailed by appropriately qualified persons and included with the approved documents as referenced in the CDC.

Connector brackets should be installed by suitably qualified and experienced persons. Installation should be in accordance with the approved documents and manufacturer's installation instructions.

Timber framing work should be supervised by appropriately qualified and experienced persons who understand the chain of tie-down through the wall frame. Supervisors should also have a high level understanding of the approved documents and manufacturer's installation requirements.

Further resources



[Industry Bulletin 121 - Tie-down of timber framed sheet metal clad roofs to timber frame walls and beams](#)

[General Inspection Report One: A general inspection into metal roof construction](#)

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