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Super Stubbie Pty Ltd

Engineering Advice

Fixing Methods for Face-Fixed Veneer Ties

This advice provides background and context to the recommendation for face-fixed masonry veneer ties to be screw fixed to the frame.

Research into the behaviour of masonry veneer ties following the 1989 Newcastle earthquake (Page & Simondic, 2001) showed poor performance of both nail fastened face-fixed veneer ties and clip on ties with metal frames against cyclic loading. In the case of nailing to timber, failure was by nail pullout at relatively low loads after a low number of cycles. In the case of ties that clip to steel frames, the ties would disengage from the stud after a relatively low number of cycles. The conclusion was that the performance of face-fixed veneer ties was greatly improved by fixing with screws. Recommendations were made to improve relevant Code provisions accordingly.

Since the 2011 edition of AS 3700, Clause 4.10 (c) (i) has required face-fixed veneer ties in masonry veneer construction more than 3.0 m above the ground to be positively attached to the structural backing by screw fixing. Below is an extract from the current 2018 edition:

4.10 WALL TIES

Wall ties for cavity walls and masonry veneer walls shall be as follows:

(a) Of Type A and a duty rating appropriate to the structural requirements of the masonry (see Clauses 7.6.2, 7.6.3 and 7.7.4).

(b) Designed to transfer the design loads.

(c) Embedded at least 50 mm into the mortar joint and, where applicable, into the grout, have at least 15 mm cover from any exposed surface of the joint and be positively attached to the structural backing as follows:

(i) For face-fixed ties in masonry veneer more than 3.0 m above the ground, by screw fixing.

(ii) For side-fixed ties, by either screw or nail fixing.

NOTES:

1 AS 2699 (all parts) requires the manufacturer to supply the fasteners with the ties.

2 Tests have shown that nail fixing for face-fixed ties in timber veneer construction and clip-on ties in steel stud veneer construction do not provide the required attachment to the structural backing under earthquake loading.

3 Reduction of embedment within the limits of wall tolerance (see Table 12.1) is assumed not to affect performance.

An extract of AS 2699.1 Clause 2.5 (b) is provided below, echoing the highlighted note 2 above, and also requiring that the tie and fastener be supplied as an integral system. That requirement is considered necessary to ensure that the tie and fastener combination installed in buildings complies with the strength data from testing (AS 2699.1 Appendix F).

(b) Wall ties that are designed to be fixed to non-rigid members shall be capable of being fixed by impact and non-impact methods (for example, screwing).

Ties and fasteners shall be supplied as an integral system.

NOTE 2 Tests have shown that nail fixing for face-fixed ties in timber veneer construction and clip-on ties in steel stud veneer construction do not provide the required attachment to the structural backing under earthquake loading (see AS 3700).

NOTE 3 Screw fixings do not suffer or produce the same problems as do impact fixings such as nails.

NOTE 4 Galvanic compatibility between the tie and fastener is required by Clause 2.3.6.

When it comes to other specification sources in relation to face-fixed veneer ties, the following is noted, seemingly in conflict with AS 3700:

1. AS 4773.1 and AS 4773.2 are silent on the fixing type for face-fixed veneer ties, except for the requirement as per AS 2699.1 that the tie shall be fixed with the fastener type that was used in the strength tests.
2. NCC Volume Two Deemed-to-Satisfy Provisions in Clause 3.3.5.10 does not specify any limitations in relation to veneer tie fixings. The note to Table 3.3.5.3b states, "Ties are to be fixed to the supporting frame at all regular stud positions using screws or nails."

The relevant industry guide is Think Brick Australia Technical Manual 10 – Construction Guidelines for Clay Masonry. Section 4.4.2 explains the background for the requirement for screw fixing of veneer ties in AS 3700 and reinforces the need for positive attachment by screws.

All structures including houses must be designed to resist earthquake actions, even if the magnitude of induced forces is less than those caused by wind actions. The cyclic nature of earthquake actions is an important factor that cannot be overlooked, and screw fastening of face-fixed masonry veneer ties is more reliable and provides a greater degree of certainty of compliance with the NCC.

References

AS 2699.1:2020 Built-in components for masonry construction – Part 1: Wall ties

AS 3700:2018 Masonry structures

AS 4773.1:2015 Masonry in small buildings – Part 1: Design

AS 4773.1:2015 Masonry in small buildings – Part 2: Construction

NCC 2019(+A1) Building Code of Australia – Volume Two National Construction Code, Volume Two, Class 1 and Class 10a Buildings, Australian Building Codes Board, 2020

Page, A.W., Simondic, G., Earthquake Performance of Veneer Ties, 6th Australasian Masonry Conference, Adelaide, South Australia, 12-13 July, 2001

Think Brick Australia Manual 10 – Construction Guidelines for Clay Masonry, 2018

Please contact the undersigned if you have any queries regarding this document.

Yours sincerely,

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