



# Bottom plate anchors



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NZS 3604:2011 *TIMBER-FRAMED BUILDINGS* HAS TWO TYPES OF ANCHOR OPTIONS FOR FIXING BOTTOM PLATES TO CONCRETE FLOORS. WE REVIEW THE OPTIONS AND REQUIREMENTS.

**ANCHORS THAT FIX BOTTOM PLATES** to concrete slab-on-ground floors are an essential component of timber-frame construction as they secure the upper building structure to the foundation.

They must withstand forces in three directions:

- Uplift – tension.
- Along the wall – in-plane shear.
- Across the wall – out-of-plane shear.

Section 7 of NZS 3604:2011 *Timber-framed buildings* provides two options for fixing bottom plates to concrete floor slabs:

- Cast-in anchors.
- Proprietary (post-fixed) anchors.

## Cast-in anchors

Cast-in anchors consist of M12 bolts and either 50 × 50 × 3 mm square washers or 55 × 3 mm round washers.

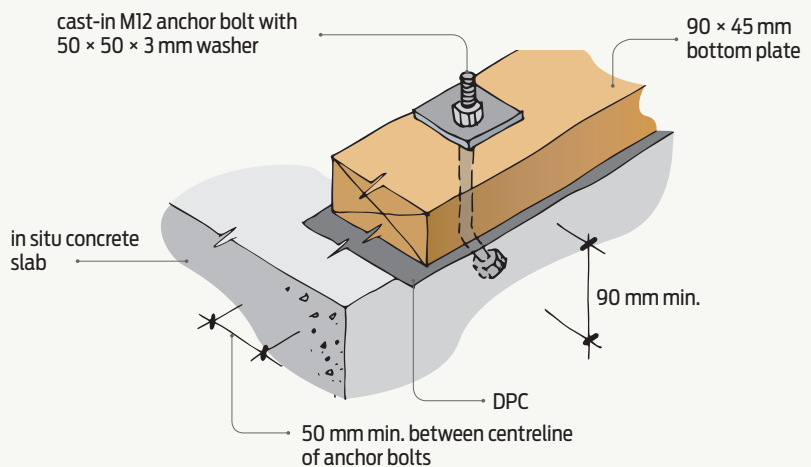
Where the slab edge is in situ concrete, anchors must be embedded at least 90 mm into the slab (see Figure 1). Where concrete masonry header blocks are used at the slab edge, anchors must be embedded at least 120 mm (see Figure 2).

### Edge distance at least 50 mm

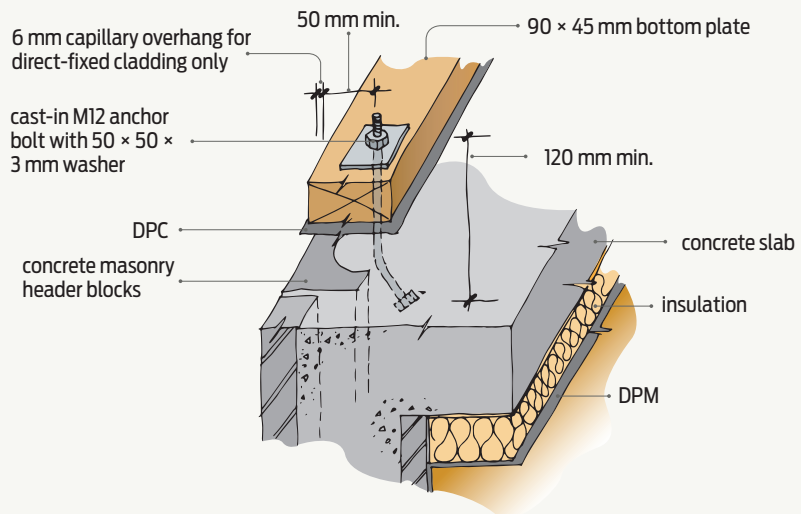
Cast-in anchors must be fixed at least 50 mm from the edge of the slab for both in situ concrete and masonry header blocks. For masonry header blocks, the distance is measured from the outside face of the blocks (see Figure 2).

The previous 1999 edition of NZS 3604 did not specify this dimension, but BRANZ testing (see BRANZ Study Report SR125) showed that, where the slab edge distance was less than 50 mm, anchors frequently failed, particularly where masonry header blocks were used.

If a 90 mm bottom plate is used and the anchors are fixed in the centre of the bottom plate, the distance between anchors and the slab edge may be insufficient to withstand the forces on the wall framing. ➤



**Figure 1** Cast-in anchor – in situ concrete slab edge.



**Note:** Reinforcing and exterior cladding omitted for clarity.

**Figure 2** Cast-in anchor – concrete masonry header blocks at slab edge.

**Table 1**

# MINIMUM HOLDING CAPACITIES FOR PROPRIETARY ANCHORS

TYPE OF FORCE		CAPACITY
EXTERNAL WALLS	Horizontal in-plane (along wall)	2 kN
	Horizontal out-of-plane (across wall)	3 kN
	Vertical (uplift)	7 kN
INTERNAL WALLS	Horizontal in-plane (along wall)	2 kN
	Horizontal out-of-plane (across wall)	2 kN

### Spacings and concrete

Cast-in anchor bolts must be installed at a maximum of 1.2 m centres and no more than 150 mm from each end of every plate.

Where concrete blocks are used in zone D, concrete is required to be 25 MPa and steel needs 60 mm cover from the outside face of the block.

### Proprietary anchors

Proprietary anchors are inserted into the concrete once the slab has cured. The performance criteria of post-fixed anchors are set out in NZS 3604:2011 paragraphs 7.5.12.3 and 7.5.12.4 for

external and internal walls respectively and are shown in Table 1.

Proprietary anchor fixings include:

- expanding or wedge anchors
- anchors set in epoxy fitted into predrilled holes
- sockets with threaded rods
- anchors screwed into predrilled holes.

Proprietary anchors used as hold-downs for walls containing bracing will require additional uplift capacity depending on the bracing panel rating:

- 150 BUs/m is the maximum permitted in NZS 3604:2011 and requires 15 kN uplift fixings
- 120 BUs/m requires 12 kN uplift fixings.

Proprietary anchors should have test results showing they have been tested to and meet the NZS 3604:2011 requirements for their intended use.

### Edge distances depend on product

No edge distance dimension is given in NZS 3604:2011 for proprietary bottom plate anchors but verification is required for the performance in plane, out of plane and vertically.

### Spacings for proprietary anchors

Proprietary anchors must be installed at a maximum of 900 mm centres where the slab edge is in situ concrete and a maximum of 600 mm centres where the slab edge is formed with concrete masonry header blocks. They must be no more than 150 mm from each end of every plate.

### Durability requirements

Durability requirements for anchors in NZS 3604:2011 Table 4.1 specify that, for all zones in a closed environment, mild steel anchors (uncoated and non-galvanised) are allowed.

However, where these are into timber treated with a copper-based preservative, it is recommended that the anchors be at least hot-dip galvanised steel. ◀