

**DESIGN  
RIGHT**



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# Free-standing timber decks

IN SOME SITUATIONS A FREE-STANDING DECK OR PLATFORM MAY BE A SIMPLER SOLUTION THAN AN ATTACHED DECK. ALTHOUGH THE DESIGN REQUIREMENTS FOR BOTH ARE GENERALLY THE SAME, THERE ARE SOME DIFFERENCES TO CONSIDER.

**THE DESIGN REQUIREMENTS** for decks attached to a building are set out in NZS 3604:2011 *Timber-framed buildings* section 7.4. Where applicable, the structural and durability requirements and the selection of timber, fixings and fastenings are the same for both free-standing and attached decks.

### Subfloor bracing

Subfloor bracing requirements are set out in NZS 3604:2011 section 5.

Piles may be braced, anchor or cantilevered, or a combination of these.

### Calculate deck bracing demand

When determining bracing, first calculate the bracing demand for the deck.

**Step 1:** Select the earthquake zone from NZS 3604:2011 Figure 5.4 Earthquake zone maps.

**Step 2:** Obtain the bracing demand from NZS 3604:2011 Table 5.8. Using half the value for light cladding for wall, roof and subfloor and 0–25° roof pitch, this is  $15 \times 0.5 = 7.5 \text{ BU/m}^2$ .

**Step 3:** Multiply the bracing demand by a multiplication factor (given at the bottom of Table 5.8) for soil class and earthquake zone.

**Step 4:** Multiply the resulting value by the area of the deck to calculate the total number of bracing units (BUs) required in each direction (NZS 3604:2011 5.3.1).

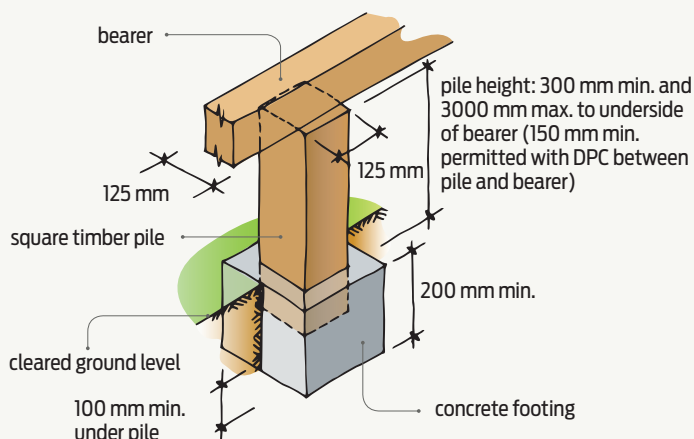
**Example:** For a proposed 10 m<sup>2</sup> (5 × 2 m) deck with an earthquake zone 3 and soil class E.

From Table 5.8, the multiplication factor is 1.0, so  $15 \times 0.5 \times 1.0 = 7.5 \text{ BU/m}^2$ . Multiply 7.5 BU/m<sup>2</sup> by the area of the deck to obtain the total bracing units required gives  $7.5 \times 10 = 75 \text{ BUs}$  in each direction.

### Applying bracing to a deck design

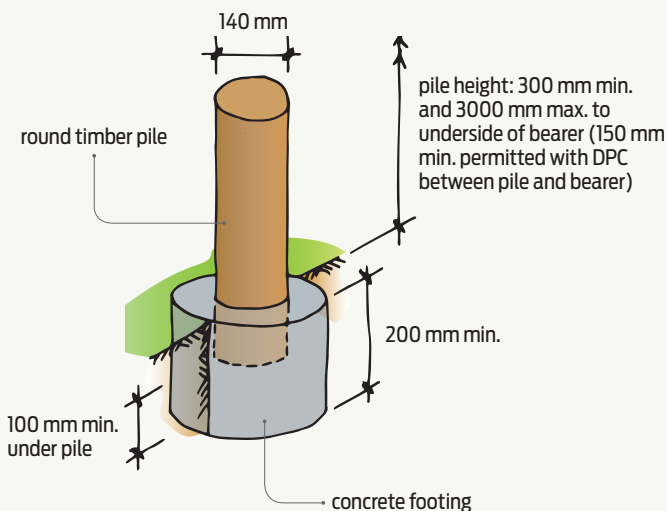
There are no specific requirements in NZS 3604:2011 for bracing distribution for free-standing decks, but the following rules should be used as far as practicable. Bracing should be:

- provided in two directions at right angles to one another to provide horizontal support
- located in perimeter foundation and subfloor framing



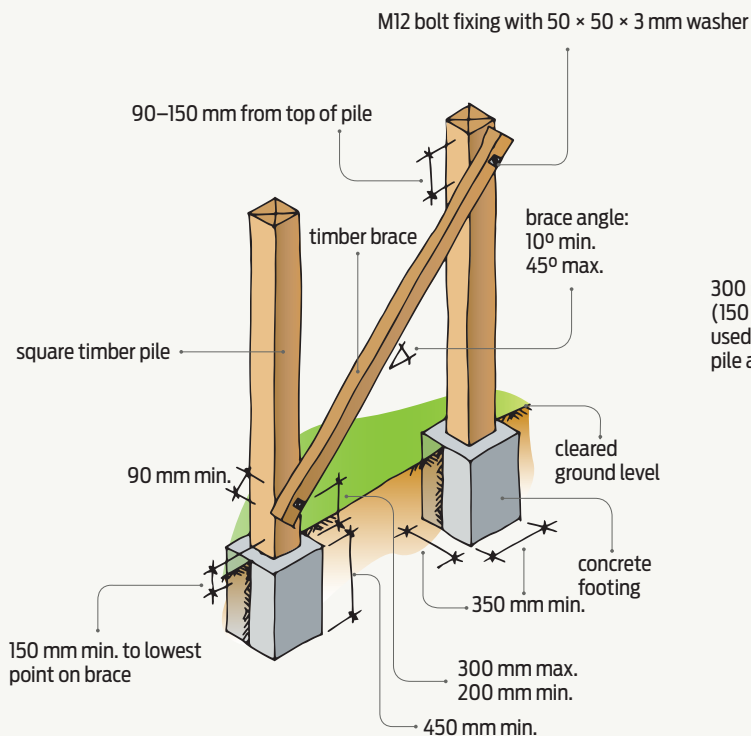
**Figure 1**

**Square timber (ordinary) pile.**

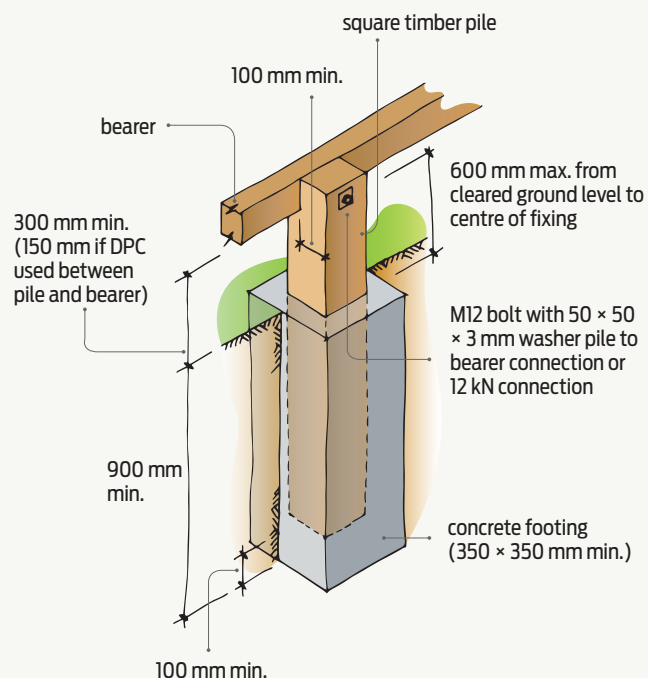


**Figure 2**

**Round timber (ordinary) pile.**



**Note:** 120 BUs (earthquake) per pair of piles.



**Note:** 120 BUs (earthquake) per pile in any direction.

**Figure 3** Braced pile system (pairs of piles).

**Figure 4** Anchor pile.

- located in internal lines parallel to the perimeter at a maximum of 5.0 m centres
- distributed as evenly as possible along each line.

### Pile height and footings

The maximum height of the piles will influence the choice of braced pile system (NZS 3604: 2011 6.4.4.1 (b)). This is summarised in Table 1 and Figures 1–5.

Except for driven piles, all timber piles must have a concrete footing that is at least 100 mm below the pile and be cast in situ on undisturbed good ground.

Footings below cleared ground level must have a minimum depth of:

- 200 mm for ordinary piles
- 450 mm for braced piles
- 900 mm for anchor piles. ➤

**Table 1**

## MAXIMUM HEIGHTS FOR TIMBER PILES

TYPE OF SUBFLOOR BRACING SYSTEM	MAXIMUM PERMITTED HEIGHT ABOVE CLEARED GROUND LEVEL
Cantilevered piles	1200 mm
Anchor piles	600 mm to centre of fixing
Braced timber piles (when they directly support bearers)	3000 mm

The plan area of the footing depends on bearer and joist spans and is determined from NZS 3604:2011 Table 6.1, except that braced and anchor piles must be a minimum of 350 × 350 mm for square piles and 400 mm diameter for round piles.

### Bearers

Bearer sizes are selected from NZS 3604:2011 Table 6.4 Part (b) for a 2 kPa wet-in-service floor load (NZS 3604:2011 6.12). They must:

- be continuous over two or more spans
- be laid in straight lines on edge
- have a minimum landing of 90 mm, except this may be 45 mm where butted over the support
- be jointed only over ordinary pile supports (i.e. they must not be jointed where the bearer is fixed directly to an anchor or braced pile)
- have a connection capacity at joists of:

- 12 kN minimum capacity in tension or compression along the line of the bearer, or
- 6 kN minimum capacity each on both sides of a continuous bearer.

### Joists

Timber joists for decks are selected from NZS 3604:2011 Table 7.1 Part (b) for a 2 kPa wet-in-service floor load. They must be laid in straight lines on edge with top surfaces set to a common level and have 32 mm minimum bearing over supports.

### Joist fixings

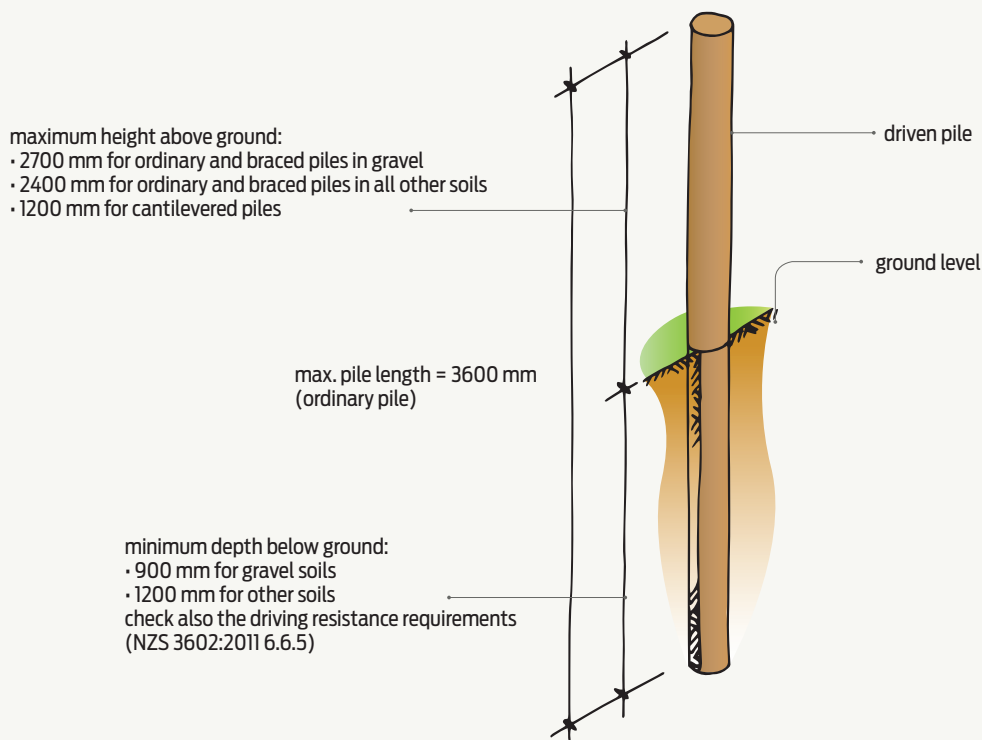
Joist fixings to piles or bearers are in NZS 3604:2011 6.8.6:

- If the brace is connected to the pile and parallel to the joist direction, the two joists on either side of the brace must be fixed to the bearer with a 6 kN capacity connection in the horizontal direction.

- If the brace is connected to the joist, the joist to bearer connection must have 12 kN capacity in the vertical direction (see NZS 3604:2011 Figure 6.8).
- Bearers and joists connected to anchor piles must be fixed with:
  - M12 bolts with 50 × 50 × 3 mm washers, or
  - 12 mm diameter threaded rod and washers, or
  - 12 kN capacity connections in tension or compression along the joist or bearer.

### Trimmers and trimming joists

Where an opening (such as for stairs) is required in a deck, trimmers and trimming joists must be fitted around the opening in accordance with NZS 3604:2011 7.1.6. ◀



**Note:** 30 BUs (earthquake) per pile in any direction.

**Figure 5**

**Cantilevered (driven) pile.**