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# Chimney fixing and bracing

Most new chimneys are just a chimney shape that encloses the flue, unlike traditional solid chimneys. We look at some of the construction, fixing and bracing requirements for both options.

**TRADITIONALLY**, chimneys attached to timber-framed buildings were constructed from brick or masonry systems such as concrete/pumice blocks or precast concrete. Usually, they were freestanding, placing little direct demand on the framing.

## Chimneys changed with the times

In newer buildings, with the replacement of old open fires with wood burners and flued gas appliances, the chimney has simply become a framed enclosure around a lightweight flue.

Where a heavy chimney was incorporated, Building Code Acceptable Solution B1/AS3 *Small chimneys* included details of structural connection so that the earthquake loads from the heavy chimney could be transferred to suitably braced timber framing. Today, this is more likely to be used in renovation projects.

## Framed flue enclosures

Framing that forms a chimney shape but simply encloses the flue can be spaced, sized and fixed as for any timber (or lightweight steel) stud wall as there is no significant load applied to it from the flue. The key considerations will be:

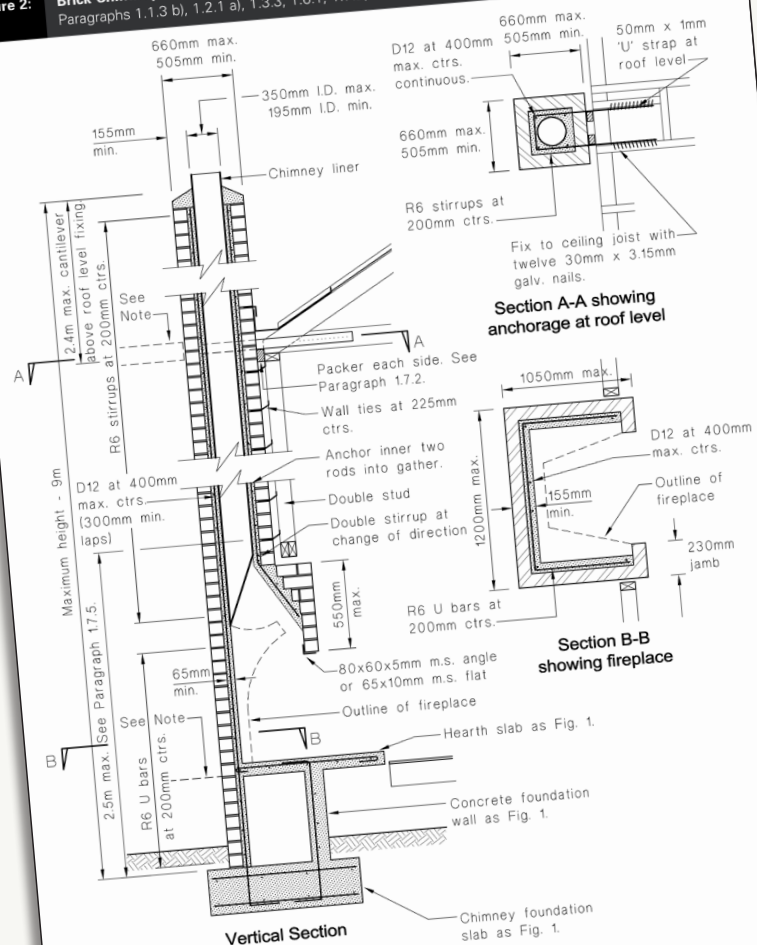
- the actual height of the framing needed
- whether the wall framing is continuous, as under NZS 3604:2011 *Timber-framed buildings*, the maximum stud height is 4.8 m.

For taller framed flue enclosures, the construction options are to:

- decrease the stud spacing or increase stud depth
- utilise a wall plate at each floor level – effectively reducing stud heights
- ensure the framing is able to cantilever above roof level to resist wind loads ➤

**Figure 2: Brick Chimney with Liner**

Paragraphs 1.1.3 b), 1.2.1 a), 1.3.3, 1.6.1, 1.7.2, 1.7.5 and 1.7.6



**NOTES:**  
Figure 2 has been drawn for the chimney being exterior to the building. The dotted lines indicate the ceiling joists and floor for the situation where the chimney is internal.  
Flues must be sized to ensure adequate draught. Sizing depends on many factors including the height of the flue but generally flue cross sectional area needs to be a minimum of 1/12th of the fireplace opening. The flue also needs to be sufficiently large to enable cleaning. 195mm is regarded as a practical minimum diameter.

**Figure 1**

**Figure 1: Brick chimney with liner. (Source: B1/AS3, MBIE.)**

- cantilever intermediate floor joists or a ceiling outrigger at each side of the enclosure to tie it back to the main building
- use specific engineering design.

Bracing is unlikely to be required in framed flue enclosures as their lateral stability can be provided by the adjacent building structure. However, if it is and the flue wall is within 2 m of a parallel wall bracing line, it can be treated as on the same bracing line.

### **Traditional brick or concrete chimneys**

B1/AS3 sets out fixing requirements for timber-frame construction for brick, concrete and precast pumice concrete chimneys. It covers chimneys connected to timber-frame or masonry buildings complying with NZS 3604:2011 or NZS 4229:2013.

### **Height restrictions**

The height of any chimney covered by B1/AS3 measured from the top of the chimney foundation slab to the top of the chimney stack shall not exceed 9 m. Chimneys shall not cantilever more than 2.4 m above the fixing at roof level and need to be within the size limits of B1/AS3 paragraph 1.1.3.

### **Bracing elements**

Paragraph 1.9.2 of B1/AS3 states that 'the building supporting the chimney shall contain bracing elements to resist earthquake loads from the chimney ... applied at roof level and at each floor to which the chimney is connected'.

According to paragraph 1.9.4, a chimney is connected to the building when:

- at roof level – it is held either by a roof bracket or by a roof tie
- at ground floor level – it is held by a floor bracket or the chimney base is integral with the building foundation wall
- at an intermediate floor level – it is held either by a floor bracket or by closely spaced wall ties spanning the floor.

Brackets are to be 50 × 4 mm hot-dip galvanised steel straps fitted around the chimney and bolted on each side to floor and ceiling joists with three M12 bolts at 75 mm centres (see Figure 1).

### **Alternative tie options**

B1/AS3 gives alternative tie options:

- For brick chimneys, restrain at roof level with

a zinc-coated 50 × 1.0 mm mild steel U strap cast into the grout and used in conjunction with closely spaced wall ties.

- For precast pumice concrete chimneys, restrain at roof level by a 50 × 1 mm U strap wrapped around the chimney or by a hot-dip galvanised deformed 6 mm reinforcing bar placed into the grout around the reinforcing steel, together with either fixing brackets or fixing ties.
- Any proprietary bracing strip system of equal durability to the U strap described in B1/AS3 paragraph 1.7.6 and capable of carrying a seismic force of 12 kN without elongating by more than 1.5 mm.
- Cast-in hot-dip galvanised deformed 6.0 mm reinforcing bar bent to a U shape, with each end fixed to the roof or ceiling framing with six 50 × 4.0 mm galvanised fencing staples.

The building supporting the chimney shall contain bracing elements to resist 'the additional' earthquake loads from the chimney (B1/AS3 Table 2). These loads are applied at roof level and at each floor to which the chimney is connected. ◀