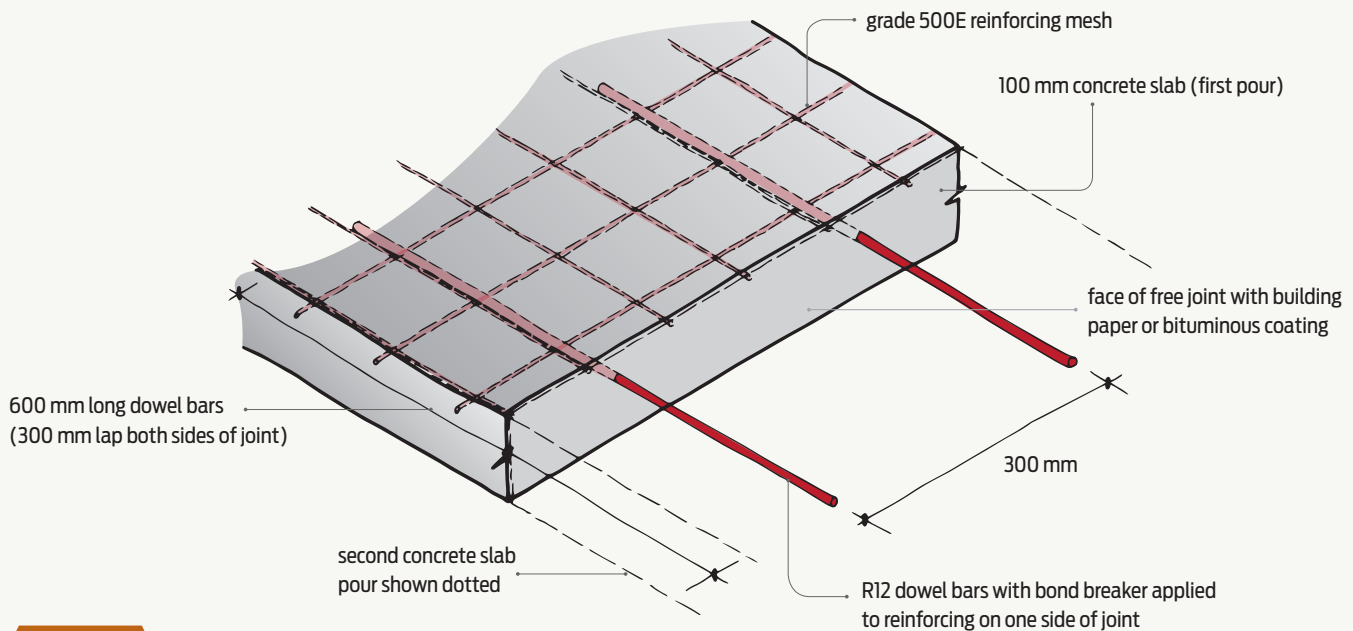




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# Concrete slabs and control joints

AS A RESULT OF THE CANTERBURY EARTHQUAKES, THERE HAVE BEEN CHANGES TO THE REQUIREMENTS FOR CONCRETE FLOOR SLABS. ARE YOU UP TO DATE?



**Figure 1** Reinforcing a free joint.

**BEFORE THE CANTERBURY EARTHQUAKES,** concrete floor slabs for single-storey dwellings could be unreinforced or reinforced with polypropylene fibres.

Due to the poor performance of concrete slabs in the earthquakes, the New Zealand Building Code compliance document B1 *Structure* was amended to require concrete slab-on-ground floors to be reinforced with grade 500E ductile reinforcing mesh in accordance with AS/NZS 4671:2001.

## Reinforcing mesh

Although the requirement for reinforcing all concrete floor slabs initially only applied to the

Canterbury region, since 1 February 2012, it has been mandatory for concrete slabs on ground throughout the country.

The 500E reinforcing must be a minimum 2.27 kg/m<sup>2</sup> (or 1.15 kg/m<sup>2</sup> in each direction) welded mesh sheets. The reinforcing mesh sheets must be lapped at sheet joints by the greater of a minimum 225 mm lap or in accordance with the manufacturer's specifications. It must extend to within 75 mm of the outside edge of the floor slab (including foundation wall) and be tied to foundation wall reinforcing according to NZS 3604:2011 Figures 7.13, 7.14, 7.15 and 7.16 with R10 starters

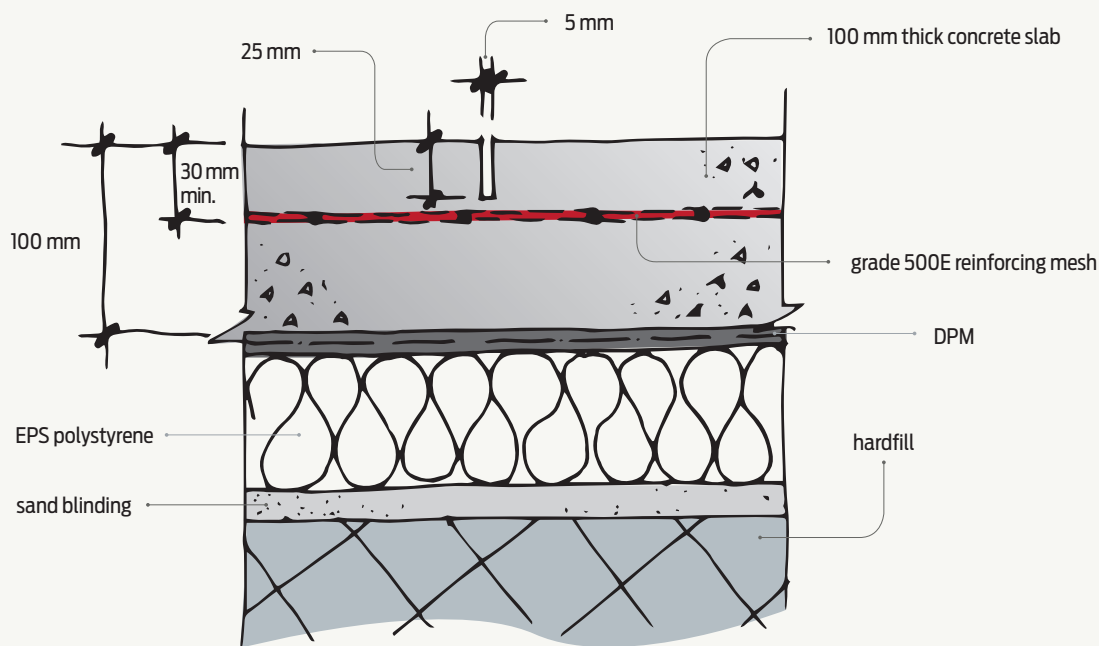
at 600 mm centres and lapped with the slab mesh.

## When are free joints needed?

In NZS 3604:2011 paragraph 7.5.1, the size of a reinforced concrete slab on ground is limited to a maximum of 24 m in any direction. Where concrete floor slab dimensions exceed 24 m in one or both directions, a free joint must be installed.

If a slab exceeds the 24 m maximum dimension without the inclusion of free joints, it must be specifically designed.

A free joint is defined as a construction joint 'where no reinforcing mesh passes through the



**Figure 2** Shrinkage control joint.

joint [to link] both sides of the concrete slab, and the vertical faces of the joint are not in bonded contact with each other'.

Bonding of concrete at the free joint is prevented by inserting building paper in the joint or by applying a bituminous coating to one face of the joint.

Reinforcement of the free joint consists of 600 mm long R12 dowel bars installed at 300 mm centres along the joint and lapped 300 mm with the slab reinforcement on both sides of the joint (see Figure 1). All dowel bars on one side of the joint must have a bond breaker applied, for example, petrolatum tape

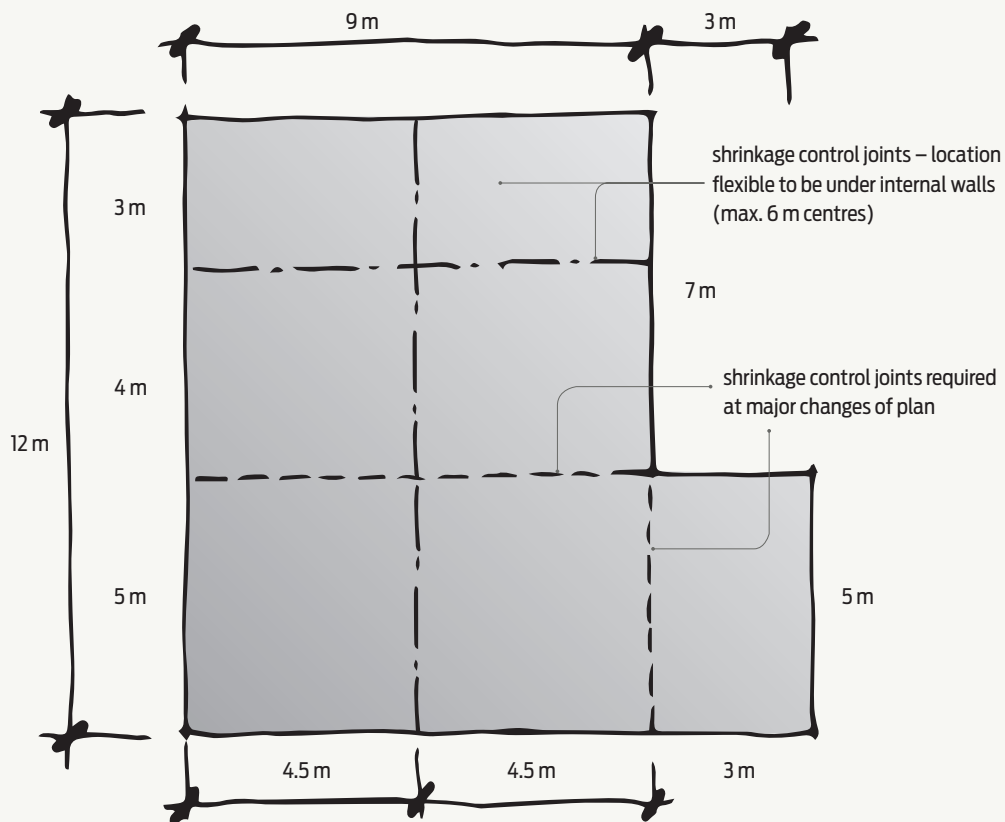
wrapped around the dowel bars for 300 mm. Dowel bars must be aligned and parallel with the reinforcing mesh.

### **Shrinkage control joints**

Concrete shrinks as it cures, and unless controlled, this can result in unsightly cracking across the slab. Shrinkage control joints, defined in NZS 3604:2011 as lines 'along which the horizontal strength of the slab is deliberately reduced so that any shrinkage in the slab will result in a crack forming along that line', can contain cracking to locations where they have minimal impact or visibility.

Shrinkage control joints should extend into the slab for one-quarter of the slab's depth (see Figure 2) and must not damage the DPM underneath. They may be formed either by saw cutting the slab after it has hardened or by casting a crack inducer into the slab when the concrete is poured. Control joints that are cut into the slab should be formed within 24–48 hours after pouring, depending on the ambient temperature.

Cracking is most likely to occur at major changes of plan, so NZS 3604:2011 paragraph 7.5.8.6.4 requires that shrinkage control joints are created to coincide with these locations (see Figure 3). ➤



**Figure 3** Shrinkage control joint locations.

Shrinkage control joints must be at a maximum of 6 m spacings to create bays. The length to width ratio of bays between shrinkage control joints, or between shrinkage control joints and a free joint, should be between 2:1 and 1:1, so no bay should be more than 6 × 6 m.

Supplementary steel may be placed in irregularly shaped concrete floor slabs in positions shown in NZS 3604:2011 Figure 7.18 but must not be installed across shrinkage control joints.

### Laying flooring over top

Flooring, particularly ceramic tiles, should not be laid across the free joint or shrinkage control joints, as any movement in the slab is very likely to cause cracking or damage to the flooring. Instead, create movement control joints in the tiling or other flooring to coincide with the shrinkage control joints in the concrete slab.

### Referenced standards

The changes to concrete slabs on ground in clause B1 *Structure* reference NZS 3604:2011 *Timber-*

*framed buildings*, NZS 4299:1998 *Earth buildings not requiring specific design* and NZS 4229:1999 *Concrete masonry buildings not requiring specific engineering design*.

Although Standards New Zealand published NZS 4229:2013 *Concrete masonry buildings not requiring specific engineering design* earlier this year, this latest standard is not yet referenced in clause B1, so the 1999 standard still applies. ◀