



Allow for movement

Precast hollow-core floor assemblies

(web version revised November 2008)

Issues of concern

Common practice to date in the design of precast hollow-core floor assemblies may not fully address the actual conditions likely to be experienced during the life of a structure, particularly in strong earthquake shaking.

Designers should consider the real actions on the design elements and the mechanisms that will be needed for the floor and its supports to maintain their integrity as the building structure deforms at or beyond the design limits. Recent research has revealed gaps in our understanding of the behaviour of these floors in these situations.

Background

Testing by Matthews et al at the University of Canterbury raised concerns about the performance of precast hollow-core floor units in a major earthquake. Key concerns were:

- beam elongation and other effects caused damage to the hollow-core seating (loss of seating or damage to the edge of the hollow-core unit)
- splitting of the hollow-core units at mid-depth occurred
- delamination of the topping concrete occurred
- in the latter stages of the test, the hollow-core units collapsed on to the floor of the laboratory.

Subsequent testing using revised details showed satisfactory performance and amendments have been made to NZS 3101. Research is ongoing to better understand the behaviour and to develop improved details.

Further information: NZS 3101 Concrete Structures Standard, University of Canterbury test results – Matthews, Lindsay

Note that this Practice Advisory is issued as guidance information in accordance with section 175 of the Building Act 2004 and, if used, does not relieve any person of the obligation to consider any matter to which the information relates according to the circumstances of the particular case.

Don't

- ✗ **Don't** ignore the effects of earthquake-induced displacements and forces on the performance of hollow-core floors.
- ✗ **Don't** leave detailing to chance. The designer must determine and design the appropriate connection detail between the flooring system and support structure for the type of structure.

Do

- ✓ **Do** ensure that account is taken of three-dimensional effects when considering floor support details and floor system behaviour.
- ✓ **Do** follow recommended practices in NZS 3101 Amendment 3 to show exactly the correct connection details.
- ✓ **Do** design floor systems to have robust and displacement-tolerant support connections.
- ✓ **Do** insist that the contractor provides adequate shop drawings.
- ✓ **Do** ensure that the designer and contractor's engineer review shop drawings and sign them off.
- ✓ Designers and building officials should inform themselves of the latest recommendations from research in the area of hollow-core flooring and the updated design guidelines. These can be obtained through the Cement and Concrete Association, New Zealand Society of Earthquake Engineering and Standards New Zealand among other sources.

Practice Advisory 5 cont.

Figure 1 Example of failure in hollow-core flooring test after severe lateral displacement.
Source: University of Canterbury, Department of Civil Engineering



Figure 2 Improved hollow-core flooring details from NZS 3101 Amendment 3.

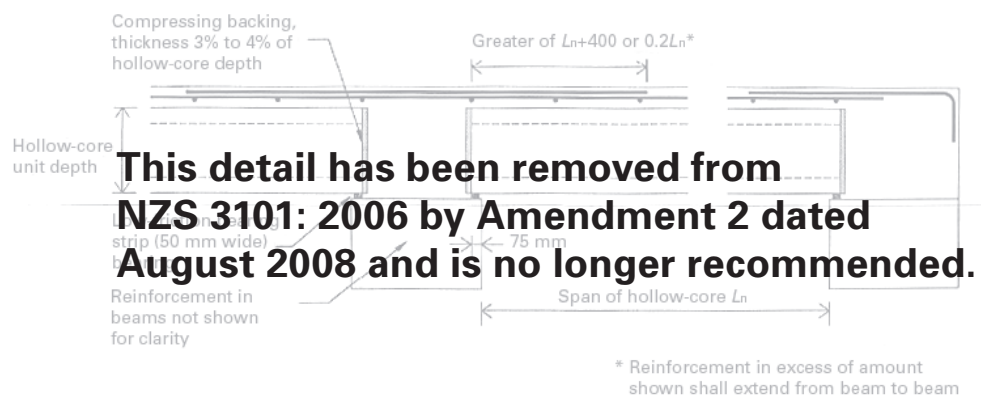


Figure C 18.3 – Hollow-core with compressible backing on low friction bearing strips

Figure 3 Improved hollow-core flooring details from NZS 3101 Amendment 3.

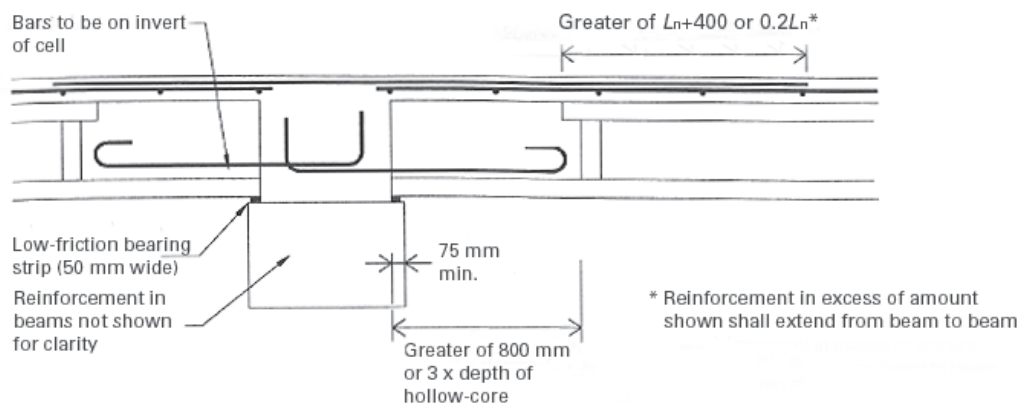


Figure C18.4 – Hollow-core with 2 – 2 leg R 12 hairpins on low friction bearing strips