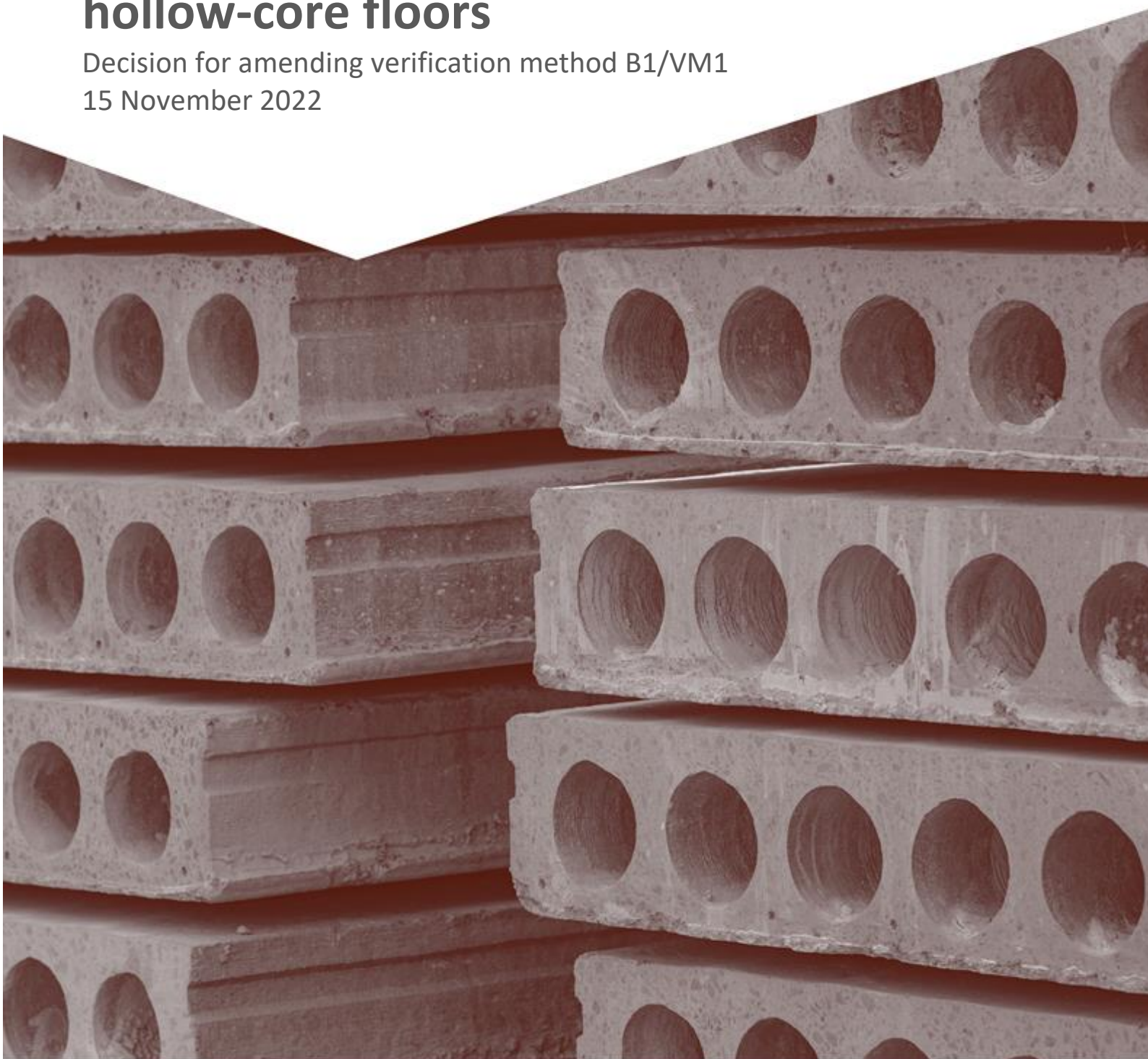


Outcome of consultation
Building Code update 2022
**Structural stability of
hollow-core floors**

Decision for amending verification method B1/VM1
15 November 2022



Ministry of Business, Innovation and Employment (MBIE)

Hikina Whakatutuki – Lifting to make successful

MBIE develops and delivers policy, services, advice and regulation to support economic growth and the prosperity and wellbeing of New Zealanders.

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Summary of the consultation

Consultation process

Consultation is an important part of developing updates to the Building Code acceptable solutions and verification methods. Consultation provides the sector and public an opportunity to provide their feedback on proposed changes.

Between May and July 2022, MBIE sought feedback for proposals on:

- plumbing and drainage
- structural stability of hollow-core floors
- protection from fire for residential homes
- fire safety system standards.

In June 2022, MBIE conducted an additional consultation to extend the transition period for changes to insulation requirements for housing from the 2021 Building Code update. In July, MBIE released an outcome document advising the decision to extend the transition period for insulation for housing to May 2023, with a staged transition for windows and doors.

Submissions received

The 2022 Building Code update consultation received 111 submissions across the proposals for plumbing and drainage, structural stability of hollow-core floors, and protection from fire.

MBIE would like to thank the individuals and organisations who took the time to prepare a submission for this consultation.

Number of submissions received by occupation

Occupation	Number of submissions and percentage of total
Architects	2 (2%)
Designers or engineers	35 (31%)
Builders or tradespersons	9 (8%)
Building Consent Authorities	22 (20%)
Building product manufacturers	12 (11%)
Building owners, occupants or renters	4 (4%)
Other submitters including those who did not specify their occupation	27 (24%)
Total	111

Purpose of this document

This outcome document explains the decision made for the proposal on structural stability of hollow-core floors. The feedback received during the consultation was used to inform this decision. A similar document for the outcome of the plumbing and drainage proposal for lead in plumbing products is available on building.govt.nz.

Work is underway analysing submissions on the remaining proposals for plumbing and drainage and protection from fire. We want to fully understand the comments provided and ensure all feedback is taken into consideration before updating the provisions in the Building Code.

Due to the breadth of in-depth submissions received for these other topics in the consultation, MBIE will publish the remaining outcome documents no later than November 2023.

MBIE is committed to updating the Building Code so that it keeps pace with innovation, current construction methods and the needs of modern society. The Building Code provides clarity, certainty and consistency to the building and construction sector.

Summary of the decision

MBIE is removing the deemed to comply method for the design of supports for hollow-core floors from the Verification Method B1/VM1.

The verification method will be amended to remove the citation of Clause 18.7.4.4 of the New Zealand Standard NZS 3101.1: 2006 from the Verification Method B1/VM1.

This decision is being made following support of the proposed change during consultation.

This proposal received 26 submissions with 92 per cent of the submissions supporting the proposal. These submissions primarily came from engineering technical societies, building consent authorities, and the concrete industry. Twenty-one submissions preferred a transition period of 12 months or less for the change to take effect. Only one submission preferred a transition period greater than 12 months.

MBIE understands that there is already a downward trend in use of these systems following the 2016 Kaikōura earthquake and the advisory note from SESOC and NZSEE technical societies in 2021. MBIE believes that removing this deemed to comply solution from B1/VM1 will minimise the chance of poorly designed hollow-core floor systems being specified in new building work.

It will take time to revise the technical documentation and build awareness of the change. Therefore, the amended Verification Method B1/VM1 will be published along with other documents in November 2023. This change for hollow-core floor systems will take immediate effect when published – there will be no additional transition period.

In the interim period prior to November 2023, structural engineers looking to use these types of floors or provide advice to building owners should review the advice on hollow-core floors issued by Engineering New Zealand, the Structural Engineering Society New Zealand, and the New Zealand Society of Earthquake Engineering available online at <https://www.sesoc.org.nz/precast-flooring-resources/>

1. Structural stability of hollow-core floors

1.1. What we proposed

In May and June 2022, MBIE sought feedback on amending the Verification Method B1/VM1 which is used by structural engineers for the structural design of buildings. In this consultation, it was proposed to remove the deemed to comply pathway in B1/VM1 for design of the support of hollow-core floor systems as a result of recent research in understanding the behaviour these floor systems in earthquakes. This proposal included modifying the citation of New Zealand Standard NZS 3101.1: 2006 within B1/VM1 Paragraph 3.1.1. The proposed modification would delete Clause 18.7.4.4 of this standard. Engineers looking to use these types of floors would have to demonstrate that the design of the support complies with the Building Code as an alternative solution.

As part of this proposed change, MBIE would remove Practice Advisory 5: Allow for movement - Precast hollow core floor assemblies from our website at the end of the transition period. This practice advisory refers to the use of the design details in NZS 3101.1 which would no longer be included as part of the verification method.

For this proposal, MBIE considered three options against the status quo:

- Option 1. Sponsoring an update of the cited standard NZS 3101.1 to address hollow-core floors
- Option 2. Developing new deemed to comply requirements
- Option 3. Amend B1/VM1 to remove the portion of the standard relating to the support of hollow-core floors (Recommended)

Option 3 provided the only reasonable option for further analysis in the consultation document due to its timeliness and consistency with current technical recommendations.

In the consultation, MBIE sought feedback on four questions:

- Do you support amending Verification Method B1/VM1 Paragraph 3.1.1 as proposed to make the design of hollow-core floor supports an alternative solution?
- What impacts would you expect for you or your business from the proposed change to the transition period? These impacts may be economic/financial, environmental, health and wellbeing, or other areas.
- What support, if required would you or your business would need to implement the proposed changes if introduced?
- Do you agree with the proposed transition time of 1 year for the new requirements to take effect?

Respondents were given tick box options for the first and third questions with space available for free text responses across all questions. Responses to the consultation were received through an online survey portal as well as through emails to MBIE directly.

1.2. What we heard

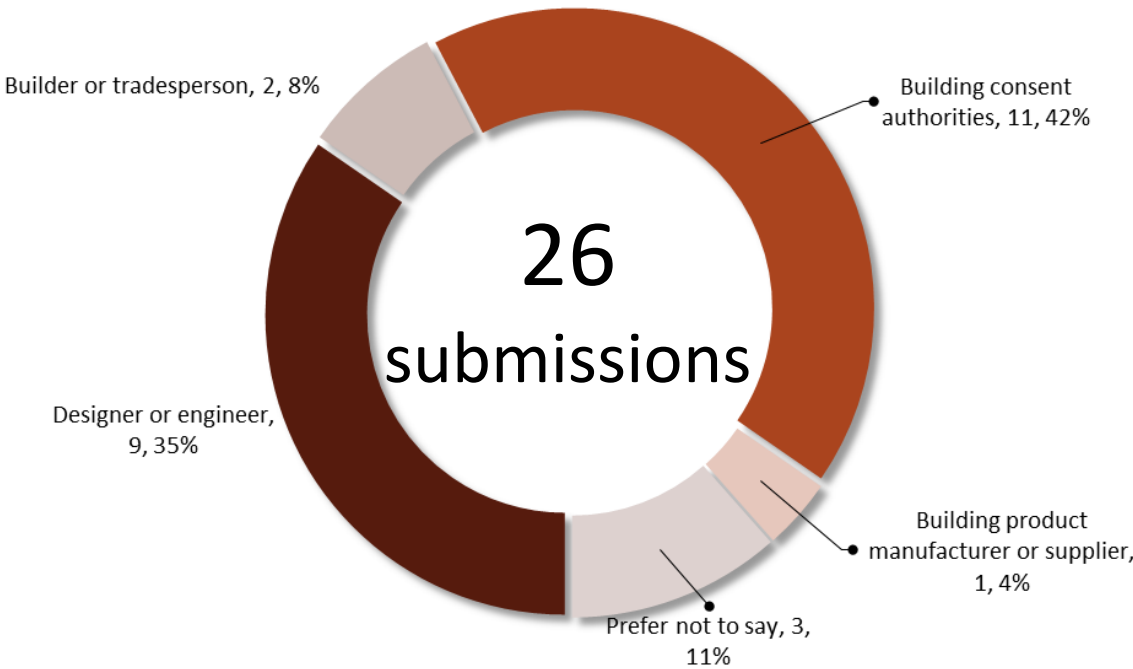
1.2.1. Who submitted on the proposal

There were 26 submissions on this consultation as shown in Table 1.1 and Figure 1.1. Feedback was primarily received from building consent authorities, structural engineers and designers, and the concrete industry.

TABLE 1.1: Number of submissions received on the proposal for structural stability of hollow-core floors

Occupation	Number of submissions and percentage of total
Architects	0 (0%)
Designers or engineers	9 (35%)
Builders or tradespersons	2 (8%)
Building consent authorities	11 (42%)
Building product manufacturers	1 (4%)
Building owners, occupants or renters	0 (0%)
Other submitters including those who did not specify their occupation	3 (12%)
Total	26

FIGURE 1.1: Number of submissions received on the proposal for structural stability of hollow-core floors



Structural stability of hollow-core floors

1.2.2. Submitter preferences on the proposal

Ninety-two percent of the submissions supported the proposal. Support for the proposal came from engineering technical societies, building consent authorities, and the concrete industry. Of those who supported the changes, comments provided on the proposals highlighted that these types of floors were now less common in design and not significantly impactful for new buildings. They also highlighted the importance of MBIE continuing to provide awareness to the public, designers, and building consent authorities on the change. None of the submitters identified any substantial impacts due to this change. One of the submitters expressed concerns around the impact of this change on the existing buildings which was beyond the scope of the proposal.

TABLE 1.2: Responses to the question in the consultation: Do you support amending Verification Method B1/VM1 Paragraph 3.1.1 as proposed to make the design of hollow-core floor supports an alternative solution?

Occupation	Response		
	Yes, I support the proposal	No, I don't support the proposal	Not sure/no preference
Architects	-	-	-
Designers or engineers	7	2	0
Builders or tradespersons	2	0	0
Building consent authorities	11	0	0
Building product manufacturers	1	0	0
Building owners, occupants or renters	-	-	-
Other submitters	3	0	0
Total	24 (92%)	2 (8%)	0

The two submissions that did not agree with the proposal expressed that there is still a place for hollow-core floors in design and that:

- other factors such as human errors and fabrication are more important than the design
- the use of these floors can comply in some circumstances, such as within basement carpark levels with stiff basement walls
- there are other jurisdictions (such as California) where the use of hollow-core floors is permitted.

In response to these submissions, MBIE's position is that:

- The design of the floors is still important and that the advice from SESOC and NZSEE highlighting the design issues is relevant.
- MBIE are not proposing a ban on the use of hollow-core floors and the proposed approach allows the use of alternative solutions for hollow-core floors to demonstrate compliance with the Building Code in specific situations. Therefore, this would allow their use in rigid low-rise buildings and basements on a case-by-case basis subject to other means of design verification.
- The most important consideration for this proposal is to prohibit the universal use of the existing design details. As there is a downward trend in the use of the floor systems in New Zealand, it is not prudent for MBIE to develop alternate details that may support their use at this time. Developing new requirements was considered in the options analysis for this proposal and ruled out from further consideration.

We also received feedback on the proposed text for B1/VM1 for this change. It was suggested to MBIE that the proposed revised comment for B1/VM1 gave the impression that this change was an administrative or editorial issue instead of a design issue. The driver for the change outlined in the consultation document was the lack of reliable seismic performance for generic support detailing of hollow-core floors within the cited concrete standard. It was suggested that MBIE consider revising the proposal comment text for B1/VM1 to remove some of the commentary.

1.2.3. Submitter preferences on the transition period

There were 24 responses to the question on the transition period (see Table 1.3 and Figure 1.2). Twenty-one submissions (80%) preferred a transition period of 12 months or less for the change to take effect with four submissions (including EQC and the Insurance Council) preferring the change to take immediate effect. Two submissions had no preference and two more submissions provided no response. Only one submission preferred that the change should be longer than 12 months

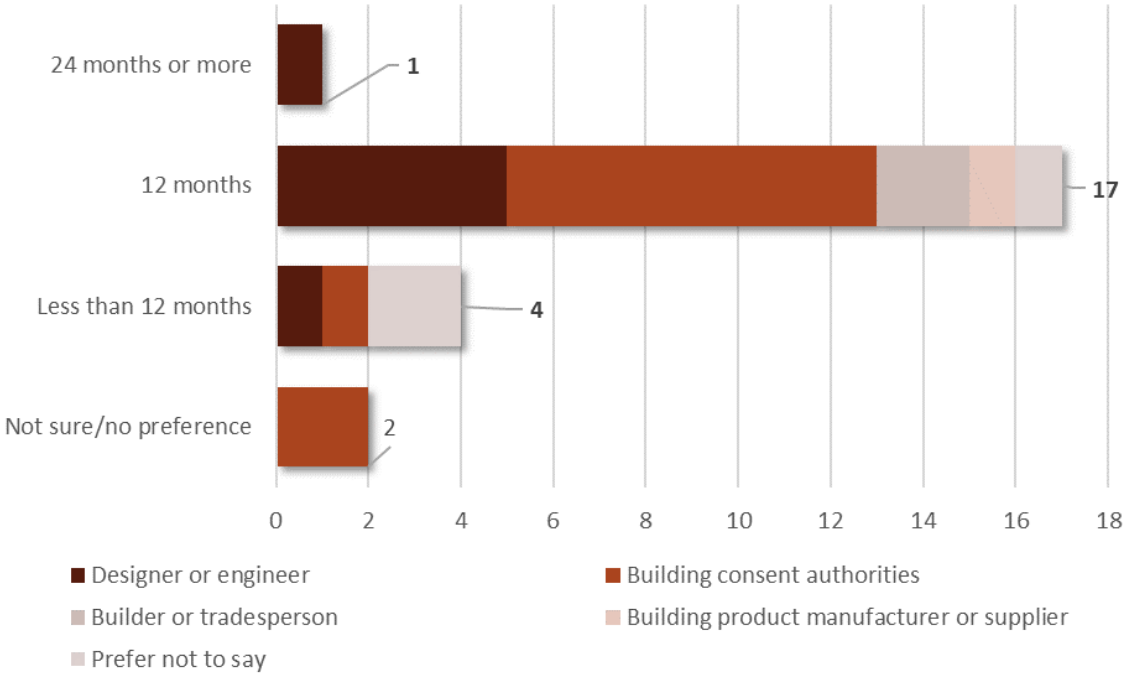
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but this submission did not provide any further comments or reasons for this preference.

TABLE 1.3: Preferred transition period from the public consultation submissions

Occupation	Preferred transition period			
	24 months or more	12 months	Less than 12 months	Not sure/No preference
Architects	-	-	-	-
Designers or engineers	1	5	1	0
Builders or tradespersons	0	2	0	0
Building consent authorities	0	8	1	2
Building product manufacturers	0	1	0	0
Building owners, occupants or renters	0	0	0	0
Other submitters	0	1	2	0
Total	1	17	4	2

FIGURE 1.2: Preferred transition period for the proposal for structural stability of hollow-core floors



1.3. What we are doing

Considering the feedback from the consultation, MBIE is proceeding with this proposal to remove the citation of Clause 18.7.4.4 of NZS 3101.1: 2006 from the verification method B1/VM1. The verification method will be amended in November 2023. There will be no transition period for this change when published and it will take effect when the new documents are published in November 2023. MBIE will continue to work to build awareness of this change before it takes effect. This will minimise the chance of excessive damage or injury from poorly designed hollow-core floor systems in the event of a range of potential earthquakes.

The text to be amended in B1/VM1 Paragraph 3.1.1 is provided in Table 1.3.

As part of this change, MBIE will also remove Practice Advisory 5: Allow for movement - Precast hollow core floor assemblies from our website in November 2023. This practice advisory refers to the use of the design details in NZS 3101.1 which would no longer be included as part of the verification method as a result of the change.

In the interim period prior to November 2023, structural engineers looking to use these types of floors or provide advice to building owners should review the advice on hollow-core floors issued by Engineering New Zealand, the Structural Engineering Society New Zealand, and the New Zealand Society of Earthquake Engineering available online at <https://www.sesoc.org.nz/precaster-flooring-resources/>

TABLE 1.3: Text to be amended for B1/VM1 Paragraph 3.1.1

Current text in B1/VM1, First Edition Amendment 20 (red text to be removed)	Amended text for B1/VM1 (blue text to be added)
Verification Method B1/VM1 Paragraph 3.0	
<p>3.0 Concrete</p> <p>3.1 NZS 3101: Part 1 subject to the following modifications:</p> <p>3.1.0 Referenced Documents Replace reference to AS/NZS 4671: 2001, in NZS 3101: Part 1 with the 2019 version that is referenced in this Verification Method.</p> <p>3.1.1 Clause 18.7.4.4 Detailing requirements for support of hollow core floors At the end of Clause 18.7.4.4 (b) add an additional sentence: “The details given by C18.6.7 (e) may be applied to hollow-core units where the depth of the precast unit is equal to or less than 400 mm.”</p>	<p>3.0 Concrete</p> <p>3.1 NZS 3101: Part 1 subject to the following modifications:</p> <p>3.1.0 Referenced Documents Replace reference to AS/NZS 4671: 2001, in NZS 3101: Part 1 with the 2019 version that is referenced in this verification method.</p> <p>3.1.1 Delete the existing Clause 18.7.4.4 and replace with ‘support of hollow-core floors is not part of this verification method’.</p>
	<p>COMMENT:</p> <p>1. The detailing requirements for the support of hollow-core floors, including use of the proposed detail of NZS 3101.1 and C18.6.7 of NZS 3101.2: 2006, comprises an alternative solution.</p> <p>2. It is expected that additional evidence (both testing and analysis) would be required to demonstrate the compliance of support design for the hollow-core floors. This would need to include demonstrating that the support is able to accommodate deformation of the structure taking into account three-dimensional boundary conditions and diaphragm inertial loads.</p>

