



Department of
Building and Housing
Te Tari Kaupapa Whare

Proposed changes to
B1 Structure Compliance Document
Closing date for public comment: 15 February 2010



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Request for comment

The Department of Building and Housing (the Department) is consulting on the B1 Structure Compliance Document and is requesting your comment as part of this consultation on proposed changes to the 11 Compliance Documents listed below. The proposed amendments are restricted to updating reference documents and associated changes in the body of the Compliance Document.

Comments can be submitted on individual Compliance Documents.

- **B1 Structure.** Consulting on one new Standard; and changes to 18 updated Standards applying to: B1/VM1, B1/AS1, B1/AS2, B1/AS3 and B1/VM4. The new Standard covers the design of concrete tanks. The significant updated Standards cover the design of concrete structures and steel structures.
- **B2 Durability.** Consulting on two updated Standards for the durability of concrete structures and solid plastering. The changes apply to B2/AS1.
- **C Fire Safety.** Consulting on two updated Standards, through proposed changes to C/AS1. The Standards cover Automatic fire sprinkler systems and Fire hydrant systems for buildings.
- **E1 Surface Water.** Consulting on one new Standard, along with 10 deleted and 12 updated Standards. The new and revised Standards cover piping materials and jointing methods, affecting E1/AS1.
- **G9 Electricity.** Consulting on one updated Standard, relating to electrical installations in G9/AS1.
- **G10 Piped Services.** Consulting on two deleted and 13 updated Standards, relating to piping materials and jointing methods and affecting G10/AS1.
- **G11 Gas as an Energy Source.** Consulting on one updated Standard, relating to gas installations in G11/AS1.
- **G12 Water Supplies.** Consulting on 11 updated Standards covering piping materials and installation methods in G12/AS1.
- **G13 Foul Water.** Consulting on two deleted and 12 updated Standards covering piping materials and installation methods in G13/AS1, G13/AS2 and G13/AS3.
- **G14 Industrial Liquid Waste.** Consulting on 11 updated Standards covering piping materials in G14/VM1.
- **G15 Solid Waste.** Consulting on one Standard for health-care waste management in G15/AS1.

The Department is also seeking comment on the effective dates and the transitional arrangements for the amendments to the Compliance Documents.

How to comment

Online or email comments are preferred, but clear handwritten submissions will also be accepted. Submissions should be sent to the Department at the addresses below.

This document can be downloaded as a PDF from the Department's website at www.dbh.govt.nz or a paper copy can be obtained by calling the Department on 0800 242 243.

The closing date for submissions on the proposed changes is **15 February 2010**.

Online comments can be made from www.dbh.govt.nz/compliance-documents-consultation

Where to send comments:

Email to comments@dbh.govt.nz with 'Consultation feedback – Compliance Document Amendments' in the subject line, or

Fax to (04) 494 0290 with 'Consultation feedback – Compliance Document Amendments' in the subject line, or

Post or courier to:

Consultation feedback – Compliance Document Amendments
Department of Building and Housing
Building Quality
Level 6, 86 Customhouse Quay
PO Box 10-729
Wellington 6143

Important note

Please note that all responses will be public information. Responses may be the subject of requests for information under the Official Information Act 1982 (OIA). The OIA specifies that information is to be made available to requesters unless there are sufficient grounds for withholding it, as set out in the OIA. Submitters may wish to indicate grounds for withholding specific information contained in their submission, such as that the information is commercially sensitive or that they wish personal information to be withheld. Any decision to withhold information requested under the OIA is reviewable by the Ombudsman.

Proposed changes

Introduction

The Department is consulting on proposed changes to the B1 Structure Compliance Document.

The proposed amendments are restricted to updating reference documents and related changes in the body of the B1 Structure Compliance Document.

The Proposal

The Department is proposing to amend the B1 Structure Compliance Document by incorporating revised referenced documents and by amending:

- Verification Method B1/VM1
- Acceptable Solution B1/AS1
- Acceptable Solution B1/AS2
- Acceptable Solution B1/AS3
- Verification Method B1/VM4

If implemented, this will be Amendment 9 to the B1 Structure Compliance Document.

Effective date

It is proposed that the amendments to the B1 Structure Compliance Documents will be published on 30 June 2010 and have an effective date of 30 September 2010

Transitional arrangements

The amended Compliance Documents will apply to all building work for which a building consent is issued on or after the effective date. The time between the publication date and the effective date is the introductory period. During the introductory period a building consent authority can accept the published amendment as an alternative solution.

The introductory period is 3 months.

Application of the transitional arrangements

How the transitional arrangements relate to building consents and code compliance certificates is explained below.

Building consents applied for before the effective date

Where a building consent is applied for before the effective date, and the application for consent complies with the B1 Structure Compliance Document including Amendment 8, the building consent authority must accept the consent for compliance with B1 Structure. At the completion of the building work, the building consent authority must issue the code compliance certificate (CCC) if the building work complies with the building consent.

Where a building consent is applied for before the effective date, and the application for consent either complies with the B1 Structure Compliance Document including Amendment 9, or uses another alternative solution proposal, the building consent authority has to issue the consent if it is satisfied that the performance criteria of the Building Code will be achieved. At the completion of the building work, the building consent authority must issue the CCC if the building work complies with the building consent. If the building consent authority refuses to issue the consent, it must notify the applicant in writing giving reasons why.

Building consents applied for after the effective date

Where a building consent is applied for on or after the effective date, the applicant complies with the B1 Structure Compliance Document including Amendment 9, the building consent authority must not refuse the consent for compliance with B1 Structure. At the completion of the building work, the building consent authority must issue the CCC if the building work complies with the building consent.

Question B1 - 1

Do you agree with the proposed introductory period?

Agree

Agree
with comment

Disagree
with reason/proposed change

Comment/reason/proposed change

Background

NZS 3101 Part 1 Concrete Structures Standard

After three years in development, including consultation in accordance with Standards New Zealand's procedures, NZS 3101 Part 1 was published in March 2006.

Amendment 1 to NZS 3101 Part 1: 2006, which contains minor corrections to NZS 3101, was published in July 2006.

Amendment 2 to NZS 3101 Part 1: 2006 was published in August 2008 and together with Amendment 1, completes alignment of NZS 3101 Part 1 with the AS/NZS 1170 suite of Standards that specifies the design actions (loads) that a structure must be designed to resist. In particular, Appendix D of NZS 1170: Part 5 sets out requirements for material-specific structural design standards for information that is necessary for use with seismic capacity design methodologies. NZS 3101 Part 1: 2006 with Amendments 1 and 2 has been developed to comply with these requirements. Amendment 2 to NZS 3101 Part 1: 2006 specifically addresses issues raised by the Department to make the Standard suitable for citation in Compliance Documents.

NZS 3404 Steel Structures Standard

NZS 3404 was published in June 1997, and was a revision of the 1992 edition. Amendment 1 published in October 2000 made minor changes, deletions and insertions.

Amendment 2, an amendment to align with AS/NZS 1170 was published in October 2007.

Other Standards

In addition to the amendments outlined above to NZS 3101 and NZS 3404, there are a number of other Standards that have been revised, amended, or withdrawn and the Department is proposing to update these referenced Standards and where appropriate, incorporate replacement Standards.

Alignment with AS/NZS 1170

NZS 3101 Part 1, NZS 3404 and other material Standards have been aligned with the latest Loadings Standard, AS/NZS 1170.

The AS/NZS 1170 suite of Standards has been cited (with amendments and modifications) in Amendment 8 to the B1 Structure Compliance Document was effective from 1 December 2008. This Standards suite is:

AS/NZS 1170: Structural Design Actions
Part 0:2002: General Principles;

Part 1:2002: *Permanent, imposed and other actions*;
Part 2:2002: *Wind actions*;
Part 3:2003: *Snow and ice actions*.

NZS 1170: *Structural Design Actions*
Part 5:2004: *Earthquake actions – New Zealand*.

This suite of Standards is collectively referred to in this consultation document as NZS 1170.

New material proposed to be incorporated

NZS 3101 Concrete Structures Standard

The B1 Structure Compliance Document currently cites NZS 3101 Part 1: 1995 and it is proposed to update this reference with the revised edition of that Standard. This amendment is as follows:

NZS 3101 Part 1: 2006, with Amendments 1 and 2, incorporates changes from the 1995 edition including:

- compatibility with the NZS 1170 suite of Standards
- shifting from an action-based to a component-based layout in response to user preferences
- grade 500 reinforcing steel
- fire design material from the latest revisions of AS 3600
- guidance on the fire design of thin panel walls
- durability for lives of up to 100 years for some structures
- coverage of supplementary cementitious materials for durability enhancement
- detailing to achieve particular curvature ductilities
- fibre reinforced concrete
- ductile jointed precast systems (PRESSSS)
- thin precast concrete walls, both structural and fire design
- fixings and fastening section updating with new test results
- strut and tie analysis
- two approaches to capacity design.

Amendment 2 to NZS 3101 Part 1: 2006 specifically addresses issues raised by the Department to make the Standard suitable for citation in Compliance Documents.

The new edition of NZS 3101 Part 1 has been reorganised on a component basis (beams, slabs, columns etc.) rather than on an actions basis (compression, bending, shear etc), as was the case for NZS 3101 Part 1: 1995.

NZS 3101 Part 2: 2006 is published as a companion Commentary to Part 1 and provides background, references, explanations, and suggests approaches for the

use of the Standard. The Commentary contains tables which summarise the design requirements for several sections as an aid for users. The Commentary is not proposed to be cited in the Compliance Documents.

NZS 3404 Steel Structures Standard

The 1997 edition of the Steel Structures Standard is currently cited in B1/VM1 and this project seeks to update that citation by including Amendments to that Standard, No. 1 published in 2001 and No. 2 published in 2007. These Amendments include:

- referencing NZS 1170 instead of NZS 4203
- correcting errors in NZS 3404:1997
- aligning notation and definitions with NZS 1170
- updating design provisions following recent research
- updating of design properties to align with available steel grades
- improving pin and bearing design
- adjusting web slenderness limits for rectangular and square hollow sections
- modifying composite floor design provisions to improve their performance
- changing material selection criteria to suppress brittle fracture
- updating plastic hinge rotation limits to align with the requirements of NZS 1170.5
- aligning the structural performance factors, S_p , with NZS 1170.5
- aligning seismic design provisions of Section 12 with NZS 1170.5.

Options

Options for Standards referenced in B1 Structure Compliance Document.

Status quo

The Department could continue to reference the existing editions of Standards but these do not reflect current knowledge and practice. Therefore this option is not favoured.

Amend Compliance Documents

This is the preferred option and is for amending the Compliance Document to include the latest Standards available along with any amendments. The advantages of this option are that:

- the latest Standards represent current best practice
- there is no confusion over which Standard to use for compliance with the Building Code.

Assessment of particular options for NZS 3101 Part 1 and NZS 3404 Part 1 Amendment 2

Option 1 — Continue to cite existing Standards

This option would allow the existing, familiar standards to continue to be used thus avoiding the costs of training and software updating that will be associated with adopting a new Standard. No other benefits are foreseen. The disadvantage would be not using the technological updates incorporated in the latest Standards editions and their amendments. There may also be confusion among the sector where participants are aware that the Standard has been updated.

Option 2 — Cite new Standards editions with amendments

NZS 3101 Part 1: 2006 and NZS 3404 Part 1: 1997, together with their amendments, were specifically written as a means of compliance with the Building Code and include up-to-date technical developments that result from recent research and new products. They also align with other design standards of international significance and with, NZS 1170.

The amended Standards are based on considerable input from the structural engineering and concrete and steel technology communities in New Zealand with the intention of providing New Zealand-specific, state-of-the-art design documents. For this citation to be effective, the present citation of NZS 3101:1995 would be removed. Citing the latest design Standards would provide benchmarks against which alternative solution proposals can be evaluated. Their citation would demonstrate leadership by the Department in expecting state-of-the-art Standards to be used.

Option 3 — Remove citation of concrete and steel design Standards

NZS 3101 Part 1: 1995, NZS 3101 Part 1: 2006 and NZS 3404 Part 1: 1997 contain requirements that are non-specific and require interpretation and judgement for their application. Citing these Standards as means of compliance involves some risk because designs that do not comply with the Building Code could result from an application of inappropriate interpretation or exercise of judgement. A building consent authority may issue a building consent for such a non code-compliant design if the Building Consent Authority believes it complies with the cited Standard.

This risk could be managed by neither Standard being cited but by them being available as the basis of proposed alternative solution designs. It would be then clear to designers and building consent authorities that compliance with the Building Code would need to be demonstrated and verified. However, the Department

considers that this risk is adequately managed by the requirement contained in Amendment 8 to the B1, Structure Compliance Document that an engineer with relevant experience and skills in structural engineering must be responsible for interpreting the requirements of the Standards cited.

Although the costs detailed above in Option 1 as a result of citing the latest editions of these Standards would not be incurred, additional costs would result from the lack of clarity when assessing a design for building consent compliance and the uncertainty of the outcome. These costs would come from increased design effort and documentation for building consent application and from delays to projects when additional information is sought from a designer to support a consent application. These additional sources of cost and delay would result from there being less certainty about what constitutes a Building Code compliant design because of the lack of cited design Standards. Designers may choose to continue to use out-of-date design Standards resulting in less economic designs and less certain performance under live, dead, wind, earthquake and snow actions. In each case the building consent authority would need to decide from first principles, if the design was code-compliant without reference to benchmarks in the form of cited Standards.

Preferred option

The preferred option is Option 2 to cite NZS 3101 Part 1:2006 with Amendments 1 and 2 and NZS 3404 Part 1: 1997 with Amendments 1 and 2. This signals that these two updated structural Standards are the preferred design basis for New Zealand. B1/VM1 contains constraints on the use of Standards where judgements, assumptions or interpretations regarding non-specific requirements of a cited Standard are present. These constraints manage the risk that resulting designs may not be Building Code compliant. See cost benefit section below.

Proposal to cite the newest design Standards

The latest edition of essential design and specification Standards have been revised and amended and the Department is now proposing to replace the currently related referenced documents.

A number of other currently referenced Standards have been withdrawn, replaced with current New Zealand, Joint Australian/New Zealand, Australian or British Standards or otherwise superseded. It is proposed to, where appropriate, to reference the most up to date Standard available. In some cases Standards New Zealand had adopted some British Standards, these adopted Standards have since been withdrawn and the current British/European Standard is to be referenced in its place.

Cost-benefit implications of citing updated Standards NZS 3101 and NZS 3404

NZS 3101 Part 1:2006 and Amendments 1 and 2

The Department commissioned a detailed, clause by clause comparison of NZS 3101:1995 with NZS 3101 Part 1: 2006 to determine which changes would result in variations to the cost of concrete construction. The numbering, but not the content, of most clauses was altered as a result of the change from an action-based to a component-based layout. Of the more than 900 clauses in the Standard, the content of 97% was either unchanged or the changes had no cost implications. Insignificant cost impacts were associated with 2% of the remaining 3% of clauses. These include minor effects such as a small increase in the number of sets of stirrups in a beam due to increases in the minimum shear reinforcement requirements.

The most significant effect from the remaining 1% is raising the structural performance factor, S_p , from 0.7 to 0.9 for nominally ductile structures. This results from the need to conform with NZS 1170.5 and has the effect of increasing the earthquake load on such structures by nearly 30%. The cost implications of such an increase would be expected to be only about 0.5%. (Page, I., (2006) Report E410 "AS/NZS 1170 Loading Standard cost benefit analysis," BRANZ.) A lesser increase in S_p applies to structures with a structural ductility factor of up to 3.0 with a corresponding smaller increase in cost.

This additional cost would apply to the 25% of new buildings by value that are large (medium and high rise buildings together with public and essential buildings) and also have concrete structures with low structural ductility (taken as 20%). The national effect of a 0.5% cost increase on 5% (being 25% x 20%) of new buildings which are both large and made from concrete is about 0.025% of the national annual building cost.

NZS 3404 Part 1: 1997 and Amendments 1 and 2

The Department commissioned a detailed cost comparison of replacing NZS 3404 Part 1: 1997 plus Amendment 2 with NZS 3404: Part 1: 2007. The analysis was carried out by BRANZ based on advice from the Standards New Zealand P3404 Technical Committee on the cost implications of the changes.

The total additional annual cost of steel building construction was estimated as 0.038% of the national annual building cost (\$8.7billion). The most significant component of this is 0.025% resulting from the requirement to design elastically responding structures for higher loads. Other significant components are the use of higher grade steels (0.005%), a requirement for larger sections in eccentrically braced frames (0.006%) and two-way concurrent loading on columns resulting in increased column size (0.003%). A further five minor changes account for a further (0.006%) additional cost. A relaxation in splice contact tolerances results in a saving of (0.006%).

The effect of these cost changes on the national annual building cost is of the same order of magnitude as the costs for changes to concrete construction noted above.

Combined construction costs of updated concrete and steel design Standards

Together, the cost increase for concrete and steel construction is 0.063% of the

national annual building cost which is of little significance when weighed against the benefits.

Other cost effects common to both NZS 3101 and NZS 3404

Other costs result from the one-off costs of acquiring the new Standards, training in their use and modifying software. These costs are expected as part of a professional engineer's ongoing professional development and are consequences of technical advances.

There are likely to be some minor additional design costs involved in checking that strengths are adequate at the serviceability limit state for earthquake actions which had not previously governed. This is a result of the reassessment of serviceability limit state loads in NZS 1170 Part 5 and was considered in the cost benefit analysis for the adoption of the NZS 1170 suite of Standards.

Offsetting these costs is the benefit of superior performance resulting in less damage, fewer injuries and reduced repair costs after an earthquake. This has not been quantified, although aspects of reduced damage and maintenance, less business disruption, fewer injuries and more lives saved were considered in the cost-benefit analysis for the NZS 1170 suite. These showed a net benefit if a design earthquake occurs, for example, in Wellington within the next 45 years.

Safety benefits of new Standards editions with amendments

The full benefits of citing the NZS 1170 suite of Structural Action Standards in Amendment 8 to the B1 Structure Compliance Document will only be realised when the latest editions with amendments of the associated material Standards, NZS 3101 Part 1 and NZS 3404, are also cited.

These benefits include:

- more appropriate seismic design of brittle structures
- the strength of buildings to resist earthquakes would be more closely related to the risk levels evaluated using improved methodologies
- designing for near fault effects that account for ground motions close to an earthquake producing fault
- critical facilities would remain operational after a major earthquake
- buildings would in general be more robust with loadings that more closely align with those in use in other countries.

NZS 1170 provides a more up-to-date understanding of environmental hazards (earthquake, wind, snow etc) so buildings would have a strength that is better aligned with the expected demand resulting in more economical designs.

Other Standards

The main benefit of updating the referenced Standards that have been revised,

amended, or withdrawn is reduced confusion over which Standard to use for compliance with the Building Code. Furthermore by updating the referenced Standards the Compliance Document continues to represent current best practice.

NZS 3106 Design of concrete structures for the storage of liquids

The 1986 edition of the Concrete Structures for the Storage of Liquids standard was withdrawn from B1/VM1 in Amendment 8. The 1986 Standard was withdrawn as it

was incompatible with the AS/NZS1170 suite of Standards and was based on out dated design principles. The new 2009 edition of Standard includes the following updates:

- strength requirements for ultimate limit state loads are now included consistent with the design procedures used for other structures
- liquid tightness classification and associated crack control provisions are included
- updated earthquake provisions with seismic force coefficient based on NZS 1170.5.

By reintroducing an updated edition of this previously referenced Standard confusion over which edition of this Standard to use for compliance is avoided and the benefits of recent advances in the design of concrete storage tanks of liquids can be taken advantage of by designers.

Question B1 – 2

What is your comment about the options?

Comment

Proposed changes to the B1 Structure Compliance Document

References

Current text	Proposed changes
NZS/AS 1650: 1989 Hot-dipped galvanised coatings on ferrous articles	AS/NZS 4680: 2006 Hot-Dip Galvanised (zinc) Coating
	Explanation: Standard withdrawn and replaced
NZS 3101 Part 1: 1995 Concrete structures standard. The design of concrete structures Amend: 1, 2, 3	NZS 3101 Part 1: 2006 Concrete Structures Standard Amend 1, 2
	Explanation: Standard revised and replaced
Not currently cited	NZS 3106: 2009 Design of Concrete Structures for the Storage of Liquids.
	Explanation: Previously withdrawn Standard replaced with latest version.
NZS 3107: 1978 Specification for precast concrete drainage and pressure pipes	AS/NZS 4058: 2007 Pre cast concrete pipes(pressure and non-pressure)
	Explanation: Standard withdrawn and replaced
NZS 3112 Part 2: 1986: Methods of test for concrete tests relating to the determination of strength of concrete Amend: 1	NZS 3112 Part 2: 1986 Methods of test for concrete tests relating to the determination of strength of concrete Amend: 1, 2
	Explanation: Adding Amendment 2
NZS 3402: 1989 Steel bars for the reinforcement of concrete	AS/NZS 4671: 2001 Steel Reinforcing Materials
	Explanation: Standard withdrawn and replaced
NZS 3404: 1997 Steel structures standard Part 1 Steel structures standard Amend 1	NZS 3404: 1997 Steel structures standard Part 1 Steel structures standard Amend 1, 2
	Explanation: Adding Amendment 2
NZS 3421: 1975 Specification for hard drawn mild steel wire for concrete reinforcement	Deleted
	Explanation: Standard withdrawn and replaced by AS/NZS 4671. See above
NZS 3422: 1975 Specification for welded fabric of drawn steel wire for concrete reinforcement	Deleted
	Explanation: Standard withdrawn and replaced by AS/NZS 4671. See above
NZS 3441: 1978 Specification for hot-dipped zinc-coated steel coil and cut lengths. Amend: 1, 2	AS 1397: 2001 Steel sheet and strip - Hot-dipped zinc-coated or aluminium/zinc-coated
	Explanation: Standard withdrawn and replaced

Current text	Proposed changes
NZS 3605: 1992 Specification for timber piles and poles for use in building	NZS 3605: 2001 Timber piles and poles for use in building
	Explanation: Standard revised
NZMP 3640: 1992 Specification of the minimum requirements of the, NZ Timber Preservation Council Inc Amend: 1	NZS 3640: 2003 Chemical Preservation of Round and Sawn Timber. Amend: 1, 2
	Explanation: Standard revised
NZS/AS 3725: 1989 Loads on buried concrete pipes	AS/NZS 3725: 2007 Design for installation of buried concrete pipes
	Explanation: Standard revised and become a joint standard
NZS 4210: 1989 Code of practice for masonry construction: materials and workmanship Amend: 1, 2	NZS 4210: 2001 Code of practice for masonry construction: materials and workmanship. Amend: 1
	Explanation: Standard revised
NZS 4452: 1986 Code of practice for the construction of underground pipe sewers and drains Amend: 1	AS/NZS 2566.1: 1998 Buried Flexible pipelines. Part 1 Structural Design
	AS/NZS 2566.2: 2002 Buried Flexible pipelines. Part 2 Installation
	Explanation: Standard withdrawn and replaced
NZS 7401: 1985 Specification for solid fuel burning domestic appliances Amend: 1	AS/NZS 3869: 1999 Domestic solid fuel burning appliances
	Explanation: Standard withdrawn and replaced
NZS 7421: 1990 Specification for installation of solid fuel burning domestic appliances	AS/NZS 2918: 2001 Domestic Solid Fuel Heating Appliances Installation
	Explanation: Standard withdrawn and replaced
NZS 7643: 1979 Code of practice for the installation of unplasticized PVC pipe systems Amend: 1	AS/NZS 2032: 2006 Installation of PVC pipe systems
	Explanation: Standard replaced with a joint standard.
AS/NZS 4600: 1996 Cold-formed steel structures	AS/NZS 4600: 2005 Cold-formed steel structures
	Explanation: Standard revised

Question B1 – 3

Do you agree with the proposed references for B1 Structure Compliance Document?

Agree

Agree
with comment

Disagree
with reason/ proposed change

Comment/reason/proposed change

Verification Method B1/VM1

Current text	Proposed changes
<p>2.2.13 AS/NZS 1170 Part 3, Clause 5.4.3 Add the following to end of Clause 5.4.3: “For Regions N4 and N5 the minimum value of s_g must be taken as 0.9kPa.”</p>	<p>2.2.13 AS/NZS 1170 Part 3, Clause 5.4.3 Add the following to end of the Clause 5.4.3: “For Regions N4 and N5 the minimum value of s_g for the ultimate limit state only must be taken as 0.9kPa.”</p>
	<p>Explanation: Clarification of modification.</p>
<p>3.0 Concrete 3.1 NZS 3101: Part 1 subject to the following modifications:</p> <p>a) The word “may” where used to describe provisions of the Standard shall be taken to read “is permitted”.</p> <p>b) Refer to B1/VM1 Paragraph 1.1.2 a)</p> <p>c) Normative appendices A and B shall be read as an integral part of the text which means that they do not have the status of recommendation but are required to be followed. Accordingly, all references in these appendices to “recommended” (or “suggested”) are to be read as “required” and references to “should” are to be read as “shall”.</p> <p>d) The word “should” is to be read as “shall” in Notes 1 and 2 of Table 5.1, and Clauses 10.3.1.2, 14.4.6 and 16.3.16.</p> <p>f) Actions must be determined in accordance with NZS 1170. All other references to NZS 4203 are replaced by equivalent references to NZS 1170.</p> <p>e) In Clause 7.3.1.1 delete the words “unless there is a special reason for using plain bars”.</p> <p>3.1.2 Some provisions of NZS 3101 may exceed the requirements of the NZBC</p>	<p>3.0 Concrete 3.1 NZS 3101: Part 1 subject to the following modifications:</p> <p>a) Replace clause 4.8 External walls that could collapse outward in fire with:</p> <p><i>4.8 External walls that could collapse inwards or outwards in fire</i></p> <p><i>4.8.1 Application</i></p> <p>This clause applies to external walls which could collapse inwards or outwards from a building as a result of internal fire exposure. All such walls shall:</p> <p>(a) Be attached to the building structure by steel connections;</p> <p>(b) Be restrained by these connections, when subject to fire, from inwards or outward movement of the wall relative to the building structure; and</p> <p>(c) Comply with the appropriate provisions of this Standard for walls.</p>

Current text	Proposed changes
	<p data-bbox="879 353 1257 387"><i>4.8.2 Forces on connections</i></p> <p data-bbox="879 421 1445 622">The connections between each wall and the supporting structure shall be designed to resist all anticipated forces. In the absence of a detailed analysis, the connections shall be designed to resist the largest of:</p> <ul style="list-style-type: none"> <li data-bbox="975 663 1457 757">(a) The force resulting from applying Clause 2.2.4 of Verification Method B1/VM1; <li data-bbox="975 797 1445 958">(b) for walls fixed to a flexible structure of unprotected steel, the force required to develop the nominal flexural strength of the wall at its base; <li data-bbox="975 999 1445 1234">(c) for walls fixed to a rigid structure such as reinforced concrete columns or protected steel columns or another wall at right angles, the force required to develop the nominal flexural strength of the wall at mid-height.
	<p data-bbox="879 1312 1054 1346">Explanation:</p> <p data-bbox="879 1368 1457 1507">The change to Clause 4.8 aligns the fire performance of external walls specified in NZS 3101 Part 1 with AS/NZS 1170.0 clause 4.2.4 as modified by B1/VM1 2.2.4.</p>

Current text	Proposed changes
	<p>b) Amend Clause 9.3.9.4.13 <i>Minimum area of shear reinforcement</i></p> <p>In Clause 9.3.9.4.13 c) delete the words after “750 mm” and substitute “and the depth of the precast unit is equal to or less than 300 mm.”</p> <p>c) Amend Clause 18.7.4 <i>Floor or roof members supported by bearing on a seating</i></p> <p>Add to the end of Clause 18.7.4 (g)(ii) add an additional sentence: “The details given by C19.6.7(e) may be applied to hollow-core units where the depth of the precast unit is equal to or less than 300 mm.”</p>
	<p>Explanation:</p> <p>The change to 9.3.9.4.13(c) in item a) reduces the depth at which the exemption to providing minimum shear steel applies. University of Canterbury tests drew attention to the issue of shear failure in hollow-core units and because of the uncertainty in determining the shear loads and strengths of the hollow-core webs, the Department recommends this conservative approach.</p> <p>The change to 18.7.4 (g)(ii) in item b) reflects the Department’s concern that tests to date have been confined to hollow-core units with depths of 300 mm or less. There is doubt that results are scalable to deeper units.</p>

Current text	Proposed changes
	<p>3.2 NZS 3106</p> <p>Explanation: Previously withdrawn standard replaced with latest version.</p>
<p>5.0 Steel</p> <p>5.1 NZS 3404: Part 1 subject to the following modifications:</p> <p>Actions must be determined in accordance with NZS 1170. All references to NZS 4203 are replaced by equivalent references to NZS 1170.</p>	<p>5.0 Steel</p> <p>5.1 NZS 3404: Part 1</p> <p>Explanation: Amendments 1 and 2 align NZS 3404 with NZS 1170.</p>
<p>11.0 Drains</p> <p>11.1 NZS/AS 3725 subject to the following modifications:</p> <p><i>Clause 1(b)</i> After the words “AS 1342 and AS 1392” add “or NZS 3107”.</p> <p><i>Clause 3</i> Add to the list of reference documents: “NZS 3101 The design of concrete structures. NZS 3107 Specification for precast concrete drainage and pressure pipes. NZS 4402 Methods of testing soils for civil engineering purposes: Tests 2.4, 2.8, 4.1.1, 4.2.1, 4.2.2, 4.2.3 and 5.1.1. Transit New Zealand Bridge Manual for Design and Evaluation. New Zealand Geomechanics Society, Guidelines for the field description of soils and rocks in engineering use.”</p> <p><i>Clause 4</i> In the paragraph headed “Bedding factor (F)”, after the words “AS 1342 and AS 1392” add “or NZS 3107”. In the paragraph headed “(c) Select fill”, after the words “Appendix D of AS 1726” add “or the New Zealand Geomechanics Society guidelines”. In the paragraph headed “Test load”, after the words “AS 1342” add “or NZS 3107”.</p>	<p>11.0 Drains</p> <p>11.1 AS/NZS 3725 subject to the following modifications</p> <p><i>Clause 3</i> Add to the list of reference documents: “NZS 3101 The design of concrete structures. NZS 4402 Methods of testing soils for civil engineering purposes: Tests 2.4, 2.8, 4.1.1, 4.2.1, 4.2.2, 4.2.3 and 5.1.1. New Zealand Geomechanics Society, Guidelines for the field description of soils and rocks in engineering use.”</p> <p><i>Clause 4</i> In the paragraph headed “(c) Select fill”, after the words “given in Table 1” add “or the New Zealand Geomechanics Society guidelines”.</p>

Current text	Proposed changes
<p><i>Clause 5</i> In definition of Pt, after the words “AS 1392” add “or NZS 3107”.</p> <p><i>Clause 6.4</i> Replace the word “may” with “shall”. Delete the words “Superimposed concentrated dead loads should be avoided.”</p> <p><i>Clause 6.5.2.1</i> Delete the words “Unless otherwise specified by the relevant Regulatory Authority”.</p> <p><i>Clause 6.5.2.2</i> In the last paragraph replace the words “may not apply” with “shall be reassessed”.</p> <p><i>Clause 6.5.2.3</i> Add new text after note 3 to read: “Alternatively, vehicle loads may be taken as HN-HO-72 loading as specified in the Transit New Zealand Bridge Manual for Design and Evaluation. The average live load intensity (q) due to those vehicles and their impact effects shall be calculated in accordance with Clause 6.5.2.2. Notes: 1. For depths of cover less than 0.6 m, the wheel loads shall be considered to act directly on the pipe. However the length of pipe supporting the load shall be taken as not greater than L_e (see Clause 6.5.2.4). 2. For single pipes, the effect of HN-HO-72 wheel loads may be neglected when the depth of cover (H) is greater than 2.4 m, and exceeds the pipe diameter (D).”</p> <p><i>Clause 6.5.3</i> In the first paragraph delete the words “Unless otherwise specified by the relevant Regulatory Authority”. In the last paragraph delete the words “unless specifically approved by the relevant Railway Authority”.</p>	<p><i>Clause 5</i> In definition of Pt, replace “AS 4058” with “AS/NZS 4058”</p> <p><i>Clause 6.4</i> Replace the word “may” with “shall”. Delete the words “Superimposed concentrated dead loads should be avoided.”</p> <p><i>Clause 6.5.3.1</i> Delete the words “The appropriate road vehicle loading shall be specified by the relevant highway authority or owner”.</p> <p><i>Clause 6.5.3.2.2</i> Replace the word “may” with “shall”.</p>

Current text	Proposed changes
<p><i>Clause 6.5.4</i> Replace the words “shall be obtained from the relevant Regulatory Authority” with “are not covered by this document”.</p> <p><i>Clause 7</i> Replace the word “should” with “shall”.</p> <p><i>Clause 8</i> Reword 8(a) and (b) to read: “a) Cohesive soils. The dry density ratio (RD) shall be determined either: i) in accordance with AS 1289 E4.1, based on the field dry density in accordance with AS 1289 E3.2 and the maximum dry density in accordance with AS 1289 E1.1, or ii) as the ratio of the field dry density in accordance with NZS 4402 Test 5.1 and the maximum dry density in accordance with NZS 4402 Test 4.1.1, expressed as a percentage. b) Cohesionless soils. The density index (ID) shall be determined either: i) in accordance with AS 1289 E6.1, based on the maximum and minimum dry densities in accordance with AS 1289 E5.1 and the field dry density in accordance with AS 1289 E3.2 or AS 1289 E3.5, or ii) as the relative density in accordance with NZS 4402 Test 4.2.3.”</p>	<p><i>Clause 6.5.4.3</i> Delete the words “unless otherwise specified by the Relevant Authority”.</p> <p><i>Clause 6.5.5</i> Delete the first words “For” and after the words “for aircraft types” add the words “is outside the scope of this Standard but...”</p> <p><i>Clause 7</i> Replace the word “should” with “shall”.</p>

Current text	Proposed changes
<p><i>Clause 9.2.2.2</i> Reword first paragraph to read: “9.2.2.2 Types H1 and H2. For support types H1 and H2, select fill in both the bed and the haunch zones and which is not cement stabilized, shall have a particle size distribution, determined in accordance with either:</p> <ul style="list-style-type: none"> i) AS 1289 C6.1, preferably falling within the limits given in Table 3 with the fraction passing the 0.075 mm sieve being material of low plasticity, as defined in Appendix D of AS 1726, or ii) NZS 4402 Test 2.8.1, falling within the limits given in Table 3 with the fraction passing the 0.075 mm sieve having a plasticity index of less than 15 as determined in accordance with NZS 4402 Test 2.4. The fill shall be placed and compacted to the appropriate depths and densities given in Clause 9.3.” 	
<p><i>Clause 9.2.3.2</i> After the words “AS 1289 C6.1” add “or NZS 4402 Test 2.8.1”.</p> <p><i>Clause 10.1</i> After the words “AS 1342 or AS 1392, as appropriate” add “or NZS 3107”.</p> <p><i>Clause 10.2(a)</i> After the word “(Tc)” add “or proof load”.</p> <p><i>Clause 10.2(b)</i> Reword to read: “The test ultimate load (Tu) or ultimate load shall be obtained from AS 1342 or NZS 3107 respectively, for the appropriate pipe size. A load class shall be determined from either AS 1342 or NZS 3107 corresponding to the value of Tc determined from (a) above.”</p> <p><i>Clause 10.4</i> After the words “(Tcp)” add “or proof load”. After the words “AS 1392” add “or NZS 3107”.</p>	<p><i>Clause 10.3</i> After the words “the test load” add “or proof load”.</p> <p>Appendix A Delete “Normative” and replace with “Informative”</p> <p>Appendix B Delete “Normative” and replace with “Informative”</p>

	Explanation: Joint Standard replaces the adopted Standard that has been withdrawn and modifications are amended.
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Question B1 - 4

Do you agree with the proposed changes to B1/VM1?

Agree

Agree
with comment

Disagree
with reason/ proposed change

Comment/reason/proposed change

Acceptable Solution B1/AS1

Current text	Proposed text
<p>6.1 NZS 4452</p>	<p>6.0 Drains</p> <p>6.1.1 AS/NZS 2566.1</p> <p>6.1.2 AS/NZS 2566.2</p> <p>Explanation: AS/NZS 2566.1 and AS/NZS 2566.2 become the acceptable solution for drains</p>
<p>6.2 NZS 7643 subject to the following modifications:</p> <p><i>Clause 1.1</i> Add a sentence at the end with the words “Pipes below ground shall be laid in narrow trenches as defined in clause 1.2”.</p> <p><i>Clause 1.2</i> Add new clause:</p> <p><i>1.2 Definition</i> NARROW TRENCH means a trench with sides having a slope no flatter than 1 horizontal to 4 vertical and having dimensions of either: a) $B \leq 2.0D$ and $H > 1.5B$, or b) $2.0D < B < 3.0D$ and $H > 3.5B$ where B = trench width at the top of the pipe, but not greater than 600 mm. H = depth of cover over the pipe. D = outside diameter of the pipe. The bottom width of the trench shall be $D + 200$ mm or $2D$, whichever is the lesser.”</p> <p><i>Clause 5.1.1</i> Reword to read: “5.1.1 This section sets out the rules for laying uPVC pressure pipelines underground in a narrow trench.”</p> <p><i>Clause 5.4</i> Reword heading to read: “5.4 <i>Pipe installation in a narrow trench.</i>”</p> <p><i>Clause 5.4.1</i> Reword text to read: “5.4.1 Trench construction. Pipes shall be laid in narrow trenches that comply with the definition given in Clause 1.2. The bedding, surround and backfilling details shall comply with Type A, B, C, D or F as given in Appendix D.” <i>Tables 2 and 3.</i> Amend as shown on previous page.</p>	<p>6.2 AS/NZS 2032</p>

Current text	Proposed text
<p><i>Clause 6.5.2</i> Delete.</p> <p><i>Clause 6.5.3</i> Replace the words “Where permitted by the Engineer” with the words “Subject to specific design”.</p> <p><i>Clause 6.13</i> Delete the words “Type F bedding shall be used where pipe is laid at depths less than those shown in Table 3”.</p> <p><i>Appendix D</i> Amend as follows: Reword heading to read “Construction details for pipes laid in narrow trenches (see Clause 1.2)”. Delete the dimension “D + 300” from the bottom of all figures and replace with “The lesser of 2D or D + 200 mm”.</p>	
	<p>Explanation: AS/NZS 2032 is an acceptable solution</p>

Question B1 - 5

Do you agree with the proposed to B1/AS1?

Agree

Agree
with comment

Disagree
with reason/ proposed change

Comment/reason/proposed change

Acceptable Solution B1/AS2

Current text	Proposed text
<p>1.0.5 Barriers exposed to the weather shall have:</p> <p>a) All timber treated to at least hazard class H3 in accordance with NZMP 3640.</p> <p>b) Mild steel fixings hot-dip galvanised as specified in NZS/AS 1650 for nails, and AS 1214 for bolts and coach screws.</p> <p>c) Circular toothed plate connectors and nail plates, where required by this document, that are formed from 1.0 mm thick sheet mild steel with a zinc coating of at least 275 g/m² in accordance with NZS 3441.</p>	<p>1.0.5 Barriers exposed to the weather shall have:</p> <p>a) All timber treated to at least hazard class H3 in accordance with NZS 3640.</p> <p>b) Mild steel fixings hot-dip galvanised as specified in AS/NZS 4680 for nails, and AS 1214 for bolts and coach screws.</p> <p>c) Circular toothed plate connectors and nail plates, where required by this document, that are formed from 1.0 mm thick sheet mild steel with a zinc coating of at least 275 g/m² in accordance with AS 1397.</p>
	<p>Explanation: Standards are replaced with current Standards</p>

Question B1 - 6

Do you agree with the proposed to B1/AS2?

Agree

Agree
with comment

Disagree
with reason/ proposed change

Comment/reason/proposed change

Acceptable Solution B1/AS3

Current text	Proposed text
1.7.9 Where zinc coating of components is required it shall be no less than 300 g/m ² in accordance with NZS 3441.	1.7.9 Where zinc coating of components is required it shall be no less than 300 g/m ² in accordance with AS 1397
	Explanation: Withdrawn and revised Standards are replaced with current Standards
1.8.5 <i>Reinforcing steel</i> Reinforcing used in chimneys is to conform to NZS 3402 for steel bars and NZS 3421, NZS 3422 for steel wire, and shall: a) For brick, be embedded centrally in the thickness of the grout.	1.8.5 <i>Reinforcing steel</i> Reinforcing used in chimneys is to conform to AS/NZS 4671, and shall: a) For brick, be embedded centrally in the thickness of the grout.
	Explanation: Withdrawn and revised standards are replaced with current Standards
1.8.6 <i>Hot dip galvanising</i> Hot dip galvanising shall comply with NZS/AS 1650.	1.8.6 <i>Hot dip galvanising</i> Hot dip galvanising shall comply with AS/NZS 4680.
2.1.1 Chimneys for solid fuel burning appliances shall comply with Paragraph 1.0 or with the relevant sections of NZS 7401 and NZS 7421 for sheetmetal chimneys.	2.1.1 <i>Chimneys</i> for solid fuel burning appliances shall comply with Paragraph 1.0 or with the relevant sections of AS/NZS 3869 and AS/NZS 2918 for sheetmetal <i>chimneys</i> .
	Explanation: Withdrawn and revised Standards are replaced with current Standards
2.2.4 Paragraphs 2.2.1 to 2.2.3 provide an acceptable structural solution, but depending on the particular installation, different hearth dimensions may be necessary to meet the spread of fire requirements of NZBC Clause C1.3.2. Hearth slabs for solid fuel burning appliances shall comply with NZS 7421.	2.2.4 Paragraphs 2.2.1 to 2.2.3 provide an acceptable structural solution, but depending on the particular installation, different hearth dimensions may be necessary to meet the spread of fire requirements of NZBC Clause C1.3.2. Hearth slabs for solid fuel burning appliances shall comply with AS/NZS 2918.
	Explanation: Withdrawn and revised Standards are replaced with current Standards

Question B1 - 7

Do you agree with the proposed changes to B1/AS3?

Agree

Agree
with comment

Disagree
with reason/ proposed change

Comment/reason/proposed change

Verification Method B1/VM4

Current text	Proposed text
<p>4.3 Ultimate lateral strength of single piles 4.3.2 Undrained lateral strength of piles in cohesive soil having a constant undrained shear strength with depth.</p> <p>(a) Free head piles i) short free head piles The ultimate lateral strength of a short free head pile is given by:</p> $H_u = 9s_u D_s \left[\sqrt{2 \left[(f+L)^2 + (f+f_o)^2 \right]} f - (L+2f+f_o) \right]$	<p>4.3 Ultimate lateral strength of single piles 4.3.2 Undrained lateral strength of piles in cohesive soil having a constant undrained shear strength with depth.</p> <p>(a) Free head piles i) short free head piles The ultimate lateral strength of a short free head pile is given by:</p> $H_u = 9s_u D_s \left[\sqrt{2 \left[(f+L)^2 + (f+f_o)^2 \right]} - (L+2f+f_o) \right]$ <p>Explanation: The proposed change is to correct a printing error where an additional f was introduced after the square root portion of the equation.</p>
<p>5.3 Timber piles</p> <p>5.3.1 Timber piles shall comply with NZS 3605 or NZS 3603 as applicable, and be naturally durable or treated to the appropriate hazard level as recommended by NZMP 3640.</p>	<p>5.3 Timber piles</p> <p>5.3.1 Timber piles shall comply with NZS 3605 or NZS 3603 as applicable, and be naturally durable or treated to the appropriate hazard level as recommended by NZS 3640.</p> <p>5.3.1.1 NZS 3605 shall be subject to the following modification: Clause 4.2.4.1 after “limitations for” add the word “verified”</p>
	<p>Explanation Change to NZS 3640 and modifying the referencing of NZS 3605 to reflect the addition of verified grades of timber.</p>

Question B1 - 8

Do you agree with the proposed changes to B1/VM4?

Agree

Agree
with comment

Disagree
with reason/ proposed change

Comment/reason/proposed change