Dear Customer

Please find enclosed Amendment 11, effective 1 August 2011, to the Compliance Document for Clause B1 Structure of the New Zealand Building Code. The previous amendment to B1 was Amendment 10, May 2011.

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**Status of Compliance Documents**

Compliance Documents are prepared by the Department of Building and Housing in accordance with section 22 of the Building Act 2004. A Compliance Document is for use in establishing compliance with the New Zealand Building Code.

A person who complies with a Compliance Document will be treated as having complied with the provisions of the Building Code to which the Compliance Document relates. However, a Compliance Document is only one method of complying with the Building Code. There may be alternative ways to comply.

Users should make themselves familiar with the preface to the New Zealand Building Code Handbook, which describes the status of Compliance Documents and explains alternative methods of achieving compliance.

Defined words (italicised in the text) and classified uses are explained in Clauses A1 and A2 of the Building Code and in the Definitions at the start of this Compliance Document.

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### Document Status

Recent versions of this document, as detailed in the Document History, are approved by the Chief Executive of the Department of Building and Housing.

B1 Structure Compliance Document Amendment 11 is the most recent document and is effective from 1 August 2011.
B1 Structure Compliance Document Amendment 10 may also be used until 31 January 2012.
B1 Structure Compliance Document Amendment 11 supersedes all previous versions from 1 February 2012.

People using this Compliance Document should check for amendments on a regular basis. The Department of Building and Housing may amend any part of any Compliance Document at any time. Up-to-date versions of Compliance Documents are available from www.dbh.govt.nz.
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For the purposes of New Zealand Building Code compliance, the acceptable New Zealand and other Standards, and other documents referred to in this Compliance Document (primary reference documents) shall be the editions, along with their specific amendments, listed below. Where the primary reference documents refer to other Standards or other documents (secondary reference documents), which in turn may also refer to other Standards or other documents, and so on (lower order reference documents), then the applicable version of these secondary and lower order reference documents shall be the version in effect at the date this Compliance Document was published.

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**COMMENT**

The above suite of Structural Design Action Standards, together with their amendments, are referred to collectively as “AS/NZS 1170”.

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<td>Timber – Stress graded – Product requirements for mechanically stress-graded timber</td>
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AS/NZS 2918: 2001 Domestic solid fuel heating appliances installation
NZS 3101:- Concrete structures standard
Part 1: 2006 The design of concrete structures
   Amend: 1, 2


NZS 3109: 1997 Concrete construction
   Amend: 1, 2

NZS 3112:- Methods of test for concrete
Part 2: 1986 Tests relating to the determination of strength of concrete
   Amend: 1, 2

NZS 3404:- Steel structures standard
Part 1: 1997 Steel structures standard
   Amend: 1, 2

NZS 3603: 1993 Timber structures standard
   Amend: 1, 2 (Applies to building work consented prior to 1 April 2007)
   Amend: 1, 2, 4 (Applies to building work consented on or after 1 April 2007)

NZS 3604: 2011 Timber framed buildings

NZS 3605: 2001 Timber piles and poles for use in building

NZS 3622: 2004 Verification of timber properties
   Amend: 1

NZS 3640: 2003 Chemical preservation of round and sawn timber
   Amend: 1, 2

Where quoted
AS3 3.2.1, 2.2.4
VM1 3.1, 11.1
VM1 3.2
AS3 1.8.2, 1.8.5 b), 2.2.1 c), 2.2.3
AS3 1.8.3 c)
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<td>Pre cast concrete pipes (pressure and non-pressure)</td>
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<td>NZS 4210: 2001</td>
<td>Code of practice for masonry construction: materials and workmanship &lt;br&gt; <em>Amend: 1</em></td>
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<td>NZS 4211: 2008</td>
<td>Specification for performance of windows</td>
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<td>NZS 4229: 1999</td>
<td>Concrete masonry buildings not requiring specific engineering design &lt;br&gt; <em>Amend: 1</em></td>
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<td>Design of reinforced concrete masonry structures &lt;br&gt; <em>Amend: 1</em></td>
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<td>NZS 4251:-</td>
<td>Solid plastering &lt;br&gt; Part 1: 2007 Cement plasters for walls, ceilings and soffits</td>
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<td>Engineering design of earth buildings</td>
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<td>NZS 4299: 1998</td>
<td>Earth buildings not requiring specific design &lt;br&gt; <em>Amend: 1</em></td>
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<td>NZS 4402:-</td>
<td>Methods of testing soils for civil engineering purposes. Parts 2, 4 and 5: 1986 and 1988 &lt;br&gt; Part 2: Soil classification tests &lt;br&gt; Test 2.2: 1986 Determination of liquid limit &lt;br&gt; Test 2.6: 1986 Determination of the linear shrinkage</td>
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Where quoted:
- VM1 11.1
- AS3 1.8.1, 1.8.3 (f and g)
- VM1 11.1
- VM1 12.1
- VM1 1.3.1
- AS1 7.1, 7.2.1, 7.3.7
- AS1 7.2
- AS1 7.3
- AS1 7.4
- AS1 1.4, 2.1
- AS3 1.1.1, 1.8.4, 1.9.2, 1.9.5, 2.2.1 b)
- VM1 4.0
- AS1 5.1
- VM1 8.1
- AS1 1.4, 4.1
- VM1 11.1
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<td>AS/NZS 4600: 2005</td>
<td>Cold-formed steel structures</td>
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<td>AS/NZS 4671: 2001</td>
<td>Steel Reinforcing Materials</td>
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<td>AS/NZS 4680: 2006</td>
<td>Hot-Dip Galvanised (zinc) Coating</td>
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<td>SNZ HB 8630: 2004</td>
<td>Tracks and outdoor visitor structures</td>
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<tr>
<td>The National Association of Steel Framed Housing Inc (NASH)</td>
<td>NASH Standard: Residential and Low Rise Steel Framing Part 1 2010 Design Criteria</td>
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<td>BS 8004: 1986</td>
<td>Code of practice for foundations</td>
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<tr>
<td>Standards Australia</td>
<td>AS 1397: 2001 Steel sheet and strip – Hot-dipped zinc-coated or aluminium/zinc-coated</td>
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<td>AS 2159: 1995</td>
<td>Rules for the design and installation of piling (known as the SAA Piling Code)</td>
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<tr>
<td>New Zealand Geomechanics Society</td>
<td>Guidelines for the field descriptions of soils and rocks in engineering use. Nov 1988</td>
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<tr>
<td>New Zealand Legislation</td>
<td>Chartered Professional Engineers of New Zealand Act 2002</td>
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**Where quoted**

- VM4 4.1.1
- VM1 10.1
- VM1 2.2.9
- VM1 5.3
- VM4 4.0.3
- AS3 1.7.9
- AS3 1.8.6
- AS3 1.8.5
- VM4 4.0.3
- VM4 4.0.3
- VM1 11.1
- VM1 1.0
1.0 General

1.0.1 The Standards cited in this Verification Method provide a means for the design of structures to meet the performance requirements of New Zealand Building Code Clause B1 Structure. For any particular building or building design, the Verification Method shall consist of AS/NZS 1170 used in conjunction with the relevant cited material standards as modified by this Verification Method.

1.0.2 Modifications to the Standards, necessary for compliance with the New Zealand Building Code, are given against the relevant clause number of each Standard.

1.0.3 Citation of Standards in this Verification Method is subject to the following conditions.

a) The citation covers only the scope stated or implicit in each Standard. Aspects outside the scope, when applied to a particular building, are not part of the Verification Method.

b) Further limitations, modifications and/or constraints apply to each Standard as noted below.

c) Provisions in the cited Standards that are in non-specific or unquantified terms do not form part of the Verification Method. Non-specific or unquantified terms include, but are not limited to, special studies, manufacturer’s advice and references to methods that are appropriate, adequate, suitable, relevant, satisfactory, acceptable, applicable, or the like.

d) Where AS/NZS 1170 is used in combination with other Standards cited in this Verification Method and there are incompatibilities with these other Standards, then the underlying philosophy, general approach, currency of information and methods of AS/NZS 1170 are to take precedence.

e) An engineer with relevant experience and skills in structural engineering shall be responsible for interpretation of the requirements of the Standards cited when used for building structure design. A structural engineer who is chartered under the Chartered Professional Engineers of New Zealand Act 2002 would satisfy this requirement.

COMMENT
The Standards referenced in this Verification Method relating to building design require the application of specialist engineering knowledge, experience and judgement in their use.

2.0 Structural Design Actions Standards

2.1 The requirements of the AS/NZS 1170 suite of Standards are to be complied with. These comprise:

AS/NZS 1170.0: 2002 including Amendments 1, 2 and 4,

AS/NZS 1170.1: 2002 including Amendment 1,

AS/NZS 1170.2: 2002 including Amendment 1,

AS/NZS 1170.3: 2003 including Amendment 1, and


COMMENT
This suite of Standards, together with their amendments, are referred to collectively in this Verification Method as “AS/NZS 1170”.

2.2 The requirements of AS/NZS 1170 are subject to the following modifications.

2.2.1 Material Standards Where AS/NZS 1170 calls for the use of appropriate material Standards, only those material Standards referenced in this Verification Method B1/VM1 are included. Use of other Standards with AS/NZS 1170 must be treated as an alternative means of verification.
2.2.2 Notes in AS/NZS 1170 “Notes” that relate to clauses, tables or figures of AS/NZS 1170 are part of the Verification Method.

COMMENT
AS/NZS 1170 makes a general statement that notes are not an integral part of the Standard. However, in many cases the content of the notes makes them an integral part of the interpretation of the Standard. In these cases, the notes have been specifically cited as being part of this Verification Method.

2.2.3 AS/NZS 1170 Part 0, Clause 4.1 General
Add the following to the end of the Clause:
“The combination factors for permanent actions (dead loads) are based on the assumption that they have a coefficient of variation of approximately 10%. Situations where this assumption is not valid are outside the scope of this Verification Method.”

2.2.4 AS/NZS 1170 Part 0, Clause 4.2.4
Replace the Clause with the following:
“The combination of actions for checking strength and stability for the ultimate limit state for fire shall be as follows:
(a) During the fire:
(i) \( G, \) thermal actions arising from fire, \( \psi l Q \)
together with:
(ii) a lateral force of 2.5% of \( (G + \psi l Q) \) applied as per Clause 6.2.2.
(b) After the fire until the building is either repaired or demolished:
(i) \( G, \) thermal actions arising from fire, \( \psi l Q \)
together with the more critical of either:
(ii) a lateral force of 2.5% of \( (G + \psi l Q) \) applied as per Clause 6.2.2.
or
(iii) a uniformly distributed horizontal face load of 0.5 kPa in any direction.
Account shall be taken of the effects of the fire on material properties and the geometry of the structure.”

2.2.5 AS/NZS 1170 Part 0, Clause 5.2 Structural models
Delete (a) to (d) in Clause 5.2 and replace with:
“(a) Static and/or dynamic response.
(b) Elastic and/or non-elastic (plastic) response.
(c) Geometrically linear and/or geometrically non-linear response.
(d) Time-independent and/or time-dependent behaviour.”

2.2.6 AS/NZS 1170 Part 1, Table 3.2
Replace the entry for “R2, Other roofs (i) Structural elements” with:
“R2 Other roofs (i) Structural elements 0.25 1.1 (See Note 1)”

2.2.7 AS/NZS 1170 Part 1, Clause 3.6 Barriers
In the first paragraph, second sentence, delete “… top edge or handrail…” and substitute “… top edge and rail…”
Delete the second paragraph and substitute:
“Apply as detailed below the uniformly distributed line loads (kN/m), uniformly distributed loads (kPa) and concentrated loads (kN) given in Table 3.3.
For the purposes of applying loads, a rail shall be any handrail or any top rail having a width in plan of greater than 30 mm.
The following are separate load cases, and one load at a time, either vertical or horizontal, is to be applied.
(a) Line loads (kN/m). Regardless of barrier height, line loads need not be applied more than 1200 mm above the floor (or stair pitch line):
(i) For domestic and residential activities, other residential (Row 2 of Table 3.3)
- For barriers with a rail or rails:
  - apply the horizontal load to the top rail..."
– where the top of the barrier is not a rail and where it is less than 200 mm above the top rail, the horizontal load to the top of the barrier may be reduced by 50%, otherwise apply the full horizontal load
– apply the vertical load to the top of the barrier.

For barriers without a rail, apply:
– the horizontal load at 900 mm above the floor (or stair pitch line)
– 50% of the horizontal load to the top of the barrier
– the vertical load to the top of the barrier.

(ii) For all types of occupancy other than Row 2 of Table 3.3:
• apply the loads to the top edge of the barrier and to the top rail
• where the top of the barrier is not a rail and where it is less than 200 mm above the top rail, the horizontal load to the top of the barrier may be reduced by 50%, otherwise apply the full horizontal load.

(b) Distributed loads (kPa):
For all types of occupancy:
• consider the load as acting over the whole area bounded by the top of the barrier and the floor line for the full length of the barrier
• distribute this load to the appropriate solid portions of the barrier.

(c) Concentrated loads (kN):
For all types of occupancy:
• consider each concentrated load to be distributed over a circular or square area of 2000 mm²
• apply concentrated loads so as to produce the most severe effect on the structural element being considered
• concentrated loads applied more than 1200 mm above the floor (or stair pitch line) may be reduced by 50%
• where the barrier infill or balustrade consists of parallel vertical members, less than 100 mm wide and with spaces between them of less than 100 mm, 50% of the concentrated load may be applied to each vertical member.

In Table 3.3, “external balconies” for domestic and residential activities applies to decks, balconies, verandas and the like of individual houses as well as multi household unit buildings. Such barriers may be required by Clause F4 of the Building Code.

2.2.8 AS/NZS 1170 Part 1, Clause 3.8
Car park
Add to the last paragraph of Clause 3.8:
“The basis for determining the horizontal impact actions on barriers quoted in the Clause, including the assumed deceleration distances, is given in Clause C 3.8 of the Commentary to AS/NZS 1170 Part 1. Different design actions may be derived using Equation C3.8, provided that:
(i) The deceleration length applied is based on analysis or tests.
(ii) The vehicle mass and associated velocity are not reduced from those quoted in Commentary Clause C3.8.”

2.2.9 AS/NZS 1170 Part 1, Appendix B
Replace the last paragraph with the following:
“For the design of outdoor visitor structures as defined in SNZ HB 8630: 2004, the imposed actions must be as given by that publication with references to NZS 4203 replaced by equivalent references to AS/NZS 1170.”

2.2.10 AS/NZS 1170 Part 2, Clauses 3.2 and 4.4.3
Add the following at the end of Clauses 3.2 and 4.4.3:
“Where local wind design information is more onerous than determined by this Standard and is published and required to be used by any territorial authority for its area, this local wind design information shall take precedence over
the equivalent information in this Standard for the determination of wind actions on buildings.

Where such local wind design information is less onerous than that of this Standard, the use of such information is not part of this Verification Method.”

2.2.11 AS/NZS 1170 Part 2, Clause 4.3.1
General Add the following to the end of Clause 4.3.1:

“Account must be taken of combinations of isolated tall buildings placed together that lead to local and overall increases in wind.”

2.2.12 AS/NZS 1170 Part 3, Clause 2.1
Add the following at the end of Clause 2.1:

“Where local snow and ice design information is more onerous than determined by this Standard and is published by any territorial authority for its area, this local snow and ice design information shall take precedence over the equivalent information in this Standard for the determination of snow and ice actions on buildings.

Where such local snow and ice design information is less onerous than that of this Standard, the use of such information is not part of this Verification Method.”

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 sg for the ultimate limit state only must be taken as 0.9 kPa.”

2.2.14 NZS 1170 Part 5, Clause 1.4
Add the following to the end of the Clause 1.4:

“In areas where the uniform risk hazard factor is less than 0.08, the use of a minimum hazard factor Z = 0.13 implies design for earthquakes with extremely low probabilities of occurrence. For some projects in these areas this may involve considerable cost consequences and a reduction in requirements is acceptable when site-specific hazard studies are undertaken.”

Consequential changes due to 2010/11 Canterbury earthquakes

COMMENT:

1. As a result of the 2010/11 sequence of earthquakes in Canterbury, there is a heightened risk of seismic activity over the next few decades above that currently factored into structural design requirements. B1/VM1 is amended to reflect an increased seismic hazard factor for the Canterbury earthquake region.

2. The seismic hazard factor Z defined in NZS 1170 Part 5 (Table 3.3) has been raised for the Canterbury earthquake region. This is reflected in the following amendments to B1/VM1.

2.2.14a NZS 1170 Part 5, Clause 3.1.4
Add (to the end of Clause 3.1.4):

“The minimum hazard factor Z (defined in Table 3.3) for the Canterbury earthquake region shall be 0.3. Where factors within this region are greater than 0.3 as provided by NZS 1170 Part 5, then the higher value shall apply.

The hazard factor for Christchurch City, Selwyn District and Waimakariri District shall apply to all structure periods less than 1.5 seconds.”

COMMENT:

The revised Z factor is intended only for use for the design and assessment of buildings and structures, pending further research. All structures with periods in excess of 1.5 seconds should be subject to specific investigation, pending further research.

2.2.14b NZS 1170 Part 5, Table 3.3
Delete row: 102 Christchurch 0.22 -
Replace with: 102 Christchurch 0.3 -
Delete row: 101 Akaroa 0.16 -
Replace with: 101 Akaroa 0.3 -

2.2.14c NZS 1170 Part 5, Clause 3.1.5
Add (as another paragraph after the last sentence in Clause 3.15):

“In the Canterbury earthquake region, the risk factor for the serviceability limit state shall not be taken less than $R_s = 0.33$.”

2.2.14d NZS 1170 Part 5, Figure 3.4
Figure 3.4 Hazard factor Z for the South Island is amended as per Paragraph 2.2.14a above.
2.2.15 NZS 1170 Part 5, Clause 4.2 Seismic weight and seismic mass After: “0.3 is the earthquake imposed action (live load) combination factor for all other applications” add the following:
“except roofs.
ψ_E = 0.0 is the earthquake imposed action (live load) combination factor for roofs.”

2.2.16 NZS 1170 Part 5, Sections 5 and 6 Time history analysis Time history analysis is not part of this Verification Method.

COMMENT:
Time history analysis is a highly specialised method of assessing structural response to earthquakes. It requires many detailed and interdependent assumptions to be made in relation to the nature of earthquake shaking and its propagation from the source, the properties of the building site and the detailed characteristics of the building and its structural elements.

AS/NZS 1170 outlines the steps for time history analysis in some detail, but the applicability of each step needs to be evaluated on a building-by-building basis. More importantly, the output of the analysis needs to be examined carefully in each particular context.

Time history analysis can be an acceptable aid to verifying compliance with structural requirements provided that:
- It is carried out by specialists with in-depth experience in applying the technique.
- The output of the analysis and the viability of the resulting structural design are reviewed by an independent team experienced in both analysis and design.

2.2.17 NZS 1170 Part 5, Clause 5.2.2.3, equation 5.2(4) Delete equation 5.2(4) and replace with:
\[ C_d(T) = \frac{C(T) S_p}{k \mu} \] ...

2.2.18 NZS 1170 Part 5, Clause 6.1.4.1 Requirement for modelling Delete the last sentence of the first paragraph and replace with:
“The model shall include representation of the diaphragm’s flexibility.”

Delete the third (last) paragraph.

3.0 Concrete

3.1 NZS 3101: Part 1 subject to the following modifications:
a) Replace clause 4.8 External walls that could collapse outward in fire with:

4.8 External walls that could collapse inwards or outwards in fire

4.8.1 Application
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:
(a) Be attached to the building structure by steel connections;
(b) Be restrained by these connections, when subject to fire, from inwards or outward movement of the wall relative to the building structure; and
(c) Comply with the appropriate provisions of this Standard for walls.

4.8.2 Forces on connections
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:
(a) The force resulting from applying Clause 2.2.4 of Verification Method B1/VM1;
(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;
(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.

b) Amend Clause 9.3.9.4.13 Minimum area of shear reinforcement
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.”
c) Amend Clause 18.7.4 Floor or roof members supported by bearing on a seating

Add to the end of Clause 18.7.4 (g)(ii) 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 300 mm.”

3.2 NZS 3106

4.0 Concrete Masonry

4.1 NZS 4230

5.0 Steel

5.1 NZS 3404: Part 1

5.2 AS/NZS 4600 subject to the following modifications:

a) Actions must be determined in accordance with AS/NZS 1170. All references to NZS 4203 are replaced by equivalent references to AS/NZS 1170.

b) The term “normative” identifies a mandatory requirement for compliance with this Standard.

c) The term “informative” identifies information provided for guidance or background which may be of interest to the Standard’s users. Informative provisions do not form part of the mandatory requirements of the Standard.

d) Where this Standard has provisions that are in non-specific or unquantified terms then these do not form part of the Verification Method and the proposed details must be submitted to the territorial authority for approval as part of the building consent application. This includes, but is not limited to, special studies and manufacturer’s advice.

e) All stages of construction of a structure or part of a structure to which this Standard is applied shall be adequately reviewed by a person who, on the basis of experience or qualifications, is competent to undertake the review.

f) The extent of the review to be undertaken shall be nominated by the design engineer, taking into account those materials and workmanship factors which are likely to influence the ability of the finished construction to perform in the predicted manner.

g) At the end of the first paragraph of Appendix A add the words “Unless noted otherwise a document referred to below shall be the version of that document current at the date of issue of this Standard or if amendments are cited to this Standard in the “References” pages of Compliance Document B1 at the latest date of those amendments.”

h) Appendix B shall be read as normative with “shoulds” changed to “shall”s”.

5.3 NASH Standard – Residential and Low-rise Steel Framing Part 1: Design Criteria

6.0 Timber

6.1 NZS 3603 subject to the following modifications:

a) Actions must be determined in accordance with AS/NZS 1170. All references to NZS 4203 are replaced by equivalent references to AS/NZS 1170.

b) Delete Clause 2.2.1.2 and replace with:
“Machine stress-grading shall be in accordance with AS/NZS 1748 as modified by NZS 3622. Machine stress-graded timber shall have its properties verified, and be identified, in accordance with the requirements of NZS 3622.”

7.0 Aluminium

7.1 AS/NZS 1664.1 subject to the following modifications:

a) Actions must be determined in accordance with AS/NZS 1170. All references to NZS 4203 are replaced by equivalent references to AS/NZS 1170.

b) The terms “capacity factor” and “strength limit state” are to be read as “strength reduction factor” and “ultimate limit state” respectively.
c) Where this Standard has provisions that are in non-specific or unquantified terms then these do not form part of the Verification Method and the proposed details must be submitted to the territorial authority for approval as part of the building consent application. This includes, but is not limited to, special studies and manufacturer’s advice.

d) All stages of construction of a structure or part of a structure to which this Standard is applied shall be adequately reviewed by a person who, on the basis of experience or qualifications, is competent to undertake the review.

e) The extent of the review to be undertaken shall be nominated by the design engineer, taking into account those materials and workmanship factors which are likely to influence the ability of the finished construction to perform in the predicted manner.

f) Clause 1.2 to read “MATERIALS This Standard applies to aluminium alloys listed in Table 3.3(A) that comply with AS 1734, AS 1865, AS 1866, AS 1867 and AS 2748.1.”

g) At the end of the first paragraph of Clause 1.4 add the words “Unless noted otherwise a document referred to below shall be the version of that document current at the date of issue of this Standard or if amendments are cited to this Standard in the “References” pages of Compliance Document B1 at the latest date of those amendments.”

8.0 Earth Buildings

8.1 NZS 4297 subject to the following modifications:

Actions must be determined in accordance with AS/NZS 1170. All references to NZS 4203 are replaced by equivalent references to AS/NZS 1170.

9.0 Foundations

See B1/VM4 of this Compliance Document.

10.0 Siteworks

10.1 NZS 4431

11.0 Drains

11.1 AS/NZS 3725 subject to the following modifications:

Clause 3 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.”

Clause 4 In the paragraph headed “(c) Select fill”, after the words “given in Table 1” add “or the New Zealand Geomechanics Society Guidelines”.

Clause 5 In definition of Pt, replace “AS 4058” with “AS/NZS 4058”

Clause 6.4 Replace the word “may” with “shall”. Delete the words “Superimposed concentrated dead loads should be avoided.”

Clause 6.5.3.1 Delete the words “The appropriate road vehicle loading shall be specified by the relevant highway authority or owner”.

Clause 6.5.3.2.2.2 Replace the word “may” with “shall”.

Clause 6.5.4.3 Delete the words “unless otherwise specified by the Relevant Authority”.

Clause 6.5.5 Delete the first words “For” and after the words “for aircraft types” add the words “is outside the scope of this Standard but...”

Clause 7 Replace the word “should” with “shall”.

Amend 8 Dec 2008

Amend 9 Sep 2010

Amend 11 Aug 2011
Clause 10.3 After the words “the test load” add “or proof load”.

Appendix A Delete “Normative” and replace with “Informative”

Appendix B Delete “Normative” and replace with “Informative”

12.0 Windows

12.1 NZS 4211 subject to the following modification:
References to air leakage, water leakage and operational effectiveness of opening sashes in NZS 4211, are non-structural considerations and do not apply to this Compliance Document.

13.0 Seismic Performance of Engineering Systems in Buildings

13.1 NZS 4219 subject to the following modifications in the Canterbury earthquake region:
Where the building structure period is less than 1.5 seconds, the zone factor $Z$ shall be determined from the Standard but shall not be less than 0.3.

COMMENT:
All building structure periods in excess of 1.5 seconds should be subject to specific investigation, pending further research.

The component risk factor $R_c$ shall be determined from the Standard but shall not be less than 0.33.
Acceptable Solution B1/AS1

General

1.0 Explanatory Note

1.1 This part of the Compliance Document lists under category headings other Compliance Documents and Standards, suitable as acceptable solutions.

1.2 In other parts of this Compliance Document an Acceptable Solution is given for small chimneys. This is referred to in Paragraph 8.0.

1.3 Modifications to the Standards, necessary for compliance with the New Zealand Building Code, are given against the relevant clause number of each Standard.

1.4 Consequential changes due to 2010/11 Canterbury earthquakes

COMMENT:
Raising the seismic hazard factor Z in NZS 1170 Part 5 (Table 3.3) for the Canterbury earthquake region through amendments to B1/VM1 requires consequential amendments to NZS 4229, NZS 3604 and NZS 4299 referenced in B1/AS1.

2.0 Masonry

2.1 NZS 4229 subject to the following modifications:

2.1.1 NZS 4229, Paragraph 1.3 Definitions
Add (in the definition for Good Ground):
“(liquefaction, lateral spread – for the Canterbury earthquake region only)” after “subsidence” in subparagraph (c).

2.1.2 NZS 4229, Clause 4.2.1 Earthquake zones
Add (as another paragraph to the end of this clause):
“The Canterbury earthquake region shall be treated as Earthquake zone A for the purpose of determining the earthquake bracing demand.”

2.1.3 NZS 4229, Figure 4.1 Earthquake zones
On the map shown in NZS 4229 Figure 4.1 Earthquake zones, the area within the Canterbury earthquake region shall be interpreted as Earthquake zone A.

2.1.4 NZS 4229, Table 4.1 Earthquake zones
Delete: “Christchurch and Lyttelton Earthquake zone B.”
Replace with: “Christchurch and Lyttelton Earthquake zone A.”

2.1.5 NZS 4229, Clause 7.8.1
Delete: Clause 7.8.1(a) and (b)
Replace with: “Clause 7.8.1(a) All slab-on-ground floors shall be reinforced in accordance with Clauses 7.8.3, 7.8.4 and 7.8.5.4. All reinforcing steel, including welded mesh, shall be Ductility Class E in accordance with NZS 4671.”

2.1.6 NZS 4229, Clause 7.8.3
Delete: Clause 7.8.3
Replace with: “Clause 7.8.3 All slab-on-ground reinforcing shall extend to within 75 mm of the outside edge of the slab (including the foundation wall) and shall consist of a minimum 2.27 kg/m² welded reinforcing mesh sheets (1.14 kg/m² in each direction), which shall be lapped at sheet joints by 225 mm or in accordance with the manufacturer’s requirements, whichever is greater. Slabs shall have a maximum dimension of 18 metres between free joints.”

2.1.7 NZS 4229, Clause 7.8.5.2
Delete: Clause 7.8.5.2

2.1.8 NZS 4229, Clause 7.8.5.3
Delete: Clause 7.8.5.3

2.1.9 NZS 4229, New Clause
Add: New “Clause 7.8.5.5 Free Joints.
At free joints, slab reinforcement shall be terminated and there shall be no bonding between vertical concrete faces (prevented by using building paper or a bituminous coating). R12 dowel bars 600 mm long shall be placed at 300 mm centres along the free joint and lapped 300 mm with slab reinforcement on both sides of the joint. All dowel bars on one side of the joint shall have a bond breaker applied, e.g. by wrapping dowel bars for 300 mm with petrolatum tape. Joint dowel bars must be installed in a single plane, in true alignment and parallel.”
2.1.10 NZS 4229 Foundations in the Canterbury earthquake region only where good ground has not been established

COMMENTS:
1. Foundations for houses built on ground that has the potential for liquefaction or lateral spread are outside the scope of B1/AS1.
2. Foundation designs for houses built in areas that have the potential for liquefaction, as defined by the Christchurch City Council, the Selwyn District Council and the Waimakariri District Council, may be in accordance with the Department’s “Guidance on house repairs and reconstruction following the Canterbury earthquake” as amended from time to time (refer to www.dbh.govt.nz).

Note: The foundation options provided in the guidance do not apply in areas:
(a) where there is the potential for lateral spreading of greater than 50 mm over the property and not protected by perimeter ground treatment, or
(b) where there has been severe ground damage during the 2010/11 earthquakes. This is in areas where the crust (the distance between the ground surface and the water table) is thin, generally occurring in low-lying coastal and estuarine areas.

Further guidance is being developed and will be released following additional research. Foundation designs for houses built in areas (a) and (b), as defined by the Christchurch City Council, the Selwyn District Council and the Waimakariri District Council, need to be specifically designed following appropriate geotechnical investigations.

3.0 Timber

3.1 NZS 3604 subject to the following modifications:

3.1.1 NZS 3604 Paragraph 1.3 Definitions
Add (in the definition for Good Ground):
“liquefaction, lateral spread – for the Canterbury earthquake region only)” after “subsidence” in subparagraph (c).

3.1.2 NZS 3604 Section 5 Bracing Design

Make the following amendments:
Amend Figure 5.4, Earthquake zones, so that all the area within the Christchurch City Council boundary is within Zone 2.
Amend Figure 5.4 Earthquake zones, so that the lowest zone within the Selwyn or Waimakariri District Council boundaries is within Zone 2. Areas within Selwyn District that are designated as Zone 1 in NZS 3604 shall become Zone 2.

3.1.3 NZS 3604 Clause 7.5.2.3
Delete: Clause 7.5.2.3
Replace with: “Clause 7.5.2.3 The combined foundation and edge details shall be constructed as shown in Figures 7.13(B), 7.14(B) or (C) (and Figures 7.15(B) and 7.16(B) or (C) for foundations supporting a masonry veneer).”

3.1.4 NZS 3604 Figure 7.13
Delete: Figure 7.13(A) – Foundation edge details – In situ concrete – Dimensions & reinforcing for single storey.
Amend title of Figure 7.13(B) to “Dimensions & reinforcing for 1 or 2 storeys”,

3.1.5 NZS 3604 Figure 7.14
Delete: Figure 7.14(A) – Foundation edge details – Concrete masonry – Single storey
Amend title of Figure 7.14(B) to “1 or 2 storeys”,
and add a note: “for a single storey foundation, 15 Series masonry may be used and the minimum footing width may be 190 mm”.

COMMENT:
Unreinforced and untied slab to footing single storey option removed.
3.1.6 NZS 3604 Figure 7.15
Delete: Figure 7.15(A) – Masonry veneer foundation edge details – Dimensions and reinforcement for single storeys.

COMMENT:
Unreinforced and untied slab to footing single storey options removed.

3.1.7 NZS 3604 Figure 7.16
Delete: Figure 7.16 (A) – Masonry veneer foundation edge details – Concrete masonry – Single storey.

COMMENT:
Unreinforced and untied slab to footing single storey option removed.

3.1.8 NZS 3604 Clause 7.5.8.1
Delete: Clause 7.5.8.1
Replace with: “Clause 7.5.8.1 All slab-on-ground floors shall be reinforced concrete in accordance with Clauses 7.5.8.3, 7.5.8.4 and 7.5.8.6.4. All reinforcing steel, including welded mesh, shall be Ductility Class E in accordance with NZS 4671.”

3.1.9 NZS 3604 Clause 7.5.8.3
Delete: Clause 7.5.8.3
Replace with: “Clause 7.5.8.3 All slab-on-ground reinforcing shall extend to within 75 mm of the outside edge of the slab (including the foundation wall) and shall consist of a minimum 2.27 kg/m² welded reinforcing mesh sheets (1.15 kg/m² in each direction), which shall be lapped at sheet joints by 225 mm or in accordance with the manufacturer’s requirements, whichever is greater. Slabs shall have a maximum dimension of 24 metres between free joints.”

3.1.10 NZS 3604 Clause 7.5.8.6.2
Delete: Clause 7.5.8.6.2

3.1.11 NZS 3604 Figure 7.18
Delete title: Figure 7.18 – Irregular slab (plan view) (see 7.5.8.6.2)
Replace with: “Figure 7.18 – Irregular slab (plan view) (see 7.5.8.6.4)”.

3.1.12 NZS 3604 Clause 7.5.8.6.3
Delete: Clause 7.5.8.6.3.

3.1.13 NZS 3604 New Clause
Add new: “Clause 7.5.8.8 Free Joints.
At free joints, slab reinforcement shall be terminated and there shall be no bonding between vertical concrete faces (prevented by using building paper or a bituminous coating). R12 dowel bars 600 mm long shall be placed at 300 mm centres along the free joint and lapped 300 mm with slab reinforcement on both sides of the joint. All dowel bars on one side of the joint shall have a bond breaker applied, e.g. by wrapping dowel bars for 300 mm with petrolatum tape. Joint dowel bars must be installed in a single plane, in true alignment and parallel.”

3.1.14 NZS 3604 Foundations in the Canterbury earthquake region only where good ground has not been established

COMMENT:
1. Foundations for houses built on ground that has the potential for liquefaction or lateral spread are outside the scope of B1/AS1.
2. Foundation designs for houses built in areas that have the potential for liquefaction, as defined by the Christchurch City Council, the Selwyn District Council and the Waimakariri District Council, may be in accordance with the Department’s “Guidance on house repairs and reconstruction following the Canterbury earthquake” as amended from time to time (refer to www.dbh.govt.nz).

Note: The foundation options provided in the guidance do not apply in areas:
(a) where there is the potential for lateral spreading of greater than 50 mm over the property and not protected by perimeter ground treatment, or
(b) where there has been severe ground damage during the 2010/11 earthquakes. This is in areas where the crust (the distance between the ground surface and the water table) is thin, generally occurring in low-lying coastal and estuarine areas.

Further guidance is being developed and will be released following additional research. Foundation designs for houses built in areas (a) and (b), as defined by the Christchurch City Council, the Selwyn District Council and the Waimakariri District Council, need to be specifically designed following appropriate geotechnical investigations.
4.0 Earth Buildings

4.1 NZS 4299 subject to the following modifications:

4.1.1 NZS 4299, Paragraph 1.3 Definitions
Add (in the definition for Good Ground):
“(liquefaction, lateral spread – for the Canterbury earthquake region only)” after “subsidence” in subparagraph (c).

4.1.2 NZS 4299, Clause 2.3 Earthquake zones
Add to the end of Clause 2.3:
“The earthquake zone factor > 0.6 shall apply to the Canterbury earthquake region.”

4.1.3 NZS 4299, Figure 2.1 Earthquake zones
On the map shown in NZS 4299 Figure 2.1 Earthquake zones, the Canterbury earthquake region shall be interpreted as having an earthquake zone factor of > 0.6.

4.1.4 NZS 4299, Clause 4.8.6.
Delete: Clause 4.8.6
Replace with: “Clause 4.8.6 The thickness and reinforcement and detail of concrete slabs shall comply with the requirements of NZS 3604 as modified in B1/AS1 Paragraph 3.1.”

4.1.5 NZS 4299 Foundations in the Canterbury earthquake region only where good ground has not been established

COMMENT:
1. Foundations for houses built on ground that has the potential for liquefaction or lateral spread are outside the scope of B1/AS1.
2. Foundation designs for houses built in areas that have the potential for liquefaction, as defined by the Christchurch City Council, the Selwyn District Council and the Waimakariri District Council, may be in accordance with the Department’s “Guidance on house repairs and reconstruction following the Canterbury earthquake” as amended from time to time (refer to www.dbh.govt.nz).

Note: The foundation options provided in the guidance do not apply in areas:
(a) where there is the potential for lateral spreading of greater than 50 mm over the property and not protected by perimeter ground treatment, or
(b) where there has been severe ground damage during the 2010/11 earthquakes. This is in areas where the crust (the distance between the ground surface and the water table) is thin, generally occurring in low-lying coastal and estuarine areas.

Further guidance is being developed and will be released following additional research. Foundation designs for houses built in areas (a) and (b), as defined by the Christchurch City Council, the Selwyn District Council and the Waimakariri District Council, need to be specifically designed following appropriate geotechnical investigations.

5.0 Stucco

5.1 NZS 4251
6.0 Drains

6.1 AS/NZS 2566.1

6.2 AS/NZS 2566.2

6.3 AS/NZS 2032

6.4 AS/NZS 2033
7.0 Glazing

7.1 NZS 4223.1 subject to the following modifications:

Clause 1.2(e) Reword to read:

“For framed, unframed, and partly framed glass assemblies in buildings up to 10 m high, glass shall be selected in accordance with section 5.”

7.2 NZS 4223.2

7.2.1 201 Selection and installation of sash and frames

Delete Clause 201.1 (b)

Replace with: “Clause 201.1(b). They must allow for contraction and expansion of the building and comply with relevant clauses of AS/NZS 1170 and NZS 4223.1 section 3.5.”

7.3 NZS 4223.3

7.3.1 Related documents, New Zealand Standards

Delete NZS 4203: 1992 General structural design and design loadings for buildings

Replace with: “AS/NZS 1170 Structural Design Actions.”

7.3.2 Clause 310.1

Delete Clause 310.1

Replace with: “Glazing used in any building in situations that require protection for occupants from falling 1000 mm or more from the floor level shall meet the barrier requirements of AS/NZS 1170 as modified by B1/VM1.”

7.3.3 NZS 4223: Part 3 Clause 312.2

Unframed or partly framed balustrades and fences

Delete Clause 312.2 (a) and (b)

Replace with: “Unframed and partly framed balustrade systems shall be designed in accordance with AS/NZS 1170 as modified by B1/VM1.”

7.3.4 NZS 4223: Part 3 Clause 312.3

Structural balustrades and fences

Delete Clause 312.3

Replace with: “Clause 312.3. Where glass is used as a structural member, toughened safety glass shall be used. The thickness used shall be determined in accordance with AS/NZS 1170 as modified by B1/VM1.”

7.3.5 NZS 4223: Part 3 Section 313

Stairwells and Porches

Delete Clause 313.1

Replace with: “Glazing in stairways within 2000 mm horizontally or vertically, from any part of a stairway or landing shall be Grade A safety glass in accordance with Table 3.1. Stairways include stairwells, landings and porches and comprise at least two risers. All glazing in stairways protecting a fall of 1000 mm or more shall also meet the barrier requirements of AS/NZS 1170 as modified by B1/VM1.”

7.3.6 Table 3.7 Glazing protecting a difference in level in any building.

Delete Table 3.7

7.3.7 Table 3.8 Unframed or partly framed balustrades and fences.

Delete Table 3.8

Appendix 3.E

Delete Appendix 3.E

Replace with: “Refer to NZS 4223 Part 1 Section 5.4”

7.4 NZS 4223.4

8.0 Small Chimneys

See B1/AS3 of this Compliance Document.

9.0 Timber Barriers

See B1/AS2 of this Compliance Document.
Acceptable Solution B1/AS2

Timber Barriers

No specific Acceptable Solution has been adopted for compliance of timber barriers with NZBC Performance B1. The previous Acceptable Solution for Timber barriers has been removed. It is intended that the Department’s Barrier Guide will provide design guidance for several barrier types.

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## Buildings

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