Dear Customer

Please find enclosed Amendment 14, effective 4 November 2016 (except for Paragraph 14.1, which is effective 1 January 2017), to the Acceptable Solutions and Verification Methods for Clause B1 Structure of the New Zealand Building Code. The previous amendment to B1 was Amendment 13, June 2016.

<table>
<thead>
<tr>
<th>Section</th>
<th>Old B1</th>
<th>B1 Amendment 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title pages</td>
<td>Remove document history and status page 3/4</td>
<td>Replace with new document history and status pages 3/4</td>
</tr>
<tr>
<td>Contents</td>
<td>Remove page 9/10</td>
<td>Replace with new page 9/10</td>
</tr>
<tr>
<td>References</td>
<td>Remove page 13/14</td>
<td>Replace with new page 13/14</td>
</tr>
<tr>
<td>B1/VM1</td>
<td>Remove pages 21–22B</td>
<td>Replace with new pages 21–22F</td>
</tr>
<tr>
<td>B1/AS1</td>
<td>Remove pages 23–23C</td>
<td>Replace with new pages 23–23C</td>
</tr>
<tr>
<td>Index</td>
<td>Remove pages 83/84 and 87/88</td>
<td>Replace with new pages 83/84 and 87/88</td>
</tr>
</tbody>
</table>
Document Status

The most recent version of this document (Amendment 14), as detailed in the Document History, is approved by the Chief Executive of the Ministry of Business, Innovation and Employment.

The previous version of this document (Amendment 13) will cease to have effect on 30 May 2017.

People using this document should check for amendments on a regular basis. The Ministry of Business, Innovation and Employment may amend any part of any Verification Method or Acceptable Solution at any time. Up-to-date versions of Verification Methods and Acceptable Solutions are available from www.building.govt.nz

<table>
<thead>
<tr>
<th>Date</th>
<th>Alterations</th>
</tr>
</thead>
<tbody>
<tr>
<td>First published</td>
<td>July 1992</td>
</tr>
</tbody>
</table>
| Amendment 1 | September 1993
  p. ix–xii, References
  p. 1, 1.3, 1.4.1–1.4.3,
  2.1, 2.2, 3.1–3.3, 4.1, 5.1
  p. 2, 6.1, 6.2, 8.1, 9.1
  p. 4, 11.1, 12.1
  p. 5, 1.2, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 6.1, 6.2, 7.1
  p. 9, 1.0.1, 1.0.5 b) c
  p. 10, 2.3.5
  p. 13, Figure 4
  p. 14, 2.3.6
  p. 16, 2.3.8, 2.3.9
  p. 34, Table 1
  p. 47, 1.0.1
  pp. 49-54, Index |
| Amendment 2 | 19 August 1994
  pp. i and ii, Document History
  pp. vii and viii, Contents
  pp. x and xi, References
  p. xiv, Definitions
  p. 1, 1.4.2, 5.1
  p. 2, 6.1
  p. 5, 1.3, 3.1, 4.1
  p. 6, 7.1
  p. 10, 2.3.5
  p. 12, Figure 3
  p. 13, Figure 4
  p. 14, 2.3.6, 2.3.7
  p. 15, Tables 4 and 5
  p. 16, 2.4.1
  p. 21, Figure 2
  p. 22, Figure 3
  p. 32, 2.2.4
  p. 33, 1.0.2
  p. 34, 3.2.1, Table 1
  p. 35, 4.1, 4.1.2, 4.1.3, 4.2.1,
  4.2.2, 4.3, 4.3.1, 5.0.1, Table 2
  p. 36, 6.1.2, 7.1, 7.1.1
  p. 37, 7.3.4
  pp. 49, 50, 51, 54, Index |
| Reprinted incorporating Amendments 1 and 2 | October 1994 |
| Amendment 3 | 1 December 1995
  p. ii, Document History
  p. ix, References
  p. 1, 3.1
  p. 5, 6.2
  p. 50, Index |
| Reprinted incorporating Amendments 1, 2 and 3 | July 1996 |
| Amendment 4 | 1 December 2000
  p. ii, Document History
  pp. vii and viii, Contents
  pp. ix – xii, Revised References
  pp. xiii and xiv, Definitions
  pp. 1–4A, Revised B1/VM1
  pp. 5 and 6, Revised B1/AS1
  pp. 33–63, Revised B1/VM4
  p. 65, Revised B1/AS4
  pp. 67–72, Revised Index |
| Erratum | 9 February 2001
  p. 46, 4.3.2 a) i |
| Amendment 5 incorporating Erratum | 1 July 2001
  p. 2, Document Status
  p. 3, Document History
  p. 7, References
  p. 41, 1.7.2 Comment
  p. 49, 2.2.4
  p. 48, 1.9.1 b) i |
| Amendment 6 | 1 March 2006
  p. 11, References |
| Amendment 7 | 1 April 2007
  pp. 11–12, 14, References
  pp. 15–16, Definitions
  p. 18, 6.1 |
## B1: Document History

<table>
<thead>
<tr>
<th>Amendment</th>
<th>Date</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amendment 9</td>
<td>30 September 2010</td>
<td>pp. 2–3, Document History, Status, pp. 11–14, References p. 20, B1/VM1 2.2.13 p. 21, B1/VM1 3.0, 5.1 pp. 22–22B, B1/VM1 11.0 pp. 23–24, B1/AS1 6.0, 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.3, 7.4 p. 27, B1/AS2 1.0.5 p. 44, B1/AS3 1.7.9 p. 47, B1/AS3 1.8.5, 1.8.6 p. 49, B1/AS3 2.1.1, 2.2.4 p. 63, B1/VM4 4.3.2 p. 67, B1/VM4 5.3.1</td>
</tr>
<tr>
<td>Reprinted incorporating Amendments 4–9</td>
<td>30 September 2010</td>
<td></td>
</tr>
<tr>
<td>Erratum 1</td>
<td>30 September 2010</td>
<td>p. 21, B1/VM1 3.1</td>
</tr>
<tr>
<td>Amendment 10 (Canterbury)</td>
<td>Effective from 19 May 2011 until 31 January 2012</td>
<td>p. 9, Contents p. 12–14, References p. 15, Definitions p. 17, B1/VM1 p. 20, B1/VM1 2.2.14a to 2.2.14b pp. 23–23C B1/AS1 1.4, 2.0, 3.0, 4.0 p. 48, B1/AS3 1.9.3 p. 84, Index</td>
</tr>
<tr>
<td>Amendment 11</td>
<td>Effective from 1 August 2011 until 14 August 2014</td>
<td>p. 9, Contents p. 11–14, References pp. 17–22B, B1/VM1 1.0, 2.0, 2.2.9, 2.2.14c, 5.2, 6.1, 7.1, 8.1, 12.1, 13.0 pp. 23–24, B1/AS1 1.2, 2.0, 3.0, 4.0, 7.0, 8.0, 9.0 pp. 27–34, B1/AS2 pp. 83–87, Index</td>
</tr>
<tr>
<td>Amendment 12</td>
<td>Effective from 14 February 2014 until 31 May 2016</td>
<td>p. 9, Contents pp. 11–13, References pp. 15, 16, Definitions pp. 17, 18, 20, 22, 22A, 22B, B1/VM1 2.1, 2.2.6, 2.2.11, 5.2, 9.0, 12.1 pp. 23–23C, 24 B1/AS1 1.1, 1.2, 2.1.1–2.1.10, 3.1.9, 4.1.5, 8.0, 9.0 p. 79, B1/VM4 C11.0</td>
</tr>
<tr>
<td>Amendment 13</td>
<td>Effective from 1 June 2016 until 30 May 2017</td>
<td>p. 13, References p. 24, B1/AS1 7.3.3, 7.3.4</td>
</tr>
</tbody>
</table>

Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document.
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>References</td>
<td>11</td>
</tr>
<tr>
<td>Definitions</td>
<td>15</td>
</tr>
<tr>
<td>Verification Method B1/VM1</td>
<td>17</td>
</tr>
<tr>
<td>General</td>
<td>17</td>
</tr>
<tr>
<td>1.0 General</td>
<td>17-18</td>
</tr>
<tr>
<td>2.0 Structural Design Actions Standards</td>
<td>17-18</td>
</tr>
<tr>
<td>3.0 Concrete</td>
<td>21</td>
</tr>
<tr>
<td>3.1 NZS 3101: Part 1</td>
<td>21</td>
</tr>
<tr>
<td>4.0 Concrete Masonry</td>
<td>22</td>
</tr>
<tr>
<td>4.1 NZS 4230</td>
<td>22</td>
</tr>
<tr>
<td>5.0 Steel</td>
<td>22</td>
</tr>
<tr>
<td>5.1 NZS 3404: Part 1</td>
<td>22</td>
</tr>
<tr>
<td>5.2 AS/NZS 4600</td>
<td>22</td>
</tr>
<tr>
<td>5.3 NASH Standard: Part 1</td>
<td>22</td>
</tr>
<tr>
<td>6.0 Timber</td>
<td>22</td>
</tr>
<tr>
<td>6.1 NZS 3603</td>
<td>22</td>
</tr>
<tr>
<td>7.0 Aluminium</td>
<td>22</td>
</tr>
<tr>
<td>7.1 AS/NZS 1664.1</td>
<td>22</td>
</tr>
<tr>
<td>8.0 Earth Buildings</td>
<td>22A</td>
</tr>
<tr>
<td>8.1 NZS 4297</td>
<td>22A</td>
</tr>
<tr>
<td>9.0 Foundations</td>
<td>22A</td>
</tr>
<tr>
<td>10.0 Siteworks</td>
<td>22A</td>
</tr>
<tr>
<td>10.1 NZS 4431</td>
<td>22A</td>
</tr>
<tr>
<td>11.0 Drains</td>
<td>22A</td>
</tr>
<tr>
<td>11.1 NZS/AS 3725</td>
<td>22A</td>
</tr>
<tr>
<td>12.0 Windows</td>
<td>22B</td>
</tr>
<tr>
<td>12.1 NZS 4211</td>
<td>22B</td>
</tr>
<tr>
<td>13.0 Seismic Performance of Engineering Systems in Buildings</td>
<td>22B</td>
</tr>
<tr>
<td>13.1 NZS 4219</td>
<td>22B</td>
</tr>
<tr>
<td>14.0 Ductile Steel Mesh</td>
<td>22C</td>
</tr>
<tr>
<td>14.1 Grade 500E welded steel mesh</td>
<td>22C</td>
</tr>
<tr>
<td>Acceptable Solution B1/AS1</td>
<td>23</td>
</tr>
<tr>
<td>General</td>
<td>23</td>
</tr>
<tr>
<td>1.0 Explanatory Note</td>
<td>23</td>
</tr>
<tr>
<td>2.0 Masonry</td>
<td>23</td>
</tr>
<tr>
<td>2.1 NZS 4229</td>
<td>23</td>
</tr>
<tr>
<td>Acceptable Solution B1/AS2</td>
<td>27</td>
</tr>
<tr>
<td>Timber</td>
<td>23A</td>
</tr>
<tr>
<td>3.0 Timber</td>
<td>23A</td>
</tr>
<tr>
<td>3.1 NZS 3604</td>
<td>23A</td>
</tr>
<tr>
<td>4.0 Earth Buildings</td>
<td>23C</td>
</tr>
<tr>
<td>4.1 NZS 4299</td>
<td>23C</td>
</tr>
<tr>
<td>5.0 Stucco</td>
<td>23C</td>
</tr>
<tr>
<td>5.1 NZS 4251</td>
<td>23C</td>
</tr>
<tr>
<td>6.0 Drains</td>
<td>23D</td>
</tr>
<tr>
<td>6.1 AS/NZS 2566.1</td>
<td>23D</td>
</tr>
<tr>
<td>6.2 AS/NZS 2566.2</td>
<td>23D</td>
</tr>
<tr>
<td>6.3 AS/NZS 2032</td>
<td>23D</td>
</tr>
<tr>
<td>6.4 AS/NZS 2033</td>
<td>23D</td>
</tr>
<tr>
<td>7.0 Glazing</td>
<td>24</td>
</tr>
<tr>
<td>7.1 NZS 4223</td>
<td>24</td>
</tr>
<tr>
<td>8.0 Small Chimneys</td>
<td>24</td>
</tr>
<tr>
<td>Verification Method B1/VM2</td>
<td>25</td>
</tr>
<tr>
<td>Timber Barriers</td>
<td></td>
</tr>
<tr>
<td>Acceptable Solution B1/AS2</td>
<td>27</td>
</tr>
<tr>
<td>Timber Barriers</td>
<td></td>
</tr>
<tr>
<td>Verification Method B1/VM3</td>
<td>35</td>
</tr>
<tr>
<td>Small Chimneys</td>
<td></td>
</tr>
<tr>
<td>Acceptable Solution B1/AS3</td>
<td>37</td>
</tr>
<tr>
<td>Small Chimneys</td>
<td></td>
</tr>
</tbody>
</table>
Scope

1.0 Chimney Construction 37
  1.1 General 37
  1.2 Chimney wall thickness 37
  1.3 Foundations 37
  1.4 Hearths 41
  1.5 Chimney breasts 41
  1.6 Reinforcing 41
  1.7 Chimney restraint 41
  1.8 Materials and construction 47
  1.9 Systems to resist horizontal earthquake loadings 47

2.0 Solid Fuel Burning Domestic Appliances 49
  2.1 Chimneys 49
  2.2 Hearth slab 49

Verification Method B1/VM4 Foundations

1.0 Scope and limitations 51
  2.0 General 51

3.0 Shallow Foundations 52
  3.1 General provisions 52
  3.2 Ultimate and design bearing strength and design bearing pressure 52
  3.3 Ultimate limit state bearing strength for shallow foundations 52
  3.4 Ultimate limit state sliding resistance 58
  3.5 Strength reduction factors 59

4.0 Pile Foundations 59
  4.1 Ultimate vertical strength of single piles 60
  4.2 Column action 61
  4.3 Ultimate lateral strength of single piles 63
  4.4 Pile groups 66
  4.5 Downdrag 66
  4.6 Ultimate lateral strength of pile groups 66
  4.7 Strength reduction factors 66

5.0 Pile Types 66
  5.1 Concrete piles 66
  5.2 Steel piles 67
  5.3 Timber piles 67

Appendix A (Informative) 69
  A1.0 Site Investigations 69
Appendix B (Informative) 70
  B1.0 Serviceability Limit State Deformations (Settlement)

Appendix C (Informative) 71
  C1.0 Description of Wall, Limit States and Soil Properties 71
  C2.0 Earth Pressure Coefficients 72
  C3.0 Load Factors and Strength Reduction Factors 72
  C4.0 Notation 72
  C5.0 Loadings 73
  C6.0 Surcharge Pressures at Toe 75
  C7.0 First Ultimate Limit State (short term static foundation bearing failure) 76
  C8.0 Second Ultimate Limit State (short term static foundation sliding failure) 77
  C9.0 Third Ultimate Limit State (short term foundation bearing failure under EQ) 77
  C10.0 Fourth Ultimate Limit State (short term foundation sliding failure under EQ) 78
  C11.0 Fifth Ultimate Limit State (long term foundation bearing failure) 78
  C12.0 Sixth Ultimate Limit State (long term foundation sliding failure) 79
  C13.0 Comments 80

Acceptable Solution B1/AS4 Foundations (Revised by Amendment 4) 81

Index (Revised by Amendment 4) 83

Amend 4 Dec 2000

1 December 2008 DEPARTMENT OF BUILDING AND HOUSING
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AS/NZS 3725: 2007</td>
<td>Design for installation of buried concrete pipes</td>
</tr>
<tr>
<td>Amend 8</td>
<td>Dec 2008</td>
</tr>
<tr>
<td>AS/NZS 3869: 1999 Domestic solid fuel burning appliances – Design and construction</td>
<td></td>
</tr>
<tr>
<td>Amend 9</td>
<td>Sep 2010</td>
</tr>
<tr>
<td>AS/NZS 4058: 2007 Pre cast concrete pipes (pressure and non-pressure)</td>
<td></td>
</tr>
<tr>
<td>Amend 10 and 11</td>
<td></td>
</tr>
</tbody>
</table>
| NZS 4210: 2001 | Code of practice for masonry construction: materials and workmanship  
| Amend: 1 |
| Amend 9 | Sep 2010 |
| NZS 4211: 2008 | Specification for performance of windows |
| Amend 11 | Aug 2011 |
| Amend 11 | Aug 2011 |
| NZS 4223: 2008 Glass selection and glazing  
Part 1: 2008 Glass selection and glazing  
Part 2: 1985 The selection and installation of manufactured sealed insulating glass units  
Amend: 1, 2 |
| Amend 9 | Sep 2010 |
| NZS 4229: 2013 Concrete masonry buildings not requiring specific engineering design |
| Amend 12 | Feb 2014 |
| NZS 4230: 2004 Design of reinforced concrete masonry structures  
Amend: 1 |
| Amend 9 | Aug 2011 |
| NZS 4251: 1999 Solid plastering  
Part 1: 2007 Cement plasters for walls, ceilings and soffits |
| Amend 9 | Sep 2010 |
| NZS 4297: 1998 Engineering design of earth buildings |
| Amend 10 and 11 | |
| NZS 4299: 1998 Earth buildings not requiring specific design  
Amend: 1 |
| NZS 4402: 1986 Methods of testing soils for civil engineering purposes. Parts 2, 4 and 5:1986 and 1988  
Part 2: Soil classification tests  
Test 2.2: 1986 Determination of liquid limit  
Test 2.6: 1986 Determination of the linear shrinkage |
| Amend 10 and 11 | |
| Where quoted |
| VM1 11.1 |
| AS3 2.1 |
| VM1 11.1 |
| AS3 1.8.1, 1.8.3 (f and g) |
| VM1 12.1 |
| VM1 1.3.1 |
| AS1 7.1, 7.2.1, 7.3.7 |
| AS1 7.2 |
| AS1 7.33 |
| 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 |
Part 4: Soil compaction tests
Test 4.2.3: 1988 Relative densities
NZS 4431: 1989 Code of practice for earth fill for residential development
Amend: 1

Where quoted
VM4 4.1.1
VM1 10.1

Amends 10 and 11

AS/NZS 4600: 2005 Cold-formed steel structures
AS/NZS 4671: 2001 Steel Reinforcing Materials
Amend: 1
AS/NZS 4680: 2006 Hot-Dip Galvanised (zinc) Coating

SNZ HB 8630: 2004 Tracks and outdoor visitor structures
The National Association of Steel Framed Housing Inc (NASH)
NASH Standard: Residential and Low Rise Steel Framing Part 1 2010 Design Criteria

British Standards Institution
BS 8004: 1986 Code of practice for foundations

Standards Australia
AS 1391: 2007 Metallic materials – Tensile testing at ambient temperature
AS 1397: 2001 Steel sheet and strip – Hot-dipped zinc-coated or aluminium/zinc-coated

American Society of Testing and Materials
ASTM D1143: 1981 Test method for piles under static axial compressive load

New Zealand Geomechanics Society
Guidelines for the field descriptions of soils and rocks in engineering use. Nov 1988

New Zealand Legislation
Chartered Professional Engineers of New Zealand Act 2002

International Organization for Standardization
ISO 15630-2 2010: Steel for the reinforcement and and prestressing of concrete – Test Methods – Part 2 Welded Fabric
ISO 17025: 2005 General requirements for the competence of testing and calibration laboratories

Amend 9
Dec 2008
Amend 10 and 11
Amend 11
Aug 2011
Amend 14
Nov 2016
Amend 9
Sep 2010
Amend 14
Nov 2016
Amend 9
Dec 2008
Amend 14
Nov 2016
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 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:

\[ C_d(T) = \frac{C(T) S_p}{k} \] ...

5.2(4)

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.”

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.”

d) Amend NZS 3101 Clause 5.3.2.6 Ductile welded wire fabric  
Delete the clause and replace with:  
“Welded steel mesh shall be Ductility Class E in accordance with Paragraph 14 of this Verification Method unless the conditions of Clause 5.3.2.7 for the use of lower ductility welded wire fabric are satisfied.”

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 this document at the latest date of those amendments.”

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

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 the Acceptable Solutions and Verification Methods 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.

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 Replace the word “may” with “shall”.

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT 14 February 2014
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”.

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 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.
14.0 Ductile Steel Mesh

14.1 Grade 500E welded steel mesh

Where Grade 500E welded steel mesh is specified, it shall meet the requirements of AS/NZS 4671 subject to the following modifications.

14.1.1 Laboratory accreditation

COMMENT:
Amendment 14 to Verification Method B1/VM1 is effective from 4 November 2016, except for this Paragraph 14.1.1 which is effective from 1 January 2017.

Laboratories that provide testing and certification of Grade 500E welded steel mesh for use in New Zealand must be accredited for testing to ISO 17025: General requirements for the competence of testing and calibration laboratories, with a scope of accreditation that includes:

- AS 1391: 2007: Metallic materials – Tensile testing at ambient temperature
- AS/NZS 4671: 2001 Steel Reinforcing Materials as modified by this Verification Method.

Accreditation must be by a signatory to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA).

COMMENT:
International Accreditation New Zealand (IANZ) in NZ and the National Association of Testing Authorities (NATA) in Australia are signatories to the ILAC MRA. Details of signatory accreditation bodies in other economies are available on request from IANZ or directly from the ILAC website at http://ilac.org/signatory-search/?q=all

Test certificates must be endorsed i.e. must carry the symbol of their accreditation body and/or a statement that they are accredited, by a named accreditation body, for the reported tests.

14.1.2 Interpretation and Clarification of AS/NZS 4671

Where conflicting or contradictory information is found between AS/NZS 4671:2001 and Standards it references, AS/NZS 4671:2001 takes precedence.

14.1.3 AS/NZS 4671 Clause 3.1 Ageing

Delete Clause 3.1 and replace with:

“The test samples must be brought up to a surface temperature of 100±10°C (i.e. the surface of the steel is recorded at 100±10°C) then held at 100±10°C for 60 minutes (+15, -0 minutes). The method used to generate the temperature increase can be a suitable calibrated oven (calibrated for both temperature and temperature spatial distribution) or boiling water.

“Once heating is completed as detailed above, the samples are to be cooled in still air to ambient room temperature.”

14.1.4 AS/NZS 4671 Clause 9.3 Labelling of reinforcing steel

Add a line:

“9.3 (a)(vii) that Grade 500E steel mesh complies with Paragraph 14 of B1/VM1.”

Add a line:

“9.3 (b)(vi) that Grade 500E steel mesh complies with Paragraph 14 of B1/VM1.”

14.1.5 AS/NZS 4671 Appendix A

Delete Appendix A.

14.1.6 AS/NZS 4671 Clause B1.1

Insert “through steel processing” after “steel melting”.

14.1.7 AS/NZS 4671 Clause B1.3.1

Delete paragraph (b) and replace with:

“Unless specified differently in Clauses other than Clause B1.3.1 in AS/NZS 4671, a batch shall be:

For mesh products:

(i) A quantity of mesh not exceeding 1000 sheets produced from steel of the same surface geometry and nominal diameter, of the same nominal strength grade and of the same ductility class and the mesh is manufactured in the same run under the same conditions using the same equipment; or

(ii) Where sheets of mesh have steel wires that differ in any of surface geometry, diameter, nominal strength grade, or
ductility class, a quantity of mesh not exceeding 1000 sheets considering each type of steel separately (e.g. if different types of steel wires are used in each direction then the wires in each direction will be considered a separate batch).”

**COMMENT:**
In (i) above, the term ‘same run’ allows for breaks in production (e.g. overnight or weekends etc. provided the other criteria remain constant).

14.1.8 AS/NZS 4671 Clause B1.3.5
Delete and replace with:
“The minimum length of specimen test piece will be determined by the requirement to obtain a test piece including at least one welded intersection and a gauge length for the measurement of elongation remote at least 20 mm from the welded intersections. Furthermore, additional length of the test piece will be required to keep both the welded intersection and gauge length of the elongation measurement remote at least 20 mm from the jaws of the testing machine.
“Taha is no maximum limitation imposed on the length of the test piece. The test piece must not be subject to any post-production treatment that will unduly affect the test result.”

14.1.9 AS/NZS 4671 Clause B1 Scope and general
Add a Clause:
“B1.4 For grade 500E steel mesh, all test certificates produced in compliance with AS/NZS 4671 shall note that they are compliant with B1/VM1 Paragraph 14.”

14.1.10 AS/NZS 4671 Clause B3 (c)
Delete Amendment No 1 June 2003 to Clause B3 (c)(i).
Delete Clause B3 (c) i and ii and replace with:
“(i) Mechanical properties, one test per batch on each of three separate longitudinal bars and three separate transverse bars (i.e. 6 tensile tests). If different grade ductility class, surface geometry or nominal diameter edge bars are used on the mesh, one extra tensile test per batch is required on the differing edge bars per sheet.
(ii) Weld-shear tests, one test per batch on each of three separate intersections from different wires. If different grade ductility class, surface geometry or nominal diameter edge bars are used on the mesh, one extra shear test per batch is required on the differing edge bars per sheet.”

Add after (v):
“(vi) Where a manufacturer can demonstrate long-term quality compliance for mesh with respect to Re, Agt and Rm/Re in accordance with Clause B6, the testing frequencies required in Clause B3 (c)(i) may be reduced to one test on each of two separate longitudinal and two transverse bars (i.e. 4 tensile tests). However, the testing requirement on edge wires will remain unchanged from Clause B3 (c)(ii).”

14.1.11 AS/NZS 4671 Clause B4.1.1 Batch parameters
Add a Clause:
“The individual results for Agt shall be rounded to 0.1% and for Rm/Re to 0.01 and the average of these results shall be then rounded.”

14.1.12 AS/NZS 4671 Clause B4.1.2
Delete the first sentence and replace with:
“A batch analysis shall be undertaken at the completion of all batch testing undertaken in accordance with Clause B3. The batch shall be deemed to conform with the tensile parameters specified in Table 2 if the following criteria are satisfied:”
Add a second line to Clause B4.1.2(b)
“For mesh manufactured from Grade 500E, all individual test sample results of Agt must be a minimum of 6%.”

14.1.13 AS/NZS 4671 Clause B5
Add to the last sentence of paragraph 2:
“along with the original test results.”
14.1.14 AS/NZS 4671 Clause B6
Add a comment:

“COMMENT:
Long-term conformance is shown by completing a statistical analysis in accordance with clause B6 on the collected batch results. Clause B6.3 requires all production and processing to be subject to continual control in accordance with Clause 8 and Clause B6. Clause B6.3 makes it mandatory to undertake batch testing.”

14.1.15 AS/NZS 4671 Clause B6.1
Add the following to the end of the last sentence of paragraph 2:

“and including a minimum of four separate batches.”

Add the following sentence:

“If different grade ductility class, surface geometry or nominal diameter edge bars are used on the mesh, then a separate analysis for long-term quality level shall be carried out on these bars.”

Delete the Note to Clause B6.1 in Amendment No 1: June 2003.

Add the following paragraph:

“For New Zealand, the application of long-term quality compliance for mesh with respect to Agt and Rm/Re may be waived, at the choice of the manufacturer. However, all batch test results in the long-term compliance review must meet the requirements defined in Clause B4.”

14.1.16 AS/NZS 4671 Clause B6.2.1
Add a comment:

“COMMENT:
The mean and standard deviation are to be calculated from the individual test values for each test sample from each batch as defined in Section B2.”

14.1.17 AS/NZS 4671 Clause B6.3
Add a comment:

“COMMENT:
Clause 6.3 requires all production and processing to be subject to continued control in accordance with Clause 8 and Appendix B. Appendix B provides two pathways to compliance: using long-term conformance; and not using long-term conformance.”

14.1.18 AS/NZS 4671 B6.4
Add a Clause after B6.3:

“B6.4 Non-conformance to long-term quality levels
Where steel of welded mesh is sourced on the spot market from random different suppliers, then Clause B6 cannot be used and Clause B7 must be used to show conformance.”

“When using long-term conformance:

- Individual batches (defined in B1.3.1) are subjected to testing in accordance with Clause B3 and evaluated to the requirement of Clause B4.
- A batch will fail the initial testing if it does not comply with all requirements of Clause B4.1.2 or Clause B4.2.
- If the additional testing on twice as many test samples (i.e. 12 tensile pieces or six weld shear pieces) for the specific parameter investigated, do not meet the requirements of Clause B4.1.2 or Clause B4.2, then the batch will have failed to comply with the Standard and needs to be downgraded and removed from the data for long-term quality analysis.”

Add a sentence after the existing sentence as follows:

“Where the sample size of a batch falls between sample sizes given in Table B1, the value of the multiplier ‘K’ may be interpolated linearly between the next lowest and next highest number of samples given in Table B1 Statistical Multiplier ‘K’.”

Add a comment:

“COMMENT:
Clause B6.3 details the conformance criteria and makes reference to CvL (the lower characteristic value of a variable parameter) and CvU (the upper characteristic value of a variable parameter). For Re, these are detailed in Table 2 of the Standard as 500 MPa and 600 MPa respectively. One interpretation is that the 95% and 105% allowances can be applied to these having relied on the CvL: p=0.95, and CvU: p=0.05 figures in Table 2 to make this allowance. This is incorrect.

“The p-values are provided to indicate that this is a 90% confidence level and are used to determine the correct ‘K’ statistical multiplier from Table B1 that should be applied to the sample test results dataset, and to calculate the required confidence interval. These p-values are not to be used to expand the lower and upper limits of 500 MPa and 600 MPa within which the confidence interval is required to fall. The same issue exists for Agt and Rm/Re unless the manufacturer has waived the Long-term quality level (LTQL) for these parameters.”
14.1.19 AS/NZS 4671 Clause B7.2
Add the following before the first paragraph:
"Individual batches must be subjected to
testing in accordance with Clause B7.2 and
Clause B7.3.

"The results shall be evaluated against the
requirements of Clause B7.4.1 (a) and Clause
B7.4.2.

"If the steel does not comply with the
requirements of Clause B7.4.1 (a) then it shall
be subjected to additional testing in
accordance with Clause B7.4.1 (b).

"If the additional results fail to meet the
specified values, the batches are deemed to
be non-conforming and the manufacturer/
supplier must demonstrate ongoing
compliance through B7 until a new LTQL can
be established in accordance with B6.1 (for
example 200 test results)."

Add a comment:

"COMMENT:
Test piece and specimen have the same meaning."

14.1.20 AS/NZS 4671 Clause B7.3
Add a line in Clause B7.3(a) after (iv):
“(v) Shear strength of joints in mesh”

14.1.21 AS/NZS 4671 Clause B7.4.1(a)(iii)
Delete the two equations and replace them
with:
\[
\tau_{s15} - 2.33s_{s15} \geq R_{uk,\text{L}} \quad \text{and}
\tau_{s15} - 2.33s_{s15} \leq R_{uk,\text{U}}. 
\]

"COMMENT:
The error in these equations only appears to affect
downloaded copies of AS/NZS 4671.

14.1.22 AS/NZS 4671 Clause C2.2.2
Delete all but the last sentence and replace
with:
"The uniform elongation Agt shall be
determined in accordance with ISO 15630-2
with the following permitted amendments:
(a) a minimum extensometer gauge length of
50 mm may be used
(b) for measurements taken after failure gauge
marks of up to 25 mm may be used."

Amend the last sentence by deleting “unless
otherwise agreed between the parties
concerned.”
Add a sentence after the last sentence:
“Where possible when testing for Agt, the
gauge length for the measurement of elongation
shall exclude the welded intersection.”

Amend 14
Nov 2016
Acceptable Solution B1/AS1

General

1.0 Explanatory Note

1.1 B1/AS1 contains Acceptable Solutions for Masonry (Paragraph 2.0), Timber (Paragraph 3.0), Earth Buildings (Paragraph 4.0) and Stucco (Paragraph 5.0), Drains (Paragraph 6.0) and Glazing (Paragraph 7.0).

1.2 B1/AS gives an Acceptable Solution for small chimneys (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 Clause 7.8.3
Delete clause 7.8.3.
Replace with:
“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 2.27kg/m² welded Grade 500E reinforcing mesh sheets (1.14 kg/m² in each direction), which shall be lapped at sheet joints such that the overlap measurement between the outermost cross wires of each fabric sheet is equal to the greater of one of the following:
- the spacing of cross wires plus 50 mm;
- 150 mm; or
- the manufacturer’s requirements.
Slabs shall have a maximum dimension of 18 m between free joints.”

2.1.2 NZS 4229
Foundations in the Canterbury earthquake region only where good ground has not been established.

COMMENT:
Foundations for houses built on ground that has the potential for liquefaction or lateral spread are outside the scope of B1/AS1.

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 MBIE Guidance Document “Repairing and rebuilding houses affected by the Canterbury earthquakes” (refer to www.mbie.govt.nz).

The foundation options in the MBIE Guidance Document apply to properties in the Canterbury earthquake region that have been categorised as Technical Category 1 to 3 (TC1, TC2 and TC3).
For TC1 properties, provided the conditions for good ground in Section 3 of NZS 3604 are met, house foundations following B1/AS1 can be used.
For TC2 and TC3 properties the MBIE Guidance Document provides a range of foundation solutions depending on expected ground movement and available bearing capacity. These parameters also determine the degree of involvement of structural and geotechnical engineers and the extent of specific engineering design.

Further guidance is being developed for other New Zealand regions and it is expected that this will inform the wider building and construction sector in due course. In the meantime for properties outside the Canterbury earthquake region that have the potential for liquefaction, MBIE recommends that further engineering advice is sought. For these properties a foundation solution following those provided for TC2 in the MBIE Guidance Document may be appropriate.

2.1.3 NZS 4229 Grade 500E welded steel mesh

Where Grade 500E welded steel mesh is specified, it shall meet the requirements of Paragraph 14.0 in B1/VM1.
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”.

3.1.6 NZS 3604 Figure 7.15
Delete: Figure 7.15(A) – Masonry veneer foundation edge details – Dimensions and reinforcement for single storeys.
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 options 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.” Where Grade 500E welded steel mesh is specified, it shall meet the requirements of Paragraph 14.0 in B1/VM1.

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 (1.14 kg/m² in each direction), which shall be lapped at sheet joints such that the overlap measurement between the outmost cross wires of each fabric sheet is equal to the greater of one of the following:
- the spacing of cross wires plus 50 mm,
- 150 mm or
- the manufacturer’s requirements.
Slabs shall have a maximum dimension of 24 m 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:
Foundations for houses built on ground that has the potential for liquefaction or lateral spread are outside the scope of B1/AS1.

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 MBIE Guidance Document “Repairing and rebuilding houses affected by the Canterbury earthquakes” (refer to www.mbie.govt.nz). The foundation options in the MBIE Guidance Document apply to properties in the Canterbury earthquake region that have been categorised as Technical Category 1 to 3 (TC1, TC2 and TC3).

For TC1 properties, provided the conditions for good ground in Section 3 of NZS 3604 are met, house foundations following B1/AS1 can be used. For TC2 and TC3 properties the MBIE Guidance Document provides a range of foundation solutions depending on expected ground movement and available bearing capacity. These parameters also determine the degree of involvement of structural and geotechnical engineers and the extent of specific engineering design.

Further guidance is being developed for other New Zealand regions and it is expected that this will inform the wider building and construction sector in due course. In the meantime for properties outside the Canterbury earthquake region that have the potential for

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT 4 November 2016
liquefaction, MBIE recommends that further engineering advice is sought. For these properties a foundation solution following those provided for TC2 in the MBIE Guidance Document may be appropriate.

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:
Foundations for houses built on ground that has the potential for liquefaction or lateral spread are outside the scope of B1/AS1.

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 MBIE Guidance Document “Repairing and rebuilding houses affected by the Canterbury earthquakes” (refer to www.mbie.govt.nz).

The foundation options in the MBIE Guidance Document apply to properties in the Canterbury earthquake region that have been categorised as Technical Category 1 to 3 (TC1, TC2 and TC3).

For TC1 properties, provided the conditions for good ground in Section 3 of NZS 3604 are met, house foundations following B1/AS1 can be used.

For TC2 and TC3 properties the MBIE Guidance Document provides a range of foundation solutions depending on expected ground movement and available bearing capacity. These parameters also determine the degree of involvement of structural and geotechnical engineers and the extent of specific engineering design.

Further guidance is being developed for other New Zealand regions and it is expected that this will inform the wider building and construction sector in due course. In the meantime for properties outside the Canterbury earthquake region that have the potential for liquefaction, MBIE recommends that further engineering advice is sought. For these properties a foundation solution following those provided for TC2 in the MBIE Guidance Document may be appropriate.

5.0 Stucco

5.1 NZS 4251
### Index B1/VM1/VM2/VM3/VM4

& AS1/AS2/AS3/AS4

(Revised by Amendment 4)

All references to Verification Methods and Acceptable Solutions are preceded by VM or AS respectively.

#### Buildings

- **AS3** 1.9.2, 1.9.4
  - **VM4** 2.0.3
  - **VM1** 8.0, **AS1** 4.0

#### Masonry Buildings

- **AS1** 2.0, **AS3** 1.1.1
  - **AS3** 3.0, **AS3** 1.1.1

#### Chimneys

- **AS1** 1.2, 8.0, **AS3** 2.1
  - **AS3** 1.9, 1.9.3, 1.9.6, Table 2
  - **AS3** 1.1.1, 1.1.3 a) b), 1.2.1 a), 1.6.2 a), 1.7.1, 1.7.6, 1.8.1, 1.8.5 a), Figures 2, 3, 4, 7, Table 1
  - **AS3** 1.1.2
  - **AS3** 1.1.3 a), 1.6.1, 1.9.4 b)
  - **AS3** 1.5, Table 1
  - **AS3** 1.1.3
  - **AS3** 1.1.4
  - **AS3** Table 1
  - **AS3** 1.2, 1.6.2
  - **AS3** 1.7, 1.7.1, 1.7.13, Figures 6, 7
  - **AS3** 1.7.2, 1.7.5
  - **AS3** 1.8

#### Precast Pumice Concrete Chimneys

- **AS3** 1.1.1, 1.1.3 a) c), 1.2.1 b) c), 1.6.2 a) b), 1.7.1, 1.7.13, 1.8.2, 1.8.5 b), Figures 4, 5, Table 1
  - **AS3** 1.8.4

#### Concrete Masonry

- **AS3** 1.2, 1.7.4, 1.7.5

#### Foundation Slabs

- **AS3** 1.1.2, 1.3.2, 1.7.4, 1.7.5

#### Roof Brackets

- **AS3** 1.7.1, 1.7.3, 1.7.4, 1.7.5, 1.8.4, 1.9.4 b) c), Figure 6

#### Roof Ties

- **AS3** 1.7.1, 1.7.3, 1.7.4, Figure 6

#### Structural Diaphragms

- **AS3** 1.7.5

---

**DEPARTMENT OF BUILDING AND HOUSING**

1 August 2011
Chimneys (continued)
  wall ties ........................................ AS3 1.7.5, 1.7.7, 1.7.8
  closely spaced wall ties ....................... AS3 1.7.5, 1.9.4 c)

Concealed works ................................. VM4 A1.2.1 b)

Concrete ........................................ see Design, concrete

Design
  aluminium ....................................... VM1 7.0
  concrete ........................................ VM1 3.0
  concrete masonry ............................... VM1 4.0, AS1 2.0, AS3 1.3.3
  drains .......................................... see Drains
  earth building ................................ VM1 8.0, AS1 4.0
  foundations ................................... see Foundations
  loadings ....................................... VM1 2.0
  earthquake .................................... VM1 1.0, 2.0, AS1 1.4, AS3 1.9, Table 2
  limit state .................................... VM1 2.0, 7.1

  siteworks ...................................... VM1 10.0
  steel ........................................... VM1 5.0
  strength reduction factor .................... VM4 2.0.1, 3.5.1, 4.7, Tables 1, 4
  structural design actions Standards .......... VM1 2.0
  timber ......................................... VM1 6.0, AS1 3.0

  windows ...................................... see Windows

Drains ........................................... VM1 11.0, AS1 6.0

Ductile steel mesh ............................... VM1 3.1(d), 14.0
  Grade 500E welded steel mesh .................. VM1 14.1, AS1 2.1.3, 3.1.8

Earth retaining structures ...................... VM4 2.0.3

Effluents ....................................... VM4 A1.2.1 f)

Foundations .................................... VM1 9.0, VM4
  design parameters
    continuous vibration ......................... VM4 1.0.6
    depth ........................................ VM4 2.0.4
    ground stability ............................ VM4 1.0.4
    long-term loading ........................... VM4 2.0.6
    short-term loading .......................... VM4 2.0.6
    serviceability deformations ............... VM4 1.0.3, Appendix B
Solid fuel burning domestic appliances .................. AS3 2.0
Steel ............................................. see Design, steel
Steel mesh ....................................... VM1 3.1(d), 14.0
Grade 500E welded steel mesh ........ VM1 14.1, AS1 2.1.3, 3.1.8
Stucco ............................................. AS1 5.0
Subsidence ...................................... VM4 A1.2.1 a)
Timber ............................................. see Design, timber
Timber barriers .................................. AS2 1.0

Windows ........................................... VM1 12.0
glazing .......................................... AS1 7.0