



Department of
Building and Housing
Te Tari Kaupapa Whare

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.

Section	Old B1	August 2011 Amendments to B1
Title pages	Remove title page and document history pages 1–4	Replace with new title page and document history pages 1–4
Contents	Remove page 9/10	Replace with new page 9/10
References	Remove pages 11–14	Replace with new pages 11–14
B1/VM1	Remove pages 17–22B	Replace with new pages 17–22B
B1/AS1	Remove pages 23, 23A–D, 24	Replace with new pages 23, 23A–D, 24
B1/AS2	Remove pages 27–34	Replace with new pages 27/28
Index	Remove pages 83–88	Replace with new pages 83–88

Compliance Document for New Zealand Building Code Clause B1 Structure

Prepared by the Department of Building and Housing

This Compliance Document is prepared by the Department of Building and Housing. The Department of Building and Housing is a Government Department established under the State Sector Act 1988.

Enquiries about the content of this document should be directed to:



Department of
Building and Housing
Te Tari Kaupapa Whare

Department of Building and Housing
PO Box 10-729, Wellington.
Telephone 0800 242 243
Fax 04 494 0290
Email: info@dbh.govt.nz

Compliance Documents are available from www.dbh.govt.nz

New Zealand Government

© Department of Building and Housing 2011

This Compliance Document is protected by Crown copyright, unless indicated otherwise. The Department of Building and Housing administers the copyright in this document. You may use and reproduce this document for your personal use or for the purposes of your business provided you reproduce the document accurately and not in an inappropriate or misleading context. You may not distribute this document to others or reproduce it for sale or profit.

The Department of Building and Housing owns or has licences to use all images and trademarks in this document. You must not use or reproduce images and trademarks featured in this document for any purpose (except as part of an accurate reproduction of this document) unless you first obtain the written permission of the Department of Building and Housing.

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.

B1: Document History			
	Date	Alterations	
First published	July 1992		
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,s 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)

B1: Document History (continued)			
Amendment 6	1 March 2005	p. 11, References	
Amendment 7	1 April 2007	pp. 11–12, 14, References pp. 15–16, Definitions	p. 18, 6.1
Amendment 8	1 December 2008	p. 2, Document Status p. 3, Document History p. 9, Contents pp. 11–14, References pp. 15–16, Definitions	pp. 17–22B, B1/VM1 p. 51, B1/VM4 1.0.5, 2.0.1 p. 56, B1/VM4 Figure 2 p. 70, B1/VM4 B1.0.2 pp. 83–84, 86 Index
Amendment 9	30 September 2010	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
Reprinted incorporating Amendments 4–9	30 September 2010		
Erratum 1	30 September 2010	p. 21, B1/VM1 3.1	
Amendment 10 (Canterbury)	Effective from 19 May 2011 until 31 January 2012	p. 9, Contents p. 12–14, References p. 15, Definitions p. 17, B1/VM1	p. 20, B1/VM1 2.2.14A to 2.2.14D pp. 23–23C B1/AS1 1.4, 2.0, 3.0, 4.0 p. 48, B1/AS3 1.9.3 p. 84, Index
Amendment 11	Effective from 1 August 2011	p. 9, Contents p. 11–14, References p. 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
Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document.			

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

Contents

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

Scope	37	5.0 Pile Types	66
1.0 Chimney Construction	37	5.1 Concrete piles	66
1.1 General	37	5.2 Steel piles	67
1.2 Chimney wall thickness	37	5.3 Timber piles	67
1.3 Foundations	37	Appendix A (Informative)	69
1.4 Hearths	41	A1.0 Site Investigations	69
1.5 Chimney breasts	41	Appendix B (Informative)	70
1.6 Reinforcing	41	B1.0 Serviceability Limit State Deformations (Settlement)	70
1.7 Chimney restraint	41	Appendix C (Informative)	71
1.8 Materials and construction	47	C1.0 Description of Wall, Limit States and Soil Properties	71
1.9 Systems to resist horizontal earthquake loadings	47	C2.0 Earth Pressure Coefficients	72
2.0 Solid Fuel Burning Domestic Appliances	49	C3.0 Load Factors and Strength Reduction Factors	72
2.1 Chimneys	49	C4.0 Notation	72
2.2 Hearth slab	49	C5.0 Loadings	73
Verification Method B1/VM4 Foundations	51	C6.0 Surcharge Pressures at Toe	75
1.0 Scope and limitations	51	C7.0 First Ultimate Limit State (short term static foundation bearing failure)	76
2.0 General	51	C8.0 Second Ultimate Limit State (short term static foundation sliding failure)	77
3.0 Shallow Foundations	52	C9.0 Third Ultimate Limit State (short term foundation bearing failure under EQ)	77
3.1 General provisions	52	C10.0 Fourth Ultimate Limit State (short term foundation sliding failure under EQ)	78
3.2 Ultimate and design bearing strength and design bearing pressure	52	C11.0 Fifth Ultimate Limit State (long term foundation bearing failure)	78
3.3 Ultimate limit state bearing strength for shallow foundations	52	C12.0 Sixth Ultimate Limit State (long term foundation sliding failure)	79
3.4 Ultimate limit state sliding resistance	58	C13.0 Comments	80
3.5 Strength reduction factors	59	Acceptable Solution B1/AS4 Foundations	81
4.0 Pile Foundations	59	(Revised by Amendment 4)	
4.1 Ultimate vertical strength of single piles	60	Index	83
4.2 Column action	61	(Revised by Amendment 4)	
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		

Amend 4
Dec 2000

Amend 4
Dec 2000

Amend 4
Dec 2000

Amend 4
Dec 2000

Amend 11
Aug 2011

References

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.

Amend 7
Apr 2007

Standards New Zealand

Where quoted

Amend 11 Aug 2011	AS/NZS 1170: Structural design actions –	VM1 1.0, 2.1, 2.2, 5.2, 6.1, 7.1, 8.1
	Part 0: 2002 General principles <i>Amends: 1, 2, 4</i>	AS1 7.2, 7.3
	Part 1: 2002 Permanent imposed and other actions <i>Amend: 1</i>	VM4 2.0, B1.0
	Part 2: 2002 Wind actions <i>Amend: 1</i>	
	Part 3: 2003 Snow and ice actions <i>Amend: 1</i>	
Amends 10 and 11	NZS 1170: Structural design actions – Part 5: 2004 Earthquake actions – New Zealand	VM1 2.1, 2.2
Amend 11 Aug 2011	COMMENT The above suite of Structural Design Action Standards, together with their amendments, are referred to collectively as "AS/NZS 1170".	
Amend 8 Dec 2008	AS/NZS 1664: Aluminium structures – Part 1: 1997 Limit state design <i>Amend: 1</i>	VM1 7.1
Amend 8 Dec 2008 Amend 9 Sep 2010	AS/NZS 1748: 1997 Timber – Stress graded – Product requirements for mechanically stress-graded timber	VM1 6.1
Amend 8 Dec 2008	AS/NZS 2032: 2006 Installation of PVC pipe systems <i>Amend: 1</i>	AS1 6.3
Amend 7 Apr 2007	AS/NZS 2033: 2008 Installation of polyethylene pipe systems <i>Amends 1, 2</i>	AS1 6.4
Amend 9 Sep 2010	AS/NZS 2566: 2002 Buried Flexible pipelines. Part 1: 1998 Structural Design Part 2: 2002 Installation	AS1 6.1 AS1 6.2

			Where quoted
	AS/NZS 2918: 2001	Domestic solid fuel heating appliances installation	AS3 3.2.1, 2.2.4
Amend 9 Sep 2010	NZS 3101:- Part 1: 2006	Concrete structures standard The design of concrete structures <i>Amend: 1, 2</i>	VM1 3.1, 11.1
Amend 6 Mar 2005			
Amend 8 Dec 2008	NZS 3106: 2009	Design of concrete structures for the storage of liquids.	VM1 3.2
Amend 9 Sep 2010			
Amend 7 Apr 2007	NZS 3109: 1997	Concrete construction <i>Amend: 1, 2</i>	AS3 1.8.2, 1.8.5 b), 2.2.1 c), 2.2.3
Amend 9 Sep 2010	NZS 3112:- Part 2: 1986	Methods of test for concrete Tests relating to the determination of strength of concrete <i>Amend: 1, 2</i>	AS3 1.8.3 c)
Amend 9 Sep 2010			
	NZS 3404:- Part 1: 1997	Steel structures standard Steel structures standard <i>Amend: 1, 2</i>	VM1 5.1
Amend 9 Sep 2010			
Amend 11 Aug 2011			
	NZS 3603: 1993	Timber structures standard <i>Amend: 1, 2</i> (Applies to building work consented prior to 1 April 2007) <i>Amend: 1, 2, 4</i> (Applies to building work consented on or after 1 April 2007)	VM1 6.1, VM4 5.3.1
Amend 7 Apr 2007			
Amend 10 May 2011	NZS 3604: 2011	Timber framed buildings	AS1 1.4, 3.1, 4.1 AS3 1.1.1, 1.9.1 b), 1.9.2, 1.9.5, 2.2.1 b)
Amend 11 Aug 2011			
Amend 9 Sep 2010	NZS 3605: 2001	Timber piles and poles for use in building	VM4 5.3.1
Amend 7 Apr 2007	NZS 3622: 2004	Verification of timber properties <i>Amend: 1</i>	VM1 6.1
Amend 11 Aug 2011			
Amend 9 Sep 2010	NZS 3640: 2003	Chemical preservation of round and sawn timber <i>Amend: 1, 2</i>	VM4 5.3.1,

		Where quoted
	AS/NZS 3725: 2007 Design for installation of buried concrete pipes	VM1 11.1
Amend 8 Dec 2008		
	AS/NZS 3869: 1999 Domestic solid fuel burning appliances – Design and construction	AS3 2.1
Amend 9 Sep 2010		
	AS/NZS 4058: 2007 Pre cast concrete pipes (pressure and non-pressure)	VM1 11.1
Amends 10 and 11	NZS 4210: 2001 Code of practice for masonry construction: materials and workmanship	AS3 1.8.1, 1.8.3 (f and g)
Amend 9 Sep 2010	<i>Amend: 1</i>	
Amend 11 Aug 2011	NZS 4211: 2008 Specification for performance of windows	VM1 12.1
Amend 8 Dec 2008		
Amend 11 Aug 2011	NZS 4219 : 2009 Seismic Performance of Engineering Systems in Buildings	VM1 1.3.1
Amend 9 Sep 2010	NZS 4223:- Part 1: 2008 Glazing in buildings Glass selection and glazing	AS1 7.1, 7.2.1, 7.3.7
	Part 2: 1985 The selection and installation of manufactured sealed insulating glass units	AS1 7.2
	<i>Amend: 1, 2</i>	
Amend 9 Sep 2010	Part 3: 1999 Human impact safety requirements	AS1 7.3
	Part 4: 2008 Wind, dead, snow, and live actions	AS1 7.4
Amends 10 and 11	NZS 4229: 1999 Concrete masonry buildings not requiring specific engineering design	AS1 1.4, 2.1 AS3 1.1.1, 1.8.4, 1.9.2, 1.9.5, 2.2.1 b)
	<i>Amend: 1</i>	
Amend 8 Dec 2008	NZS 4230: 2004 Design of reinforced concrete masonry structures	VM1 4.0
	<i>Amend: 1</i>	
Amend 11 Aug 2011	NZS 4251:- Part 1: 2007 Solid plastering Cement plasters for walls, ceilings and soffits	AS1 5.1
	NZS 4297: 1998 Engineering design of earth buildings	VM1 8.1
Amends 10 and 11	NZS 4299: 1998 Earth buildings not requiring specific design	AS1 1.4, 4.1
	<i>Amend: 1</i>	
	NZS 4402:- Part 2: Methods of testing soils for civil engineering purposes. Parts 2, 4 and 5: 1986 and 1988	VM1 11.1
	Test 2.2: 1986 Soil classification tests Determination of liquid limit	Definitions
	Test 2.6: 1986 Determination of the linear shrinkage	Definitions

		Where quoted
	Part 4: Soil compaction tests	
	Test 4.2.3: 1988 Relative densities	VM4 4.1.1
	NZS 4431: 1989 Code of practice for earth fill for residential development <i>Amend: 1</i>	VM1 10.1
	AS/NZS 4600: 2005 Cold-formed steel structures	VM1 5.2
Amends 10 and 11	AS/NZS 4671: 2001 Steel Reinforcing Materials <i>Amend: 1</i>	AS1 2.1.5, 3.1.8 AS3 1.8.5
	AS/NZS 4680: 2006 Hot-Dip Galvanised (zinc) Coating	AS3 1.8.6
Amend 9 Sep 2010		
Amend 8 Dec 2008	SNZ HB 8630: 2004 Tracks and outdoor visitor structures	VM1 2.2.9
	The National Association of Steel Framed Housing Inc (NASH)	
Amend 11 Aug 2011	NASH Standard: Residential and Low Rise Steel Framing Part 1 2010 Design Criteria	VM1 5.3
	British Standards Institution	
	BS 8004: 1986 Code of practice for foundations	VM4 4.0.3
	Standards Australia	
Amend 9 Sep 2010	AS 1397: 2001 Steel sheet and strip – Hot-dipped zinc-coated or aluminium/zinc-coated	AS3 1.7.9
Amend 11 Aug 2011	AS 2159: 1995 Rules for the design and installation of piling (known as the SAA Piling Code) <i>Amend: 1</i>	VM4 4.0.3
	American Society of Testing and Materials	
	ASTM D1143: 1981 Test method for piles under static axial compressive load	VM4 4.0.3
	New Zealand Geomechanics Society	
	Guidelines for the field descriptions of soils and rocks in engineering use. Nov 1988	VM1 11.1
	New Zealand Legislation	
Amend 8 Dec 2008	Chartered Professional Engineers of New Zealand Act 2002	VM1 1.0

Verification Method B1/VM1

General

Amend 10
May 2011Amend 8
Dec 2008

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.

Amend 11
Aug 2011Amend 11
Aug 2011Amend 11
Aug 2011

- 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 NZS 1170.5: 2004.

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.

Amend 8
Dec 2008Amend 11
Aug 2011Amend 11
Aug 2011Amend 11
Aug 2011

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*, $\Psi_f Q$]

together with:

(ii) a lateral force of 2.5% of $(G + \Psi_c Q)$ 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*, $\Psi_f Q$]

together with the more critical of either:

(ii) a lateral force of 2.5% of $(G + \Psi_c Q)$ 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."

COMMENT

Each of the modelling approaches (a), (b), (c) and (d) allows only one method. This is unnecessarily restrictive since designers may decide to use both approaches for a particular *building*. Accordingly, "or" has been replaced with "and/or".

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

Amend 11
Aug 2011

Amend 8
Dec 2008

Amend 8
Dec 2008

- 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."

COMMENT

In Table 3.3, "external balconies" for domestic and residential activities applies to decks, balconies, verandahs 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 s_g 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:

"Where a special study yields a site-specific uniform risk design spectrum for 500 year return period equivalent to a hazard factor, Z , of less than 0.08, a design spectrum equivalent to at least $Z = 0.10$ may be adopted and the minimum magnitude 6.5 earthquake need not be considered.

COMMENT:

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.

Amend 9
Sep 2010

Amend 8
Dec 2008

Amend 11
Aug 2011

Amend 10
May 2011

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.

$\Psi_E = 0.0$ 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:

$$C_d(T) = \frac{C(T) S_p}{k_\mu} \quad \dots \text{5.2(4)}$$

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."

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:

- Be attached to the building structure by steel connections;
- Be restrained by these connections, when subject to fire, from inwards or outward movement of the wall relative to the building structure; and
- 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:

- The force resulting from applying Clause 2.2.4 of Verification Method B1/VM1;
 - 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;
 - 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.”

Erratum 1
Sep 2010

Amend 9
Sep 2010

3.2 NZS 3106

4.0 Concrete Masonry

Amend 8
Dec 2008

4.1 NZS 4230

5.0 Steel

Amend 9
Sep 2010

5.1 NZS 3404: Part 1

Amend 8
Dec 2008

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.

Amend 11
Aug 2011

Amend 8
Dec 2008

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 “shalls”.

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

Amend 11
Aug 2011

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.”

Amend 11
Aug 2011

Amend 11
Aug 2011

Amend 7
Apr 2007

Amend 8
Dec 2008

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.

Amend 11
Aug 2011

Amend 8
Dec 2008

- 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.”

Amend 8
Dec 2008

Amend 8
Dec 2008

Amend 8
Dec 2008

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.

Amend 11
Aug 2011

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 9
Sep 2010

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*.

Amend 11
Aug 2011

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.

Amend 11
Aug 2011

Amend 9
Sep 2010

Amend 8
Jun 2008

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.”

Amend 11
Aug 2011

Amend 11
Aug 2011

Amend 11
Aug 2011

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).

Amend 11
Aug 2011

Amend 10
May 2011

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.

Amend 11
Aug 2011

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 11
Aug 2011

Amend title of Figure 7.13(B) to “Dimensions & reinforcing for 1 or 2 storeys”.

Amend 11
Aug 2011

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”.

Amend 11
Aug 2011

COMMENT:

Unreinforced and untied slab to footing single storey option removed.

Amend 10
May 2011

Amend 11
Aug 2011

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.

Amend 11
Aug 2011

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.

Amend 11
Aug 2011

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."

Amend 11
Aug 2011

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."

Amend 11
Aug 2011

3.1.10 NZS 3604 Clause 7.5.8.6.2

Delete: Clause 7.5.8.6.2

Amend 11
Aug 2011

3.1.11 NZS 3604 Figure 7.18

Delete title: Figure 7.18 – Irregular slab (plan view) (see 7.5.8.6.2)

Amend 11
Aug 2011

Replace with: "Figure 7.18 – Irregular slab (plan view) (see 7.5.8.6.4)".

Amend 11
Aug 2011

3.1.12 NZS 3604 Clause 7.5.8.6.3

Delete: Clause 7.5.8.6.3.

Amend 10
May 2011

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."

Amend 11
Aug 2011

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.

Amend 11
Aug 2011

Amend 10
May 2011

4.0 Earth Buildings

Amend 11
Aug 2011

4.1 NZS 4299 subject to the following modifications:

Amend 11
Aug 2011

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).

Amend 11
Aug 2011

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*.”

Amend 11
Aug 2011

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.

Amend 11
Aug 2011

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.”

Amend 10
May 2011

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

Amend 11
Aug 2011

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

Amend 10
May 2011

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

Amend 9
Sep 2010

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.

Amend 11
Aug 2011

Amend 11
Aug 2011

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.

Pages 28–34 deleted by Amendment 11

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.

Amend 11
Aug 2011

Buildings **AS3** 1.9.2, 1.9.4
 building elements **VM4** 2.0.3
 earth buildings **VM1** 8.0, **AS1** 4.0

Amend 8
Dec 2008

masonry buildings **AS1** 2.0, **AS3** 1.1.1
 timber framed buildings **AS1** 3.0, **AS3** 1.1.1

Amend 11
Aug 2011

Chimneys **AS1** 1.2, 8.0, **AS3** 2.1

bracing units **AS3** 1.9, 1.9.3, 1.9.6, Table 2
 brick chimneys **AS3** 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

cantilever height **AS3** 1.1.2

chimney bases **AS3** 1.1.3 a), 1.6.1, 1.9.4 b)

chimney breasts **AS3** 1.5, Table 1

chimney depth **AS3** 1.1.3

chimney height **AS3** 1.1.2

chimney liners **AS3** 1.1.4

chimney lintels **AS3** Table 1

chimney materials **AS3** 1.8

chimney stacks **AS3** 1.1.2, 1.6.1

chimney wall thicknesses **AS3** 1.2, 1.2.1

chimney width **AS3** 1.1.3

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

concrete masonry **AS3** 1.8.4

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

foundations **AS3** 1.1.2, 1.1.3 a), 1.3, 1.3.1, 1.3.2,
 1.3.3, 1.7.4, 1.7.5, 1.8.4, Figure 1

 foundation slabs **AS3** 1.1.2, 1.3.2, 1.7.4, 1.7.5

gathers **AS3** 1.6.1, 1.6.2, 1.7.5

packers **AS3** 1.7.2, 1.7.6 c)

precast pumice concrete chimneys **AS3** 1.1.1, 1.1.3 a) c),
 1.2.1 c), 1.6.2 b), 1.7.1, 1.7.13, 1.8.3,
 1.8.3 c), 1.8.5 c), Figures 5, 7, Table 1

 compressive strength **AS3** 1.8.3 c)

 construction of **AS3** 1.8.3

restraint **AS3** 1.7, 1.7.1, 1.7.13, Figures 6, 7

roof brackets **AS3** 1.7.1, 1.7.3, 1.7.4, Figure 6

roof ties **AS3** 1.7.5

structural diaphragms **AS3** 1.9.5

Amend 8
Dec 2008

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

Amend 8
Dec 2008

Amends
8 and 11

Amend 10
May 2011

Amend 8
Dec 2008

Amend 8
Dec 2008

Amend 11
Aug 2011

- 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

Earth retaining structures **VM4** 2.0.3

Amend 8
Dec 2008

Effluents **VM4** A1.2.1 f)

Amend 8
Dec 2008

Amend 11
Aug 2011

Amend 8
Dec 2008

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

Foundations (continued)

pile foundations	VM4 4.0
belled piles	VM4 4.0.3 b), 5.1.2
bulbed piles	VM4 4.0.3 c)
concrete piles	
cast-in-situ	VM4 3.4.4
precast	VM4 3.4.4, 5.1.1
downdrag	VM4 4.5
nominal width	VM4 4.0.3, 4.2, 4.6.1
notation	VM4 4.1.1, Figure 5, Table 2
pile driving	VM4 5.1.1
pile driving formula	VM4 4.0.1
pile groups	
design pile lateral strength	VM4 4.0.4
design pile vertical strength	VM4 4.0.4
ultimate lateral strength	VM4 4.6.1, Table 3
ultimate vertical strength	VM4 4.4.1
single piles	
base resistance	VM4 4.1.3, Figures 3, 4
column action design	VM4 4.2
design pile vertical strength	VM4 4.0.4
design pile lateral strength	VM4 4.0.4
lateral strength	VM4 4.3
drained cohesionless soil	VM4 4.3.4
free head pile	VM4 4.3.2 a), 4.3.3 a), 4.3.4 a)
restrained head pile	VM4 4.3.2 b), 4.3.3 b), 4.3.4 b)
undrained cohesive soil	VM4 4.3.2
undrained consolidated soil	VM4 4.3.3
shaft resistance	VM4 4.1.4, Figure 5, Table 2
ultimate axial compression	VM4 4.0.1, 4.0.2, 4.0.3
vertical strength	VM4 4.1.2
strength reduction factors	VM4 4.7, Table 4
types	
concrete	VM4 5.1.1, 5.1.2
steel	VM4 5.2.1, 5.2.2
timber	VM4 5.3
shallow foundations	VM4 3.0
concrete slab-on-ground	AS1 2.1, 3.1, 4.1, AS3 1.3
design bearing pressure	VM4 3.2.1, 3.2.4
design bearing strength	VM4 3.2.3
design sliding resistance	VM4 3.4.6
local shear	VM4 3.3.3
moment loading	VM4 3.1.4
notation	VM4 3.3.1, Figures 1, 2
soils	VM4 3.1.2, 3.4.3
strength reduction factors	VM4 3.5, Table 1
surcharge	VM4 3.1.3
ultimate bearing strength	VM4 3.1.1, 3.2.2, 3.3.2, Figure 3
ultimate sliding resistance	VM4 3.4.2
ultimate sliding strength	VM4 3.4.4, 3.4.5
see also Chimneys, foundations	

Amend 11
Aug 2011

	Geology	VM4 A1.2.1 a)
	Glazing	AS1 7.0
	Ground	
Amend 11 Aug 2011	good ground	AS1 2.1, 3.1, 4.1, AS3 1.3.2
	Ground conditions	VM4 1.0.2, Appendix A
	Ground water	VM4 1.0.2, Appendices A, B
	conditions	VM4 1.0.2
	seasonal changes	VM4 A1.2.1 e)
	tidal changes	VM4 A1.2.1 e)
	Hearths	AS3 1.4, 2.2, 2.2.1, 2.2.2, 2.2.3
	hearth slabs	AS3 2.2, 2.2.1, 2.2.2, 2.2.3
Amend 11 Aug 2011	Hot dip galvanising	AS3 1.8.6
	Landslip	VM4 A1.2.1 a)
	Loadings	see Design, loadings
Amend 8 Dec 2008	Masonry	see Design, concrete masonry
	Materials	AS3 1.8
	chimneys	see Chimneys, chimney material
Amend 8 Dec 2008	Standards	VM1 1.0
	Piles	see Foundations
Amend 11 Aug 2011	Reinforcing steel	AS1 2.1, 3.1, AS3 1.3.2 b) c), 1.4, 1.6, 1.6.1, 1.6.2, 1.8.5, 2.2.1 a), Table 1
Amend 11 Aug 2011	Seismic resistance of engineering systems	VM1 13.0
	Settlement	VM4 4.0.3, Appendix B
	differential settlement	VM4 B1.0.2
	factors affecting settlement	VM4 B1.0.3
	Site characteristics	VM4 Appendix A
	Site investigations	VM4 3.5.1, 4.7.1, Appendix A
	detailed investigations	VM4 A1.3
	preliminary investigations	VM4 A1.2
	recording information	VM4 A1.4
	Siteworks	see Design, siteworks
	Slope stability	VM4 1.0.4
	Small chimneys	see Chimneys
	Soil properties	VM4 1.0.5, 2.0.6, 2.0.7, Appendix A
	Soil shrinkage and expansion	VM4 3.1.2, 3.4.3, A1.2.1 a)
	Soils	
	adverse moisture conditions	VM4 1.0.2

Solid fuel burning domestic appliances **AS3** 2.0

Steel see Design, steel

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

Amend 11
Aug 2011

