

Please find enclosed Amendment 18, effective 27 June 2019, to the Acceptable Solutions and Verification Methods for Clause B1 Structure of the New Zealand Building Code. The previous amendment to the B1 Acceptable Solutions and Verification Methods was Amendment 17, in November 2018.

Section	Previous Amendment	November 2019 Amendment 18
Title pages	Remove title page, document history and status pages 1–4	Replace with new document history and status page 1–4
Contents	Remove page 9/10	Replace with new page 9/10
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MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Acceptable Solutions and Verification Methods

For New Zealand Building Code Clause
B1 Structure



Status of Verification Methods and Acceptable Solutions

Verification Methods and Acceptable Solutions are prepared by the Ministry of Business, Innovation and Employment in accordance with section 22 of the Building Act 2004. Verification Methods and Acceptable Solutions are for use in establishing compliance with the New Zealand Building Code.

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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 document.

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**Verification Methods and Acceptable Solutions
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New Zealand Government

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Document Status

The most recent version of this document (Amendment 18), as detailed in the Document History, is approved by the Chief Executive of the Ministry of Business, Innovation and Employment. It is effective from 27 June 2019 and supersedes all previous versions of this document.

The previous version of this document (Amendment 17) will cease to have effect on 31 October 2019.

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

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)
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

B1: Document History

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 until 14 August 2014	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
Amendment 12	Effective from 14 February 2014 until 31 May 2016	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
Amendment 13	Effective from 1 June 2016 until 30 May 2017	p. 13, References	p. 24, B1/AS1 7.3.3, 7.3.4
Amendment 14	Effective from 4 November 2016 until 30 May 2017 Effective from 1 January 2017 until 30 May 2017	p. 9 Contents p.p. 14 References p. 22 B1/VM1 3.1 d) p. 22C VM1 14.1.1	pp. 22C–22F B1/VM1 14.1, 14.1.2 - 14.1.22 pp. 23, 23B B1/AS1 2.1.3, 3.1.8 pp. 84, 87 Index
Amendment 15	Effective from 1 January 2017 until 30 June 2018	p. 13 References p. 20 B1/VM1 2.2.14A, 2.2.14B p. 21 B1/VM1 3.1 p. 22B 13.1 p. 23A B1/AS1 3.1.2A, 3.1.2B, 3.1.2C	p. 24 B1/AS1 7.0 p. 37 B1/AS3 Scope p. 41 B1/AS3 1.7.2 p. 49 B1/AS3 2.2.4 p. 54 B1/VM4 3.3.2
Amendment 16	Effective 3 April 2018 until 31 March 2019	p. 9 Contents pp. 11–14A References p. 18 B1/VM1 2.2.5	pp. 21–22 B1/VM1 3.1, 5.1 p. 57 B1/VM4 3.3.2 p. 65 B1/VM4 4.3.4
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Amend 4
Dec 2000

Amend 4
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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 these Verification Methods and Acceptable Solutions (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 these Verification Methods and Acceptable Solutions were published.

Amend 12
Feb 2014

Amend 7
Apr 2007

Amend 12
Feb 2014

Standards New Zealand

Where quoted

Amend 16 Apr 2018	AS/NZS 1163: 2016 Cold-formed structural steel hollow sections	VM1 5.1.1
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
Amend 12 Feb 2014	Part 0: 2002 General principles <i>Amends: 1, 2, 3, 4, 5</i>	AS1 7.2, 7.3
Amend 12 Feb 2014	Part 1: 2002 Permanent imposed and other actions <i>Amends: 1, 2</i>	VM4 2.0, B1.0
Amends 12 and 17	Part 2: 2011 Wind actions <i>Amends: 1, 2, 3, 4, 5</i>	
Amends 10 and 11	Part 3: 2003 Snow and ice actions <i>Amend: 1</i>	
Amends 10 and 11	NZS 1170: Structural design actions –	VM1 2.1, 2.2
	Part 5: 2004 Earthquake actions – New Zealand	
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 1554: Structural steel welding	
	Part 1: 2014 Welding of steel structures <i>Amends: 1, 2</i>	VM1 5.1.13
Amend 16 Apr 2018	AS/NZS 1594: 2002 Hot-rolled steel flat products	VM1 5.1.1
	AS/NZS 1664: Aluminium structures –	VM1 7.1
	Part 1: 1997 Limit state design <i>Amend: 1</i>	
Amends 8 and 9		
Amend 7 Apr 2007	AS/NZS 1748:- Timber – Stress graded for structural purposes	VM1 6.1
	Part 1: 2011 General requirements <i>Amend: 1</i>	VM1 6.1
Amend 12 Feb 2014	Part 2: 2011 Qualification of grading method <i>Amend: 1</i>	VM1 6.1
Amend 9 Sep 2010	AS/NZS 2032: 2006 Installation of PVC pipe systems <i>Amend: 1</i>	AS1 6.3

STRUCTURE

**References B1/VM1/VM2/VM3/VM4
& AS1/AS2/AS3/AS4**

		Where quoted
Amend 9 Sep 2010	AS/NZS 2033: 2008 Installation of polyethylene pipe systems <i>Amends 1, 2</i>	AS1 6.4
Amend 17 Nov 2018	AS/NZS 2327: 2017 Composite structures – Composite steel-concrete construction in buildings	VM1 5.1.4A
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
	AS/NZS 2918: 2001 Domestic solid fuel heating appliances installation	AS3 3.2.1, 2.2.4
Amend 16 Apr 2018	NZS 3101:- Concrete structures standard Part 1: 2006 The design of concrete structures <i>Amends: 1, 2, 3</i>	VM1 3.1, 11.1
Amend 6 Mar 2005		Amend 18 Jun 2019
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:- Methods of test for concrete Part 2: 1986 Tests relating to the determination of strength of concrete <i>Amend: 1, 2</i>	AS3 1.8.3 c)
Amend 9 Sep 2010		
Amend 9 Sep 2010	NZS 3404:- Steel structures standard Part 1: 1997 Steel structures standard <i>Amend: 1, 2</i>	VM1 5.1
Amend 17 Nov 2018	SNZ TS 3404: 2018 Durability requirements for steel structures and components	VM1 5.1.9A
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

		Where quoted
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 Part 2: May 2019 Light Steel Framed Buildings	AS1 9.1
Amend 18 Jun 2019		
British Standards Institution		
	BS 8004: 1986 Code of practice for foundations	VM4 4.0.3
	BS EN 14399 High-strength structural bolting assemblies for preloading	
	Part 1: 2015 General requirements	VM1 5.1.4
	Part 2: 2015 Suitability for preloading	VM1 5.1.4
	Part 3: 2015 System HR. Hexagon bolt and nut assemblies	VM1 5.1.2, 5.1.4
Amend 16 Apr 2018	Part 5: 2015 Plain washers	VM1 5.1.2, 5.1.4
Standards Australia		
Amend 14 Nov 2016	AS 1391: 2007 Metallic materials – Tensile testing at ambient temperature	VM1 14.1.1
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
International Organization for Standardization		
	ISO 15630-2 2010: Steel for the reinforcement and and prestressing of concrete – Test Methods – Part 2 Welded Fabric	VM1 14.1.1
Amend 14 Nov 2016	ISO 17025: 2005 General requirements for the competence of testing and calibration laboratories	VM1 14.1.1

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:

3.1.1 Clause 18.7.4.4 Detailing requirements for support of hollow core floors

At the end of Clause 18.7.4.4 (b) add an additional sentence:

“The details given by C18.6.7(e) may be applied to hollow-core units where the depth of the precast unit is equal to or less than 400 mm.”

COMMENT:

Welded wire fabric that is used in designs to NZS 3101 is subject to the requirements of Paragraph 14.0 Ductile Steel Mesh of this *Verification Method*.

3.2 NZS 3106

4.0 Concrete Masonry

4.1 NZS 4230

5.0 Steel

5.1 NZS 3404: Part 1 subject to the following modifications:

5.1.1 Clause 2.2.1 Specification

In Clause 2.2.1 a) replace:

“AS 1163 Structural steel hollow sections AS 1594 Hot-rolled steel flat products”, with

“AS/NZS 1163 Cold-formed structural steel hollow sections

AS/NZS 1594 Hot-rolled steel flat products”

5.1.2 Clause 2.3.1 Steel bolts, nuts and washers

In Clause 2.3.1 add the following to the end of the Clause:

“BS EN 14399-3 High-strength structural bolting assemblies for preloading, System HR. Hexagon bolt and nut assemblies

Amends 9, 14, 15, 16, Err 1

Amend 18 Jun 2019

Amend 16 Apr 2018

Amend 9 Sep 2010

Amend 8 Dec 2008

Amends 8 and 9

Amend 16 Apr 2018

Amend 8 Dec 2008

Amend 9 Sep 2010

BS EN 14399-5: High-strength structural bolting assemblies for preloading, Plain washers”

5.1.3 new Clause 3.10 Documentation

Insert the following after clause 3.9:

“Clause 3.10 Documentation

The requirements in AS/NZS 5131 Section 4.1.1 General shall be applied.”

5.1.4 Clause 9.3.1 Bolts and bolting category

In Clause 9.3.1.2 replace:

“and AS 1559”

with

“, AS 1559, BS EN 14399.1, BS EN 14399.2, BS EN 14399.3 and BS EN 14399.5”.

Amend 16
Apr 2018

5.1.4A Section 13 Design of composite members and structures

Replace Section 13 Design of composite members and structures with the following:

“13 Design of composite members and structures shall be in accordance with AS/NZS 2327.”

Amend 17
Nov 2018

5.1.5 Section 14 Fabrication

Replace Section 14 Fabrication with the following:

“14 Fabrication

The fabrication of steel structures shall be in accordance with AS/NZS 5131.

Construction categories for the purposes of this Standard shall be determined in accordance with Appendix C of AS/NZS 5131.”

5.1.6 Section 15 Erection

Replace Section 15 Erection with the following:

“15 Erection

The erection of steel structures shall be in accordance with AS/NZS 5131.

Construction categories for the purposes of this standard shall be determined in accordance with Appendix C of AS/NZS 5131.”

5.1.7 Section 16 Modification of Existing Structures

Replace Section 16 Modification of existing structures with the following:

“16 Site modifications during erection and modification and repair of existing structures

Site modifications during erection and modification and repair of existing structures shall be in accordance with AS/NZS 5131 Section 14 Site modifications during erection and modification and repair of existing structures.”

5.1.8 new Section 18 Architecturally Exposed Structural Steelwork

Insert the following after Section 17:

“18 Architecturally exposed structural steelwork

The requirements in AS/NZS 5131 Section 10 Architecturally exposed structural steelwork shall be applied.”

5.1.9 Appendix A

Replace references to AS/NZS 3678, AS/NZS 3769.1 and AS/NZS 3679.2 in NZS 3404 with the 2016 versions that are referenced in this Verification Method

Amend 16
Apr 2018

5.1.9A Appendix C

Replace Appendix C Corrosion Protection with the following:

“Appendix C Corrosion Protection

Corrosion protection shall be in accordance with SNZ TS 3404.”

Amend 17
Nov 2018

5.1.10 Appendix D

Replace Appendix D Inspection of Welding to AS/NZS 1554.1 with the following:

“Appendix D Inspection of Welding

The recommendations in AS/NZS 5131 Appendix I Inspection of Welding and Bolting. (Informative) should be used.”

5.1.11 Appendix K

Replace Appendix K Standard test for evaluation of slip factor (normative) with the following:

“Appendix K Standard test for evaluation of slip factor (normative)

The requirements in AS/NZS 5131 Appendix G Standard test for evaluation of slip factor shall be used.”

5.1.12 Appendix L

Replace Appendix L Inspection of bolt tension using a torque wrench (informative) with the following”

Amend 16
Apr 2018

Amend 16
Apr 2018

“Appendix L Inspection of bolt tension using a torque wrench (informative)

The recommendations in AS/NZS 5131 Appendix H Inspection of bolt tension using a torque wrench should be used.”

5.1.13 new Appendix R

Insert the following after Appendix Q:

“Appendix R Selection of materials for the avoidance of lamellar tearing (informative)

The guidance in AS/NZS 1554.1 Appendix H Selection of materials for the avoidance of lamellar tearing should be used.”

Amend 16
Apr 2018

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.

Amends
8 and 11

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.”

Amend 12
Feb 2014

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

Amends
11 and 18

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.
- 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.

Amend 11
Aug 2011

Amend 8
Dec 2008

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.

Amend 8
Dec 2008

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.

Amend 8
Dec 2008

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."

Amend 8
Dec 2008

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."

Amend 12
Feb 2014

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.

Amend 12
Feb 2014

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".

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"

Amend 9
Sep 2010

Acceptable Solution B1/AS1

General

1.0 Explanatory Note

Amend 12
Feb 2014

1.1 B1/AS1 contains Acceptable Solutions for Masonry (Paragraph 2.0), Timber (Paragraph 3.0), Earth Buildings (Paragraph 4.0), Stucco (Paragraph 5.0), Drains (Paragraph 6.0), Glazing (Paragraph 7.0) and Steel (Paragraph 9.0).

Amend 18
Jun 2019

1.2 B1/AS gives an Acceptable Solution for small *chimneys* (referred to in Paragraph 8.0).

Amend 11
Aug 2011

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.

Amend 11
Aug 2011

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.”

Amend 12
Feb 2014

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.

Amends
11 and 12

Amend 14
Nov 2016

Amend 12
Feb 2014

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

Amend 15
Jan 2017

3.1.2A NZS 3604 Clause 7.4.1.3

Delete Subclause 7.4.1.3 (c).

3.1.2B NZS 3604 Figure 7.10(b)

On the plan view replace the text “2/M12 x 250 mm coach screws at 140 crs” with “2/M12 x 240 mm coach screws at 140 crs vertically.”

On the plan view replace “2/M12 at 400 crs” twice with “2 M12 bolts at 140crs vertically to capture end joist laminations and blocking, and boundary joist laminations and blocking, at post centrelines.”

Add to Note 3: “All coach screws to have 50 x 50 washers.”

3.1.2C NZS 3604 Figure 7.10(c)

On the plan view insert the text “At each strap location (at joist ends and nogging), 2/M12 x 240 mm long coach screws are required.”

On the plan view, replace the text “ 2/M12 x 250 mm coach screws at 140 crs vertically” with “ 2/M12 x 200mm coach screws at 140 crs vertically.”

On the section view, replace the text “M12 x 200 mm coach screws at 400 crs vertically” with M12 x 240 mm coach screws at 140 crs vertically.

Delete “2/M12 bolts at 400crs” which tie laminations together along edge joists and along boundary joists.

Amend 15
Jan 2017

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”.

Amend 11
Aug 2011

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.

3.1.6 NZS 3604 Figure 7.15

Delete: Figure 7.15(A) – Masonry veneer foundation edge details – Dimensions and reinforcement for single storeys.

Amend 11
Aug 2011
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

Amends
9, 11, 15

7.0 Glazing

7.1 NZS 4223.1

7.2 NZS 4223.2

7.3 NZS 4223.3

7.3.1 Clause 22.4.3 modified

Delete clause 22.4.3

Replace with:

“22.4.3 Structural glass barriers

Structural glass barriers use glass as a structural element and are normally classified by the following types. Glass design for these types shall comply with the following tables (see note 1):

Table 14 - Structural balustrade – cantilevered glass;

Table 15 - Structural balustrade – two-edge point fixed;

Table 16 - Structural balustrade – two-edge support;

Table 17 - Structural balustrade – three-edge support.

Design types and glass types not shown in Tables 14 to 17 require specific design.

All structural glass barriers safeguarding a fall of 1000 mm or more shall have interlinking rails, which in the event a glass pane breaks, spans the broken pane at the required barrier height and,

- i) resists Line and Concentrated design loads (SLS) specified in Tables 14 to 17, and
- ii) does not deflect more than 100 mm, in any direction, under the design loads.

Interlinking rails are not required for a heat-strengthened or toughened laminated safety glass barrier that:

- (a) has a top capping, corner brackets or a proprietary system and will, when both panes of the laminate are fractured, resist a 0.2 kN concentrated load and not deflect more than 250 mm (see note 2), or
- (b) has two or three edges supported by structural sealant joints or continuous

clamps, and will, when both panes of the laminate are fractured, resist a 0.2 kN concentrated load and not deflect more than 250 mm (see note 2), or

- (c) has a stiff interlayer and will, when both panes of the laminate are fractured, resist a 0.2 kN concentrated load and not deflect more than 250 mm (see note 2). Physical testing must be undertaken to demonstrate compliance with the load and deflection requirements for laminated glass barriers with a stiff interlayer (see note 3).

Physical testing of glass barriers must include all components of the barrier system, including all structural connections. Loads and deflections must be applied and measured horizontally, at midspan, at the required barrier height. The concentrated load shall be applied over an area of 100 mm x 100 mm and for at least one minute.

NOTE –

- (1) The design of structural connections, fasteners and mounting hardware, that are part of the glass barrier, is outside the scope of this Standard and must be specifically designed.
- (2) Laminated glass is susceptible to minor edge delamination, depending on the interlayer type and laminating process. Normally this will not affect the mechanical properties but can be noticeable on exposed edges.
- (3) Test results for dual pane fracture of laminated glass barriers with stiff interlayers are not applicable to barriers that have narrower glass panes than that tested”

7.4 NZS 4223.4

8.0 Small Chimneys

See Acceptable Solution B1/AS3.

9.0 Steel

9.1 NASH Standard Part 2 Light Steel Framed Buildings

Amend 15
Jan 2017

Amend 13
Jun 2016

Amend 11
Aug 2011

Amend 12
Feb 2014

Amend 18
Jun 2019

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

Amend 8
Dec 2008

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

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
- Amend 17 Nov 2018 | composite steel-concrete **VM1** 5.1.4A
- concrete **VM1** 3.0
- Amend 8 Dec 2008 | concrete masonry **VM1** 4.0, **AS1** 2.0, **AS3** 1.3.3
- drains see Drains
- Amends 8 and 11 | earth building **VM1** 8.0, **AS1** 4.0
- foundations see Foundations
- loadings **VM1** 2.0
- Amend 10 May 2011 | 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 | siteworks **VM1** 10.0
- Amend 18 Jun 2019 | steel **VM1** 5.0, **AS1** 9.0
- strength reduction factor **VM4** 2.0.1, 3.5.1, 4.7, Tables 1, 4
- Amend 8 Dec 2008 | structural design actions Standards **VM1** 2.0
- timber **VM1** 6.0, **AS1** 3.0
- Amend 11 Aug 2011 | windows see Windows

Drains **VM1** 11.0, **AS1** 6.0

- Ductile steel mesh** **VM1** 3.1(d), 14.0
- Amend 14 Nov 2016 | Grade 500E welded steel mesh **VM1** 14.1, **AS1** 2.1.3, 3.1.8

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