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.

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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.

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

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.

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

MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT

MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT

Ministry of Business, Innovation and Employment
PO Box 1473, Wellington 6140
Telephone 0800 242 243
Email: info@building.govt.nz

Verification Methods and Acceptable Solutions are available from www.building.govt.nz

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

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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.

Where quoted
VM1 5.1.1
VM1 1.0, 2.1, 2.2, 5.2, 6.1, 7.1, 8.1
AS1 7.2, 7.3
VM4 2.0, B1.0

Standards New Zealand

AS/NZS 1163: 2016 Cold-formed structural steel hollow sections

AS/NZS 1170: Structural design actions –
  Part 0: 2002 General principles
    Amends: 1, 2, 3, 4, 5
  Part 1: 2002 Permanent imposed and other actions
    Amends: 1, 2
  Part 2: 2011 Wind actions
    Amends: 1, 2, 3, 4, 5
  Part 3: 2003 Snow and ice actions
    Amend: 1

NZS 1170: Structural design actions –
  Part 5: 2004 Earthquake actions – New Zealand

AS/NZS 1554: Structural steel welding
  Part 1: 2014 Welding of steel structures
    Amends: 1, 2

AS/NZS 1594: 2002 Hot-rolled steel flat products

AS/NZS 1664: Aluminium structures –
  Part 1: 1997 Limit state design
    Amend: 1

AS/NZS 2032: 2006 Installation of PVC pipe systems
    Amend: 1

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

AS/NZS 1163: 2016 Cold-formed structural steel hollow sections
AS/NZS 1170: Structural design actions –
  Part 0: 2002 General principles
    Amends: 1, 2, 3, 4, 5
  Part 1: 2002 Permanent imposed and other actions
    Amends: 1, 2
  Part 2: 2011 Wind actions
    Amends: 1, 2, 3, 4, 5
  Part 3: 2003 Snow and ice actions
    Amend: 1

NZS 1170: Structural design actions –
  Part 5: 2004 Earthquake actions – New Zealand

AS/NZS 1554: Structural steel welding
  Part 1: 2014 Welding of steel structures
    Amends: 1, 2

AS/NZS 1594: 2002 Hot-rolled steel flat products

AS/NZS 1664: Aluminium structures –
  Part 1: 1997 Limit state design
    Amend: 1

AS/NZS 1748: Timber – Stress graded for structural purposes
  Part 1: 2011 General requirements
    Amend: 1
  Part 2: 2011 Qualification of grading method
    Amend: 1

AS/NZS 2032: 2006 Installation of PVC pipe systems
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Where quoted:

- **AS1 6.4**
- **VM1 5.1.4A**
- **AS1 6.1**
- **AS1 6.2**
- **AS3 3.2.1, 2.2.4**
- **VM1 3.1, 11.1**
- **VM1 3.2**
- **AS3 1.8.2, 1.8.5 b), 2.2.1 c), 2.2.3**
- **AS3 1.8.3 c)**
- **VM1 5.1**
- **VM1 5.1.9A**
- **VM1 6.1.1, VM4 5.3.1**
- **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)**
- **VM4 5.3.1**
- **VM1 6.1**
Where quoted

SNZ HB 8630: 2004 Tracks and outdoor visitor structures

VM1 2.2.9

The National Association of Steel Framed Housing Inc (NASH)

NASH Standard Part 2: May 2019 Light Steel Framed Buildings

AS1 9.1

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

VM1 5.1.4

Part 1: 2015 General requirements

VM1 5.1.4

Part 2: 2015 Suitability for preloading

VM1 5.1.2, 5.1.4

Part 3: 2015 System HR. Hexagon bolt and nut assemblies

VM1 5.1.2, 5.1.4

Part 5: 2015 Plain washers

Standards Australia

AS 1391: 2007 Metallic materials – Tensile testing at ambient temperature

VM1 14.1.1

AS 1397: 2001 Steel sheet and strip – Hot-dipped zinc-coated or aluminium/zinc-coated

AS3 1.7.9

AS 2159: 1995 Rules for the design and installation of piling (known as the SAA Piling Code)

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

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

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.

$\psi_0 = 0.0$ 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:

$$C_d(T) = \frac{C(T) S_p}{k \mu} \quad \ldots \quad 5.2(4)$$

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.”

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

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.
5.1.3 new Clause 3.10 Documentation
Insert the following after clause 3.9:

“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”.

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.”

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 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

5.1.9A Appendix C
Replace Appendix C Corrosion Protection with the following:

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

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

“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:

“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”
“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."

5.2 AS/NZS 4600 subject to the following modifications:

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

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

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

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

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

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

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

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

6.0 Timber

6.1 NZS 3603 subject to the following modifications:

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

b) Delete Clause 2.2.1.2 and replace with:

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

7.0 Aluminium

7.1 AS/NZS 1664.1 subject to the following modifications:

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

b) The terms “capacity factor” and “strength limit state” are to be read as “strength reduction factor” and “ultimate limit state” respectively.

c) Where this Standard has provisions that are in non-specific or unquantified terms then these do not form part of the Verification Method and the proposed details must be submitted to the territorial authority for approval as part of the building consent application. This includes, but is not limited to, special studies and manufacturer’s advice.
d) All stages of construction of a structure or part of a structure to which this Standard is applied shall be adequately reviewed by a person who, on the basis of experience or qualifications, is competent to undertake the review.

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

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

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

8.0 Earth Buildings

8.1 NZS 4297 subject to the following modifications:

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

9.0 Foundations

See B1/VM4.

10.0 Siteworks

10.1 NZS 4431

11.0 Drains

11.1 AS/NZS 3725 subject to the following modifications:

Clause 3 Add to the list of reference documents:

“NZS 3101 The design of concrete structures.
NZS 4402 Methods of testing soils for civil engineering purposes: Tests 2.4, 2.8, 4.1.1, 4.2.1, 4.2.2, 4.2.3 and 5.1.1.
New Zealand Geomechanics Society, Guidelines for the field description of soils and rocks in engineering use.”

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

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

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

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

Clause 6.5.3.2.2 Replace the word “may” with “shall”.

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”
Acceptable Solution B1/AS1

General

1.0 Explanatory Note

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

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

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

1.4 Consequential changes due to 2010/11 Canterbury earthquakes

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

2.0 Masonry

2.1 NZS 4229 subject to the following modifications:

2.1.1 NZS 4229 Clause 7.8.3
Delete clause 7.8.3.
Replace with:
“All slab-on-ground reinforcing shall extend to within 75 mm of the outside edge of the slab (including the foundation wall) and shall consist of a minimum 2.27kg/m² welded Grade 500E reinforcing mesh sheets (1.14 kg/m² in each direction), which shall be lapped at sheet joints such that the overlap measurement between the outermost cross wires of each fabric sheet is equal to the greater of one of the following:
- the spacing of cross wires plus 50 mm;
- 150 mm; or
- the manufacturer’s requirements.
Slabs shall have a maximum dimension of 18 m between free joints.”

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

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

Foundation designs for houses built in areas that have the potential for liquefaction, as defined by the Christchurch City Council, the Selwyn District Council and the Waimakariri District Council, may be in accordance with the MBIE Guidance Document “Repairing and rebuilding houses affected by the Canterbury earthquakes” (refer to www.mbie.govt.nz).

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

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

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

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

2.1.3 NZS 4229 Grade 500E welded steel mesh
Where Grade 500E welded steel mesh is specified, it shall meet the requirements of Paragraph 14.0 in B1/VM1.
3.0 Timber

3.1 NZS 3604 subject to the following modifications:

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

3.1.2 NZS 3604 Section 5 Bracing Design
Make the following amendments:
Amend Figure 5.4, Earthquake zones, so that all the area within the Christchurch City Council boundary is within Zone 2.
Amend Figure 5.4 Earthquake zones, so that the lowest zone within the Selwyn or Waimakariri District Council boundaries is within Zone 2. Areas within Selwyn District that are designated as Zone 1 in NZS 3604 shall become Zone 2.

3.1.2A 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 200 mm coach screws at 140 crs vertically” twice with “2/M12 bolts at 400crs 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.

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

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

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

3.1.6 NZS 3604 Figure 7.15
Delete: Figure 7.15(A) – Masonry veneer foundation edge details – Dimensions and reinforcement for single storeys.
6.0 Drains

6.1 AS/NZS 2566.1

6.2 AS/NZS 2566.2

6.3 AS/NZS 2032

6.4 AS/NZS 2033
7.0 Glazing

7.1 NZS 4223.1
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,
\[\text{i) resists Line and Concentrated design}
loads (SLS) specified in Tables 14 to 17, and}
\[\text{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:
\[\text{(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}
\[\text{(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).}

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

**Buildings** .......................... AS3 1.9.2, 1.9.4

building elements ........................ VM4 2.0.3

earth buildings ........................ VM1 8.0, AS1 4.0

masonry buildings ........................ AS1 2.0, AS3 1.1.1

timber framed buildings ................ AS1 3.0, AS3 1.1.1

**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

congcrete 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

gathers ................................... AS3 1.1.2, 1.3.2, 1.7.4, 1.7.5

packers .................................. AS3 1.6.1, 1.6.2, 1.7.5

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
  composite steel-concrete .......... VM1 5.1.4A
  concrete ................................ VM1 3.0
  concrete masonry ................... VM1 4.0, AS1 2.0, AS3 1.3.3
  drains .................................. see Drains
  earth building ....................... VM1 8.0, AS1 4.0
  foundations ........................... see Foundations
  loadings ................................ VM1 2.0
  earthquake ............................ VM1 1.0, 2.0, AS1 1.4, AS3 1.9, Table 2
  limit state ............................. VM1 2.0, 7.1
  siteworks .............................. VM1 10.0
  strength reduction factor ........ VM1 2.0.1, 3.5.1, 4.7, Tables 1, 4
  structural design actions Standards .. VM4 2.0.3
  timber ................................ VM1 6.0, AS1 3.0
  windows .............................. see Windows

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

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

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

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

Foundations ............................. VM1 9.0, VM4
  design parameters
    continuous vibration ............... VM4 1.0.6
    depth ................................ VM4 2.0.4
    ground stability ................. VM4 1.0.4
    long-term loading ............. VM4 2.0.6
    short-term loading ............. VM4 2.0.6
    serviceability deformations .... VM4 1.0.3, Appendix B