

Please find enclosed Amendment 4, effective 28 November 2019, to the Acceptable Solutions and Verification Methods for Clause H1 Energy Efficiency of the New Zealand Building Code. The previous amendment to the H1 Acceptable Solutions and Verification Methods was Fourth Edition Amendment 3, in January 2017.

| Section | Previous Amendment | November 2019 Amendment 4 |
|----------------|--|--|
| Title pages | Remove title page, document history and status pages 1–4 | Replace with new title page, document history and status pages 1–4 |
| References | Remove page 11/12 | Remove page 11/12 |
| H1/VM1 | Remove page 17/18 | Replace with new page 17/19 |
| H1/AS1 | Remove pages 19-22 | Replace with new pages 19-22 |



**MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT**
HĪKINA WHAKATUTUKI

Acceptable Solutions and Verification Methods

For New Zealand Building Code Clause
H1 Energy Efficiency



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.

Users should make themselves familiar with the preface to the New Zealand Building Code Handbook, which describes the status of Verification Methods and Acceptable Solutions 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 document.

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



**MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT**
HĪKINA WHAKATUTUKI

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 4), as detailed in the Document History, is approved by the Chief Executive of the Ministry of Business, Innovation and Employment. It is effective 28 November 2019 and supersedes all previous versions of this document.

The previous version of this document (Amendment 3) ceases to have effect on 31 March 2020.

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

| H1: Document History | | | |
|---|---|---|--|
| | Date | Alterations | |
| First published | July 1992 | | |
| Second edition | 29 December 2000 | Document revised – second edition issued. | |
| Amendment 1 | 1 July 2001 | p. 2, Document History, Status p. 5, Classified uses | |
| Third edition | 31 October 2007 | Document revised – third edition issued. | |
| Amendment 2 | 10 October 2011 | p. 2, Document History, Status pp. 3–6, NZBC Clause H1 Energy Efficiency p. 7, Contents pp. 11–13, Definitions | p. 15, H1/VM1 1.1.1, 1.1.2 p. 20, H1/VM1 1.1.3, 1.2.1 p. 21, H1/AS1 2.1.2, 2.1.3 p. 26, H1/AS1 2.1.4, 2.3.2 p. 29, Index |
| Reprinted incorporating Amendment 2 | Effective 10 October 2011 until 30 May 2017 | | |
| Fourth edition Amendment 3 | Effective from 1 January 2017 until 31 March 2020 | | |
| Amendment 4 | Effective 28 November 2019 | p. 11 References p. 17 H1/VM1 1.1.3 Comment, 1.3.1 Comment | pp. 19–21 H1/AS1 2.1.2 Comment 2.1.4, 2.1.5, 6.1.1 |
| Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document. | | | |

References

For the purposes of New Zealand Building Code (NZBC) compliance, the Standards and documents referenced in these Acceptable Solutions and Verification Methods (primary reference documents) must be the editions, along with their specific amendments, listed below. Where these primary reference documents refer to other Standards or documents (secondary reference documents), which in turn may also refer to other Standards or documents, and so on (lower-order reference documents), then the version in effect at the date of publication of these Acceptable Solutions and Verification Methods must be used.

| | | Where quoted | |
|--|--|---|---------------------|
| Standards New Zealand | | | |
| NZS 4214: 2006 | Methods of determining the total thermal resistance of parts of buildings | VM1 1.4.1, AS1 2.3.1 | Amend 4 Nov 2019 |
| NZS 4218: 2009 | Thermal Insulation – Housing and Small Buildings | VM1 1.1.1,1.1.2 AS1 2.1.1, 2.1.2, 2.1.3, 2.1.4, 2.1.5, 2.1.6, 2.1.7, 2.2.1, 4.0.1 | Amend 4 Nov 2019 |
| NZS 4243:- Part 1: 2007 | Energy efficiency – large buildings. Building Thermal Envelope | VM1 1.3.1 AS1 2.2.1, 4.0.1 | |
| NZS 4243:- Part 2: 2007 | Energy efficiency – large buildings. Lighting <i>Amend: 1</i> | AS1 6.1.1 | |
| NZS 4305: 1996 | Energy efficiency – domestic type hot water systems | AS1 5.0.1 | |
| AS/NZS 4859:- Part 1: 2002 | Materials for the thermal insulation of buildings General criteria and technical provisions | AS1 2.3.2 | |
| BRANZ LTD | | | |
| ALF 3: | The 'Annual Loss Factor' Method. A design tool for energy efficient houses, 3 rd edition (April 2000) Albrecht Stoecklein and Mark Bassett | Definitions | |
| National Institute of Water and Atmospheric Research Ltd (NIWA) | | | |
| | Temperature Normals for New Zealand 1961-1990 by A I Tomlinson and J Sansom (ISBN 0478083343) | Definitions | |

Amend 4
Nov 2019

Verification Method H1/VM1

1.0 Building Thermal Envelope

This Verification Method can be used for HOUSING, COMMUNAL RESIDENTIAL, COMMUNAL NON-RESIDENTIAL and COMMERCIAL *buildings*.

1.0.1 For determining the insulation requirements of the *building* envelope, *buildings* other than HOUSING are classified as being either small or large. A small *building* is any *building* with a net lettable area no greater than 300 m². A large *building* is any *building* with a net lettable area greater than 300 m².

Note that NZBC H1.3.1(a) (temperature and humidity control) does not apply to ASSEMBLY SERVICE *buildings*, INDUSTRIAL *buildings*, OUTBUILDINGS, or ANCILLARY BUILDINGS.

1.0.2 In *buildings* containing both INDUSTRIAL and other classifications, the non-industrial portion shall be treated separately according to its classification. For example, in a *building* containing both INDUSTRIAL and COMMERCIAL occupancies, the COMMERCIAL area shall meet the NZBC energy efficiency requirements.

1.0.3 Text boxes headed '**COMMENT:**' occurring throughout this document are for guidance purposes only.

1.1 Modelling of housing and small buildings

1.1.1 The modelling method described in NZS 4218 section 4.3 is a Verification Method for NZBC Clause H1.3.1(a) for the following types of *buildings*:

- a) Housing, regardless of total floor area, and
- b) Small buildings other than housing having a net lettable area no greater than 300 m².

1.1.2 The modelling method described in NZS 4218 section 4.3 is a Verification Method for NZBC Clause H1.3.2E.

1.1.3 Delete clause 4.3.1.

COMMENT:

1. HOUSING includes detached dwellings, multi-unit dwellings such as *buildings* which contain more than one separate household or family, e.g. an apartment *building*, and also group dwellings, e.g. a *wharenui*.
2. The restrictions in clause 4.3.1 of NZS 4218, on when the Modelling Method must be used, do not form part of the requirements in H1/AS1 (i.e. sections 3, 4.1 and 4.2). Clause 4.3.1 of NZS 4218 is deleted from H1/VM1 solely to avoid doubt, and should not read as implying that requirements in H1/VM1 are in any way applicable to H1/AS1.

Amend 4
Nov 2019

1.2 Building performance index for housing

1.2.1 Compliance with NZBC Clause H1.3.2E (*Building Performance Index or BPI*) satisfies NZBC Clause H1.3.1(a).

COMMENT:

1. The NZBC has no requirement for the maintenance of interior temperatures except as required by NZBC G5 for old people's homes and early childhood centres. The 20°C stated in the definition of *heating energy* is for calculation purposes only.
2. To satisfy the Building Code performance requirement E3.3.1 for internal moisture, it may be necessary, depending on the method adopted, to provide more insulation (greater R-value) than that required to satisfy energy efficiency provisions alone.
3. For *buildings* in alpine areas, there may be benefits in using higher levels of insulation than that required to meet the requirements of NZBC.
4. ALF 3.2, published by BRANZ, calculates the *BPI*. Note that the ALF procedures are intended for detached dwellings and are not suitable for multi-unit dwellings.

1.3 Modelling of large buildings other than housing

1.3.1 The modelling method described in NZS 4243.1 section 4.4 is a Verification Method for NZBC Clause H1.3.1(a) for *buildings* other than HOUSING having a net lettable area greater than 300 m².

COMMENT:

1. If artificial lighting is included when applying the modelling method of NZS 4243.1 section 4.4, there is no need to comply separately with NZS 4243.2 section 3.3.
2. Note the limits on application to NZBC Clause H1.2(a) and H1.2(c).

Amend 4
Nov 2019

1.4 Determining thermal resistance

1.4.1 The *thermal resistance (R-values)* of *building elements* may be verified by using NZS 4214.

COMMENT:

1. The BRANZ 'House Insulation Guide' provides thermal resistances of common building elements and is based on calculations from NZS 4214.

Acceptable Solution H1/AS1

1.0 General

1.0.1 This Acceptable Solution can be used for HOUSING, COMMUNAL RESIDENTIAL, COMMUNAL NON-RESIDENTIAL and COMMERCIAL *buildings*.

1.0.2 This Acceptable Solution does not include the use of foil insulation.

1.0.3 For determining the insulation requirements of the *building* envelope, *buildings* other than *housing* are classified as being either small or large. A small *building* is any *building* with a net lettable area no greater than 300 m². A large *building* is any *building* with a net lettable area greater than 300 m².

1.0.4 In *buildings* containing both *industrial* and other classifications, the non-industrial portion shall be treated separately according to its classification. For example, in a *building* containing both *industrial and commercial* occupancies, the *commercial* area shall meet the NZBC energy efficiency requirements.

1.0.5 Text boxes headed '**COMMENT**' occurring throughout this document are for guidance purposes only.

COMMENT:

- Note that NZBC H1.3.1(a) (temperature and air-tightness) does not apply to *assembly service buildings, industrial buildings, outbuildings, or ancillary buildings*.
- NZBC H1.3.5 (artificial lighting) applies to *commercial and communal non-residential buildings* with a net lettable area greater than 300 m².

2.0 Building Thermal Envelope

2.1 Housing and small buildings

2.1.1 *Construction* in accordance with NZS 4218 section 3 and section 4.1 or 4.2 (as modified by Paragraphs 2.1.3 to 2.1.7) satisfies NZBC H1.3.1(a) for *housing* of any size and all *buildings* having a net lettable area no greater than 300 m².

2.1.2 *Construction* in accordance with NZS 4218 sections 3 and section 4.1 or 4.2 (as modified by Paragraphs 2.1.3 to 2.1.7) satisfies NZBC H1.3.2E for *housing* of any size, including multi-unit dwellings.

COMMENT:

- Common walls or common floors/ceilings that separate adjacent conditioned spaces in a multi-unit *building* are not required to form part of the thermal envelope. A single thermal envelope may be used to enclose all the conditioned spaces within the *building*, or multiple thermal envelopes may be used, provided all conditioned spaces are enclosed.
- When the common walls or floors/ceilings are not considered to be part of the thermal envelope, they are not required to achieve the *R-values* specified in NZS 4218. However, the maximum area of glazing (which is a percentage of the *total wall area* of the thermal envelope) will be smaller, due to the lower *total wall area* of the single thermal envelope.

Amend 4
Nov 2019

Amend 4
Nov 2019

2.1.3 Clause 3.1.2 in NZS 4218 shall be replaced as follows:

"3.1.2 Recessed luminaires shall comply with the Electricity Safety Regulations 2010."

2.1.4 Comment C3.1.2 in NZS 4218 shall be replaced as follows:

"COMMENT: Recessed luminaires that can be safely abutted to, or covered with, insulation must be used in order to comply with the Electricity (Safety) Regulations 2010. NZS 4246 provides good practice guidance on installing insulation around recessed luminaires. Ceiling access hatches often form part of the thermal envelope and therefore should be insulated."

Amend 4
Nov 2019

Amend 4
Nov 2019

2.1.5 Insert a new paragraph at the end of section 3.2 in NZS 4218, as follows:

"Concrete slab-on-ground floors are deemed to achieve a construction *R-value* of 1.3, unless a higher *R-value* is justified by calculation or physical testing".

COMMENT:

1. The *R-value* of concrete slab-on-ground floors increases as the area:perimeter ratio increases. Large uninsulated slabs (larger than 100 to 150 m²) typically have area:perimeter ratios high enough to result in *R-values* greater than R1.3. Small concrete slabs may not achieve an *R-value* of 1.3 but can be assumed to comply for the purposes of this Acceptable Solution.
2. The construction *R-value* of concrete slab-on-ground floors must be established by calculation or physical testing when the required *R-value* exceeds R1.3 (e.g. floors with embedded heating systems).

2.1.6 Clause 4.2.1 in NZS 4218 shall be replaced as follows:

"The calculation method shall only be used where the glazing area is 50% or less of the total wall area."

2.1.7 After the third sentence of Clause 4.2.7 in NZS 4218, insert a new sentence as follows:

"If A_{Door} is greater than 6 m² and 6% of the total wall area, then in equation 1, A_{Door} shall be set to the difference between A_{Door} and the greater of 6 m² or 6% of the total wall area"

COMMENT:

1. Section 4.2 "Calculation method" of NZS 4218 compares the proposed building with the "reference building" which is insulated in accordance with Tables 2, 3 or 4. This method permits roof, wall, floor and glazing insulation combinations which differ from these Tables, but the building must perform at least as well as the "reference building".
2. To satisfy the Building Code performance requirement E3.3.1 for internal moisture, it may be necessary, depending on the method adopted, to provide more insulation (greater *R-value*) than that required to satisfy energy efficiency provisions alone.
3. Tables 3 and 4 in NZS 4218 allow buildings with high thermal mass to have lower *R-values* than buildings with frame construction. This recognises benefits in the thermal performance when thermal mass is used appropriately. To be beneficial thermal mass must be integrated into the building with sound passive solar design.

4. NZS 4246 Energy Efficiency – Installing Bulk Thermal Insulation in Residential Buildings provides guidance to ensure that insulation is installed correctly and will perform as intended.

2.2 Large buildings other than housing

2.2.1 Construction in accordance with:

- NZS 4243.1 section 4.2 or
- NZS 4243.1 section 4.3 or
- NZS 4218 section 3 and 4.1 or
- NZS 4218 section 3 and 4.2

satisfies the requirements of NZBC H1.3.1(a) for the *thermal resistance* of the *building envelope* in large *buildings* other than *housing* having a net lettable area greater than 300 m².

2.3 Determining thermal resistance

2.3.1 Acceptable methods for determining the *thermal resistance (R-values)* of *building elements* are contained in NZS 4214.

2.3.2 Acceptable methods for determining the *thermal resistance (R-values)* of insulation materials are contained in AS/NZ 4859.1.

COMMENT:

The BRANZ House Insulation Guide provides thermal resistances of common building components and is based on calculations from NZS 4214.

3.0 Control of Airflow

3.0.1 To satisfy the requirements of NZBC H1.3.1(b), *buildings* shall have windows, doors, vents or other *building elements* that allow significant movement of air, to be *constructed* in such a way that they are capable of being fixed in the closed position.

COMMENT:

G4/AS1 provides for the supply of outdoor air for ventilation by way of windows and doors that can be fixed in the open position.

Amend 4
Nov 2019

Amend 4
Nov 2019

4.0 Control of Solar Heat Gain

4.0.1 The requirements of NZBC H1.3.3(f) are satisfied by complying with either NZS 4218 section 3 and section 4.2 or 4.3 for small *buildings*, or NZS 4243.1 section 4.2 or section 4.3 for large *buildings* (see Paragraph 1.0.3 for definitions of small and large *buildings*).

5.0 Hot Water Systems

5.0.1 Hot water systems complying with NZS 4305 satisfy the requirements of NZBC H1.3.4 for the provision of hot water to *sanitary fixtures* and *sanitary appliances*.

COMMENT:

1. NZS 4305 deals with domestic type electrical and gas systems having a storage water heater capacity of up to 700 litres. Larger systems and their associated piping are not controlled by the NZBC.
2. The manufacture and sale of hot water cylinders and gas water heaters are covered by the Energy Efficiency (Energy Using Products) Regulations 2002. The associated NZ Minimum Energy Performance Standards for electric storage water heaters (MEPS as defined in NZS 4606.1 and the relevant NZ section of AS/NZS 4692.2) are equivalent to the requirements in this Acceptable Solution (see NZS 4305 clause 2.1.1). Electric storage water heaters that do not comply with NZ MEPS do not comply with this Acceptable Solution.

6.0 Artificial Lighting

6.1 Commercial and Communal Non-Residential Buildings

6.1.1 Artificial lighting energy consumption in COMMERCIAL, COMMUNAL NON-RESIDENTIAL *buildings* having a net lettable area greater than 300 m² shall comply with NZS 4243.2 section 3.3 to satisfy the requirements of NZBC H1.3.5.

Amend 4
Nov 2019

