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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.

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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

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<th><strong>H1: Document History</strong></th>
<th>Date</th>
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<tr>
<td>First published</td>
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**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.

### Standards New Zealand

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<th>Standard</th>
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<tr>
<td>NZS 4214: 2006</td>
<td>Methods of determining the total thermal resistance of parts of buildings</td>
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<td>Energy efficiency – large buildings. Building Thermal Envelope</td>
<td>VM1 1.3.1, AS1 2.2.1, 4.0.1</td>
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### BRANZ LTD

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<td></td>
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### National Institute of Water and Atmospheric Research Ltd (NIWA)

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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.

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).
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:
1. Note that NZBC H1.3.1(a) (temperature and air-tightness) does not apply to assembly service buildings, industrial buildings, outbuildings, or ancillary buildings.

2. 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 sections 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:
1. 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.

2. 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.

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.’
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 m$^2$) 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 m$^2$ 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 m$^2$ 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.
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.

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 m$^2$.

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.
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.