Compliance Document for New Zealand Building Code Clause H1 Energy Efficiency – Third Edition

Prepared by the Department of Building and Housing

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

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New Zealand Government

Status of Compliance Documents

Compliance Documents are prepared by the Department of Building and Housing in accordance with section 22 of the Building Act 2004. A Compliance Document is for use in establishing compliance with the New Zealand Building Code.

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

Users should make themselves familiar with the preface to the New Zealand Building Code Handbook, which describes the status of Compliance Documents and explains alternative methods of achieving compliance.

Defined words (italicised in the text) and classified uses (small CAPITALS) are explained in Clauses A1 and A2 of the Building Code and in the Definitions at the start of this Compliance Document.

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.	
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Reprinted incorporating Amendment 2	10 October 2011		

Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document.

Document Status

The most recent version of this Compliance Document, as detailed in the Document History, is approved by the Chief Executive of the Department of Building and Housing. This Compliance Document is effective for building consents issued on or after 10 October 2011 and supersedes all previous versions of this document.

People using this Compliance Document should check for amendments on a regular basis. The Department of Building and Housing may amend any part of any Compliance Document at any time. Up-to-date versions of Compliance Documents are available from www.dbh.govt.nz

New Zealand Building Code Clause H1 Energy Efficiency

The mandatory provisions for building work are contained in the New Zealand Building Code (NZBC), which comprises the First Schedule to the Building Regulations 1992. The relevant NZBC Clause for Energy Efficiency is H1, as amended by:

- Building Amendment Regulations 2000 (SR 2000/119) on 26 June 2000
- Building Amendment Regulations (No 2) 2007 (SR 2007/226) on 13 August 2007
- Building (Building Code: Energy Efficiency of Temperature, Humidity, and Ventilation Systems) Amendment Regulations 2008 (SR 2008/97) on 7 April 2008, and
- Building (Building Code: Energy Efficiency of Domestic Hot Water Systems) Amendment Regulations 2008 (SR 2008/256) on 11 August 2008

Amend 2 Oct 2011

Schedule 1 **Building Regulations 1992** Reprinted as at 1 February 2009

Clause H1–Energy efficiency provisions

Provisions	Limits on application
Objective	
H1.1 The objective of this provision is to facilitate efficient use of energy.	Objective H1.1 applies only when the energy is sourced from a *network utility operator* or a depletable energy resource.
Functional requirement	
H1.2 *Buildings* must be *constructed* to achieve an *adequate* degree of energy efficiency when that energy is used for—	
(a) modifying temperature, modifying humidity, providing ventilation, or doing all or any of those things; or	Requirement H1.2(a) does not apply to *assembly service buildings, industrial buildings, outbuildings,* or *ancillary buildings.*
(b) providing hot water to *sanitary fixtures* or *sanitary appliances*, or both; or	
(c) providing artificial lighting	Requirement H1.2(c) applies only to *commercial buildings* and *communal non-residential buildings* whose floor area is greater than 300 m².
Performance	
H1.3.1 The *building* envelope enclosing spaces where the temperature or humidity (or both) are modified must be constructed to—	
(a) provide *adequate thermal resistance*; and	
(b) limit uncontrollable airflow.	

Effective from 1 Feb 2009

Provisions	Limits on application
Effective from 30 Sep 2008 **H1.3.2E** *Buildings* must be constructed to ensure that their *building performance index* does not exceed 1.55.	Performance H1.3.2E applies only to *housing*.
H1.3.3 Account must be taken of physical conditions likely to affect energy performance of *buildings*, including— (a) the thermal mass of *building elements*; and (b) the building orientation and shape; and (c) the airtightness of the building envelope; and (d) the heat gains from services, processes and occupants; and (e) the local climate; and (f) heat gains from solar radiation.	
Effective from 1 Feb 2009 **H1.3.4** Systems for the heating, storage, or distribution of hot water to and from *sanitary fixtures* or *sanitary appliances* must, having regard to the energy source used,—	
(a) limit the energy lost in the heating process; and	
(b) be constructed to limit heat losses from storage vessels and from distribution systems; and	Performance H1.3.4(b) does not apply to individual storage vessels that are greater than 700 litres in capacity.
Effective from 1 Feb 2009 (c) be constructed to facilitate the efficient use of hot water.	Performance H1.3.4(c) applies only to *housing*.
H1.3.5 Artificial lighting fixtures must—	Performance H1.3.5 does not apply to lighting provided solely to meet the requirements in clause F6.
(a) be located and sized to limit energy use, consistent with the *intended use* of space; and	
(b) be fitted with a means to enable light intensities to be reduced, consistent with reduced activity in the space.	
H1.3.6 *HVAC systems* must be located, *constructed*, and installed to—	Performance H1.3.6 applies only to *commercial buildings*.
(a) limit energy use, consistent with the *intended use* of space; and	
(b) enable them to be maintained to ensure their use of energy remains limited, consistent with the *intended use* of space.	
Effective from 1 Feb 2009	

New Zealand Building Code Clause A1 Classified Uses

Clause A1 – Classified Uses

1.0 Explanation

1.0.1 For the purposes of this building code *buildings* are classified according to type, under seven categories.

1.0.2 A *building* with a given classified use may have one or more *intended uses* as defined in the Act.

2.0 HOUSING

2.0.1 Applies to *buildings* or use where there is self care and service (internal management). There are three types.

2.0.2 Detached dwellings
Applies to a *building* or use where a group of people live as a single household or family. Examples: a holiday cottage, boarding house accommodating fewer than 6 people, dwelling or hut.

2.0.3 Multi-unit dwelling
Applies to a *building* or use which contains more than one separate household or family. Examples: an attached dwelling, flat or multi-unit apartment.

2.0.4 Group dwelling
Applies to a building or use where groups of people live as one large extended family. Examples: within a commune or marae.

3.0 Communal residential

3.0.1 Applies to *buildings* or use where assistance or care is extended to the principal users. There are two types.

3.0.2 Community service
Applies to a residential *building* or use where limited assistance or care is extended to the *principal users*. Examples: a boarding house, hall of residence, holiday cabin, *backcountry hut*, hostel, hotel, motel, nurse's home, retirement village, time-share accommodation, a work camp, or camping ground.

Effective from 31 Oct 2008

3.0.3 Community care
Applies to a residential *building* or use where a large degree of assistance or care is extended to the *principal users*. There are two types:

(a) **Unrestrained**; where the *principal users* are free to come and go. Examples: a hospital, an old people's home or a health camp.

(b) **Restrained**; where the *principal users* are legally or physically constrained in their movements. Examples: a borstal or drug rehabilitation centre, an old people's home where substantial care is extended, a prison or hospital.

4.0 Communal non-residential

4.0.1 Applies to a *building* or use being a meeting place for people where care and service is provided by people other than the *principal users*. There are two types.

4.0.2 Assembly service
Applies to a *building* or use where limited care and service is provided. Examples: a church, cinema, clubroom, hall, museum, public swimming pool, stadium, theatre, or whare runanga (the assembly house).

Effective from 1 Dec 2008

4.0.3 Assembly care
Applies to a *building* or use where a large degree of care and service is provided. Examples: an early childhood education and care centre, college, day care institution, centre for handicapped persons, kindergarten, school or university.

5.0 Commercial

5.0.1 Applies to a *building* or use in which any natural resources, goods, services or money are either developed, sold, exchanged or stored. Examples: an amusement park, auction room, bank, car-park, catering facility, coffee bar, computer centre, fire station, funeral parlour, hairdresser, library, office (commercial or government), Police station, post office, public laundry, radio station, restaurant, service station, shop, showroom, storage facility, television station or transport terminal.

6.0 Industrial

6.0.1 Applies to a *building* or use where people use material and physical effort to:

(a) extract or convert natural resources,
(b) produce goods or energy from natural or converted resources,
(c) repair goods, or
(d) store goods (ensuing from the industrial process).

Examples: an agricultural building, agricultural processing facility, aircraft hanger, factory, power station, sewage treatment works, warehouse or utility.

7.0 Outbuildings

7.0.1 Applies to a *building* or use which may be included within each classified use but are not intended for human habitation, and are accessory to the principal use of associated *buildings*. Examples: a carport, farm *building*, garage, greenhouse, machinery room, private swimming pool, public toilet, or shed.

8.0 Ancillary

8.0.1 Applies to a *building* or use not for human habitation and which may be exempted from some amenity provisions, but which are required to comply with structural and safety-related aspects of the *building code*. Examples: a bridge, derrick, fence, free-standing outdoor fireplace, jetty, mast, path, platform, pylon, retaining wall, tank, tunnel or dam.

Contents

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References

For the purposes of New Zealand Building Code (NZBC) compliance, the Standards and documents referenced in this Compliance Document (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 this Compliance Document must be used.

		Where quoted
Standards New Zealand		
NZS 4214: 2006	Methods of determining the total thermal resistance of parts of buildings	VM1 1.1.2, 1.4.1, AS1 1.0.5, 2.3.1
NZS 4218: 2004	Energy efficiency – housing and small building envelope	VM1 1.1.1, 1.1.2 AS1 1.0.5, 1.0.6, 2.1.1, 2.2.2, 4.0.1
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	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, 3rd 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

Definitions

This is an abbreviated list of definitions for words or terms particularly relevant to this Compliance Document. The definitions for any other italicised words may be found in the New Zealand Building Code (NZBC) or New Zealand Building Code Handbook.

Note: Classified uses for *buildings*, as described in Clause A1 of the *Building Code*, are printed in SMALL CAPITALS in these documents. Clause A1 is reprinted at the front of this publication.

Adequate means *adequate* to achieve the objectives of the *building code*.

Approved temperature data means the temperature data contained in A I Tomlinson and J Sansom, *Temperature Normals for New Zealand for period 1961 to 1990* (NIWA, ISBN 0478083343).

Building has the meaning given to it by sections 8 and 9 of the *Building Act 2004*.

Building Code means the regulations made under section 400 of the *Building Act 2004.*

Building element any structural or non-structural component or assembly incorporated into or associated with a *building*. Included are *fixtures*, services, *drains*, permanent mechanical installations for access, glazing, partitions, ceilings and temporary supports.

Building performance index (BPI) in relation to a *building*, means the *heating energy* of the *building* divided by the product of the *heating degrees total* and the sum of the *floor area* and the *total wall area*, and so is calculated in accordance with the following formula:

$$BPI = \frac{\textit{heating energy}}{\textit{heating degrees total} \times (\textit{floor area} + \textit{total wall area})}$$

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Construct in relation to a *building*, includes to design, build, erect, prefabricate, and relocate the *building*.

Fixture an article intended to remain permanently attached to and form part of a *building*.

Floor area, in relation to a *building*, means the *floor area* (expressed in square metres) of all interior spaces used for activities normally associated with domestic living.

Heating degrees, in relation to a location and a *heating month*, means the degrees obtained by subtracting from a base temperature of 14°C the mean (calculated using the *approved temperature data*) of the outdoor temperatures at that location during that month.

Heating degrees total, in relation to a location and a year, means whichever is the greater of the following:

(a) the value of 12 and

(b) the sum of all the *heating degrees* (calculated using the *approved temperature data*) for all of the *heating months* of the year.

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Heating energy, in relation to a *building*, means the energy from a *network utility operator* or a depletable resource (expressed in kilowatt-hours, and calculated using the Building Research Association of New Zealand's *ALF 3, The 'Annual Loss Factor' Method, A design tool for energy efficient houses* (3rd edition, April 2000) or some other method that can be correlated with that manual) needed to maintain the *building* at all times within a year at a constant internal temperature under the following standard conditions:

(a) a continuous temperature of 20°C throughout the *building*

(b) an air change rate of 1 change per hour or the actual air leakage rate, whichever is the greater

(c) a heat emission contribution arising from internal heat sources for any period in the year of 1000 kilowatt-hours for the first 50 m^2 of *floor area*, and 10 kilowatt-hours for every additional square metre of *floor area*

(d) no allowance for—

(i) carpets or

(ii) blinds, curtains, or drapes, on windows

(e) windows to have a shading coefficient of 0.6 (made up of 0.8 for windows and recesses and 0.75 for site shading).

Heating month, in relation to a location, means a month in which a base temperature of 14°C is greater than the mean (calculated using the *approved temperature data*) of the outdoor temperatures at that location during that month.

Household unit

(a) means a *building* or group of *buildings*, or part of a *building* or group of *buildings*, that is—

(i) used, or intended to be used, only or mainly for residential purposes; and

(ii) occupied, or intended to be occupied, exclusively as the home or residence of not more than 1 household; but

(b) does not include a hostel, boardinghouse, or other specialised accommodation.

HVAC system, for the purposes of performance H1.3.6 and in relation to a *building*, means a mechanical, electrical, or other system for modifying air temperature, modifying air humidity, providing ventilation, or doing all or any of those things, in a space within the *building*. Amend 2 Oct 2011

Intended use in relation to a *building*,—

(a) includes any or all of the following:

(i) any reasonably foreseeable occasional use that is not incompatible with the *intended use*:

(ii) normal maintenance:

(iii) activities undertaken in response to *fire* or any other reasonably foreseeable emergency; but

(b) does not include any other maintenance and repairs or rebuilding.

Network utility operator means a *person* who—

(a) undertakes or proposes to undertake the distribution or transmission by pipeline of natural or manufactured gas, petroleum, biofuel, or geothermal energy; or Amend 2 Oct 2011

(b) operates or proposes to operate a network for the purposes of—

(i) telecommunications as defined in section 5 of the Telecommunications Act 2001; or

(ii) radiocommunications as defined in section 2(1) of the Radiocommunications Act 1989; or

(c) is an electricity operator or electricity distributor as defined in section 2 of the Electricity Act 1992 for the purpose of line function services as defined in that section; or

(d) undertakes or proposes to undertake the distribution of water for supply (including irrigation); or

(e) undertakes or proposes to undertake a drainage or sewerage system

Person includes—

(a) the Crown; and

(b) a corporation sole; and

(c) a body of *persons* (whether corporate or unincorporated).

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R-value The common abbreviation for describing the values of both *thermal resistance* and *total thermal resistance*.

Sanitary appliance an appliance which is intended to be used for *sanitation*, but which is not a *sanitary fixture*. Included are machines for washing dishes and clothes.

Sanitary fixture any *fixture* which is intended to be used for *sanitation*.

Sanitation the term used to describe the activities of washing and/or excretion carried out in a manner or condition such that the effect on health is minimised, with regard to dirt and infection.

Thermal resistance the resistance to heat flow of a given component of a *building element*. It is equal to the air temperature difference (°C) needed to produce unit heat flux (W/m^2) through unit area (m^2) under steady conditions. The units are $°Cm^2/W$.

Total thermal resistance The overall air-to-air *thermal resistance* across all components of a *building element* such as a wall, roof or floor.

(This includes the surface resistances which may vary with environmental changes eg temperature and humidity, but for most purposes can be regarded as having standard values as given in NZS 4214.)

Total wall area, in relation to a *building*, means the sum (expressed in square metres) of the following:

(a) the *wall area* of the *building*; and

(b) the area (expressed in square metres) of all vertical glazing in *external walls* of the *building*.

Wall area, in relation to a *building*, means the area (expressed in square metres) of internally-exposed *external walls*, including any door openings, of the *building*.

Wharenui A communal meeting house having a large open *floor area* used for both assembly and sleeping in the traditional Maori manner.

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 m^2. A large *building* is any *building* with a net lettable area greater than 300 m^2.

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 3.3 (as modified by Paragraphs 1.1.2 and 1.1.3 below) is a Verification Method for NZBC Clause H1.3.1(a) for the following types of *buildings*:

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a) HOUSING, regardless of total *floor area* (the method is also a means of compliance with H1.3.2E, which applies only to HOUSING), and

b) Small *buildings* other than HOUSING having a net lettable area no greater than 300 m^2.

1.1.2 Tables 1, 2, 3 and 4 in NZS 4218 shall be replaced with the Tables that follow.

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Replacement Table 1: **Non-solid construction – minimum R-values for schedule method (only where area of glazing is 30% or less of total wall area)**

Building thermal envelope component	Minimum R-values (m^2 °C/W)		
	Climate zone 1	Climate zone 2	Climate zone 3
Roof	R 2.9	R 2.9	R 3.3
Wall	R 1.9	R 1.9	R 2.0
Floor	R 1.3	R 1.3	R 1.3
Glazing (vertical)	R 0.26	R 0.26	R 0.26
Glazing (skylights)	R 0.26	R 0.26	R 0.31

NOTE:

(1) The R-values given in this table are those applicable to the reference building as described in this Standard (NZS 4218).

(2) Climate zone boundaries are shown in Appendix B (of NZS 4218).

(3) If the sum of the area of glazing on the East, South and West facing walls (see Appendix H of NZS 4218) is more than 30% of the total wall area of all of these walls, then the calculation or modelling method shall be used.

(4) Carpets or floor coverings are not included in the floor R-value. The floor R-value is met by concrete slab-on-ground and suspended floors with continuous closed perimeter with 100 mm draped foil. Exposed floors will require additional treatment (e.g. pole houses).

(5) The R-values for glazing refer to whole window R-values (glass and frame). The values in this table are for a standard WERS window (see Appendix G of NZS 4218). Any proposed area of glazing shall be considered to have an R-value as given in Appendix G (of NZS 4218).

(6) There are no R-value requirements for the opaque parts of a door or a door set.

(7) Total area of skylights must be no more than 1.2 m^2. The calculation or modelling methods must be used for designs where the total area of skylights is more than 1.2 m^2.

(8) An R-value of 0.26 m^2 °C/W may be used for traditional leadlight glass when the total area of leadlight glass is no greater than 2.6 m^2 and either the schedule method or calculation method is used.

Replacement Table 2(a): **Solid timber construction – alternative minimum R-values for schedule method (only where area of glazing is 30% or less of total wall area)**

Building thermal envelope component	Minimum R-values (m^2 °C/W)					
	Climate zone 1		Climate zone 2		Climate zone 3	
	Option 1a	Option 1b	Option 2a	Option 2b	Option 3a	Option 3b
Roof	R 3.5	R 3.5	R 3.5	R 3.5	R 3.5	R 3.5
Walls – external 75 mm thick and timber framed internal walls	R 1.3	R 1.0	R 1.4	R 1.1	R 1.6	R 1.2
Walls – external 60 mm thick and solid timber internal walls 45 mm thick	R 1.0	R 0.8	R 1.3	R 1.0	R 1.6	R 1.2
Walls – external 90 mm thick and solid timber internal walls 45 mm thick	R 1.0	R 0.8	R 1.2	R 0.9	R 1.4	R 1.1
Walls – external 60 mm thick and solid timber internal walls 60 mm thick	R 1.0	R 0.8	R 1.2	R 0.9	R 1.4	R 1.1
Floor	R 1.3	R 1.3	R 1.3	R 1.3	R 1.3	R 1.3
Glazing (vertical)	R 0.26	R 0.31	R 0.26	R 0.31	R 0.26	R 0.31
Glazing (skylights)	R 0.26	R 0.31	R 0.26	R 0.31	R 0.31	R 0.31

NOTE:

(1) The R-values given in this table are those applicable to the reference building as described in this Standard (NZS 4218).

(2) Climate zone boundaries are shown in Appendix B (of NZS 4218).

(3) If the sum of the area of glazing on the East, South and West facing walls (see Appendix H of NZS 4218) is more than 30% of the total wall area of all of these walls, then the calculation or modelling method shall be used.

(4) Carpets or floor coverings are not included in the floor R-value. The floor R-value is met by concrete slab-on-ground and suspended floors with continuous closed perimeter with 100 mm draped foil. Exposed floors will require additional treatment (e.g. pole houses).

(5) The R-values for glazing refer to whole window R-values (glass and frame). The values in this table are for a standard WERS window (Appendix G of NZS 4218). Any proposed area of glazing shall be considered to have an R-value as given in Appendix G (of NZS 4218).

(6) There are no R-value requirements for the opaque parts of a door or a door set.

(7) Total area of skylights must be no more than 1.2 m^2. The calculation or modelling methods must be used for designs where the total area of skylights is more than 1.2 m^2.

(8) An R-value of 0.26 m^2 °C/W may be used for traditional leadlight glass when the total area of leadlight glass is no greater than 2.6 m^2 and either the schedule method or calculation method is used.

(9) The R-values specified in Options 1b, 2b and 3b may only be used in the schedule method, i.e. shall not be used in the calculation or modelling methods.

(10) When using R-values for either Options a or b, in relation to any of the three climate zones, all R-values for that option shall be used, i.e. roof, wall, floor and glazing. The R-values for a single building component shall not be substituted from one option to another.

(11) At least 85% of internal walls must be solid timber when using the wall R-values for solid internal and external walls.

(12) Table 2(a) allows buildings of solid timber construction to have lower R-values than buildings of non-solid construction, due to the benefits of appropriate use of thermal mass. Thermal mass must be used in conjunction with good passive design to increase comfort and reduce energy use. Use of the R-values in table 2(a) requires that the thermal mass is accessible, i.e. inside the insulated building envelope. If additional bulk insulation material is required to achieve the R-values in this table, this insulation must be installed on the outside of the wall.

Replacement Table 2(b): **Solid construction (excluding solid timber) – alternative minimum R-values for schedule method (only where area of glazing is 30% or less of total wall area)**

Building thermal envelope component	Minimum R-values (m^2 °C/W)					
	Climate zone 1		Climate zone 2		Climate zone 3	
	Option 1a	Option 1b	Option 2a	Option 2b	Option 3a	Option 3b
Roof	R 3.5	R 3.5	R 3.5	R 3.5	R 3.5	R 3.5
Wall	R 0.8	R 0.8	R 1.0	R 0.9	R 1.2	R 1.0
Floor	R 1.5	R 1.3	R 1.5	R 1.3	R 1.5	R 1.3
Glazing (vertical)	R 0.26	R 0.31	R 0.26	R 0.31	R 0.26	R 0.31
Glazing (skylights)	R 0.26	R 0.31	R 0.26	R 0.31	R 0.31	R 0.31

NOTE:

(1) The R-values given in this table are those applicable to the reference building as described in this Standard (NZS 4218).

(2) Climate zone boundaries are shown in Appendix B (of NZS 4218).

(3) If the sum of the area of glazing on the East, South and West facing walls (see Appendix H of NZS 4218) is more than 30% of the total wall area of all of these walls, then the calculation or modelling method shall be used.

(4) Carpets or floor coverings are not included in the floor R-value. The floor R-value is met by concrete slab-on-ground and suspended floors with continuous closed perimeter with 100 mm draped foil. Exposed floors will require additional treatment (e.g. pole houses).

(5) The R-values for glazing refer to whole window R-values (glass and frame). The values in this table are for a standard WERS window (Appendix G of NZS 4218). Any proposed area of glazing shall be considered to have an R-value as given in Appendix G (of NZS 4218).

(6) There are no R-value requirements for the opaque parts of a door or a door set.

(7) Total area of skylights must be no more than 1.2 m^2. The calculation or modelling methods must be used for designs where the total area of skylights is more than 1.2 m^2.

(8) An R-value of 0.26 m^2 °C/W may be used for traditional leadlight glass when the total area of leadlight glass is no greater than 2.6 m^2 and either the schedule method or calculation method is used.

(9) The R-values specified in Option 1b, 2b and 3b may only be used in the schedule method, i.e. shall not be used in the calculation or modelling methods.

(10) When using R-values for either Options a or b, all R-values for that option shall be used, i.e. roof, wall, floor and glazing. The R-values for a single building component shall not be substituted from one option to another.

(11) Table 2(b) allows buildings of solid construction to have lower R-values than buildings of non-solid construction, due to the benefits of appropriate use of thermal mass. Thermal mass must be used in conjunction with good passive design to increase comfort and reduce energy use. Use of the R-values in table 2(b) requires that the thermal mass is accessible, i.e. inside the insulated building envelope. If additional bulk insulation material is required to achieve the R-values in this table, this insulation must be installed on the outside of the wall.

Replacement Table 3: Heated walls, ceilings or floors – minimum R-values for the schedule method

Building thermal envelope component	Minimum values for climate zones 1, 2 and 3 (mm^2 °C/W)
Heated ceiling (R_{OUT})	R 3.5
Heated wall (R_{OUT})	R 2.6
Heated floor (R_{OUT})	R 1.9

where

$R_{IN}/R_{OUT}<0.1$

and

R_{IN} is the *thermal resistance* between the heated plane and the inside air

R_{OUT} is the *thermal resistance* between the heated plane and the outside air.

NOTE:

Carpets or floor coverings are not included in the floor *R-value*. Floor coverings, e.g. carpet or cork, will reduce the efficiency of the heated floor.

Replacement Table 4: Reference building – area of glazing R-values

Building thermal envelope component	Minimum R-values (mm^2 °C/W)		
	Climate zone 1	Climate zone 2	Climate zone 3
Area of vertical glazing up to 30% of total wall area	0.26	0.26	0.26
The proportion of the area of vertical glazing over 30% of total wall area	0.26	0.31	0.34
Glazing – skylights	0.31	0.31	0.34

NOTE:

(1) See Appendix G (of NZS 4218) for options to achieve the window R-values in this table. The R-values in Appendix G (of NZS 4218) shall be accepted, except where a higher R-value can be demonstrated by calculation or measurement using NZS 4214 or an internationally accepted computer software program.

(2) An R-value of 0.26 m^2 °C/W may be used for traditional leadlight glass when the total area of leadlight glass is no greater than 2.6 m^2 and either the schedule method or calculation method is used.

(3) Total area of glazing over 50% of total wall area may cause excessive heat gain and/or heat loss, and the modelling method shall be used in these cases.

(4) Non-glazed areas of door openings greater than 3 m^2 are treated as wall.

(5) This table 4 applies to both solid and non-solid construction.

1.1.3 Clause 3.2.3 in NZS 4218 shall be replaced as follows:

"**3.2.3**

$HL_{Reference}$ shall be calculated from equation 2 in clause 3.2.4 using the thermal resistance and conditions for roof, wall and floor from tables 1 or 2 as appropriate. The glazing and door thermal resistances for the calculation of $HL_{Reference}$ shall be those given in table 4. Where the area of glazing is less than or equal to 30% of total wall area, the area of glazing of the reference building for use in equation 2 shall be set to 30%. The wall area of the reference building is therefore 70% of its total wall area."

Amend 2 Oct 2011

Note that Tables 1, 2, 3 and 4 from NZS 4218 are modified by Paragraph 1.1.2 of this Verification Method.

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 modelling method is to be applied to the whole *building* and not to each *household unit* within the *building*.

1.2 Building performance index for housing

Amend 2 Oct 2011

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 requirements of E3/AS1 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. See NZS 4218 clauses 1.3.3 and 3.2.6.
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.

Amend 2 Oct 2011

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 m^2.

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 or 3.4.
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' Third Edition 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 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 m^2. A large *building* is any *building* with a net lettable area greater than 300 m^2.

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

1.0.3 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.

1.0.4 The NZBC requirements for artificial lighting apply to COMMERCIAL and COMMUNAL NON-RESIDENTIAL *buildings* with a net lettable area greater than 300 m^2.

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

2.0 Building Thermal Envelope

2.1 Housing and small buildings

2.1.1 *Construction* in accordance with NZS 4218 sections 3.1 or 3.2 (as modified by Paragraphs 2.1.3 and 2.1.4) satisfies NZBC H1.3.1(a) for HOUSING of any size and all *buildings* having a net lettable area no greater than 300 m^2.

2.1.2 *Construction* in accordance with NZS 4218 sections 3.1 or 3.2 (as modified by Paragraphs 2.1.3 and 2.1.4) satisfies NZBC H1.3.2E for HOUSING of any size, including the *external walls* of multi-unit dwellings. (Note that common walls between *household units* of multi-unit dwellings need not comply with NZS 4218.)

Amend 2 Oct 2011

2.1.3 The Tables 1, 2, 3 and 4 in NZS 4218 shall be replaced with the Tables that follow.

Amend 2 Oct 2011

Replacement Table 1: **Non-solid construction – minimum R-values for schedule method (only where area of glazing is 30% or less of total wall area)**

Building thermal envelope component	Minimum R-values (m^2 °C/W)		
	Climate zone 1	Climate zone 2	Climate zone 3
Roof	R 2.9	R 2.9	R 3.3
Wall	R 1.9	R 1.9	R 2.0
Floor	R 1.3	R 1.3	R 1.3
Glazing (vertical)	R 0.26	R 0.26	R 0.26
Glazing (skylights)	R 0.26	R 0.26	R 0.31

NOTE:

(1) The R-values given in this table are those applicable to the reference building as described in this Standard (NZS 4218).

(2) Climate zone boundaries are shown in Appendix B (of NZS 4218).

(3) If the sum of the area of glazing on the East, South and West facing walls (see Appendix H of NZS 4218) is more than 30% of the total wall area of all of these walls, then the calculation or modelling method shall be used.

(4) Carpets or floor coverings are not included in the floor R-value. The floor R-value is met by concrete slab-on-ground and suspended floors with continuous closed perimeter with 100 mm draped foil. Exposed floors will require additional treatment (e.g. pole houses).

(5) The R-values for glazing refer to whole window R-values (glass and frame). The values in this table are for a standard WERS window (see Appendix G of NZS 4218). Any proposed area of glazing shall be considered to have an R-value as given in Appendix G (of NZS 4218).

(6) There are no R-value requirements for the opaque parts of a door or a door set.

(7) Total area of skylights must be no more than 1.2 m^2. The calculation or modelling methods must be used for designs where the total area of skylights is more than 1.2 m^2.

(8) An R-value of 0.26 m^2 °C/W may be used for traditional leadlight glass when the total area of leadlight glass is no greater than 2.6 m^2 and either the schedule method or calculation method is used.

Replacement Table 2(a): **Solid timber construction – alternative minimum R-values for schedule method (only where area of glazing is 30% or less of total wall area)**

Building thermal envelope component	Minimum R-values (mm^2 °C/W)					
	Climate zone 1		Climate zone 2		Climate zone 3	
	Option 1a	Option 1b	Option 2a	Option 2b	Option 3a	Option 3b
Roof	R 3.5	R 3.5	R 3.5	R 3.5	R 3.5	R 3.5
Walls – external 75 mm thick and timber framed internal walls	R 1.3	R 1.0	R 1.4	R 1.1	R 1.6	R 1.2
Walls – external 60 mm thick and solid timber internal walls 45 mm thick	R 1.0	R 0.8	R 1.3	R 1.0	R 1.6	R 1.2
Walls – external 90 mm thick and solid timber internal walls 45 mm thick	R 1.0	R 0.8	R 1.2	R 0.9	R 1.4	R 1.1
Walls – external 60 mm thick and solid timber internal walls 60 mm thick	R 1.0	R 0.8	R 1.2	R 0.9	R 1.4	R 1.1
Floor	R 1.3	R 1.3	R 1.3	R 1.3	R 1.3	R 1.3
Glazing (vertical)	R 0.26	R 0.31	R 0.26	R 0.31	R 0.26	R 0.31
Glazing (skylights)	R 0.26	R 0.31	R 0.26	R 0.31	R 0.31	R 0.31

NOTE:

(1) The R-values given in this table are those applicable to the reference building as described in this Standard (NZS 4218).

(2) Climate zone boundaries are shown in Appendix B (of NZS 4218).

(3) If the sum of the area of glazing on the East, South and West facing walls (see Appendix H of NZS 4218) is more than 30% of the total wall area of all of these walls, then the calculation or modelling method shall be used.

(4) Carpets or floor coverings are not included in the floor R-value. The floor R-value is met by concrete slab-on-ground and suspended floors with continuous closed perimeter with 100 mm draped foil. Exposed floors will require additional treatment (e.g. pole houses).

(5) The R-values for glazing refer to whole window R-values (glass and frame). The values in this table are for a standard WERS window (Appendix G of NZS 4218). Any proposed area of glazing shall be considered to have an R-value as given in Appendix G (of NZS 4218).

(6) There are no R-value requirements for the opaque parts of a door or a door set.

(7) Total area of skylights must be no more than 1.2 m^2. The calculation or modelling methods must be used for designs where the total area of skylights is more than 1.2 m^2.

(8) An R-value of 0.26 m^2 °C/W may be used for traditional leadlight glass when the total area of leadlight glass is no greater than 2.6 m^2 and either the schedule method or calculation method is used.

(9) The R-values specified in Options 1b, 2b and 3b may only be used in the schedule method, i.e. shall not be used in the calculation or modelling methods.

(10) When using R-values for either Options a or b, in relation to any of the three climate zones, all R-values for that option shall be used, i.e. roof, wall, floor and glazing. The R-values for a single building component shall not be substituted from one option to another.

(11) At least 85% of internal walls must be solid timber when using the wall R-values for solid internal and external walls.

(12) Table 2(a) allows buildings of solid timber construction to have lower R-values than buildings of non-solid construction, due to the benefits of appropriate use of thermal mass. Thermal mass must be used in conjunction with good passive design to increase comfort and reduce energy use. Use of the R-values in table 2(a) requires that the thermal mass is accessible, i.e. inside the insulated building envelope. If additional bulk insulation material is required to achieve the R-values in this table, this insulation must be installed on the outside of the wall.

Replacement Table 2(b): **Solid construction (excluding solid timber) – alternative minimum R-values for schedule method (only where area of glazing is 30% or less of total wall area)**

Building thermal envelope component	Minimum R-values (mm^2 °C/W)					
	Climate zone 1		Climate zone 2		Climate zone 3	
	Option 1a	Option 1b	Option 2a	Option 2b	Option 3a	Option 3b
Roof	R 3.5	R 3.5	R 3.5	R 3.5	R 3.5	R 3.5
Wall	R 0.8	R 0.8	R 1.0	R 0.9	R 1.2	R 1.0
Floor	R 1.5	R 1.3	R 1.5	R 1.3	R 1.5	R 1.3
Glazing (vertical)	R 0.26	R 0.31	R 0.26	R 0.31	R 0.26	R 0.31
Glazing (skylights)	R 0.26	R 0.31	R 0.26	R 0.31	R 0.31	R 0.31

NOTE:

(1) The R-values given in this table are those applicable to the reference building as described in this Standard (NZS 4218).

(2) Climate zone boundaries are shown in Appendix B (of NZS 4218).

(3) If the sum of the area of glazing on the East, South and West facing walls (see Appendix H of NZS 4218) is more than 30% of the total wall area of all of these walls, then the calculation or modelling method shall be used.

(4) Carpets or floor coverings are not included in the floor R-value. The floor R-value is met by concrete slab-on-ground and suspended floors with continuous closed perimeter with 100 mm draped foil. Exposed floors will require additional treatment (e.g. pole houses).

(5) The R-values for glazing refer to whole window R-values (glass and frame). The values in this table are for a standard WERS window (Appendix G of NZS 4218). Any proposed area of glazing shall be considered to have an R-value as given in Appendix G (of NZS 4218).

(6) There are no R-value requirements for the opaque parts of a door or a door set.

(7) Total area of skylights must be no more than 1.2 m^2. The calculation or modelling methods must be used for designs where the total area of skylights is more than 1.2 m^2.

(8) An R-value of 0.26 m^2 °C/W may be used for traditional leadlight glass when the total area of leadlight glass is no greater than 2.6 m^2 and either the schedule method or calculation method is used.

(9) The R-values specified in Options 1b, 2b and 3b may only be used in the schedule method, i.e. shall not be used in the calculation or modelling methods.

(10) When using R-values for either Options a or b, all R-values for that option shall be used, i.e. roof, wall, floor and glazing. The R-values for a single building component shall not be substituted from one option to another.

(11) Table 2(b) allows buildings of solid construction to have lower R-values than buildings of non-solid construction, due to the benefits of appropriate use of thermal mass. Thermal mass must be used in conjunction with good passive design to increase comfort and reduce energy use. Use of the R-values in table 2(b) requires that the thermal mass is accessible, i.e. inside the insulated building envelope. If additional bulk insulation material is required to achieve the R-values in this table, this insulation must be installed on the outside of the wall.

Replacement Table 3: Heated walls, ceilings or floors – minimum R-values for the schedule method

Building thermal envelope component	Minimum values for climate zones 1, 2 and 3 (mm^2 °C/W)
Heated ceiling (R_{OUT})	R 3.5
Heated wall (R_{OUT})	R 2.6
Heated floor (R_{OUT})	R 1.9

where

$R_{IN}/R_{OUT}<0.1$

and

R_{IN} is the *thermal resistance* between the heated plane and the inside air

R_{OUT} is the *thermal resistance* between the heated plane and the outside air.

NOTE:

Carpets or floor coverings are not included in the floor R-value. Floor coverings, e.g. carpet or cork, will reduce the efficiency of the heated floor.

Replacement Table 4: Reference building – area of glazing R-values

Building thermal envelope component	Minimum R-values (mm^2 °C/W)		
	Climate zone 1	Climate zone 2	Climate zone 3
Area of vertical glazing up to 30% of total wall area	0.26	0.26	0.26
The proportion of the area of vertical glazing over 30% of total wall area	0.26	0.31	0.34
Glazing – skylights	0.31	0.31	0.34

NOTE:

(1) See Appendix G (of NZS 4218) for options to achieve the window R-values in this table. The R-values in Appendix G (of NZS 4218) shall be accepted, except where a higher R-value can be demonstrated by calculation or measurement using NZS 4214 or an internationally accepted computer software program.

(2) An R-value of 0.26 m^2 °C/W may be used for traditional leadlight glass when the total area of leadlight glass is no greater than 2.6 m^2 and either the schedule method or calculation method is used.

(3) Total area of glazing over 50% of total wall area may cause excessive heat gain and/or heat loss, and the modelling method shall be used in these cases.

(4) Non-glazed areas of door openings greater than 3 m^2 are treated as wall.

(5) This table 4 applies to both solid and non-solid construction.

2.1.4 Clause 3.2.3 in NZS 4218 shall be replaced as follows:

"**3.2.3**

$HL_{Reference}$ shall be calculated from equation 2 in clause 3.2.4 using the thermal resistance and conditions for roof, wall and floor from tables 1 or 2 as appropriate. The glazing and door thermal resistances for the calculation of $HL_{Reference}$ shall be those given in table 4. Where the area of glazing is less than or equal to 30% of total wall area, the area of glazing of the reference building for use in equation 2 shall be set to 30%. The wall area of the reference building is therefore 70% of its total wall area."

Amend 2 Oct 2011

Note that Tables 1, 2, 3 and 4 from NZS 4218 are modified by Paragraph 2.1.3 of this Acceptable Solution.

COMMENT:

1. Section 3.2 "calculation method" of NZS 4218 compares the proposed *building* with the "reference building" which is insulated in accordance with Tables 1, 2 and 4 (as modified by Paragraphs 2.1.3 and 2.1.4). This method permits roof, wall, floor and glazing insulation combinations which differ from these Tables, but the *building* must still perform at least as well as the "reference building".
2. To satisfy the requirements of E3/AS1 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. Replacement Tables 2(a) and 2(b) allow *buildings* of solid *construction* to have lower *R-values* than *buildings* of non-solid *construction*, because of the benefits of appropriate use of thermal mass. To be beneficial thermal mass must be integrated into the *building* with sound passive solar design. Replacement Tables 2(a) and 2(b) assume thermal mass has been integrated with sound passive solar design.
4. "Solid construction" does not mean the full wall thickness must consist of the same material throughout.
5. NZS 4246: 2006 Energy Efficiency – Installing 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 part 4.2 or
- NZS 4243.1 part 4.3 or
- NZS 4218 part 3.1 or
- NZS 4218 part 3.2

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.

Amend 2 Oct 2011

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 part 3.1 or part 3.2 for small *buildings*, or NZS 4243.1 part 4.2 or part 4.3 for large *buildings* (see Paragraph 1.0.2 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.

Amend 2 Oct 2011

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 m^2 shall comply with NZS 4243.2 section 3.3 or section 3.4 to satisfy the requirements of NZBC H1.3.5.

Index H1/VM1 & AS1

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