COMMITTEE REPRESENTATION
This Standard was prepared under the supervision of the P 4218 Committee the Standards Council established under the Standards Act 1988.
The committee consisted of representatives of the following nominating organisations:

Association of Building Sustainability Assessors (ABSA)
Building Industry Federation
Centre for Building Performance Research, Victoria University Wellington
BRANZ Ltd
Cement and Concrete Association of New Zealand
Certified Builders’ Association New Zealand
Claddings’ Institute of New Zealand
Department of Building and Housing
Energy Efficiency and Conservation Authority (EECA)
Glass Association of New Zealand
Insulation Council of Australia and New Zealand
Local Government New Zealand
Ministry for the Environment
New Zealand Green Building Council
New Zealand Institute of Architects
New Zealand Pine Manufacturers’ Association
Windows Association of New Zealand

ACKNOWLEDGEMENT
Standards New Zealand gratefully acknowledges the contribution of time and expertise from all those involved in developing this Standard.

© COPYRIGHT
The copyright of this document is the property of the Standards Council. No part of the text may be reproduced by photocopying or by any other means without the prior written approval of the Chief Executive Officer of Standards New Zealand unless the circumstances are covered by Part III of the Copyright Act 1994.

Standards New Zealand will vigorously defend the copyright in this Standard. Every person who breaches Standards New Zealand’s copyright may be liable to a fine not exceeding $50,000 or to imprisonment for a term not to exceed three months. If there has been a flagrant breach of copyright, Standards New Zealand may also seek additional damages from the infringing party, in addition to obtaining injunctive relief and an account of profits.

Published by Standards New Zealand, the trading arm of the Standards Council, Private Bag 2439, Wellington 6140. Telephone: (04) 498 5990, Fax: (04) 498 5994, Website: http://www.standards.co.nz.

<table>
<thead>
<tr>
<th>No.</th>
<th>Date of issue</th>
<th>Description</th>
<th>Entered by, and date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
New Zealand Standard

Thermal insulation – Housing and small buildings

Superseding NZS 4218:2004

ISBN 1-86975-121-3
CONTENTS

Committee representation ................................................................. IFC
Acknowledgement ............................................................................... IFC
Copyright ............................................................................................. IFC
Referenced documents ........................................................................... 5
Review of Standards ............................................................................... 6
Foreword ................................................................................................. 7
Outcome statement .................................................................................... 7

Section

1 General ............................................................................................. 9
  1.1 Scope ........................................................................................... 9
  1.2 Exclusions ................................................................................... 9
  1.3 Interpretation ............................................................................... 10
2 Definitions ......................................................................................... 11
3 General requirements ........................................................................... 16
  3.1 Integrity of thermal insulation .................................................... 16
  3.2 Construction R-value ................................................................ 16
  3.3 Embedded heating systems ...................................................... 17
4 Compliance methods .......................................................................... 18
  4.1 Schedule method ...................................................................... 18
  4.2 Calculation method ................................................................... 22
  4.3 Modelling method ..................................................................... 27

Appendix

A Measurement details (Informative) ...................................................... 28
B Climate zones (Normative) ................................................................. 31
C Windows and glazing (Normative) ....................................................... 33
D Alterations (Informative) ................................................................. 39
E Orientation (Normative) ................................................................. 42
F Worked examples (Informative) ........................................................... 43
G Modelling method – Building energy use comparison (Normative) .... 49

Table

1 Heated ceilings, walls or floors – Construction R-values ..................... 17
2 Construction R-values for buildings with any wall type .................... 20
3 Construction R-values for buildings with solid timber walls .......... 20
4 Construction R-values for buildings with high thermal mass walls ..... 21
5 Reference building heat loss equations ........................................... 24
6 Reference building heat loss equations – Solid timber wall construction. ........................................ 25
7 Reference building heat loss equations – High thermal mass wall construction ........................................ 26
C1 Thermal performance of generic windows in aluminium frame .......... 35
C2 Thermal performance of generic windows in composite aluminium frame .......... 36
Table (continued)

C3  Thermal performance of generic windows in thermally broken aluminium frame ..........................................................37
C4  Thermal performance of generic windows in PVC/wooden frame ..........38
G1  Default power densities for internal gains from occupants and plug loads ........................................................................57
G2  Default schedules for occupancy and plug loads – Percentage of maximum load or percentage of power density ..........58

Figure

1  Decision flowchart ..................................................................................10
A1  Thermal envelope ..................................................................................28
A2  R-value locations ...................................................................................28
A3  Element measurements .........................................................................28
A4  Roof measurement – Flat ceiling .............................................................29
A5  Roof area measurements – Pitched ceiling .............................................29
A6  Wall area measurements .........................................................................29
A7  Window measurement – Single window ................................................30
A8  Bay window measurement .....................................................................30
A9  Skylight measurement ...........................................................................30
A10  Skylight with light shaft .........................................................................30
B1  Climate zones ..........................................................................................32
E1  Orientation sectors ..................................................................................42
F1  Simple example design ..........................................................................44
F2  Example of design with different types of floor, wall, and glazing ..........45
F3  Example of mixed timber framed and high thermal mass construction ..........................................................46
REFERENCED DOCUMENTS

Reference is made in this document to the following:

NEW ZEALAND STANDARDS

NZS 4214:2006  Methods of determining the total thermal resistance of parts of buildings
NZS 4303:1990  Ventilation for acceptable indoor air quality
NZS 4229:1999  Concrete masonry buildings not requiring specific engineering design

JOINT AUSTRALIAN/NEW ZEALAND STANDARDS AND HANDBOOKS

AS/NZS 4666:2000  Insulating glass units
AS/NZS 4668:2000  Glossary of terms used in the glass and glazing industry

AMERICAN STANDARD


ASHRAE SPC 142  Standard method for determining and expressing fenestration heat transfer

ISO


NEW ZEALAND LEGISLATION

Building Act 2004

Compliance Document for New Zealand Building Code, Clause E3, Internal Moisture

Compliance Document for New Zealand Building Code, Clause H1, Energy Efficiency

New Zealand Building Code (NZBC)

OTHER PUBLICATIONS


WEBSITES

http://www.branz.co.nz
http://www.ecbcs.org/
http://eeca.govt.nz
http://www.energysafety.govt.nz
http://www.iea-shc.org/
http://www.legislation.govt.nz
http://www.level.org.nz
http://www.ngdc.noaa.gov/geomag/magfield.shtml

REVIEW OF STANDARDS

Suggestions for improvement of this Standard will be welcomed. They should be sent to the Chief Executive, Standards New Zealand, Private Bag 2439, Wellington 6140.
Energy efficient design of housing and small buildings should consider solar gain from glazing, thermal insulation, and thermal mass. In the New Zealand climate, good passive solar design incorporating appropriate areas of glazing and thermal mass, combined with a well-insulated thermal envelope, can significantly reduce the energy requirements to heat and cool buildings.

This revision of NZS 4218 aims to align the Standard with the New Zealand Building Code (NZBC) Clause H1, and to improve the Standard’s usability and robustness.

Some of the most significant changes are:
(a) Increased R-values to align with NZBC Clause H1;
(b) Changes to the calculation method to ensure adequate thermal performance is not compromised by large glazing areas;
(c) A revised modelling method to take account of recent research, and to make it easier to use with recent computer modelling packages;
(d) New requirements for high thermal mass construction to ensure that the thermal mass is adequate and effective;
(e) A revised appendix (now Appendix C) on windows and glazing;
(f) A new informative Appendix D provides guidance on alterations;
(g) More worked examples in informative Appendix F; and
(h) The new term ‘construction R-value’ has been introduced to distinguish the performance values in this Standard from insulation material R-values.

The construction R-values in this Standard result in a low life cycle cost, based on current knowledge of insulation costs, energy costs, and heating behaviour. Applying these construction R-values does not necessarily achieve good passive solar design. Better thermal performance can often be achieved by applying good passive solar design principles.

Glazing area beyond 30% of total wall area may create underheating and/or overheating problems in some buildings. Designers should take this into account and it is recommended they consider using the modelling method where the glazing area is over 30% of the total wall area.

OUTCOME STATEMENT

This Standard guides the achievement of both comfort and energy efficiency for New Zealand homes and small buildings. Minimum thermal resistance can be achieved through balancing the solar gains from glazing, insulation, and thermal mass and aims to reduce heating and cooling costs.
1 GENERAL

1.1 Scope

1.1.1 This Standard specifies thermal insulation requirements for housing and small buildings.

C1.1.1 For buildings other than housing where two or more buildings are joined to form a larger building (greater than 300 m²), the joined building may be treated as a large building. For further guidance refer to NZS 4243.1 Energy efficiency – Large buildings – Building thermal envelope.

1.1.2 This Standard provides three methods of demonstrating compliance:

- Schedule method: Select from the set of minimum construction R-values requirements (see 4.1).
- Calculation method: Use a calculation to compare the proposed building with the reference building and ensure that the proposed building has no more heat loss than the reference building (see 4.2).
- Modelling method: Use a modelling technique to compare the proposed building with the reference building and ensure that the proposed building consumes no more energy than the reference building (see 4.3).

Figure 1 provides a flowchart for guidance on which method to use.

1.2 Exclusions

1.2.1 Methods to determine the thermal resistance of building elements, and a listing of thermal resistances of common building materials, are covered in NZS 4214.

1.2.2 This Standard does not address minimum R-values that may be required for other purposes such as controlling internal moisture and achieving comfort conditions. R-value requirements for controlling internal moisture may exceed those required by this Standard.
NZS 4218:2009 Thermal insulation - Housing and small buildings

This is a free sample only.

Purchase the full publication here:

Or contact Standards New Zealand using one of the following methods.

Freephone: 0800 782 632 (New Zealand)
Phone: +64 3 943 4259
Email: enquiries@standards.govt.nz