



Department of  
Building and Housing  
*Te Tari Kaupapa Whare*

**Quick Guide**

# **Building Code requirements: house insulation**

**For more information see the  
Compliance Document H1 Energy Efficiency**



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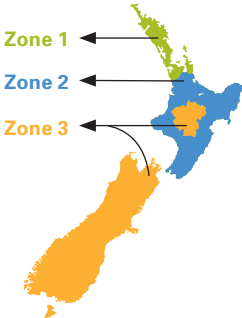
## INTRODUCTION

Changes have recently been made to the energy efficiency requirements for new homes, as well as additions and alterations to existing homes. The requirements are different for different parts of the country, with more insulation required in colder climates.

These changes will mean that homes will be warmer, healthier and less expensive to heat. The cost savings in reduced energy use are significant and will pay for any additional construction cost over time.

The simplest way to meet the new requirements for a typical house with timber-framed walls (low thermal mass) is to follow the table below. If your house meets all of the insulation levels (R-values) specified in the table, and the additional requirements specified, it complies with the new requirements – simple!

## TIMBER-FRAMED HOUSE INSULATION REQUIREMENTS

TABLE 1	ZONES 1 AND 2	
<p>Map of climate zones</p>  <p>Zone 1 ←</p> <p>Zone 2 ←</p> <p>Zone 3 ←</p>	<p>Roof R 2.9</p> <p>Walls R 1.9</p> <p>Floor R 1.3</p> <p>Heated floors R 1.9</p> <p>Windows R 0.26</p> <p>Skylights R 0.26</p>	
<p><b>Additional requirements</b></p> <ul style="list-style-type: none"> <li>• The total window area must be <math>\leq 30\%</math> of the total exterior wall area.</li> <li>• The combined window area of the east, south and west walls must be <math>\leq 30\%</math> of the combined area of these walls.</li> <li>• The total skylight area must be <math>\leq 1.2\text{m}^2</math>.</li> <li>• The total area of leadlight glass must be <math>\leq 2.6\text{m}^2</math>.</li> <li>• If you have downlights that are not CA-Rated, they will reduce the thermal resistance of the ceiling and you will need to increase the insulation R-value to compensate.<sup>1</sup></li> <li>• The R-value of carpets or floor coverings must not be included in calculation of floor R-value for heated floors.</li> <li>• For heated walls or ceilings, higher R-values are required (walls R 2.6, Ceilings R 3.5).</li> </ul>	ZONE 3	
	<p>Roof R 3.3</p> <p>Walls R 2.0</p> <p>Floor R 1.3</p> <p>Heated floors R 1.9</p> <p>Windows R 0.26</p> <p>Skylights R 0.31</p>	

<sup>1</sup> NZS 4246: 2006 (appendix C) provides required R-values.

## CALCULATING R-VALUES

The insulation R-values specified in Table 1 are for the complete building element (eg, roof or wall), not just the insulation product. The R-value of the complete building element is different to the insulation R-value. The extent of that difference depends on the construction details.

R-values for building elements can be determined using:

- The *BRANZ house insulation guide, 3rd Edition, 2007*
- NZS 4214: 2006
- The free online tool at [www.design-navigator.co.nz](http://www.design-navigator.co.nz)

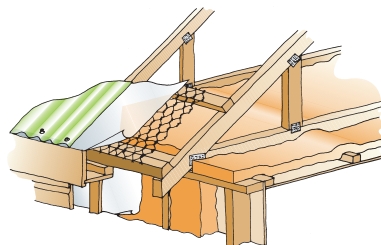
## EXAMPLES THAT COMPLY

The *BRANZ house insulation guide, 3rd Edition, 2007* provides R-values for common construction types and some examples from that guide are provided below.

## ROOFS

### Pitched timber-framed roof – R 3.3

corrugated iron cladding  
90 mm bottom chord  
chord spacing 900 mm  
insulation with R-value = 3.5

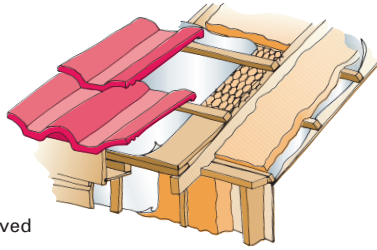


Note that an insulation R-value of R 3.5 is required in this example to get a roof R-value of 3.3

© House Insulation Guide, 3rd edition, BRANZ, 2007

### Skillion roof – R 3.3

- concrete tiles
- 190 mm rafters and battens
- rafter spacing 900 mm
- insulation with R-value = 3.1



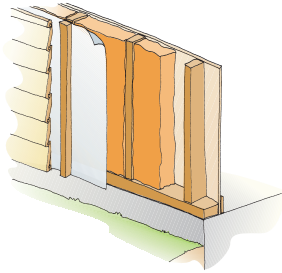
Note that a roof R-value of 3.3 is achieved using insulation with an R-value of 3.1

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## WALLS

### Timber-framed wall with weather board cladding – R 2.0

- 90 mm framing
- stud spacing 400 mm
- dwang spacing 800 mm
- insulation with R-value = 2.2

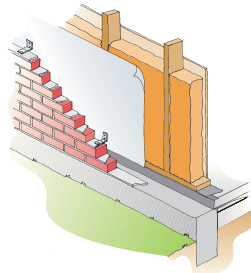


Note that an insulation R-value of R 2.2 is required in this example to achieve a wall R-value of 2.0

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### Timber-framed wall with brick veneer cladding – R 2.0

- 90 mm framing
- stud spacing 400 mm
- dwang spacing 800 mm
- insulation with R-value = 2.5



Note that an insulation R-value of R 2.5 is required in this example to achieve a wall R-value of 2.0

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## FLOORS

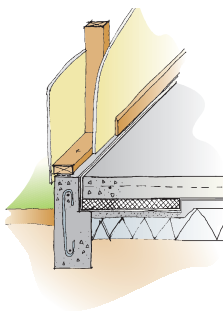
### Concrete slab on ground – R 1.3

area/perimeter ratio = 1.9

90 mm timber-framed wall

1.2 m x 50 mm perimeter  
expanded polystyrene insulation

Note that unheated slab on ground floors without polystyrene perimeter insulation also comply.<sup>3</sup> Heated slab on ground floors require insulation, specific details depend on the perimeter to area ratio.

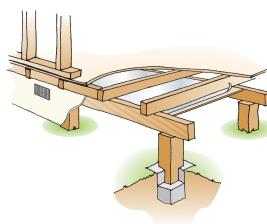


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### Suspended timber floor – R 1.3

both foil and lining under joist

Note that suspended floors with continuous closed perimeter and 100 mm draped foil also comply.<sup>3</sup> Exposed floors, such as pole houses, will need additional insulation.

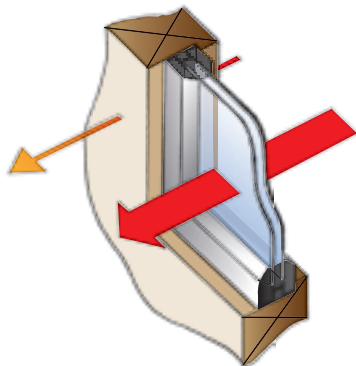


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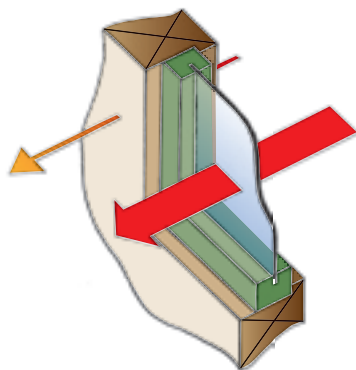
<sup>3</sup> Specifically allowed in Acceptable Solution H1/AS1, Tables 1, 2a and 2b

## WINDOWS AND SKYLIGHTS

Double-glazed aluminium – R 0.26

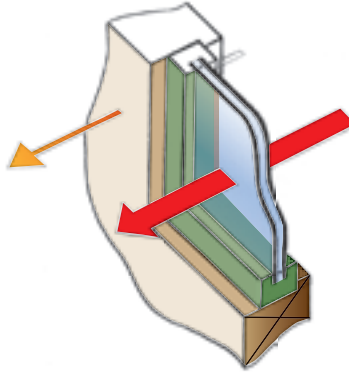


Single-glazed wood or PVC frame and low emissivity class – R 0.27



### High-performance double-glazed – R 0.48

Low-emissivity  
double-glazed  
wood/PVC-  
framed window



A very wide range of window types are available. Details of window types and the R-values for them can be found in:

- NZS 4218: 2004 appendix table G 1 and 2
- *BRANZ house insulation guide, 3rd Edition 2007*
- or at [www.design-navigator.co.nz](http://www.design-navigator.co.nz)

For all windows, but particularly for heavier double-glazed units, refer to the manufacturers' recommendations to ensure there is adequate support to carry the weight of the units.

## WHAT IF MY HOUSE DESIGN IS NOT TIMBER-FRAMED?

If your house has low thermal mass such as lightweight steel frame, the requirements in Table 1 also apply. If your house is solid construction, such as solid timber, concrete or rammed earth, simple tables of insulation requirements for each of the elements of the house are available in the Compliance Document for Clause H1 (available free from [www.dbh.govt.nz/energy-efficiency](http://www.dbh.govt.nz/energy-efficiency)). The same additional requirements specified for Table 1 for timber-framed houses must also be met. If your house has a mix of timber-framed walls and solid walls, you cannot use the simple tables and will need to use another method to demonstrate compliance. Information about these methods is provided below.

## **WHAT IF MY DESIGN DOESN'T COMPLY WITH TABLE 1 REQUIREMENTS?**

If your house does not meet all the requirements of Table 1, you can use either the calculation or modelling methods specified in NZS 4218: 2004. These methods allow you to use more insulation in some areas to compensate for lower insulation levels in other areas. However, the calculation method can only be used if the window to wall ratio is below 50 percent. The modelling method has fewer restrictions than the calculation method and it also takes into account other factors such as heat gain from the sun.

Some helpful online tools to assist with using the calculation and the modelling method are available at:

[www.dbh.govt.nz/energy-efficiency](http://www.dbh.govt.nz/energy-efficiency)  
[www.branz.co.nz](http://www.branz.co.nz) (see H1 support page)  
[www.design-navigator.co.nz](http://www.design-navigator.co.nz)

## **WHAT ABOUT ALTERATIONS?**

Although some building work does not require a building consent, all building work must still comply with the Building Code.

For alterations, the Building Act requires a building to comply with the Building Code after it has been altered, 'to at least the same extent as before the alteration'. Some alterations will decrease the overall energy efficiency of the house and so complying 'to the same extent as before the alteration' does not necessarily mean that you can simply comply with Table 1.

If, for example, a double-glazed ranch slider is put into an existing wall, the glazing will comply with the Table 1 requirement, but the heat loss through the glazing will be greater than heat loss through the old wall. In this case, additional insulation will be required, for example in the ceiling, to offset the loss through the new glazing. The calculation method can be used to work out how much additional insulation will be required.

In contrast, when an existing single-glazed wooden window is being replaced, it can be replaced with a single-glazed wooden window, as the heat loss through the new window is the same as the old window. In this example, the building will continue to comply with the Building Code to the same extent as before the window was replaced.

## **ADDITIONS**

Additions are a type of alteration and therefore fall within the definition of building work in the Building Act. The Building Act requires that 'all building work must comply with the Building Code'. Additions therefore must comply with the insulation requirements for new houses.

If, for example, a new room is added to a house, the simplest way to comply with the Building Code is for the floors, walls, windows and roof to all comply with the R-values and the additional requirements specified in Table 1.

The existing parts of the house are not required to be upgraded to current Building Code standard. If any of the proposed construction R-values are lower than those required in Table 1, or the other requirements are not all met, you can use the calculation or modelling method to evaluate options and to come up with an alternative design that will comply.

## **BUILDING CODE**

The Building Code is performance based. This means that a designer has the freedom to use any method they like to comply, provided they can demonstrate to their local building consent authority (council) that the performance specified in the relevant Building Code clauses will be met. In the case of energy efficiency, Building Code Clause H1 specifies that a building must achieve adequate thermal resistance. This performance requirement is provided in Clause H1.3.

The Building Code Compliance Documents also provide specific ways in which this performance can be achieved. These are known as Acceptable Solutions or Verification Methods. The solutions outlined in this booklet are based on the Acceptable Solution provided in the Compliance Document H1 Energy Efficiency.

The H1 Compliance Document can be downloaded free from [www.dbh.govt.nz/energy-efficiency](http://www.dbh.govt.nz/energy-efficiency)

## **ALTERNATIVE SOLUTIONS**

A design solution that falls outside an Acceptable Solution or Verification Method is referred to as an alternative solution. The use of alternative solutions to comply with the insulation requirements for houses is relatively uncommon. However, this option is available, and allows innovative designs to be approved by the local building consent authority, provided they can be demonstrated to meet the Building Code requirements.

## **MORE INFORMATION**

**[www.dbh.govt.nz](http://www.dbh.govt.nz)**

The Department of Building and Housing website provides information on building law and compliance. For Building Code Clause H1 Energy Efficiency, Acceptable Solution H1/AS1 and Verification Method H1/VM1, go to **[www.dbh.govt.nz/energy-efficiency](http://www.dbh.govt.nz/energy-efficiency)** (free download)

**[www.standards.co.nz](http://www.standards.co.nz)**

The following Standards are available for purchase online:

NZS 4218: 2004 Energy efficiency – Small building envelope

NZS 4214: 2006 Methods of determining the total thermal resistance of parts of buildings

**[www.branz.co.nz](http://www.branz.co.nz)**

BRANZ provides useful guidance on their H1 support page:

The *BRANZ house insulation guide, 3rd Edition, 2007* is also available for purchase online.

**[www.design-navigator.co.nz](http://www.design-navigator.co.nz)**

Useful guidance and free online tools to assist in the use of the simple compliance and the calculation methods.

**[www.eeca.govt.nz](http://www.eeca.govt.nz)**

NZS 4246: 2006 Energy Efficiency – Installing insulation in residential buildings is available for free download. Keyword – 4246.

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