BUILDING PERFORMANCE

Building Code requirements for house insulation

Homes in New Zealand must have adequate insulation, so you need to make sure they have the right level of thermal resistance (R-value) for their location. You can find information on zone specific R-values, as well as the calculation and modelling method for showing compliance with the Building Code Clause H1.

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House insulation requirements

You need to meet the energy efficiency requirements set out in the Building Code, whether you are building a new home or making additions or alterations to an existing home.

The requirements vary for different parts of the country, to ensure New Zealand homes are fit for purpose. More insulation is needed for houses in colder climates.

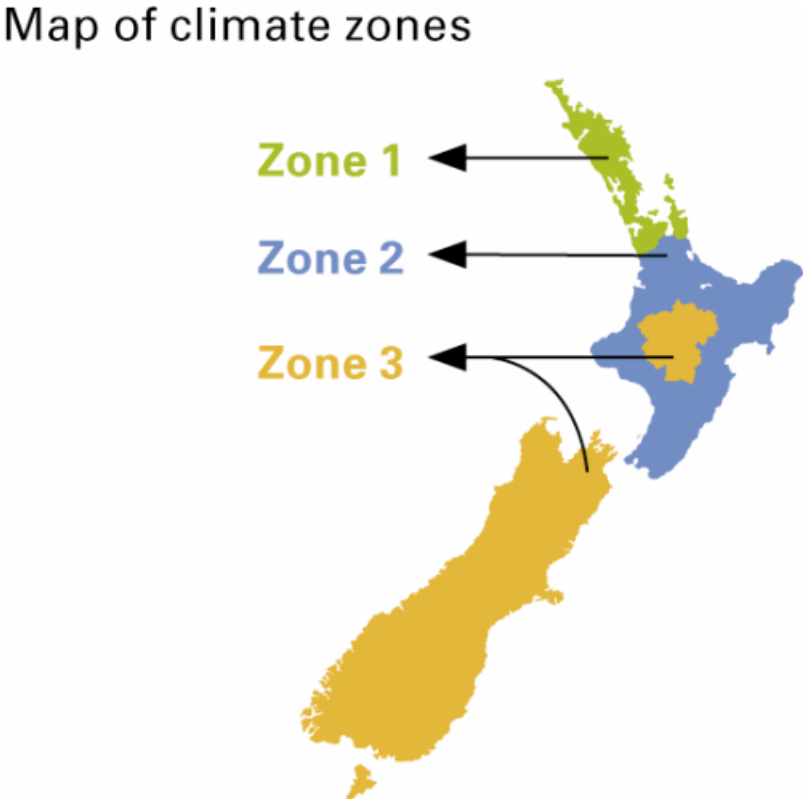
There are three main ways to check you comply with the Building Code requirements. They are the:

- Schedule Method
- Calculation Method
- Verficiation Method.

The table below summarises the construction R-values specified in the acceptable solution for a house with timber-framed walls (low thermal mass).

Table 1

	Climate Zones 1 and 2	Climate Zones 3
Roof	R 2.9	R 3.3
Walls	R 1.9	R 2.0
Floor	R 1.3	R 1.3
Heated floors	R 1.9	R 1.9
Windows	R 0.26	R 0.26
Skylights	R 0.26	R 0.31



Construction R-values are for the complete building element (such as the roof or wall), not just the insulation product.

Construction R-values of the complete building elements are different to the insulation (product) R-values. The extent of difference depends on the construction details.

Construction R-values for building elements can be determined using:

- The BRANZ House Insulation Guide
- NZS 4214:2006
- The Design Navigator website (http://www.designnavigator.co.nz/) offers you a range of online tools for buildings.

Additional requirements

- The total window area must be ≤ 30% of the total exterior wall area.
- The combined window area of the east, south and west walls must be ≤ 30% of the combined area of these walls.
- The total skylight area must be ≤ 1.2m².
- The total area of leadlight glass must be ≤ 2.6 m².
- Downlights must be classed CA80, CA135, IC or IC-F to compy with the Electricity Safety Regulations.
- The R-value of carpets or floor coverings must not be included in calculation of floor R-value for heated floors.
- For heated walls or ceilings, higher R-values are required (walls R 2.6, ceilings R 3.5).

R-values for common construction types

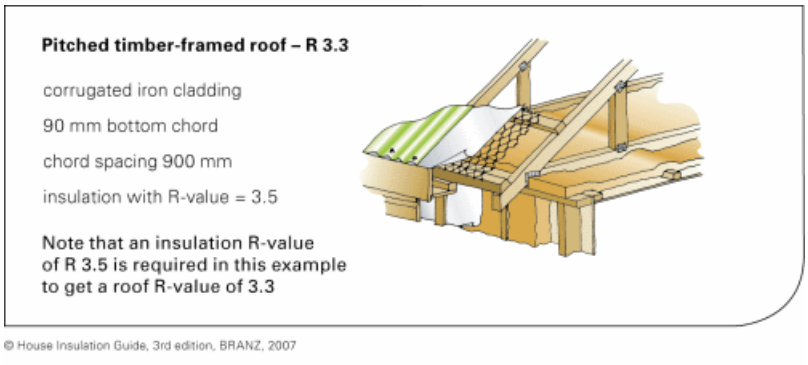
The BRANZ House Insulation Guide provides construction R-values for common construction types. You can find some of the examples here:

Roofs

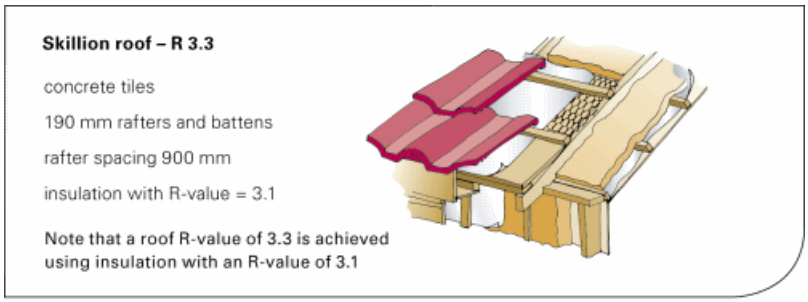
In an uninsulated house more heat is lost through the ceiling and roof than any other part of the house, making the roof the top priority for

insulation.

Pitched timber-framed roof - R 3.3



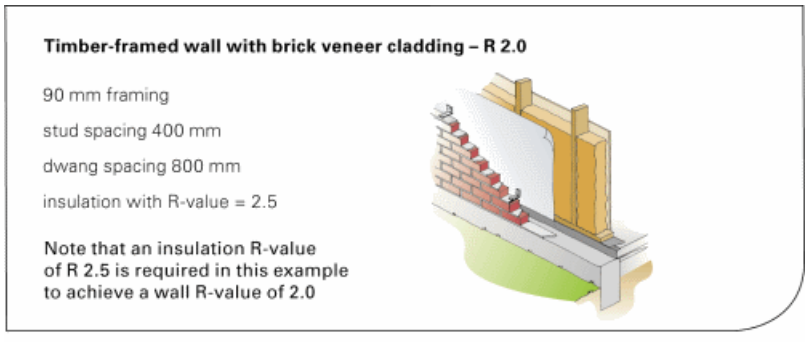
Skillion roof - R 3.3



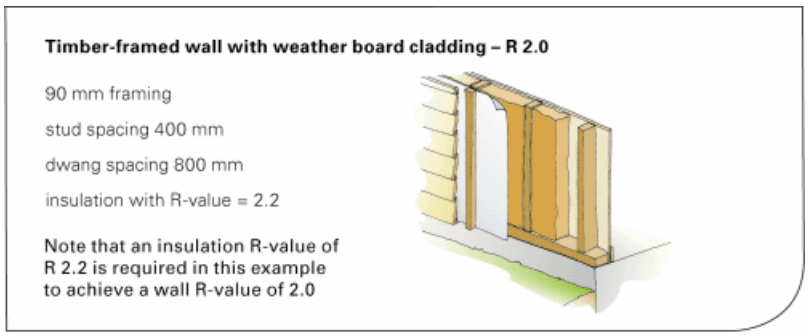
Walls

About 22 percent of heat from an average uninsulated home is lost through the walls. It can be difficult to insulate the walls of existing homes, but it's well worth insulating walls in new houses.

Timber-framed wall with brick veneer cladding - R 2.0



Timber-framed wall and weatherboard cladding - R 2.0

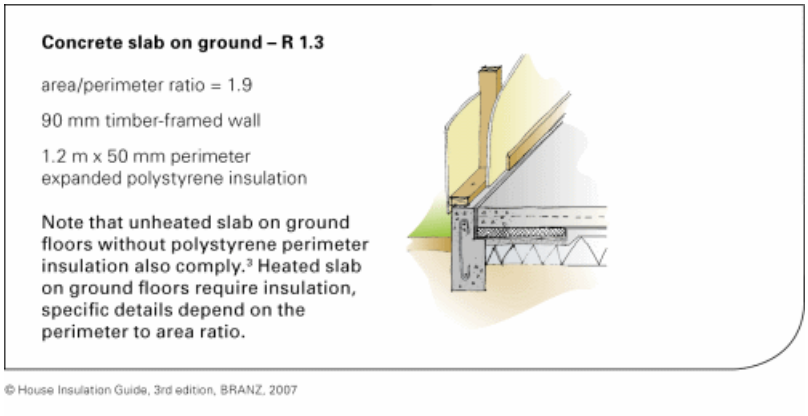


Floors

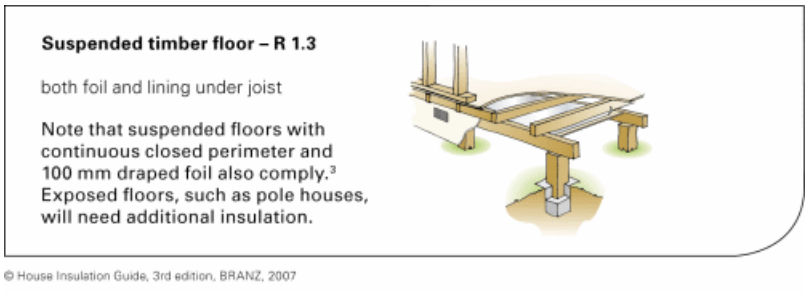
Around 14 percent of heat is typically lost through the floor. Installing underfloor foil insulation can be risky.

Risks when installing home insulation (https://www.building.govt.nz/building-code-compliance/h-energy-efficiency/h1-energy-efficiency/risks-when-installing-home-insulation/) has information about underfloor insulation.

Concrete stab on ground - R 1.3



Suspended timber froor - R 1.3



Windows and skylights

Windows are the weakest link when trying to retain heat inside during winter or keep it out during summer.

Windows are cold during winter because they lose so much heat, which can produce a downdraft of cold air and condensation. Windows also have a large influence on overheating during summer. The use of tinted or low glass, eave overhangs or other shading can limit summer heat and fading.

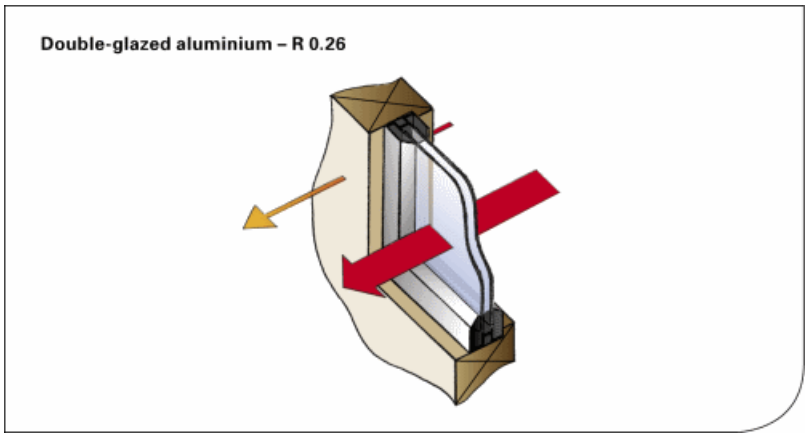
Double glazing is a big improvement over single glazing, although doubleglazed windows still conduct much more heat than walls, floors or roofs.

Window frames have a big effect on heat loss and should be carefully selected if maximum insulation is desired.

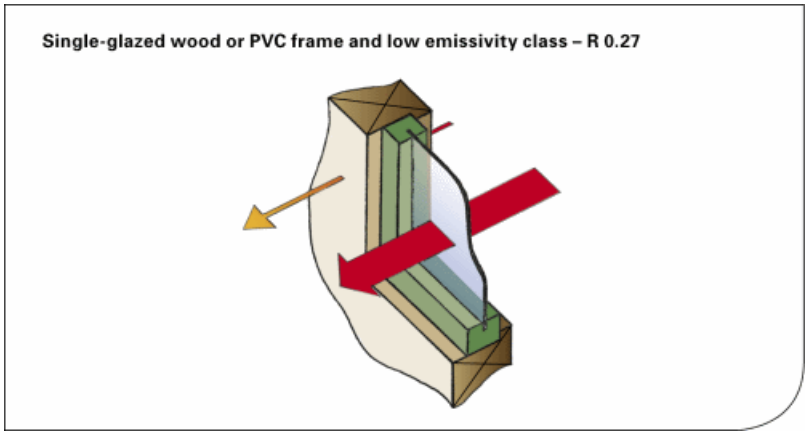
Aluminium window frames conduct heat from inside to outside very easily. Inserting thermal breaks into aluminium frames reduces the heat flow considerably.

Further improvements to window performance can be made by using wood or PVC window frames, by the type of glass used and by the gas pumped between the panes of glass.

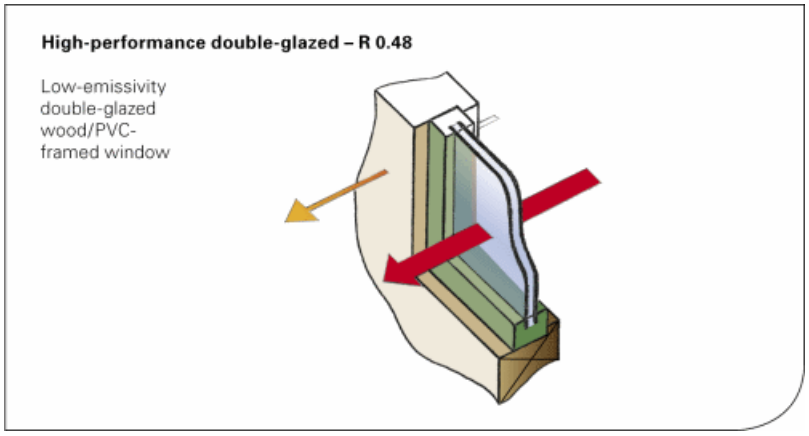
Double glazed aluminium - R 0.26



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



High performance double glazed - R 0.48



There are numerous window types available. You can find the R-values for them in:

- NZS 4218
- BRANZ House Insulation Guide
- on Design Navigator

You should refer to he manufacturers' recommendations for all windows to ensure there is adequate support to carry the weight of the windows.

Houses with "solid" walls

If your house is "solid construction", such as solid timber, concrete or rammed earth you will need to check the Acceptable Solution for Clause H1 for other insulation options.

There are tables of insulation requirements for solid construction that can be used instead of the R-values tabulated above.

The lower wall R-values for solid wall construction account for:

The performance benefits of thermal mass:

- thermal mass must be used in conjunction with good passive solar design to increase comfort and to reduce energy use.

Higher roof R-values:

- this is a trade-off to reduce the wall insulation by increasing the roof insulation.

Higher floor R-values for some options:

- this is a trade-off to reduce the wall insulation by increasing the floor insulation.

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 with the Building Code.

The most robust way to analyse a combination of different construction types in the same house is to use the modelling method in the Verification Method H1/VM1.

We suggest the best and easiest way to analyse mixed construction is to use the calculation method in the Acceptable Solution H1/AS1.

Using the calculation or modelling method

If your house does not meet all the R-value requirements, 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.

The calculation method can only be used if the total amount of glazing is below 50 percent of the total wall area.

The Acceptable Solution for H1 has three different R-value tables that correspond to three distinct types of external wall construction:

- non-solid (typically timber-framed)
- solid timber
- other solid wall construction (typically masonry and rammed earth).

If you are using the calculation method, you need to follow the rules below to combine the different construction:

- Do not mix and match the R-values (such as for walls, roofs, floors, windows and skylights) from the different tables. For example, the non-solid construction roof R-value must not be used in the place of the solid construction roof R-value.
- The R-values for each component should be used in the same proportions and should correspond to the different construction types used in the design. For example, if the design has half timber-framed walls and half masonry walls, then the R-values for Table 1 can be used for half the area and the R-values from Table 2(a) can be used for the other half of the area.
- Alternatively, the highest R-value can be selected from the different construction types and used for each component (such as the highest wall R-value and the highest roof R-value). This approach is inherently conservative and will result in better thermal performance than the Acceptable Solution requires.

The modelling method has fewer restrictions than the calculation method and takes into account other factors such as heat gain from the sun.

Insulation for doors

There are no insulation requirements for the opaque parts of a door or door set if you are following the schedule method in Acceptable Solution H1/AS1.

The exemption of opaque doors from insulation requirements has been included to ensure that the schedule method is easy to apply and not too restrictive.

However, the door exemption is not intended to allow large areas of a house to be un-insulated; nor does it indicate that doors are typically well insulated.

If the calculation method is used, the total area of doors that exceed $3m^2$ must be treated as a wall.

You must consider glazing in doors when calculating the glazing ratio as it is part of the total area.

Insulation for opaque joinery

If you use the Acceptable Solution to comply with Clause H1, then opaque joinery, other than doors, should be treated as either a window or a wall.

All parts of the house's thermal envelope must limit heat loss consistently with the criteria specified in the Building Code or in the Acceptable Solution. Any reduction in the R-values specified for the walls, floors, roofs and windows will result in additional heat loss, and the house will not comply.

Insulation (R-values) can be traded between different parts of the building using the calculation method, the modelling method or the Building Performance Index (BPI). These methods allow louvres to be used in houses when a louvre does not meet the R-values specified for walls or windows in the schedule method.

Find standards and guidance

Copies of Standards can be purchsed from the Standards New Zealand website. (http://www.standards.co.nz)

- NZS 4218: 2004 Energy efficiency - Small building envelope
- NZS 4214: 2006 Methods of determining the total thermal resistance of parts of buildings
- NZS 4246: 2006 Energy Efficiency - Installing insulation in residential buildings [PDF 6 MB] (https://www.tenancy.govt.nz/assets/Uploads/Tenancy/NZS-42462016-Energy-efficiency-Installing-bulk-thermal-insulation-in-residential-buildings.pdf). A free copy of this Standard is available on the Tenancy New Zealand website.

A copy of the BRANZ house insulation guide can be purchased from BRANZ website. (http://www.branz.co.nz/cms_display.php?sn=41&st=1&pg=15080)

There are useful guidance and free online tools to assist in the use of the simple compliance and the calculation methods from the Designer Navigator website. (http://www.designnavigator.co.nz/)