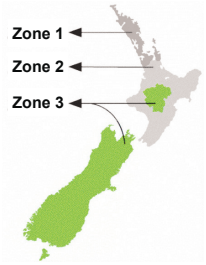
INSULATION: HOW EFFECTIVE IS IT?

INFORMATION SHEET

ZONE 3 – SOUTH ISLAND AND CENTRAL NORTH ISLAND



Two of the most common questions asked of Eco Design Advisors are how much insulation should be installed, and how do you know what difference it will make. To answer these questions there are a few basic concepts to understand.

- Heat always tries to flow from a warmer place to a colder place.
- Insulation reduces this heat flow by slowing it down.
- The unit used to measure resistance to heat flow is the R-value (m^2 °C/W). The bigger the number, the better the resistance to heat flow.

All insulation products sold in New Zealand are required to be labelled with the R-value, and when building new you need to demonstrate you can meet the insulation requirements of the New Zealand Building Code (NZBC). To give you a feel for the levels required here are some typical R-values:

Construction (Note 1)	NZBC minimum (Note 2)	Better (Note 3)	Best (Note 3)
Floor	R1.3	R1.9	R3.1
Wall	R2.0	R2.6	R3.3
Ceiling	R3.3	R4.0	R5.0
Windows (Note 4)			
Standard double glazing (aluminium frame)	R0.26		
Minimum WEERS Rated 3 Stars, or Energy Star endorsed		R0.32	
Minimum WEERS Rated 5 Stars			R0.50

Note 1: For non-solid construction.

Note 2: R values stated are total construction R-value, taking into account heat losses through framing members. Note NZBC minimum figures are for Zone 3 (South Island and Central North Island). For the rest of the North Island refer to Information Sheet: **Insulation: How effective is it? North Island Zones 1 and 2.**

Note 3: Refer to BRANZ House Insulation Guide 5th Edition, for options on achieving these desired construction R-values.

Note 4: Consult with your window supplier to ascertain what Rw value different options will give, or refer to BRANZ Bulletin 579 for guidance (branz.co.nz).

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WHAT CAN WE LEARN FROM THE TABLE ON PAGE 1?

- Insulation is your friend, the more the better, especially in the ceiling, as warm air rises (replacing the cold air that sinks).
- Windows perform really poorly thermally; even double glazed windows lose 10 times as much heat as a well-insulated wall, hence there's still a need for good curtains (see Information Sheet: **Windows**).
- Avoid too much glazing, especially on south sides and via skylights.
- Insulation works in both directions, slowing heat from entering in summer, and will reduce overheating, provided windows are well shaded.

HEATING SAVINGS

Let's look at a typical 1960s/1970s house and what insulation can do to improve the occupants' comfort and reduce the heat requirements and running costs of the house.

Reduce heating requirement through more insulation (from no insulation to best levels)

	Existing house with no insulation	Heat Load (Watts)	Insulated to NZBC minimum	Heat Load (Watts)	Insulated to better level	Heat Load (Watts)	Insulated to best levels	Heat Load (Watts)
Floor 120m2	R0.4	4,500	R1.3	1,385	R1.9	950	R3.1	580
Walls 92m2	R0.44	3,140	R2.0	690	R2.6	530	R3.3	420
Ceiling 120m2	R0.3	6,000	R3.3	545	R4.0	450	R5.0	360
Windows 34m2	R0.15	3,400	R0.26	1,960	R0.32	1,595	R0.50	1,020
Total		**17,040**		**4,580**		**3,525**		**2,380**

The house with no insulation requires a massive 17kW of heat to keep the temperature at 20°C when it is 5°C outside. The biggest heat loss is through the ceiling, followed by the floor, with the walls and the glazing losing similar amounts. That equates to $5.10 an hour (at 2018 prices, ~30c/kWh).

Once insulated to the NZBC minimum the heating requirement drops to 4.6kW, to maintain a comfortable 20°C. Now the biggest heat loss is through the glazing even though the house has been double glazed. The heating cost drops to $1.38 an hour, a saving of almost $4 per hour. If you can build to the better levels, the cost drops to only $1.05 an hour to heat the whole house!

If the house was able to be insulated to best levels, including installing minimum 5 star rated windows, and higher spec insulation, savings will be even greater. Best levels may require a deeper ceiling cavity and wider than normal wall framing to accommodate thicker insulation, an insulated floor slab (including around the perimeter of the slab). In a well-oriented, solar designed house, it is possible in the more temperate parts of New Zealand to achieve a good level of thermal comfort with no need for space heating at all.

FOR FURTHER INFORMATION

Contact your nearest Eco Design Advisor
Visit our website **ecodesignadvisor.org.nz**

View helpful resources at:

- **smarterhomes.org.nz**
- Level (Sustainable building authority): **level.org.nz**
- Energy Efficiency and Conservation Authority: **eeca.govt.nz**
- Building Research Association of New Zealand: **branz.co.nz**
- Building and Housing, MBIE: **building.govt.nz**
- Beacon Pathway: **beaconpathway.co.nz**

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