Rating our building regs – part 1

This is the first in a series looking at how New Zealand building regulations currently compare to those elsewhere.

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PEOPLE MOVING FROM the UK to New Zealand often comment that our houses are cold. Comparing the minimum thermal insulation requirements for new houses in both countries demonstrates one reason why. The second is the dominance of central heating in the UK, which is made more affordable by the greater insulation requirements.

People often think of rain and grey skies in Britain, sun and blue skies in New Zealand. In fact, as Table 1 shows, some locations in both countries share similar temperatures. A measure of climates, the Köppen-Geiger system, gives all these locations exactly the same classification.

New Zealand minimum requirements

All building work must comply with the New Zealand Building Code. Clause H1 *Energy efficiency* is the primary section covering indoor temperature. (Clause E3 *Internal moisture* Acceptable Solution E3/AS1 also stipulates minimum R-values to prevent fungal growth.)

The first of three performance requirements in H1, H1.3.1 effectively requires thermal insulation. Compliance can be demonstrated using the schedule, modelling or calculation methods in NZS 4218:2009 *Thermal insulation - Housing and small buildings*.

The schedule method specifies minimum R-values for building envelope components depending on construction type and location - there are three climate zones in New Zealand. The minimum construction R-values for timber-framed walls for zone 3 - including the South Island - are shown in Table 2. (Construction R-value is not the R-value of the insulation in a building element but of the element itself. In other words, construction R-value includes the insulation plus the effect of thermal bridges, air gaps, cladding material and so on.)

The current BRANZ *House insulation guide* makes certain assumptions about thermal bridging in its calculations, but these are being refined in the next edition.

UK minimum requirements

Rules for new houses are given in the Building Regulations 2010. Approved Documents give technical guidance on how to comply. Approved Document L1A covers new dwellings. The figures in this article come from the edition of ADL1A that came into effect in April 2014.

The designed energy loss through the building fabric is carefully calculated. The target fabric energy efficiency (TFEE) for a new house is calculated and approved before the build starts. After the build, the dwelling fabric energy efficiency (DFEE) is calculated on the actual construction and must not exceed the TFEE.

A notional dwelling of the same size and shape as the actual house can be used to determine the TFEE. The main baseline performance values for elements of the building envelope in the notional dwelling are shown in Table 2. This is one pathway to demonstrate compliance in a similar way to using an Acceptable Solution or Verification Method in New Zealand. If a house is built entirely to the notional dwelling specification, it will comply. In the UK, however, verification is more thorough in areas such as framing ratios compared to the looser assumptions involved in H1 calculations in New Zealand.

UK designers are not forced to use the notional dwelling specification. Trade-offs are possible, reducing the thermal resistance in one element while increasing it in another. Relaxed minimums for walls, roofs and floors can also be achieved (within limits) by including certain services such as photovoltaic systems in the design.

New Zealand's requirements are given in R-values - measuring resistance to heat flow. UK requirements are in U-values - measuring the rate of heat transfer, the reciprocal of the R-value. The lower the U-value/the higher the

Table 1

Average temperatures for some New Zealand and United Kingdom locations

	ASHBURTON NZ	DUNEDIN NZ	INVERCARGILL NZ	SOUTHAMPTON UK	MANCHESTER UK
Average annual temperature	11.2ºC	10.8ºC	9.9ºC	10.6ºC	10.5ºC
Average temperature coolest month	5.6ºC	5.7ºC	5.1ºC	4.7ºC	4.3ºC
Average temperature warmest month	16.2ºC	15.2ºC	14.3ºC	17.2ºC	17.8ºC
Köppen-Geiger climate classification	Cfb – temperate oceanic	Cfb	Cfb	Cfb	Cfb

Table 2

Minimum construction R-values for non-solid construction in New Zealand's zone 3 and the equivalent in England

BUILDING ELEMENT	NEW ZEALAND MINIMUM CONSTRUCTION R-VALUE (m^2.ºC/W) FOR NON-SOLID CONSTRUCTION IN ZONE 3[1]	MINIMUM REQUIREMENT IN ENGLAND, R-VALUE (m^2.ºC/W) WITH EQUIVALENT U-VALUE (W/m^2K)[2]
Roofs	R3.3	R7.7 (U0.13)
Walls	R2.0	R5.6 (U0.18)
Floors	R1.3	R7.7 (U0.13)
Windows and glazing	R0.26	R0.7 (U1.4)
Skylights	R0.31	R0.7 (U1.4)

1. From NZS 4218:2009.
2. Reference values for key elements of the building envelope from the ADL1A 2013 Notional Dwelling Specification (England). Figures in the UK are expressed as U-values. We have converted to R-values to allow easy comparison.

R-value, the more effective the insulation is. Table 2 gives the U-values quoted in the UK and our conversion to R-values to allow comparison.

Clearly the British requirements are much higher than ours, which allow more than twice as much heat loss through the walls of new houses. New Zealand allows over two and a half times more heat to escape through windows than in England. These comparisons use New Zealand zone 3.

British requirements are set to go even higher. In 2019, plans for a Future Homes Standard were announced that will prohibit fossil fuel heating systems in new homes and require them to meet a world-leading energy efficiency standard.

UK homes are centrally heated

Insulation is only part of what makes a warm home - heating is obviously significant. The UK and New Zealand are again very different.

Around 95% of UK homes have central heating compared to just 5% of New Zealand homes. New Zealanders very commonly heat just one or two rooms and leave the rest of the home unheated. In many cases, the reluctance to heat our houses is driven by cost - we have to spend more on heating because our poor insulation means more heat escapes.

Energy performance certificates

It is easy to find out the energy efficiency of UK house as house owners must get an energy performance certificate (EPC) when a property is built, sold or rented. An EPC gives a rating from A (most efficient) to G (least efficient), with information about a property's energy use and typical energy costs. EPCs can be found online by address.

What can we learn?

There are three key points that come out of this comparison between New Zealand and the UK:

- The UK requires new homes to be far better insulated than we require of ours, even though there are parts of both countries where temperatures are very similar.
- House buyers and renters in the UK can easily see the energy efficiency of a house by checking the EPC for the property.
- New Zealand rules treat different issues completely separately - such as thermal insulation, ventilation, airflow and emissions. In the UK, these are more closely integrated.

As we work to make our homes warmer and low-carbon, recognising these are interconnected and treating them that way in our building controls makes a lot of sense.