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Edge insulation of slabs

Modelling of concrete floor slabs at BRANZ has provided insights into how to optimise the effectiveness of exterior perimeter edge insulation.

SIMPLE BUILDING FOOTPRINTS often have thermally efficient concrete slabs (see page 34, *Simply efficient concrete slabs*), but for more complex designs, it is sometimes beneficial to add perimeter edge insulation.

In *Build* 151, *Edge insulation of concrete slabs* presented results of field trials conducted on a Christchurch residential floor slab and computer modelling of the performance of slab edge insulation. This discussed the R-value and height of the insulation material applied to the edge of a slab. These are the most critical features affecting the overall heat loss from the perimeter edge. However, there are other factors that also need to be considered.

Optimum R-value and height found

Modelling of floor slabs has shown that the optimum:

- thermal resistance of the edge insulation is around R1.0
- height is around 600 mm.

Decreasing the R-value or height has a significant impact on the slab R-value, whereas increasing both of those parameters any further has increasingly less benefit.

Modelling other parameters

Using the two optimum results, the next most important parameters have been investigated by computer modelling. Those parameters are:

- dimension from ground level to floor height
- distance between the top of the insulation and the floor surface
- thickness of the exterior walls of the house
- soil conductivity.

Soil conductivity is dependent on the specific location and is usually unknown. It can possibly even change with time because of changes in the wetness of the soil.

A further consideration for the modelling was the effect of combining perimeter insulation with insulation underneath the slab. An R-value of 1.2 was assumed for the underslab insulation since this is typically used.

Impact of other features varies

The modelling results for a 100 m² square floor slab with 0.6 m high R1.0 edge insulation and an area:perimeter ratio of 2.5 are shown in Figures 1-4.

The overall R-value of the floor slab is clearly less sensitive to the four additional parameters than to edge insulation R-value and height.

The two features with most impact are the:

- size of any gap between the top of the edge insulation and the floor surface (see Figure 2)
- soil conductivity when edge insulation is included (see Figure 3).

Interestingly, an uninsulated floor slab or one with just insulation underneath would receive much less benefit from having soil that is lower in conductivity.

Similarly, a floor slab with just insulation underneath receives a more noticeable benefit from thicker house walls (see Figure 4).

R1.0 edge insulation combined with R1.2 underslab insulation typically doubles the overall slab R-value. Underslab insulation alone provides 20–40% improvement on no insulation.

Variety of slabs modelled

Study Report 352 includes results for other slab sizes, waffle pod style slabs and for the floor slabs of houses with brick veneer walls.

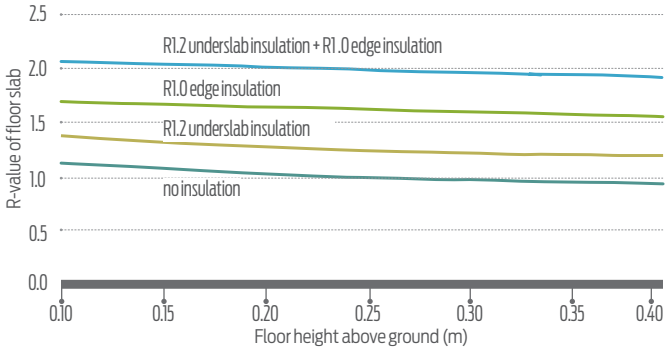

Figure 1: Impact of floor height above 100 m² floor slab.

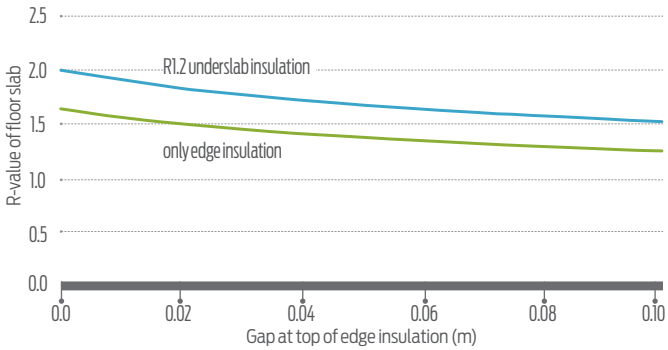

Figure 2: Impact of gap between top of the edge insulation and floor surface.

For more SR352 *Perimeter insulation of concrete slab foundations* contains design advice and is free from www.branz.co.nz/study_reports.

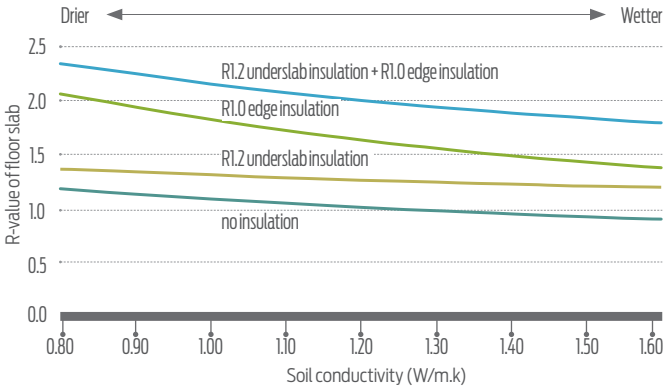

Figure 3: Impact of soil conductivity.

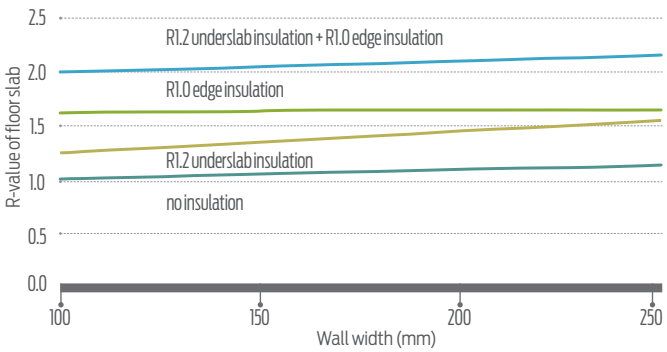

Figure 4: Impact of wall width.