OPTIMISING INSULATION

Don't just head straight for the roof when specifying insulation. It pays to look at the bigger picture in order to minimise heat loss.

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How can you get the best performance from your building design within budget and other constraints? Simply tossing thicker insulation in the roof is not usually the best option. With some thought and analysis, minor tweaks to the design can result in big improvements, often at no additional cost.

Old myths versus new reality

The message of wasteful heat loss in old, uninsulated houses has certainly been heard loud and clear by the general public, and the wide availability of subsidised insulation means many home occupants are benefitting from a long overdue upgrade. However, the information showing where heat is lost (see Figure 1) only applies to uninsulated houses. If you use this information to inform your design decisions for new insulated houses, you might make some unfortunate choices.

As a new house is required to be insulated, the heat losses are completely different (see Figure 2). The roof loss for a design that complies with the schedule method of the Building Code Acceptable Solution H1/AS1 is actually the smallest of any of the heat losses, at roughly 5–10% for typical designs – not the largest, as it is with uninsulated houses.

Heat loss in new designs

As in financial budgeting, if you want to make savings, attack the largest items first. So where are the biggest heat losses?

GLAZING

For most designs, the glazing will be the largest heat loss (35–50%), even when double glazing is used. Improving the performance of the glazing or altering its size or placement (for example, using ALF 3.2) offers big opportunities to improve the overall design.

The cost of improving all the glazing may exceed the budget, but carefully specifying higher performance glazing where it is most needed (such as in living spaces) can give worthwhile improvements.

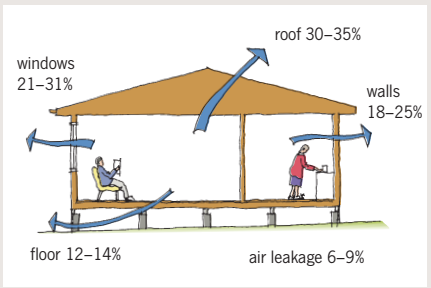

Figure 1: Heat loss from an uninsulated house.

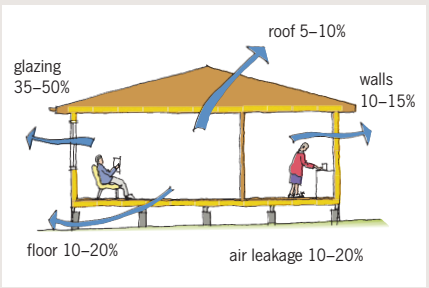

Figure 2: Heat loss from a house design that complies with the H1/AS1 schedule method.

FLOOR

The next largest heat loss is usually the floor, as the typical R-value of an uninsulated slab floor is approximately R1.3.

Major improvements are possible by using slabs with thermal breaks and insulation or using bulk insulation in suspended floors instead of foil. This not only reduces the heating energy required, but also gives warmer floors, improving perceived occupant comfort.

WALLS

Wall heat losses are usually the next largest. Walls are typically already reasonably well insulated, and although there is room for improvement by, for example, choosing higher R-value insulation or specifying deeper framing, these options are not usually as cost-effective as the previous ones.

ROOF

Roof heat losses are usually the smallest. With roof R-values typically around R3, it takes a lot of extra insulation (for example, R5–R6) to make only a small improvement (a few percent of the total heat loss).

Right tools for the job

There are easy-to-use tools that allow you to evaluate the effect of any changes or improvement. The BRANZ Calculation Method Tool enables you to quickly calculate how much improvement in heat loss is gained by changing the R-value or area of building elements. This can be used, for example, to quickly compare whether extra wall insulation or floor insulation will give the most cost-effective improvement.

ALF 3.2 is much more powerful than the Calculation Method Tool and enables you to evaluate the effects of many more factors, such as window size, placement and shading. It also gives predicted heating energy, not just the heat loss, so you can estimate savings in heating costs. Using ALF 3.2 gives a more accurate evaluation of the design and better feedback.

The BRANZ *House insulation guide*, available for purchase through www.branz.co.nz, gives the R-values for a wide range of construction types and insulation R-values, with many high-performance options detailed.

Specify products and install well

A good design can be let down by poor materials and workmanship. Ensure that the insulation products are appropriate for the application, have the right dimensions, thickness and R-value and are properly labelled. Don't just specify an R-value on plans – specify a named product including R-values and dimensions so that there are no surprise substitutions.

Insulation *must* be installed correctly. NZS 4246:2010 *Energy efficiency – Installing insulation in residential buildings* gives guidance on correct installation. Basically, if it looks messy with nips, tucks, folds or gaps, you probably have a poor installation and are likely to not be achieving the specified system R-values (see pages 68–69 for recent research).