USING THE H1 CALCULATION METHOD

This guide to the calculation method gives some hypothetical examples for common situations where this method may be needed.

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With the recent implementation of the Third Edition of New Zealand Building Code Clause H1 *Energy efficiency*, some house designs will now be ineligible for the schedule method. To demonstrate compliance, it will be necessary to use the calculation, modelling or BPI methods.

Easy to use and flexible

Using the calculation method is easier than you may have thought. It is more flexible than the schedule method and allows a design to have R-values for parts of the building that are lower than the schedule minimums, a mix of solid and non-solid walls, single glazing or larger areas of glazing. (See *Build* 104 February/March 2008, pages 32–34 for more details on the schedule method.)

Getting started

The only restrictions on the use of the calculation method are that the:

- total glazing area is no more than 50% of the total wall area, and
- R-values of the roof, walls and floor are no less than 60% of the R-value from the corresponding schedule table.

For example, for zone 3, R2.0 is the minimum schedule R-value for non-solid walls, so the lowest wall R-value permitted is R1.2 (60% of R2.0). *But,* if the E3/AS1 minimum R-value is *greater*, you must meet the E3 R-value (see below). In this example, the minimum E3/AS1 R-value is greater at R1.5, so R1.5 is the minimum framed wall R-value permitted.

The calculation method compares the heat loss of the proposed building with the heat loss of a reference building. If the proposed building's heat loss is no more than that of the reference building, then it complies with Clause H1.

NZS 4218: 2004 *Energy efficiency – Small building envelope,* as modified by Clause H1/AS1, defines the rules and the heat loss equations (see page 14 of this *Build* to update NZS 4218 before you start). The complete set of these equations is available on the BRANZ website (see www.branz.co.nz, BRANZ H1 support page). There are also Excel worksheets that have the R-values for the various climate zones, construction types and new H1 implementation dates.

Once you learn how to apply the rules, it is a simple matter of choosing the appropriate equation or worksheet, and entering the areas and R-values of the parts of the building.

Calculating the heat loss

The heat loss of each part of the building is calculated as: heat loss = area/R-value.

So for a roof with an area of 140 m^2 and an R-value of R3.0, the heat loss is 140/3.0 = 46.7 Watts per °C. The R-value is for the component, not for the insulation product. You can use the BRANZ *House insulation guide* to work out the component R-value. Then, following the instructions in NZS 4218, add up the heat losses of each of the components to get the heat loss for the building.

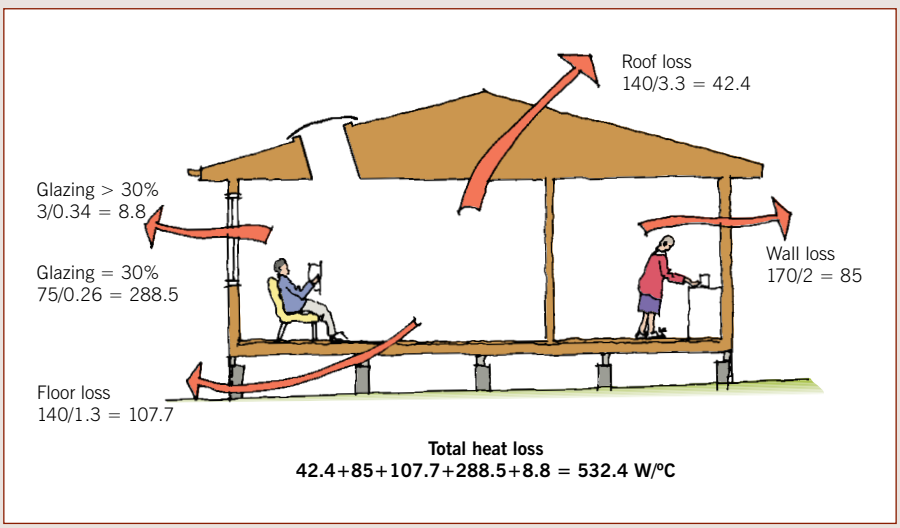
Below are examples to illustrate some common situations where the calculation method may be needed. These calculations *do not* provide a general set of R-values to be used on other designs, they only illustrate how the calculation is done and show how to trade-off R-values between components. You *must* calculate the heat loss for *every* design when using the calculation method.

Reference building

In every case, the reference building has the same basic design as the proposed building, with R-values set out according to the rules of H1 and NZS 4218. Table 1 is an example of a non-solid reference building for zone 3. To comply using the calculation method, all of these example proposed buildings must have a heat loss of no more than 532.4 W/°C.

Building A – Lots of windows

This design has glazing in more than 30% of the total wall area, so is ineligible to use the schedule method. Of course, reducing the →



Reference building heat loss, with calculations.

window area would allow the schedule method to be used.

In this proposed building, all the 78 m^2 of glazing will be standard double glazing, unlike the reference building which has 3 m^2 of a higher performance insulated glazing unit. Table 2 shows the calculation of the heat loss and the modifications required to achieve compliance. The calculated heat loss is 535.1, which is higher than that of the reference building (532.4). Hence the design fails and has to be modified to comply. An option would be to increase the wall R-value from 2.0 to 2.2.

Building B – Mixing solid and non-solid construction

If there is mix of solid and non-solid construction, or if solid walls are strapped and lined, the R-values from the non-solid schedule tables must be used for the reference building. This example (see Table 3) has a heat loss that is too high (541.6) and thus fails, even though the R-values would meet the schedule values for solid or non-solid construction if only one type was being used. However, the deficit is small and can easily be made up. For example, the design could be modified using a thermal break in the concrete slab to increase the R-value to R1.9.

Building C – Some single glazing

Achieving compliance with a small amount of single glazing is fairly easy (e.g. a single glazed French door) but if there is a lot of single glazing it is much harder, especially in climate zones 2 or 3.

In this example (see Table 4), half the windows are to be single glazed, but this makes the heat loss too high. To retain single glazing, extensive (and expensive) modification is required. To achieve the higher wall R-value, it is necessary to use a 140 mm stud wall with full insulation. The higher floor R-value requires full slab insulation with a thermal break, the roof R-value has to be increased, and high performance insulated glazing units used. Compliance could also be achieved by reducing the total area of glazing or even just the area of single glazing.

Still can't comply?

Although the calculation method provides some flexibility, it will not always be practical to reduce the heat loss enough by increasing R-values. If the building has a good passive design, the BPI calculation with ALF may provide another path to compliance.

Don't forget E3!

You *must* comply with Clause E3 minimums even if the calculation method permits lower R-values. These minimums are R0.6 for solid timber or normal weight single skin masonry walls, and R1.5 for roofs and walls with a cavity (e.g. framed walls). There are no minimum requirements for floors.

For further information, go to www.branz.co.nz (H1 support page and ALF page).

Table 1: Non-solid reference building for zone 3.

Component	Area (m^2)	R-value	Heat loss (W/°C)
Roof	140	3.3	42.4
Wall	170	2.0	85.0
Floor	140	1.3	107.7
Glazing (30%)	75	0.26	288.5
Glazing (>30%)	3	0.34	8.8
Skylights	0	0.34	0.0
		Total loss	**532.4**

Table 2: Building A example – heat loss where glazing is over 30% of wall area.

		Proposed building		Modified to comply	
Component	Area (m^2)	R-value	Heat loss (W/°C)	R-value	Heat loss (W/°C)
Roof	140	3.3	42.4	3.3	42.4
Wall	170	2.0	85.0	2.2	77.3
Floor	140	1.3	107.7	1.3	107.7
Double glazing	78	0.26	300.0	0.26	300.0
		Total loss	**535.1**	**Total loss**	**527.4**

Table 3: Building B example – heat loss for a mix of solid and non-solid construction.

		Proposed building		Modified to comply	
Component	Area (m^2)	R-value	Heat loss (W/°C)	R-value	Heat loss (W/°C)
Roof	140	3.5	40.0	3.5	40.0
Weatherboard walls	100	2.0	50.0	2.0	50.0
EIFS masonry	70	1.2	58.3	1.2	58.3
Floor	140	1.5	93.3	1.9	73.7
Glazing	78	0.26	300.0	0.26	300.0
		Total loss	**541.6**	**Total loss**	**522.0**

Table 4: Building C example – heat loss where there is both single and double glazing.

		Proposed building		Modified to comply	
Component	Area (m^2)	R-value	Heat loss (W/°C)	R-value	Heat loss (W/°C)
Roof	140	3.5	40.0	4.2	33.3
Wall	170	2.0	85.0	2.7	63.0
Floor	140	1.3	107.7	3.7	37.8
Double glazing	39	0.26	150.0	0.31	125.8
Single glazing	39	0.15	260.0	0.15	260.0
		Total loss	**642.7**	**Total loss**	**519.9**