



COMPLIANCE WITH THE H1 CALCULATION METHOD

In *Build 106*, we suggested a format to submit information to Building Consent Authorities to demonstrate compliance with the schedule method. This time, we look at a format to show compliance with the calculation method.

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The BRANZ Helpline has been hearing from many callers having trouble using the NZS 4218: 2004 *Energy efficiency – Small building envelope* calculation method. By following these steps, you may find the calculation is much easier than you think.

Calculation method can be useful

There are a number of reasons why you might use the calculation method. Sometimes, a design does not comply with some or all of the requirements of the schedule method (see Replacement Table 1 to Building Code Clause H1 *Energy efficiency*). Other times, it can be purely the designer's choice, such as when:

- a roof, wall or floor system will not meet the schedule minimum R-value
- the glazed area exceeds 30% under one or both of the glazing rules
- the total area of skylights exceeds 1.2 m²
- single glazing is used.

NZS 4218: 2004 3.2.1 states that the calculation method allows a designer 'to relax some R-value requirements providing this is compensated for by a higher R-value elsewhere in the building thermal envelope'.

Example to follow

To demonstrate the calculation method, we are going to modify the design used for the schedule method in *Build 106* (pages 22–23), and apply the calculation method.

In this scenario, the designer is concerned that the thickness of R3.6 insulation in the pitched roof might cause installation difficulties at the eaves. The most cost-effective time to maximise thermal efficiency is at initial design, so it is proposed that the wall insulation be above the minimum R-value by using R2.8 glass wool segment insulation and the roof construction R-value be reduced to R2.8 (minimum schedule R-value is R3.3). Since the roof is accessible, more insulation can be added later.

The owner has opted for the IGUs to be glazed with bronze/clear glass. These units have an R-value of R0.26. Also, the glazing area of this example has been reduced to 25% of total wall area.

Step 1 – Summarise construction details

Start with a summary of the essential project data (see top of Table 1). A few changes have been made to this form from that in the *Build 106* example. A list of the H1 compliance options has been added as well as a space to

include your reasons for using the calculation method, if that is your compliance path. This will help set the scene for the consenting authority.

Step 2 – Specify and check R-values

Compile the 'NZBC Clause E3/AS1 checklist with products to be used and R-values' in Table 1. This may seem like information overload but remember there may be building officials processing consent applications who are not as conversant with the H1 requirements as you are. The more clearly you set out what you want to achieve, the better for everyone.

The aim here is to show the relevant NZS 4218: 2004 R-values and state your specified product details and R-values schedule.

Step 3 – Download Excel worksheet and complete

The next stage is to complete the calculation. This is made easy with a BRANZ Excel file containing calculation method worksheets for all construction types and climate zones. Download this from the BRANZ H1 support page (see www.branz.co.nz), select 'Link to calculation method worksheets document'.

For this example, select the spreadsheet for zone 3, non-solid, and complete the non-solid reference building spreadsheet. The total heat loss is automatically calculated for you. It was 523.1 W/°C for this example (see Figure 1). →

When does H1 apply?

The changes to H1 apply now to all of the country *except* zone 1, which is Northland, Auckland, Thames-Coromandel districts and the Kermadecs. It will apply to these areas from 30 September 2008.

Table 1: Example of completed form to be submitted to a building consent authority.

Address	XYZ Street, Suburb, City						
Climate zone	Climate zone 3						
Construction details							
Construction type	Non-solid.						
Roof	25° pitched roof with corrugated metal roof cladding on 90 × 45 mm rafters @ 900 mm centres and 90 × 45 ceiling joists @ 900 mm centres (5% framing).						
Walls	Direct-fixed timber bevelback weatherboard on 90 × 45 mm studs @ 600 mm centres and dwangs @ 800 mm centres (14% framing).						
Floor	Particleboard on 140 × 45 mm timber floor joists @ 600 mm centres.						
Glazing type	[Specify brand] white powder coated aluminium frame IGU with bronze/clear glass. No skylights.						
Glazing rules							
Area of glazing less than 30% of total wall area	Total glazing = 62 m ²		Total wall area = 248 m ²		Glazing/wall area = 25%		
Window area of east, south and west walls less than 30% of total wall area of these walls	Total glazing = NA		Total wall area = NA		Glazing/wall area = NA		
Method of compliance with NZBC Clause H1 (please tick)							
Schedule method <input type="checkbox"/> Modelling method <input type="checkbox"/> Calculation method <input checked="" type="checkbox"/> ALF 3.2 <input type="checkbox"/>							
If calculation method, please give reasons. <i>I am concerned that the thickness of R3.6 insulation in the pitched roof might cause installation problems at the eaves. I have proposed making the wall insulation higher (R2.8 glass wool segment insulation) and reducing the roof construction R-value to R2.8.</i>							
NZBC Clause E3/AS1 checklist with products to be used and R-values							
	Minimum construction R-value in climate zone 3	A 60% of construction R-value [see NZS 4218: 2004 3.2.6]	B Minimum R-value for NZBC E3/AS1 1.1.1	Minimum R-value permitted = Greater of A or B	Product specified and R-value [from BRANZ Appraisal or manufacturer's specifications]	Construction R-value achieved [from BRANZ House insulation guide]	Reference to supporting technical data
Roof	R3.3	R1.98	R1.5	R1.98	R2.8 [Specify brand, type and product code] glass wool segments	R2.8	BRANZ House insulation guide page 30 and BRANZ Appraisal No. xxx (2008)
Walls	R2.0	R1.2	R1.5	R1.5	R2.8 [Specify brand, type and product code] glass wool segments	R2.4	BRANZ House insulation guide page 56 and BRANZ Appraisal No. xxx (2006)
Floors	R1.3	R0.78	NA	R0.78	R1.4 [Specify brand, type and product code] polystyrene under wooden floor insulation	R1.8	[Specify company] manufacturer's specifications and BRANZ Appraisal No. xxx (2006)
Glazing	R0.26	NA	NA	R0.15 (single glazing)	R0.26 [Specify brand] coated (white) aluminium frame IGU bronze/clear glass	R0.26	Table G2 in NZS 4218: 2004

Step 4 – Input proposed design detail

At the bottom of the same Excel file, find the worksheet named 'Proposed building new'. Input the proposed design detail. Like the reference building, the total heat loss will be automatically calculated for you. In this example, the total heat loss of the proposed building is 443.7 W/°C (see Figure 2).

Step 5 – Check it complies

NZS 4218: 2004 3.2.2 says the heat loss of the 'proposed' building needs to be equal to or less than the heat loss of the 'reference'

building. For our example, 443.7 W/°C is less than 523.1 W/°C for the relevant climate zone, construction type and design, so it complies with Building Code Clause H1. Attach a printout of both these completed worksheets to your building consent application.

If the heat loss of the proposed building is higher, you will need to amend one or more products specified to increase the construction R-value(s).

See also *Build 105 April/May 2008, pages 19–20, for more information on using the calculation method.* ■

Component	Description	Area	R-value	Heat Loss	Heat Loss = Area/R-value
Roof		140	3.3	42.4	
Wall		173.6	2.0	86.8	
Floor		140	1.3	107.7	
Glazing (30%)		74.4	0.26	286.2	
Glazing (>30%)			0.34		
Skylights			0.34		
				Total Loss	523.1

11 Set wall area as either 70% of total wall area, or actual wall area, whichever is **lower**
 12 Set glazing area as either 30% of total wall area, or actual window area, whichever is **higher**
 13 Total area of glazing (including skylights) must be $\approx 50\%$ of the total wall area
 14 An R-value of 0.26 may be used for traditional leadlight glass if the total area is $\leq 2.6 \text{ m}^2$
 15 Non-glazed areas of door openings greater than 3 m^2 are treated as wall.

Figure 1: BRANZ worksheet completed for the non-solid reference building.

Component	Description	Area	R-value	Heat Loss	Heat Loss = Area / R-value
Roof 1		140	2.8	50.0	
Roof 2					
Roof 3					
Wall 1		186	2.4	77.5	
Wall 2					
Wall 3					
Floor 1		140	1.8	77.8	
Floor 2					
Floor 3					
Glazing 1		62	0.26	238.5	
Glazing 2					
Skylight 1					
Skylight 2					
				Total Loss	443.7

17 R-values must be no less than 60% of the R-value of the corresponding Schedule values
 18 Total area of glazing (including skylights) must be $\approx 50\%$ of the total wall area
 19 Non-glazed areas of door openings greater than 3 m^2 are treated as wall.
 20 An R-value of 0.26 may be used for traditional leadlight glass if the total area is $\leq 2.6 \text{ m}^2$

Figure 2: BRANZ worksheet completed for the proposed new building in the example.