BRANZ

PASSIVE DESIGN

SUPPLEMENT

June 2016 Update

LEVEL SUSTAINABLE BUILDING SERIES

level

THE AUTHORITY ON SUSTAINABLE BUILDING

Thermal simulation software

Significant developments have occurred in thermal simulation software since this book was published. Simulation measures the impacts of design decisions on the thermal performance of a house. More information is available on the BRANZ Level website: www.level.org.nz/passive-design/thermal-simulation/

Page 8

Understanding the issues

1st paragraph, change "The World Health Organisation recommends 16°C as the minimum room air temperature for habitable spaces…" to "The World Health Organization's standard for warmth says 18°C is suitable for healthy people who are appropriately dressed. For those with respiratory problems or allergies, they recommend a minimum of 16°C, and for the sick, disabled, very old or very young, a minimum of 20°C (68°F)."

Page 16

Direct solar gain

4th paragraph, change "Thermal mass is not generally recommended for hot climates or, particularly, where the daily temperature range…" to "Thermal mass is not recommended where the daily temperature range…"

(Properly designed, thermal mass can reduce overheating in hot climates and can reduce heating needs in colder climates.)

Page 16

Direct solar gain

5th paragraph, delete the words "…a wall of 100 to 200 mm thick or…"

As a general rule, floors get much more sun than internal walls and will be much more effective as thermal mass.)

Page 16

Indirect solar gain

2nd paragraph, change "The wall…should be painted a dark colour…" to "The wall…should be a dark colour…"

Delete the 3rd, 4th and 5th sentences about vents. This is not the primary mechanism for thermal transference – the permeation of heat through the wall is the main mechanism. Many effective Trombe walls do not have vents.

Page 17

Figure 8 Basic principle of Trombe wall construction

BRANZ testing since the publication of this book has found little difference in thermal results between the use of single glazing and double glazing with Trombe walls. In the figure and the caption, change "insulated glazing" to "insulating glass units or single glazing".

In the figure, also change the text from "small amount of heat is re-radiated out through IGU" to "small amount of heat is re-radiated out through glazing".

Page 19

Last sentence, change "Perimeter slab insulation must still be installed, as for slabs requiring heat retention, to prevent a heat transfer from air to slab between the ground level and the top surface of the slab." to "Perimeter slab insulation must still be installed to prevent heat transfer between air and slab."

Pages 22–23

Sun path diagrams, especially Figure 14 Sunpath diagram for Auckland

For sun paths, refer to the SolarView calculator on the NIWA website: http://www.niwa.co.nz/our-services/online-services/solarview

Page 25

Establishing shadow length

Add this sentence to the end of the text: "Alternatively, various software programs including SketchUp can establish shading quickly and accurately."

Page 28

Air infiltration

Change the last sentence to "In some circumstances, air leakage can account for approximately 25% of heat loss, so any reduction will be of considerable benefit."

Page 28

Windbreaks

Change the sentence "At 20 to 30% porosity, a windbreak will… " to "At 20–30% porosity, a windbreak can reduce wind speed by 50% for a distance of around 4–5 times the height of the windbreak."

Page 39

Insulation

The standard NZS 4246 *Energy efficiency – Installing bulk thermal insulation in residential buildings* has been restructured and was open for comments when this book update was being prepared. The new version is likely to be released in 2016.

Page 39

Thermal resistance (R)

Add Table 2a under the subheading Thermal resistance (R):

TABLE 2A TYPICAL R-VALUES OF COMMON BUILDING MATERIALS

MATERIALS	TYPICAL R VALUE ($M^2°C/W$)
CONCRETE MASONRY	0.8–1.28
BRICK	0.4–0.8
GLASS	0.03 (4 mm)
CONCRETE	0.2–0.5
PLASTERBOARD	0.06 (10 mm) 0.079 (13 mm)
TIMBER (MEDIUM DENSITY)	0.5–0.7
GLASSWOOL	1.8–7.0
EPS POLYSTYRENE	2.56 (100 mm)

Page 40

Thermal resistance (R)

3rd paragraph, 4th line, change "wall claddings" to "wall claddings (surface coefficients)".

3rd paragraph, change "Refer to the *BRANZ House Insulation Guide: Third edition* for more information." to "Refer to the BRANZ *House Insulation Guide (5th edition)* for more information."

Under the line "R= d(m)…", add this new line "Then add the surface coefficient from NZS 4243. For opaque materials, the surface coefficients add 0.12 $m^2°C/W$. For transparent materials (glazing), the surface coefficients add 0.14 $m^2°C/W$. "

Last line of the calculation, change "So the R-value of 100 mm thick SL (low density) EPS polystyrene = 2.56 $m^2°C/W$" to "So the R-value of 100 mm thick SL (low-density) EPS polystyrene = 2.56 + 0.12) $m^2°C/W$ = 2.68 $m^2°C/W$."

Page 40

How insulation works

Delete the paragraph "Insulating products are classified into two main categories based on their performance properties:

- bulk insulation
- reflective insulation."

Replace "To understand how the two types of insulation work…", with "To understand how insulation works".

Reflective insulation

Delete this section. BRANZ does not support the use of reflective foil as insulation. In addition, the Ministry of Business, Innovation and Employment (MBIE) banned the use of reflective foil for retrofitting insulation under houses, effective from 1 July 2016. At the time of writing this update, MBIE also planned to change Building Code Acceptable Solution H1/AS1 to remove the ability to use foil insulation as an Acceptable Solution. This change was intended to be in place by the end of 2016.

Page 41

Figure 32 Reflected insulation

Delete Figure 32 Reflected insulation.

Page 42

Installing insulation

Replace the paragraph beginning "(Note that Acceptable Solution H1/AS1 (2007) modifies the R-value tables of NZS 4218:2004…)" with the following: "The calculation method of NZS 4218:2004 was modified by the 3rd edition of Building Code clause H1. While a new version of NZS 4218 was released in 2009, this has not been referenced in H1. Therefore, the 2004 version of the standard, which is the one referenced, is still the one used for the calculation method."

For more information, see http://www.branz.co.nz/H1_support

Page 43

3rd paragraph – the Window Efficiency Rating System (WERS) is now the Window Energy Efficiency Rating System (WEERS). See the comment on page 56 below.

Page 43

BRANZ ALF method

Change the sentence "BRANZ recommends the use of ALF 3.2 for effective passive design." to "BRANZ recommends the use of ALF 3.2 for effective passive design for regions other than Auckland/Northland. For these areas, more sophisticated software is recommended such as AccurateNZ, SUNREL, IES-VE or Sefaira. See http://www.level.org.nz/passive-design/thermal-simulation/"

Page 43

Where to insulate/Exterior walls – timber framed

There is now R4.0 insulation that can be used within 140 mm framing.

Page 47

Clearances around appliances and fittings

The situation regarding recessed downlights has changed significantly in recent years. Newer recessed downlights in categories labelled IC and IC-4 can be covered with insulation.

For older types of downlights already installed in homes, insulation must be kept 100 mm away with a fixed guard to prevent the lights, ceiling materials or insulation from overheating and causing damage. See NZS 4246 for further information.

Recessed downlights marked with “CA80” or ”CA90” can have insulation abutted against them.

BRANZ recommends replacing older downlights either with surface-mounted lights to avoid all heat loss or with IC or IC-F recessed downlights that have insulation placed over them.

Page 50

Delete the sentence in the box “Rule of thumb: the area of thermal mass should be approximately six times the area of the north facing glazing.”

Page 56

Window Efficiency Rating Scheme (WERS)

Change subheading to:

Window Energy Efficiency Rating System (WEERS)

Replace the text under the subheading with this: “The Window Energy Efficiency Rating System (WEERS) is a voluntary 6-star rating programme that compares the thermal performance of windows in housing and small buildings. It was developed by BRANZ in conjunction with the Window Association of New Zealand (WANZ) and the Energy Efficiency and Conservation Authority (EECA).

WEERS combines the thermal performance of the frame and glazing, together with the size of the window, to calculate an individual thermal performance rating (R_W) for each window and, from that, its star rating. The more stars that are shown on the window, the more energy efficient it is.

The weighted average R_W values for all windows in a houselot are combined to give an $R_{W(av)}$, which is used to give a WEERS star rating for the houselot. Houselots of windows that achieve an average $R_{W(av)}$ of 0.32 m^2K/W (or above) will achieve ENERGY STAR® endorsement for the houselot, provided no windows in the thermal envelope are single glazed.

For more information, see BRANZ Bulletin 579 *WEERS – Window Energy Efficiency Rating System*.”

Page 57

Above the section headed “Increasing internal daylight levels”, insert this new section:

ENERGY STAR®

ENERGY STAR-qualified windows reduce heat loss at least 25% better than standard aluminium-framed double glazing. An ENERGY STAR window will typically have at least one or both of:

- double glazing and a frame with a thermal break in the centre of the aluminium joinery or a frame that is made from an insulating material such as uPVC or wood
- low-emissivity (low-E) glass as one pane of double glazing – low-E glass lets light and heat in while reflecting escaping heat back into the room.

Page 62

Properties of glass

Add another bullet point: “Visual transmission”

U-value and R-value

Add this sentence at the start: “U-values are used for glass/glazing, while R-values are used for complete windows, which combine the effect of the glazing and the framing.”

Page 62

TABLE 3 Comparison of U-values for clear, single and double glazing and different frame types

Replace Table 3 with the table on page 6 below.

TABLE 3 COMPARISON OF TYPICAL WINDOW (FRAME AND GLASS) R-VALUES (R_{WINDOW})

WINDOW FRAME MATERIAL	SINGLE GLAZING	IGU WITH 4 MM GLASS AND 8 MM AIR SPACE	IGU WITH 4 MM GLASS AND 12 MM AIR SPACE	IGU WITH 4 MM GLASS, 12 MM AIR SPACE AND LOW-E PANE	IGU WITH 4 MM GLASS, 12 MM AIR SPACE, LOW-E PANE AND ARGON GAS FILL
ALUMINIUM	R0.15	R0.25	R0.26	R0.31	R0.32
THERMALLY BROKEN ALUMINIUM	R0.17	R0.30	R0.31	R0.39	R0.41
TIMBER	R0.19	R0.34	R0.36	R0.47	R0.51
UPVC	R0.19	R0.34	R0.36	R0.47	R0.51

Note:

The actual R_{window} is dependent on the glazing, frame material and window size. The R-values in this table are for generic framing systems with generic glazing systems that are 1800 mm wide by 1500 mm high with a central mullion.

Sources: NZS 4218:2009 *Thermal insulation – Housing and small buildings* and www.smarterhomes.org.nz/design/glazing/double-glazing-glass-options/

Page 63

Shading coefficient

2nd paragraph, delete from "The lower the shading coefficient…" to the end of the paragraph, and delete the 3rd paragraph.

After the "Shading coefficient" subheading and text, add this subheading and text: "Visible light transmission (VLT)

Visible light transmission (VLT) is the percentage of visible light that is transmitted through a glazing system. The higher the percentage, the more daylight passes through the glazing. Also referred to as VT, T_v, T_{vis}, LT, and VT."

Page 64

Insulating glass units (IGUs)

1st paragraph, delete the words "…but may sometimes be a partial vacuum…"

Page 64

4th paragraph, replace the first 4 sentences ("IGUs can be manufactured….a 12 mm space is considered ideal.") with "IGUs can be manufactured with either air or argon gas between the panes. Argon is the most effective for reducing heat loss. IGUs can be manufactured with spacer widths ranging from 6–18 mm. A 12 mm space is considered ideal for general use in New Zealand housing."

Page 65

New Zealand Building Code clause H1 Energy Efficiency

3rd line, delete "or solar control glazing".

Page 69

Shading devices

1st paragraph, change “north-east and south-west” to “north-east and north-west”.

Page 72

TABLE 6 RECOMMENDED VENTILATION RATES FOR DOMESTIC BUILDINGS

Middle column, Air changes per hour (ac/h), change the figure “0.35” to “0.35–0.5”.

Page 86–87

OTHER DOCUMENTS AND RESOURCES

After the listing for NZS 4246, add “(A new version will be released in 2016.)”

Designing Comfortable Homes was updated in 2010. (This also applies to the reference to the publication on pages 22 and 67–68.)

Replace “Your Home – Design for Lifestyle and the Future” with “www.yourhome.gov.au”.

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