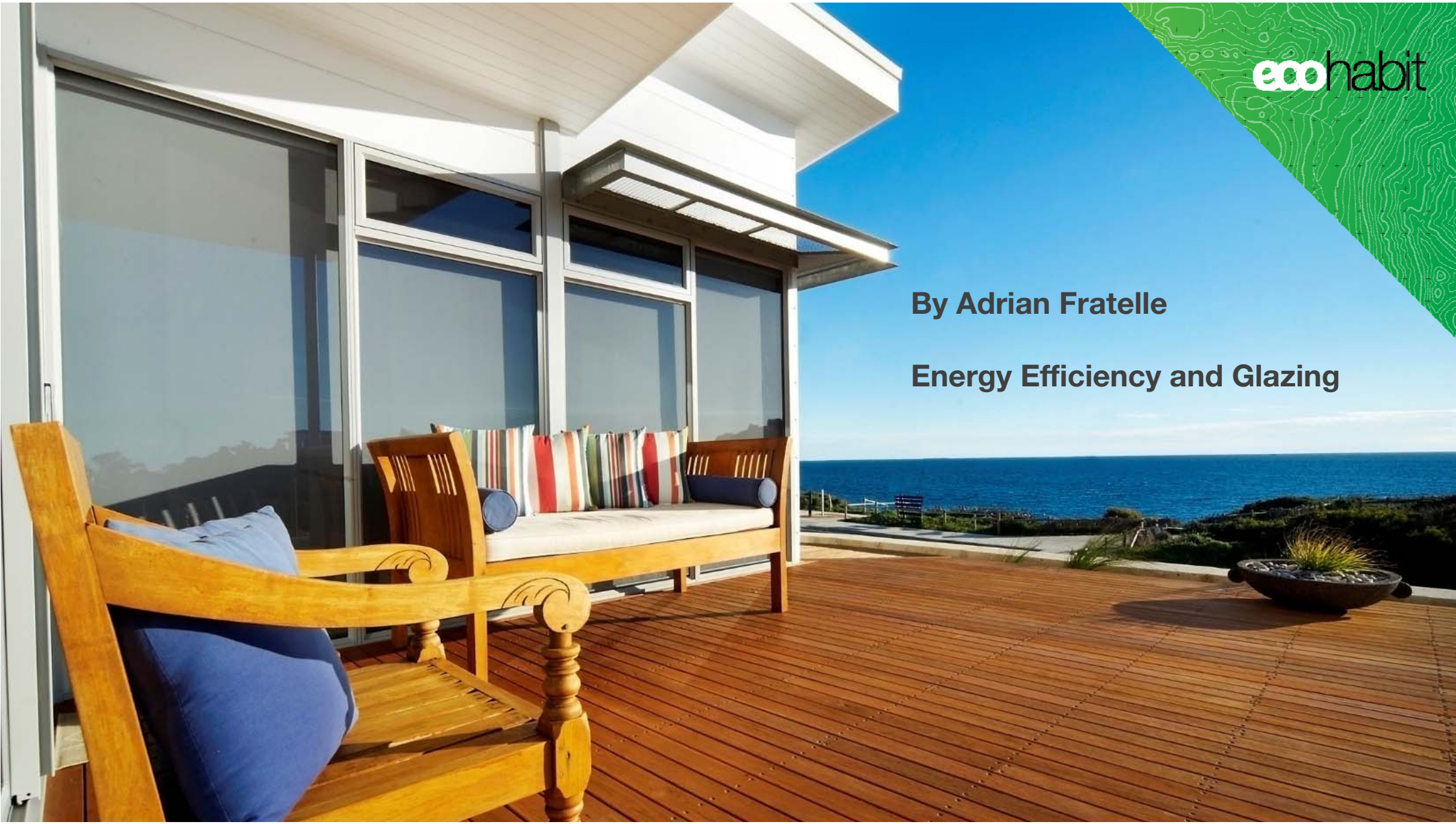


ecohabit

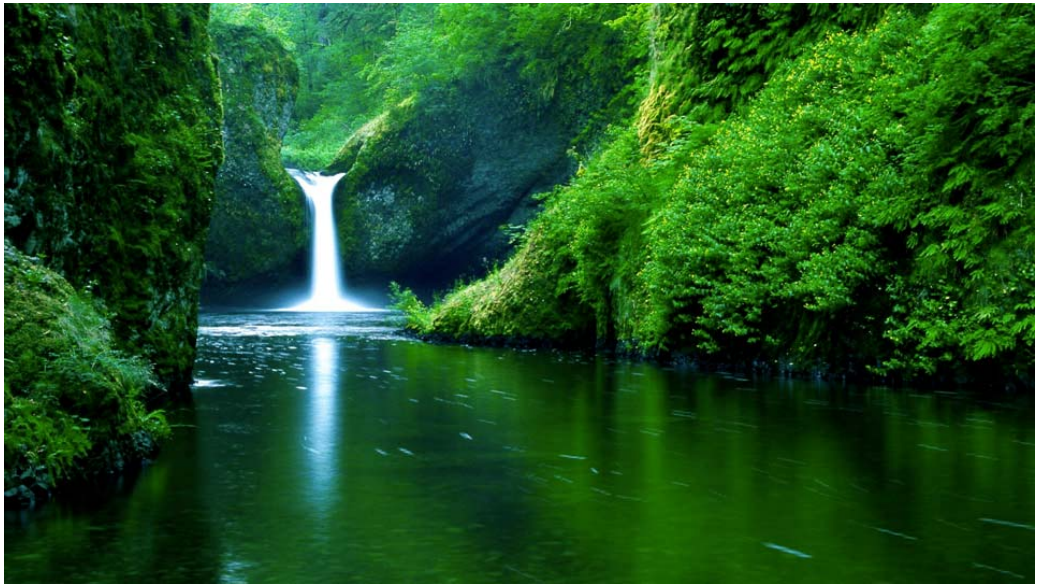
By Adrian Fratelle

Energy Efficiency and Glazing

Why should we build energy efficient homes?

Environmental

- Reduction in consumables
- Reduced production of pollutants



Legislation and Compliance

- NCC 2014 Building Code of Australia – Volume Two
- PART 1.2 ACCEPTANCE OF DESIGN AND CONSTRUCTION

PART 1.2 ACCEPTANCE OF DESIGN AND CONSTRUCTION

1.2.1 Suitability of materials

Every part of a building must be constructed in an appropriate manner to achieve the requirements of the *Housing Provisions*, using materials that are fit for the purpose for which they are intended.

1.2.2 Evidence of suitability

(a) Subject to **1.2.3** and **1.2.4**, evidence to support that the use of a material, form of construction or design meets a *Performance Requirement* or a *Deemed-to-Satisfy Provision* may be in the form of one or a combination of the following:

- (i) A report issued by a *Registered Testing Authority*, showing that the material or form of construction has been submitted to the tests listed in the report, and setting out the results of those tests and any other relevant information that demonstrates its suitability for use in the building.
- (ii) A current *Certificate of Conformity* or a current *Certificate of Accreditation*.
- (iii) A certificate from a *professional engineer* or other appropriately qualified person which—
  - (A) certifies that a material, design or form of construction complies with the requirements of the *Housing Provisions*; and
  - (B) sets out the basis on which it is given and the extent to which relevant specifications, rules, codes of practice or other publications have been relied upon.
- (iv) A current certificate issued by a product certification body that has been accredited by the Joint Accreditation Scheme of Australia and New Zealand (JAS–ANZ).
- (v) * * * * *
- (vi) Any other form of documentary evidence that correctly describes the properties and performance of the material or form of construction and adequately demonstrates its suitability for use in the building.

(b) Evidence to support that a calculation method complies with an ABCB protocol may be in the form of one or a combination of the following:

- (i) A certificate from a *professional engineer* or other appropriately qualified person which—
  - (A) certifies that the calculation method complies with a relevant ABCB protocol; and
  - (B) sets out the basis on which it is given and the extent to which relevant specifications, rules, codes of practice and other publications have been relied upon.
- (ii) Any other form of documentary evidence that correctly describes how the calculation method complies with a relevant ABCB protocol.

(c) Any copy of documentary evidence submitted, must be a complete copy of the original report or document.

1.2.3 Fire resistance of building elements

Where a *Deemed-to-Satisfy Provision* requires a building element to have an FRL, it must comply with the acceptable construction method or be determined in accordance with **Specification A2.3** of BCA Volume One.

1.2.4 Fire hazard properties

Where a *Deemed-to-Satisfy Provision* requires a building component or assembly to have a fire hazard property index, it must be determined in accordance with **Specification A2.4** of BCA Volume One.

Explanatory information:

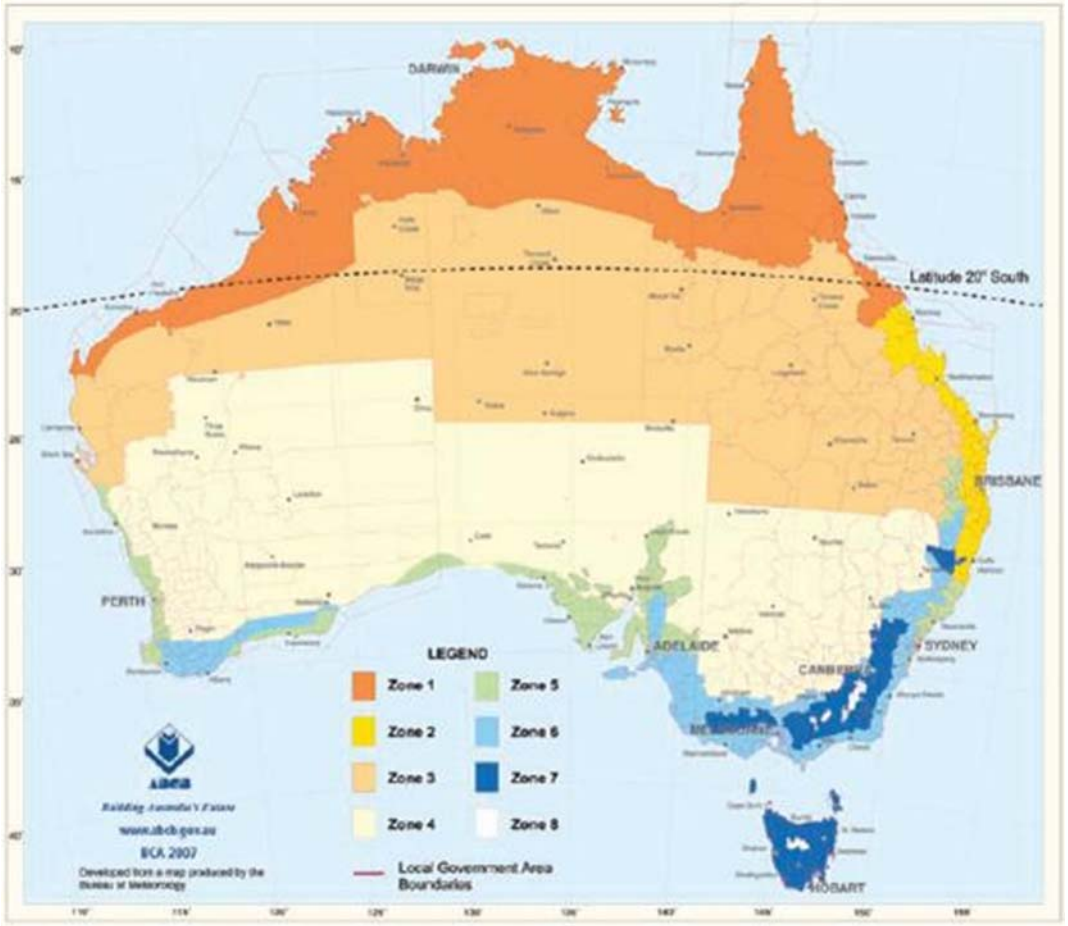
The provisions of **Part 1.2** list acceptable methods to enable verification and acceptance of both the *Performance Requirements* (listed in **Section 2**) and *Deemed-to-Satisfy Provisions* (listed in **Section 3**) of the *Housing Provisions*.

Mandatory Disclosure - It’s Coming?

Your Own Comfort

How do we assess a home?

NCC Climate Zone Map



Climate Zone 1

- Hot conditions only
- Easier to gain compliance

Climate Zone 5

- Cold and hot conditions
- Compliance harder to achieve

Winter

Summer

Thermal Assessments

Materials		
Windows	Type	Low-E glazing
	Frame	Aluminium
	U-Value	4.8
	SHGC	0.51
	VLT	59
External Walls	Construction	Steel Framed Walls
		(assumed 90mm Stud or similar)
	R-Value	R2.94
	Insulation	R2.5 batts with Air-cell Permishield or similar
Internal Walls	Construction	Framed walls
	Insulation	R2 batts
Floors	Construction	Suspended Timber Frame
	Insulation	R4 batts
Ceiling (upper floor)	Construction	Plasterboard
	Insulation	R4.0 batts
Roof	Construction	Metal roof cover
	Insulation	None specified
	Colour	As per plans

Thermal Assessments

	Zone	Cooling (MJ/m2)	Heating (MJ/m2)	Total (MJ/m2)	% energy use	Glazing to Floor ratio	Star Rating
1	Entry	16.3	48.4	64.6	4	20.3	4.3
2	Stairs	3.7	48.9	52.7	1		4.9
3	Kitchen /Living/ Dining	42.4	40.9	83.3	31	53.1	3.6
4	Pantry	14.7	49.7	64.5	2		4.3
5	Activity	6.3	64.2	70.4	5	15.7	4.1
6	Bedroom 3	7.1	12.0	19.1	2	14.6	8.1
7	Bedroom 2	6.8	10.6	17.4	2	14.6	8.3
8	Upper Living Room	77.0	118.0	195.0	33	63.1	1.4
9	Master bedroom	17.7	49.9	67.6	7	59	4.2
10	WIR	8.4	22.1	30.5	2		6.9
11	Ens	10.6	98.2	108.8		15.6	2.9
12	Study	15.7	103.2	118.9	8	7.4	2.7

	Cooling	Heating	Total	Star Rating
TOTAL ADJUSTED	31.7	57.5	89.2	3.4

Controlling heat loss and heat gain ...the science

Heat Transfer

- Conduction
  - Occurs in solids
  - Vibrating atoms
- Convection
  - Occurs in liquids and gases
  - Caused by movement due to substance becoming buoyant
- Radiation
  - Energized particles or waves travelling through a medium or space

Facts

- Heat transfer happens when there is a temperature differential from inside the building to the outside
- The rate of heat transfer is very much dependent on the conductivity of the structure itself and the temperature differential
- **Air is a bad conductor of heat thus provides good insulation**

R-Value

- Is the ratio of the temperature difference across a material

$$\mathcal{R} = \frac{d}{K}$$

- Where
  - d = Thickness of material
  - K = Conduction coefficient

- **Higher R-Value = better the insulation (slower heat transfer)**

Material	ft²·°F·h/(BTU·in)
Vacuum insulated panel	R-30–R-50
Silica aerogel	R-10
Polyurethane rigid panel (CFC/HCFC expanded) initial	R-7–R-8
Closed-cell polyurethane spray foam	R-5.5–R-6.5
Thinsulate clothing insulation	R-5.75
Polystyrene board	R-5.00
High-density fiberglass batts	R-3.6–R-5
Air-entrained concrete	R-3.90
Fiberglass batts	R-3.1–R-4.3
Cardboard	R-3–R-4
wool batts	R-3–R-3.85
Cellulose loose-fill	R-3–R-3.8
Cellulose wet-spray	R-3–R-3.8

Material	ft²·°F·h/(BTU·in)
Rock and slag wool loose-fill	R-2.5–R-3.7
Fiberglass loose-fill	R-2.5–R-3.7
Wood panels, such as sheathing	R-2.5
Fiberglass rigid panel	R-2.5
Straw bale	R-1.45
Softwood (most)	R-1.41
Wood chips and other loose-fill wood products	R-1
Snow	R-1
Hardwood (most)	R-0.71
Brick	R-0.2
Glass	R-0.14
Poured concrete	R-0.08

U-Value

- Describes how well a building element conducts heat

$$U = \frac{K}{L}$$

- Where
  - K = Conduction coefficient
  - L = Thickness of material

- **Smaller U-Value = better at reducing heat transfer**

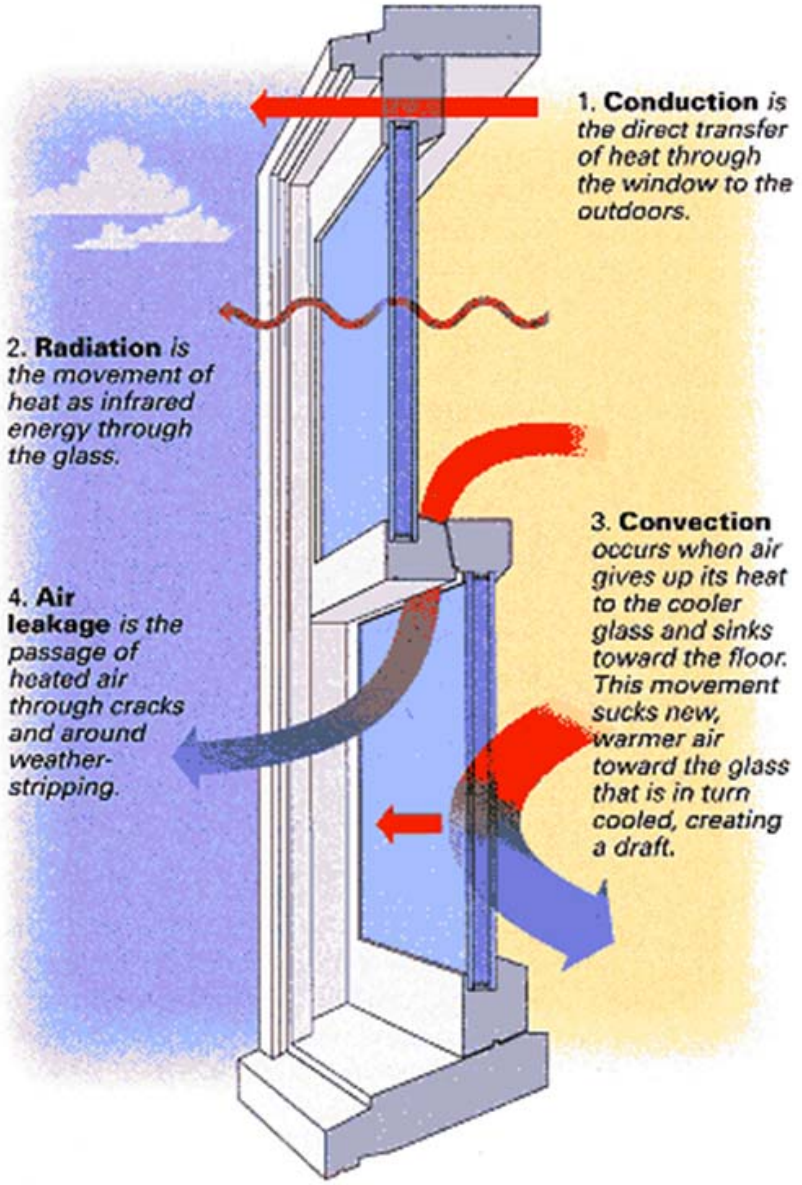
Masonry	200mm Brick	0.41
	300mm Brick	0.31
	400mm Brick	0.25
Poured Concrete	50mm Thick	0.99
	100mm Thick	0.86
	200mm Thick	0.67
	300mm Thick	0.55
Glass	Single Pane	1.22
	Double Pane	0.70

Controlling heat loss and heat gain

...focus on the weakest link

And the weakest link is

...glazing


1. **Conduction** *is the direct transfer of heat through the window to the outdoors.*
2. **Radiation** *is the movement of heat as infrared energy through the glass.*
3. **Convection** *occurs when air gives up its heat to the cooler glass and sinks toward the floor. This movement sucks new, warmer air toward the glass that is in turn cooled, creating a draft.*
4. **Air leakage** *is the passage of heated air through cracks and around weather-stripping.*

Focus on:

- Conduction
- Radiation

U-Value / SHGC

- **U-Value**
  - Measurement unit is watts per m2 per degree Celsius (W/m2º C) and is a measure of the rate of heat loss through glazing due to environmental differences between outdoor and indoor air.
  - **Lower the number = the better at reducing heat transfer**

- **SHGC (Solar Heat Gain Coefficient)**
  - The proportion of total solar radiation that is transferred through the glass at normal incidence. **Lower the number = the better the solar performance.**

Insulation = R-value = **BIG** Numbers

Windows = U-value = little numbers

Windows = SHGC = little numbers

Radiation – Film / Tinting

Conduction – Double Glaze

Viridian single glazing

Product Name	Nominal Thickness	Visible			Solar		UV Trans	U Value	SHGC	Shading Co.	Weight m²
		Trans.	Refl. Out	Refl. In	Trans.	Refl.					
Viridian VFloat™											
Clear	6	88	8	8	78	7	60	5.8	0.82	0.95	15
Viridian ComfortPlus™											
Grey 37 (#4)	8.38	37	6	9	27	6	<1	3.6	0.39	0.46	20.4

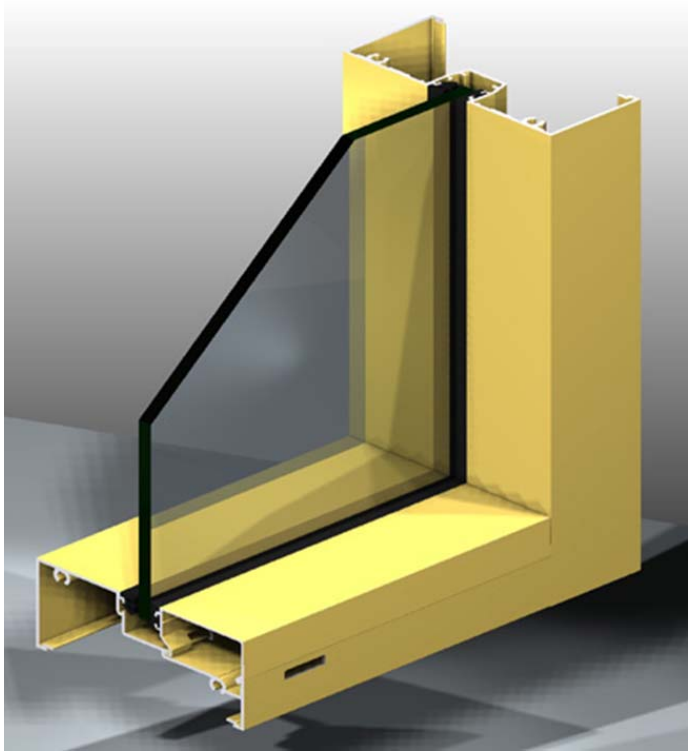
Viridian Thermotech™ insulating glass units

Product Name	Nominal Thickness	Visible			Solar		UV Trans.	U Value		SHGC	Shading Co.	Weight m²
		Trans.	Refl. Out	Refl. In	Trans.	Refl.		Air	Argon			
Viridian VFloat™												
Clear	6+12+6	78	15	15	62	12	44	2.7	2.5	0.71	0.82	30

Window frames

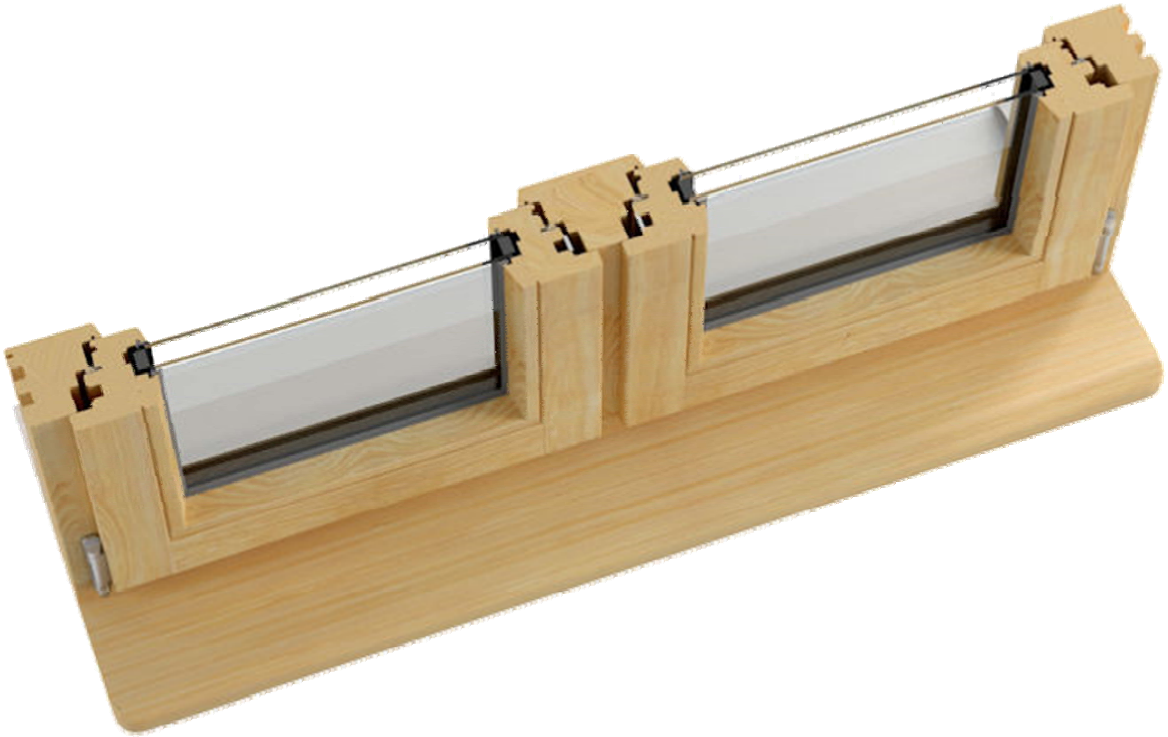
Window Frames

- Aluminium frame single glazed



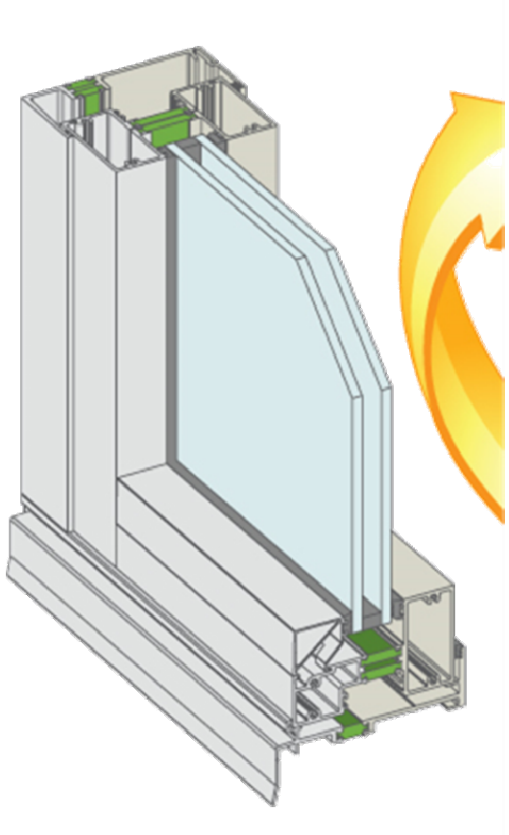
Window Frames

- Timber frame double glazed



Window Frames

- Thermally broken aluminium frame double glazed



Window Frames

- PVC frame double glazed

Window styles

Window Styles

- Sliding window

Window Styles

- Louvered window

Windows Styles

- Awning and hopper window

Windows Styles

- Double hung window

Window Styles

- Casement window

Window Styles

- Casement window

9310B-90

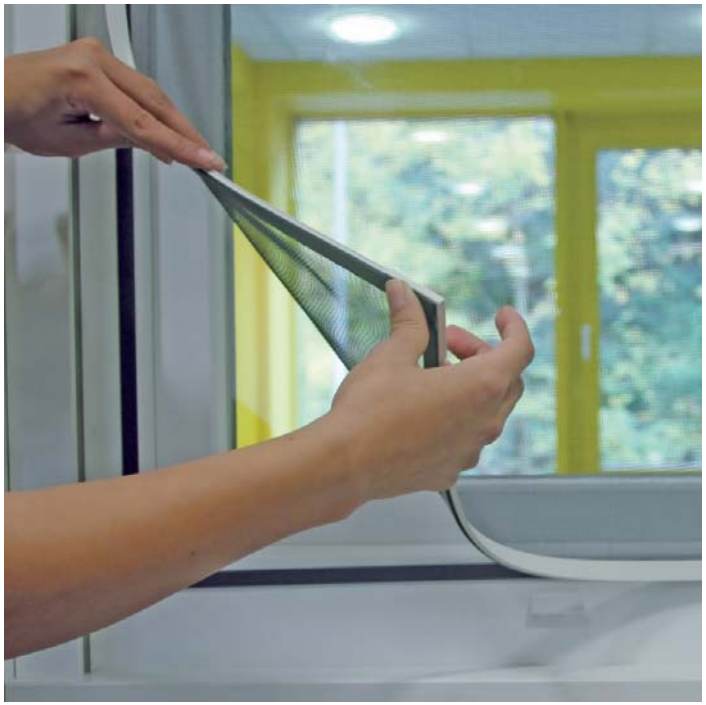
Window Styles

- Tilt and Turn

Fly Screens and Security Screens

- Cut down light and ventilation

Fly Screens and Security Screens



Thankyou

Insulation	-	R-value	-	**BIG** Numbers
Windows	-	U-value	-	little numbers
Windows	-	SHGC	-	little numbers