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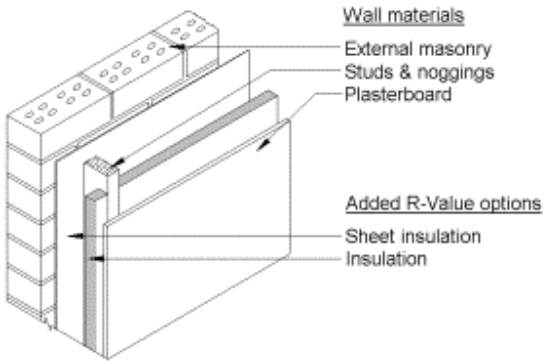
BCA 2006 Energy Efficiency Requirements and How They Apply to Alterations and Additions

Building Fabric

Class 1 Buildings (Housing)

Part 3.12.1 of the Housing Provisions of the BCA 2006 specifies insulation requirements for walls, roofs and floors. The requirements are stated in the form of **total R-Value**. For instance, when calculating the insulation needed to gain compliance for a brick veneer wall, the wall frame and brickwork is included in the walls' total R-Value. (See diagram below)



The requirements for Climate Zone 7 (i.e. ACT) are listed below.

Roofs - Total R-Value of 4.3

Walls - Total R-Value of 2.4

Floors - Suspended with enclosed perimeter – Total R-Value of 1.5
Suspended with unenclosed perimeter – Total R-Value of 2.5

Refer to Part 3.12.1 of the Housing Provisions of the BCA 2006 for further requirements.

Attached 10a Buildings (Garages, Store rooms etc.)

Class 10a buildings attached to a Class 1a building (house) must;

a) have an external fabric that achieves the required level of thermal performance for a Class 1 building (see above); or
b) be separated from a Class 1 building with construction having the required level of thermal performance for a Class 1 building.

In plain English, this means an attached garage etc. must either be insulated to the same requirements for a house or be separated from a house with a wall and/or ceiling insulated to the same requirements for a house.

External Glazing

Part 3.12.2 of the Housing Provisions of the BCA 2006 outlines the requirements for external glazing in new building work. Any new glazing, in an extension or new windows in existing walls, is required to comply with the BCA 2006.

In most cases for alterations and additions it is unreasonable for new glazing in an extension to compensate for the poor performance of existing glazing. In this instance, it would be reasonable to determine compliance as if the new glazing were uniformly applied to the whole storey of a house but only require the complying glazing to be installed in the extension.

Australian Building Codes Board Glazing Calculator

Compliance for external glazing is demonstrated by achieving a pass on the Australian Building Codes Board's Glazing Calculator. The calculator is designed to be applied to each storey of a house. For instance, a two storey house must have two passed glazing calculators (one for each storey) to demonstrate compliance.

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Before anyone should attempt to use the glazing calculator, there are two important values that must be obtained. A window's **U-Value** and **Solar Heat Gain Coefficient** (SHGC) are used to determine glazing compliance.

These values can either be obtained from the window manufacturer or from the generic values supplied by Window Energy Rating Scheme (WERS).

There are three important things to remember when obtaining these values.

1. The values **must** be in National Fenestration Rating Council (NFRC) format.

2. They must be for **total windows systems, NOT JUST GLASS**.

3. Values **must** be able to be substantiated by the window manufacturer. A certificate confirming the values will be required at the end of the project prior to obtaining a Certificate of Occupancy. This may not be required if generic values are used, however a certificate confirming the types of windows installed will be required.

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Glazing Calculator Example

The following is an example to help demonstrate how the glazing calculator is applied to alterations and additions.

I own a single storey, 150m^2 house in Deakin that is slab-on-ground and I am proposing a 30m^2 extension. The windows I propose to use in the extension are standard aluminium frame with 3/6/3 air filled double glazed units. According to the WERS generic values the windows have a U-Value of 4.8 and a Solar Heat Gain Coefficient (SHGC) of 0.67.

I then begin to input the data into the glazing calculator (see attached glazing calculator example).

1. *I firstly input the climate zone 7 (Canberra)*

2. *Secondly, a brief description of the dwelling*

3. *Then I input the storey*

4. *In the floor area box under Type A (Slab-on-ground) I input the total floor area of the house **including** the proposed extension*

5. *In the air movement box I put an 'S' for standard air movement*

6. *Now I begin to input each glazing unit into the table. This includes all glazing units from the old house and the extension. Remember to determine compliance all glazing must be included but only complying glazing needs to be installed in the extension*

Once I have put all the glazing units into the calculator I either get a pass or a fail. If I get a pass I forward on a printed copy onto my Building Certifier to demonstrate the proposed glazing in my extension complies with the BCA 2006. If I get a fail I must go back and either look at using a different window system or reduce the size of my windows.

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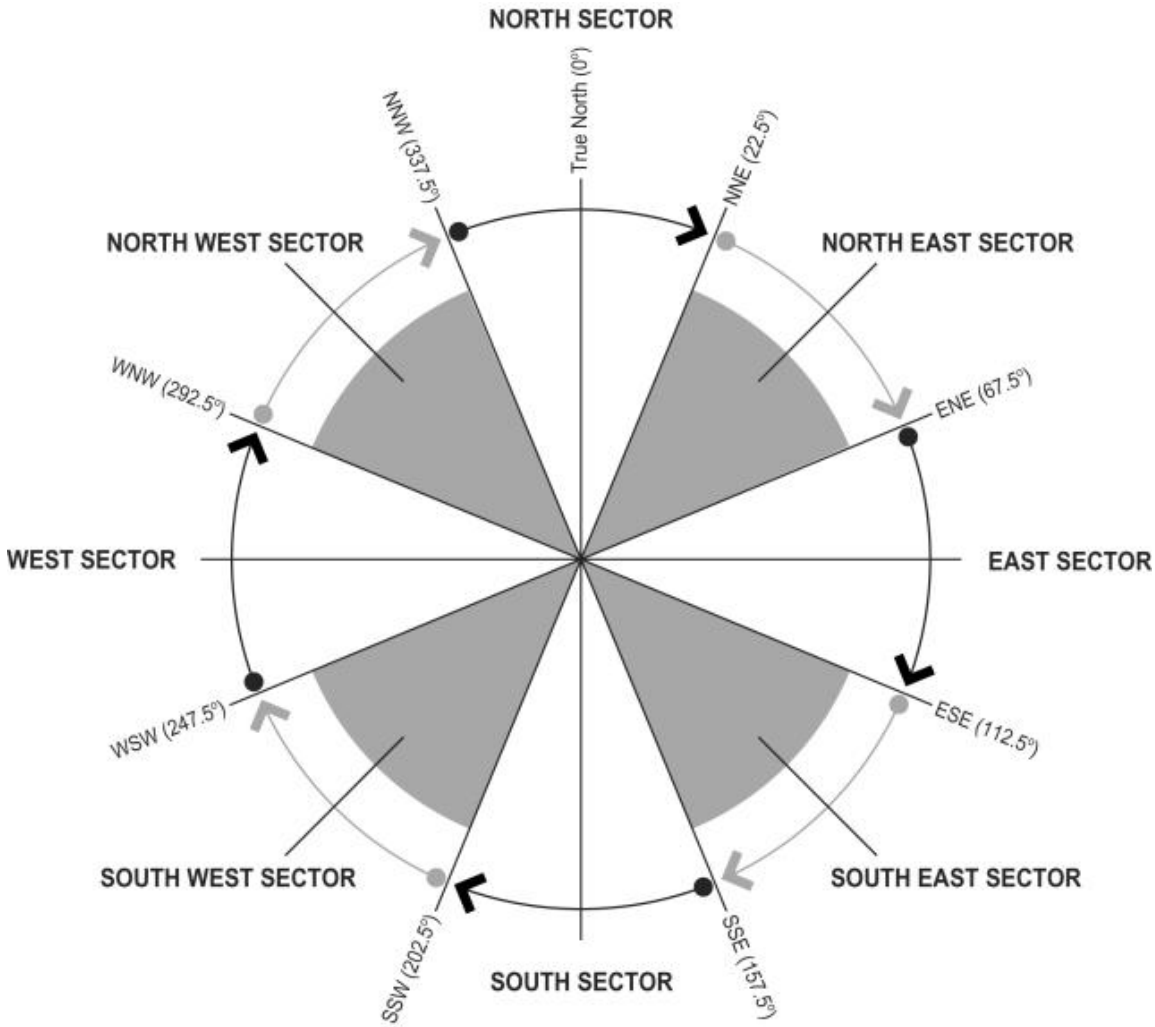
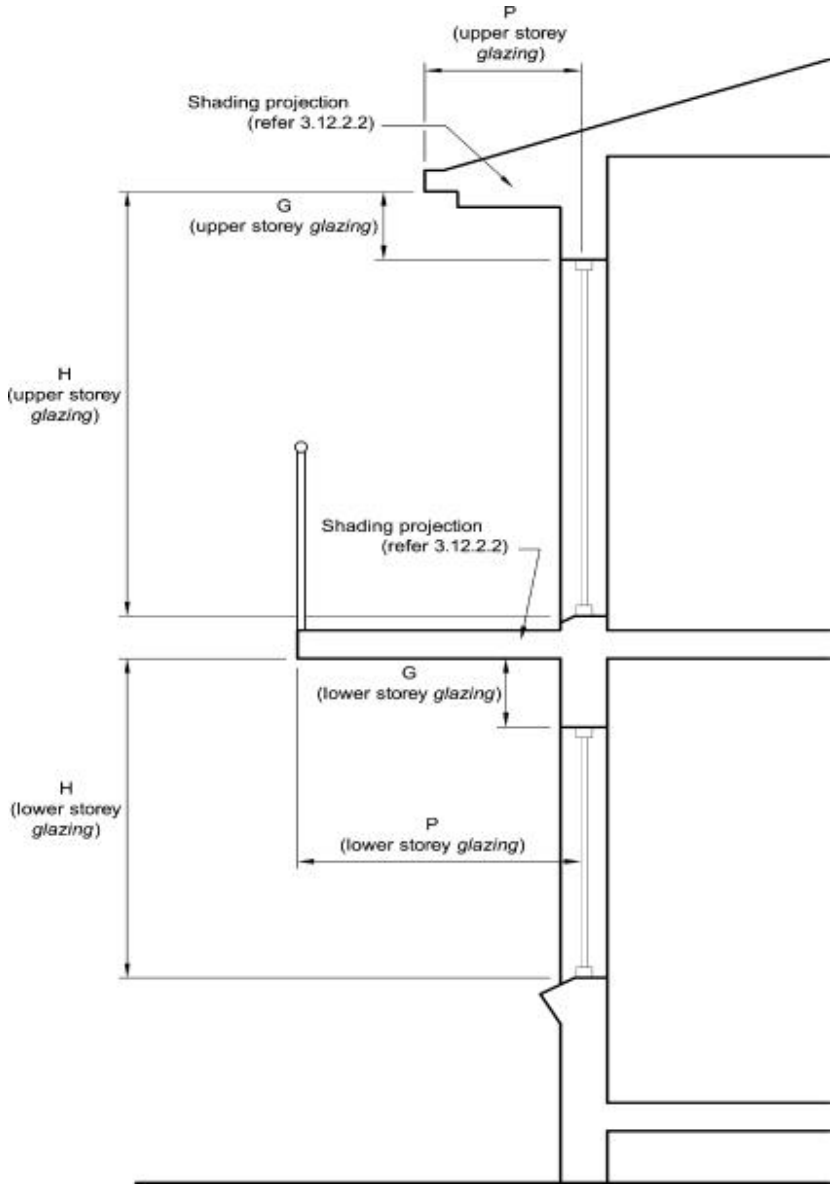
Diagrams for Assistance with the Glazing Calculator



1) Orientation Sectors



2) Method of Measuring Shading (P & H)

GLAZING CALCULATOR FOR USE WITH PART 3.12.2, BCA VOLUME TWO (HOUSING)

Climate zone: **7**

Building name/description: **Deakin Block 10 Section 34 - Family Room Addition**

Storey: **1**

Floor type	Type A	Type B
Area of floor	180m²	
Air movement	S	

Note: Air movement level must be separately verified

Glazing area 26.7m² ..... (15% of area of floor Type A)

CONSTANTS	Type A	Type B
C_U / C_{SHGC}	1.4 / 0.26	

ALLOWANCES	
C_U x Area	252.0
C_{SHGC} x Area	46.8

Number of rows preferred in table below: **12** *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATION DATA			CALCULATED OUTCOMES - OK (if inputs are valid)			
Glazing element		Sector faced		Size			Performance		P&H or device		Exposure		Size	Conductance - PASSED		Solar heat gain - PASSED	
ID	Description (optional)	Floor type A	Floor type B	Height (m)	Width (m)	Area (m²)	*Total U-Value* (NFRC)	*SHGC* (NFRC)	P (m)	H (m)	P/H	E factor	Area used (m²)	U x area	Element share of % of allowance used	SHGC x E x area	Element share of % of allowance used
1	Kitchen Window	N		1.20	1.80		4.8	0.67	0.60	1.40	0.43	0.39	2.16	10.4	8% of 51%	0.6	5% of 26%
2	Family Window	E		2.10	1.80		4.8	0.67	0.60	2.30	0.26	0.88	3.78	18.1	14% of 51%	2.2	18% of 26%
3	Family Sliding Door	N		2.10	2.00		4.8	0.67	0.60	2.30	0.26	0.55	4.20	20.2	16% of 51%	1.5	13% of 26%
4	Lounge Window 1	E		1.20	1.80		4.8	0.67	0.60	1.40	0.43	0.75	2.16	10.4	8% of 51%	1.1	9% of 26%
5	Lounge Window 2	S		1.20	1.80		4.8	0.67	0.60	1.40	0.43	0.37	2.16	10.4	8% of 51%	0.5	4% of 26%
6	Bed 1 Window	W		2.10	1.50		4.8	0.67	0.60	2.30	0.26	0.86	3.15	15.1	12% of 51%	1.8	15% of 26%
7	Ensuite Window	S		0.90	0.40		4.8	0.67	0.60	1.10	0.55	0.34	0.36	1.7	1% of 51%	0.1	1% of 26%
8	Bed 2 Window	W		2.10	1.50		4.8	0.67	0.60	2.30	0.26	0.86	3.15	15.1	12% of 51%	1.8	15% of 26%
9	Bed 3 Window	W		2.10	1.50		4.8	0.67	0.60	2.30	0.26	0.86	3.15	15.1	12% of 51%	1.8	15% of 26%
10	Bathroom Window	N		1.20	1.20		4.8	0.67	0.60	1.40	0.43	0.39	1.44	6.9	5% of 51%	0.4	3% of 26%
11	Laundry Window	N		1.20	0.80		4.8	0.67	0.60	1.40	0.43	0.39	0.96	4.6	4% of 51%	0.2	2% of 26%
12																	

If inputs (including air movement levels) are valid

IMPORTANT NOTICE AND DISCLAIMER IN RESPECT OF THE GLAZING CALCULATOR

The Glazing Calculator has been developed by the ABCB to assist in developing a better understanding of glazing energy efficiency parameters.
While the ABCB believes that the Glazing Calculator, if used correctly, will produce accurate results, it is provided "as is" and without any representation or warranty of any kind, including that it is fit for any purpose or of merchantable quality, or functions as intended or at all.
Your use of the Glazing Calculator is entirely at your own risk and the ABCB accepts no liability of any kind.

2006 WERS Generic Products Directory - NFRC Interim Values

NOTES **www.wers.net**

1. U_w is the whole window *U-value*
2. $SHGC_w$ is the whole window *solar heat gain coefficient*
3. Percentage improvement figures are compared with using base-case Generic Window 1 (3mm clear in standard aluminium frame)
4. A negative percentage improvement figure indicates performance worse than the base-case window
5. A positive percentage improvement figure indicates performance better than the base-case window
6. Maximum air infiltration is 5.0L/s.m ^{2} at a positive pressure difference of 75 Pa as measured according to AS 2047
7. Static performance (U_w $SHGC_w$) calculated using Window 5.2 and Therm 5.2 software (LBNL), 2000-2003
8. Annual energy performance (stars and % improvements) calculated using Nationwide House Energy Rating Software (NatHERS) according to procedures of WERS 2004.

GENERIC DATA Version 2.1			COOLING	HEATING	Total Window System Values NFRC-100		
No.	Glazing	FRAME	% impr.	% impr.	Uw	SHGCw	Air Inf.
1	3mm single clear	Al, standard industry typical	0%	0%	7.73	0.78	5
2	3mm single clear	Timber or uPVC	15%	15%	5.46	0.69	5
3	single solar control, pyrolytic low-e	Al, standard industry typical	28%	2%	5.76	0.48	5
4	single solar control, pyrolytic low-e	Al, thermally improved	34%	10%	4.71	0.47	5
5	single solar control, pyrolytic low-e	Timber or uPVC	42%	17%	3.67	0.41	5
6	3/6/3 clear IG, air fill	Al, standard industry typical	11%	17%	5.36	0.69	5
7	3/6/3 clear IG, air fill	Al, thermally improved	17%	25%	4.30	0.69	5
8	3/6/3 clear IG, air fill	Timber or uPVC	26%	31%	3.30	0.61	5
9	3/12/3 clear IG, air fill	Al, standard industry typical	12%	21%	5.00	0.69	5
10	3/12/3 clear IG, air fill	Al, thermally improved	18%	29%	3.93	0.69	5
11	3/12/3 clear IG, air fill	Timber or uPVC	27%	35%	2.96	0.61	5
12	3/12/4 pyrolytic low-e IG, argon fill	Al, standard industry typical	18%	29%	4.04	0.65	5
13	3/12/4 pyrolytic low-e IG, argon fill	Al, thermally improved	24%	37%	2.96	0.65	5
14	3/12/4 pyrolytic low-e IG, argon fill	Timber or uPVC	32%	43%	2.09	0.58	5
15	5mm toned	Al, standard industry typical	16%	-10%	7.67	0.57	5
16	5mm toned	Timber or uPVC	30%	6%	5.41	0.50	5
17	5mm supertoned	Al, standard industry typical	20%	-13%	7.67	0.53	5
18	5mm supertoned	Timber or uPVC	35%	3%	5.41	0.47	5
19	5/6/5 toned IG with air fill	Al, standard industry typical	29%	5%	5.33	0.47	5
20	5/6/5 toned IG with air fill	Al, thermally improved	35%	13%	4.26	0.46	5
21	5/6/5 toned IG with air fill	Timber or uPVC	43%	20%	3.27	0.41	5
22	5/12/4 supertoned low-e IG with argon fill	Al, standard industry typical	42%	13%	4.03	0.38	5
23	5/12/4 supertoned low-e IG with argon fill	Al, thermally improved	48%	21%	2.96	0.37	5
24	5/12/4 supertoned low-e IG with argon fill	Timber or uPVC	55%	28%	2.08	0.33	5
25	6/10/4 supertoned low-e IG with argon fill	Al, standard industry typical	47%	9%	4.07	0.33	5
26	6/10/4 supertoned low-e IG with argon fill	Al, thermally improved	54%	17%	3.00	0.32	5
27	6/10/4 supertoned low-e IG with argon fill	Timber or uPVC	61%	24%	2.12	0.28	5