

MEDIA RELEASE

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**INDUSTRY ALERT: Use of Outdated ASHRAE Method Linked to Decreased Energy Efficiency of Glass by as Much as 22%**



**All specifiers must use data obtained from an Accredited Simulation Laboratory which follows the NFRC standard and uses the software tool WINDOW 5.2 to calculate the U-Value and SHGC, when determining frame and glass performance in order to meet the energy efficiency requirements of the BCA.**

In 2006 the Building Code of Australia made the transition to the US National Fenestration Rating Council (NFRC) system and replaced older reference conditions such as ANAC (Australian National Average Conditions). Also replaced were some superseded conditions of the American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE). According to Dr Lyons, at the same time, this progressive move to NFRC has inadvertently opened the door for specifiers to under or overstate the energy efficiency of fenestration systems.

In complying with the Building Code of Australia, WINDOW 5.2 is currently the only ISO-compliant modelling tool approved by NFRC and its Australian licensee, the AFRC. The AFRC was formed in 2007 to administer the NRFC rating system in Australia and to ensure that ratings allow for fair and independent comparisons between products. (Note that WINDOW 5.2 is unrelated to Microsoft Windows).

Despite an awareness campaign when the BCA first implemented the NFRC method, some practitioners continue to use an outdated set of ASHRAE environmental conditions to determine the U-Value and SHGC of windows. "While some specifiers may genuinely not be aware of the difference between older ASHRAE and current NFRC conditions, significant numbers of projects are being supplied where the old ASHRAE conditions have been used to calculate performance," says Dr Lyons. In particular the ASHRAE Summer condition can result in a more flattering (lower) U-Value in comparison to that determined from current NFRC conditions.

The numbers produced by any calculation method are dependent on the environmental conditions used. If these conditions are altered then the resulting apparent performance will change.

Tables 1 and 2 below show the subtle but important differences between the old ASHRAE Summer and Winter conditions, on the one hand, and the new, unified NFRC 100-2001 conditions on the other. The examples shown are calculated at current NFRC conditions and are compared with results calculated using the old, superseded ASHRAE Winter and ASHRAE Summer conditions.

**Table 1. Current conditions used to calculate performance data: NFRC 100-2001 (unified, updated combination of Winter for U-Value and Summer for SHGC).**

Parameter	External Temp	Internal Temp	Ext Wind Speed	Solar Intensity
SHGC	32 degC	24 degC	2.8 m/s	783 W/m <sup>2</sup>
U-Value	-18 degC	21 degC	5.5 m/s	0 W/m <sup>2</sup>

**Table 2. The ‘old’ ASHRAE conditions had both summer and winter conditions which were -**

**Old ASHRAE Winter**

Parameter	External Temp	Internal Temp	Ext Wind Speed	Solar Intensity
SHGC	-17.8 degC	21.1 degC	6.7 m/s	0 W/m <sup>2</sup>
U-Value	-17.8 degC	21.1 degC	6.7 m/s	0 W/m <sup>2</sup>

**Old ASHRAE Summer**

Parameter	External Temp	Internal Temp	Ext Wind Speed	Solar Intensity
SHGC	31.7 degC	23.9 degC	3.4 m/s	783 W/m <sup>2</sup>
U-Value	31.7 degC	23.9 degC	3.4 m/s	783 W/m <sup>2</sup>

“There are numerous examples where the same piece of glass can meet or exceed minimum performance utilising ASHRAE Summer for U-Value but not when the unified NFRC 100-2001 conditions are applied,” says Dr Lyons. The onus is on the specifiers and builders to ensure the glass provided meets the performance criteria utilising the NFRC method to comply with the BCA requirements of section J - energy efficiency.

Viridian’s Technical Manager, Lynton Wombwell, says it’s important that everyone involved in the glazing industry is aware that using the ASHRAE method can miscalculate the energy efficiency of glass and windows.



“Using the old ASHRAE method to calculate the thermal performance of glass can result in the U-Value and SHGC being exaggerated. Consumers are receiving a less energy efficient product than requested, or being quoted incorrect performance data, all because the wrong method has been used,” says Lynton.

“This is of particular concern in cases where specifiers are already looking to use a product which

barely meets Code requirements. If the performance data is calculated using the old ASHRAE method then it’s probable that if recalculated with the NFRC method it won’t meet that minimum level.”

If using imported products it is equally important to check that the correct rating method has been used, as older, non-NFRC compliant figures are more commonly used from imported products. For a product to be rated using the NFRC method, the optical characteristics of its glazing system must be listed in the International Glazing Database (IGDB); the IGDB uses an independent testing and peer-review protocol.

To ensure compliance with the Code, specifiers must use performance data derived using the NFRC system and using WINDOW 5.2.

Glass is only one component of the window. To comply with the BCA, frame data also needs to be included in the calculation. Such frame data can be either default ('generic') numbers which will be punitive, or custom, ie. specific to that system and derived from a THERM5 simulation. The Glazing Calculator, which is a free download from the BCA website, requires whole-system performance data. Although its name implies that it performs the whole-window calculation from the sum of its parts, in fact it relies on the user to supply this and other façade information and then tells the user whether the overall façade complies with the BCA.

It is imperative that WINDOW 5.2 is used as it provides a heat transfer analysis method consistent with ISO 15099. There was a period in the recent past where the previous WINDOW 4.1 was used which provided different answers for the same conditions. WINDOW 4.1 is now obsolete and was de-listed several years ago by NFRC as an approved rating tool; it should not be used.

### NFRC v 'old' ASHRAE calculated using WINDOW 5.2

This table shows the performance parameters for each of the environmental conditions so you can see the difference between the old and new rating methods:

Glass Type	NFRC 100-2001		Old ASHRAE Winter			Old ASHRAE Summer			
	SHGC	U-Value	SHGC	U-Value	U-Value % of NFRC	SHGC	SHGC % of NFRC	U-Value	U-Value % of NFRC
6.38 ComfortPlus Neutral 59	0.512	3.645	N/A	3.719	<b>102.0</b>	0.504	<b>98.4</b>	2.858	<b>78.4</b>
6.38 ComfortPlus Neutral 59/ 12mm air / 6mm Clear	0.434	1.891	N/A	1.910	<b>101.0</b>	0.429	<b>98.9</b>	1.934	<b>102.3</b>

Please note: generally, the lower the U-Value and SHGC the better the performance. However in colder climates the combination of a high SHGC (increasing passive solar gain) combined with a low U-Value returns the lowest annual heating bill.

It is important to note from the results for ComfortPlus (single-glazed) in the above table that using the ASHRAE Summer conditions can make the same product U-Value 22% lower (better) than the U-Value determined under NFRC 100-2001 conditions.

"Performance data determined under different environmental conditions and calculation methods cannot be directly or realistically compared," says Dr Lyons. Those working in the industry, including architects, specifiers and glaziers, must ensure that the performance data they use is determined by the correct method – from both technical and Quality Assurance viewpoints. In order to achieve this they should ask the following questions:

**1. What set of environmental conditions has been used?**

The answer should be **NFRC 100-2001**.

**2. What calculation standard has been used?**

The answer should be ISO 15099:2003.

**3. What modelling tool has been used?**

The answer should be **WINDOW 5.2**, which will implicitly and automatically satisfy question 2.

**4. What agency has issued the window performance rating report?**

The answer should be an **NFRC or AFRC Accredited Simulation Laboratory**. See [www.afrc.org.au](http://www.afrc.org.au) for details.

In short, all specifiers must use performance data derived using the NFRC system and WINDOW 5.2 to determine the U-Value and SHGC in order to meet the energy-efficiency requirements of the BCA.

**Understanding U-Value and SHGC**

The Solar Heat Gain Coefficient (SHGC) measures the amount of solar radiation transferred through the combination of glass and frame (direct transmission plus indirect heat gain via inward transfer of absorbed solar radiation) and released into the home as heat. A lower SHGC indicates less heat entering the building and generally provides a more energy efficient building envelope. except under winter conditions where a high SHGC is desirable because it will lead to lower annual heating energy and lower greenhouse gas emissions.

The U-Value measures a window's resistance to heat flow when there is a temperature difference across the window, and takes into account the effect of frame, glass, seal and any spacers. The lower the U-value, the higher the energy efficiency of the product.