Are your windows really as energy efficient as you think?

Investigations into thermal performance values of inline reveal windows

When selecting windows and doors there are a number of factors which influence your purchase decision. In recent times Energy Performance has become a big one. The WERS (Window Energy Rating Scheme) rating of a window helps us to understand how that window is likely to perform in a real life application, providing consumers with a tool to compare and contrast the thermal performance of different windows and doors to make an informed purchase decision.

These values are published by the Australian Window Association on the WERS database.

WERS is designed to provide a scientifically based, fair and credible rating system for the assessment of fenestration products for their energy efficiency performance. WERS is accredited by the Australian Fenestration Rating Council (AFRC) and adheres to AFRC protocols and procedures for the rating of windows and glazed doors. Energy Ratings provided by WERS are third party certified to the AFRC requirements, compliant with the National Construction Code (NCC), and able to be used to meet regulatory requirements.[1]

But the big question is: Are they correct?

Although AFRC protocols and procedures are based on the internationally recognised protocols, procedures and tools of the National Fenestration Rating Council (NFRC), there is a fundamental difference in the way the AFRC protocols are applied when compared to the NFRC protocols.

For the majority of window types, the AFRC has no mandatory requirement to physically test the thermal performance of a window or door. Rating numbers are based primarily on the result of a 2-stage computer based simulation process.[2]

In other parts of the world where NFRC protocols have been adopted, the computer simulated performance numbers of a window are thoroughly validated against physical laboratory tests to ensure the results align. Any deviation of more than 10% in the results between computer simulation and physical testing will be considered by the NFRC as an inaccurate representation of the Energy Performance on real life applications. The NFRC validation protocols greatly improve the accuracy of the results for consumers and provide a credible indication of how that window is likely to perform.

For traditional window constructions and materials such as aluminium and thermally broken aluminium, the AFRC approach (i.e. of computer simulation only) proves to be fairly accurate. For these types of products there is a significant body of empirical test data existing around the world with which simulation factors and rules can be compared and calibrated to fine-tune their accuracy.

For the Australian inline reveal variant, our independent research demonstrates computer simulation alone is not a reliable predictor of actual thermal performance.

An inline reveal window can be described as a window or door product where a reveal is positioned in a way which covers a portion of the perimeter frame.

What does this mean for consumers?

AWS has undertaken physical laboratory testing of the thermal performance of inline reveal windows. This testing was conducted independently by an NFRC accredited laboratory under the guidance of NFRC staff. The results across three popular Australian inline reveal window brands demonstrated a significant variation between the actual physical and computer simulated results on the thermal performance of real world sized inline reveal windows, in some instances greater than 15%. As part of this research AWS specifically investigated the benefit of an applied inline reveal window on the thermal performance of the window.

> **Our results indicated there was no statistically significant improvement to the thermal performance of a real world size window to be gained from the application of an inline reveal.**

This leads us to conclude that the promotion of the inline reveal as thermally efficient is inaccurate and may be potentially misleading to consumers[3].

Australian inline reveal awning window being tested in accordance with NFRC testing procedures at Architectural Testing INC. in Fresno USA, 2016.

About our study

- Physical testing and analysis undertaken by Architectural Testing Inc. NFRC accredited laboratory in Fresno USA.
- More than 50 individual product variations tested including inline reveal windows from three Australian manufacturers with a variety of glass types and assembly configurations.
- At the time of publishing, this study represents the largest body of physical test data relating to the thermal performance of inline reveal windows in Australia.

Our findings

- AFRC simulation of inline reveal windows and doors is not consistent with current NFRC rules (TIR-2015-03) which stipulate that windows and doors with inline reveals should not be simulated with the reveal in place[4].
- Extensive physical testing across three popular Australian inline reveal brands demonstrated a significant variation between computer simulated performance numbers and physical test results, in some instances greater than 15%.
- The presence of an inline reveal does not provide statistically significant improvement to the energy efficiency of a window.
- Standard aluminium and thermally broken aluminium window products demonstrate a low level of variation between computer simulation and physical test results.

Conclusions

- Based on our study, the presence of an inline reveal does not significantly improve the energy efficiency of a window.
- Inline reveal windows are unlikely to exhibit thermal performance results consistent with the computer simulated outcomes when applied to real world applications.
- The current AFRC protocols for the simulation of Inline reveal windows may result in misleading WERS values.

REFERENCES

[1] *Window Energy Rating Scheme (WERS) Website https://www.wers.net/wers-home*
[2] *Window Energy Rating Scheme (WERS) Website https://www.wers.net/werscontent/about-wers*
[3] *Based on the results of 50+ Independent laboratory tests conducted at Architectural Testing Inc.(ATI) between 2012 and 2016 inclusive.*
[4] *NFRC 2010 Technical Interpretations Manual E1A23, April 7, 2017 pg 67 - TI-2015-03 07/07/2015*

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