




Enhancing Building Safety and Sustainability through Window Compliance: Insights and Pathways





Introduction

The integrity and compliance of building components are paramount to ensuring health, safety and sustainability in the evolving landscape of the building industry.

Among these components, windows play an essential role in the structural and environmental performance of buildings. Poorly manufactured or standard windows lose more heat in winter and gain more heat in summer than any other surface in a building.

This white paper delves into the multifaceted dimensions of window compliance within Australian standards and regulations, highlighting the economic, legal and social implications of non-conforming and non-compliant building products. It underscores the importance of rigorous independent testing and certification processes to mitigate risks and enhance occupants' living and working conditions.

Through a synthesis of industry insights and regulatory frameworks, this paper provides a comprehensive guide for stakeholders to navigate the complexities of window compliance, advocating for adopting tested and compliant products to achieve optimal energy efficiency and safety outcomes.



Safety - 'not a matter of luck'

The Building Ministers' Forum (BMF) has recognised the critical issue of non-conforming and non-compliant building products (NCBP), emphasising the potential for deaths and other significant health, safety, economic, legal and social consequences.

A non-complying product can pose severe risks to the building itself, people on the construction site and ultimately those who occupy it. Non-conforming building products are 'products and materials that claim to be something they are not; do not meet required standards for their intended application; or are marketed or supplied with the intent to deceive those who use them'.¹

The Senate Economics Reference Committee also recommended that the BMF note the value and importance of existing building industry initiatives, such as third-party industry certification schemes, in identifying instances of building product non-conformity.²

Windows are an integral part of buildings, and several Australian Standards cover their compliance; testing includes water penetration, wind loading, energy ratings, bushfire safety and more. Specifying a tested and compliant product reduces the need for project-based engineered solutions or deemed-to-satisfy provisions.

Australia's regulatory landscape and standards

The recently updated National Construction Code (NCC) requirements call for minimum energy efficiency for a new home's building shell of 7 stars out of 10 through the Nationwide House Energy Rating Scheme (NatHERS). The rating measures the energy needed to heat and cool a home, adjusting for different climate zones.²

As a performance-based code, the NCC sets the minimum required level for the safety, health, amenity, accessibility, and sustainability of new residential and apartment buildings, with different dates for transition and adoption in various States and Territories.³

To achieve a 7-star thermal energy rating under NatHERS, the design and building industries will need to lift the performance of window systems. Installing certified high-performance windows delivers greater comfort, significant energy costs, and reduced carbon emissions.

Various methods and schemes are used to test and prove that a building product or material is genuine and will perform as described. Multiple compliance pathways tied to performance accept various evidence to verify that a product conforms and complies with the NCC, including results from a registered testing authority.⁴

The NCC requires glazing products to be rated following the Australian Fenestration Rating Council (AFRC) protocols and procedures.

The Australian Standards AS2047 and AS1288 set out minimum mandatory specifications under the Building Code of Australia, which windows and doors must meet.

The tests for AS2047 include a Deflection Test, Operating Force Test, Air Infiltration Test, Water Penetration Resistance Test and Ultimate Strength Test. All window manufacturers must comply with this Standard and verify compliance on request.

Improving energy efficiency requires reductions in heat flows through a building's fabric, including windows. The thermal performance of a window can be measured by its thermal transmittance or U-value, which measures heat transfer through the window via conduction, and its solar heat gain coefficient (SHGC), which measures solar radiation passing through the window. Lower numbers indicate superior thermal performance. Glazing elements must be rated as an entire system to account for the different thermal properties of glass, any fills, the frame and the impact of the frame on the glass. Window performance can be checked on the WERS website.

Window Energy Rating Scheme (WERS) is accredited by the Australian Fenestration Rating Council (AFRC) and adheres to AFRC protocols and procedures for rating windows and glazed doors. Energy Ratings provided by WERS are third-party certified to AFRC requirements, compliant with the NCC, and able to be used to meet regulatory requirements.⁵





Pathways to solutions

As substantial sources of heat gains and losses, windows significantly affect a building's thermal performance.⁶ Standard windows, with basic glazing, are a typical thermal weak spot associated with up to 40% heat loss and up to 87% heat gain in Australian housing.⁷



All residential windows and doors must meet minimum requirements under Australian building regulations to withstand Australian conditions.

Under AS 2047, windows made from timber, aluminium, uPVC or other materials undergo the following performance tests to verify product performance claims:

- Deflection Test - positive and negative wind pressures are applied to the face of the window to test the maximum deflection under wind load.
- Operating Force Test - verifies that an opening sash can open and close without undue effort.
- Air Infiltration Test - air leakage of a window is tested to ensure energy and acoustic efficiency.
- Water Penetration Resistance Test - ensures no water leaks through the window into the building.
- Ultimate Strength Test - negative and positive wind pressures of at least 1.5 times the specified wind pressure are applied to the window to ensure it does not fail in unusual wind conditions.⁸

Compliance Certification



AUSTRALIAN
GLASS & WINDOW
ASSOCIATION

This manufacturer certifies that this product was designed to conform with AS2047. The design performance has been verified by a NATA accredited test laboratory. This manufacturer is a member of the AGWA Accreditation Program.



paarhammer
ACCRED MEMB No. 352

DESIGN PERFORMANCE		ENERGY RATED
N6 GEN	N6 CNR	
SLS 1.6 kPa	SLS 2.5 kPa	
ULS 4.0 kPa	ULS 6.0 kPa	
Water Resistance		
Non Exposed 450 Pa	Exposed 600 Pa	

As an example of high performance, a window can achieve a housing rating of N6, C4 with an ultimate limit state pressure rating of +5900 Pa and -5900 Pa, with low air infiltration and a high-water penetration resistance pressure of 600 Pa.

Windows and doors must display a performance label that confirms they are certified to comply with Australian Standard 2047. ⁹

A Certificate of Compliance must also be issued by the window manufacturer showing compliance of windows and doors to the National Construction Code. These certificates should only be deemed acceptable if the company providing the certificate is part of an accredited scheme, such as the AGWA independent third-party NATA accreditation scheme. The window listed on the certificate must be supplied; therefore, a custom window allows for more accurate performance and a more accessible compliance pathway. ¹⁰





AGWA

The governing body in the window and door industry is the Australian Glass and Window Association (AGWA). Members of AGWA are bound by their Code of Conduct, and their products are randomly compliance tested by an independent auditor every year to ensure ongoing compliance.

This testing guarantees that all products are manufactured exactly as tested by a National Association of Testing Authorities Australia (NATA) accredited laboratory and are manufactured in compliance with the National Construction Code (NCC) and all relevant Australian Standards. This accreditation program provides a simple and verifiable means of proving the performance of a window. ¹¹

WERS

The Window Energy Rating Scheme (WERS) provides a scientifically based, fair, rigorous and credible rating system for assessing custom window products for their energy efficiency performance and to meet regulations. The ratings apply to the effect of the whole window, including the relative contributions of glass and frame. It is all about certified performance.

WERS employs a combination of physical testing and computer simulation to generate energy ratings for fenestration products. These are shown in columns corresponding with a particular window product using a specific glazing system.

Results are shown compared with the base generic aluminium framed window with 3mm clear glass:

- Cooling and heating stars from 1 to 10 (with 10 being the highest/best),
- Percentage improvement for cooling and heating,
- Whole-window U-value (U_w) that accounts for the performance of frame, edge-of-glass and centre-of-glass components,
- Whole-window solar heat gain coefficient (SHGC_w),
- Whole-window visible transmittance (T_{vis}),
- Air infiltration rate (L/s.m²) at a positive (inward) pressure difference of 75Pa.

Consumers sometimes assume that insulated glazing is only for cold climates. However, high-performance windows with Insulating Glass Units (IGUs) can deliver better energy performance for all climates, particularly in heated or air-conditioned homes. ¹²

Paarhammer

Paarhammer continuously innovates to advance the performance of its window and door systems, and its product ranges are tested to the highest compliance requirements.

Paarhammer custom manufactures high-performance windows in Victoria and delivers Australia-wide. A market leader since 1990, Paarhammer uses only Australian-manufactured glazing systems that are fully certified and compliant, timbers from verified sustainable sources and quality German hardware. Its five ranges include Architectural Timber, Wood-Alu composite, Passive House certified, Komfort+, and Bushfire Safe, including BAL-FZ, offering an extensive choice of quality advanced window systems.

Established by Tony and Edith Paarhammer in 1990, this family-owned and operated business is the first Australian company to develop and patent bushfire-resistant windows and doors tested and approved to Australian Standards. Paarhammer has also set the benchmark for energy efficiency in Australia and offers certified Passivehaus windows. All Paarhammer windows and doors are manufactured at a purpose-built, solar-powered factory in Ballan featuring sustainable waste, light and water management systems. Its cutting-edge technology includes robotic spray painting.

With a long manufacturing history, continued professional development and staff training programs, world-leading technology, and several 'firsts', Paarhammer window products have been integral in many award-winning architectural projects.

Paarhammer is the obvious choice for tested and compliant window and door products custom-made to project requirements.



References

- ¹ Australian Building Codes Board. (2024). What are non-conforming building products? ABCB. Retrieved February 1, 2024, from <https://www.abcb.gov.au/ncbp/what-are-ncb-products>
- ² Senate Economics References Committee. (2016, May 4). Interim report: Safety—'not a matter of good luck'. Parliament of Australia. https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Economics/Non-conforming_products/Interim_Report
- ³ Australian Building Codes Board. (2024). NCC 2022 state and territory adoption dates. ABCB. <https://www.abcb.gov.au/ncc-2022-state-and-territory-adoption-dates>
- ⁴ Australian Building Codes Board. (2024). How do I ensure that I am using products that conform? Retrieved from <https://www.abcb.gov.au/ncbp/ensure-conformity>
- ⁵ Australian Glass and Window Association. (2024). How WERS works. AGWA. Retrieved February 1, 2024, from <https://www.agwa.com.au/WERS/WERS/How-WERS-Works.aspx>
- ⁶ Rajagopalan, P., Natarajan-Rajeswari, K., Andamon, M. M., Moore, T., Woo, J., Cheng, D., Ambrose, M., Reynolds-Fox, K., Willand, N., Pears, A., Simko, T., & Horne, R. (2023). Enhancing home thermal efficiency: Final report of Opportunity Assessment for research theme H2. Prepared for RACE for 2030 CRC.
- ⁷ Moore, T., de Kleyn, L., Rajagopalan, P., Simko, T., Hurley, J., Horne, R., & Dalton, T. (2023). Upscaling high-performance windows in Victoria. RMIT University for Sustainability Victoria.
- ⁸ BUILD. (2024). Window & glass regulations. BUILD. <https://build.com.au/window-glass-regulations>
- ⁹ BUILD. (2024). Do your windows comply? Retrieved from <https://build.com.au/do-your-windows-comply>
- ¹⁰ Australian Glass and Window Association. (2017). AGWA Guide to Energy Efficiency [PDF]. Australian Glass and Window Association. <https://agwa.com.au/common/Uploaded%20files/AGWA/Technical/AGWA%20Guides/AGWA-Guide-Energy.pdf>
- ¹¹ Australian Glass & Window Association. (2024). Accredited Company Program. Retrieved from <https://www.agwa.com.au/Members/Members/Accreditation-Compliance/Schemes/Accredited-Company-Program.aspx>
- ¹² Australian Government Department of Industry, Science, Energy and Resources. (2023). Glazing. Your Home. <https://www.yourhome.gov.au/passive-design/glazing>

Photographers:

pg. 1,4,5: Peter Hyatt, pg. 2: Trevor Mein, pg. 3: Genesis FX, pg. 6: Anna Wiewiora, pg. 7: Brad Griffin Photography, pg. 9: Phillip Sage

All information correct as of March 2024

