



Setting the 7-Star Standard

The Benefits of uPVC Windows for
Energy Efficiency and Performance





INTRODUCTION

The Nationwide House Energy Rating Scheme (NatHERS) is a national scheme to measure the energy efficiency of residential dwellings in Australia using a 10-star rating system. Across much of Australia, a 6-star NatHERS rating was the minimum requirement, indicating good, but not outstanding, thermal performance. Soon, the requirements for energy-efficient building design will be much higher.

In the 2022 edition of the National Construction Code (NCC), there will be new rules for 7-star thermal performance in residential homes. The aim of this change is to help support energy demand and reduce energy costs for homeowners and renters. It will also achieve 14.1 million tonnes in carbon abatement that will help the industry mitigate the impacts of climate change.

As the NCC increases its 6-star minimum NatHERS rating to 7, with even further increases likely in the future, the requirements for high-performance windows become more significant than ever. Up to 87% of a home's heating energy can be gained, and 40% of it can be lost, through windows.¹ Aluminum and wood are the first materials that come to mind when thinking about window materials, but we are not certain aluminum nor thermally broken aluminum windows will be able to meet future increases in energy efficiency requirements, while the high maintenance needs of timber present a clear downside. So, what are the alternatives?

In Europe, uPVC windows are the standard for a region that is 10–15 years ahead of Australia in terms of thermally-efficient construction. In fact, Europe is looking to raise minimum energy standards even higher with the goal of having all new structures be “zero-emissions” by 2030.² In comparison, Australia's new 7-star requirement is only a step in the right direction, and higher standards are needed to reduce energy consumption to near zero. Furthermore, Passive House, which uses a 10-star energy rating system, is gaining momentum in Australia but has been well established in Europe for many years.

New to the Australian market, uPVC windows are still a relative unknown. Common perceptions are that uPVC windows are focused on performance and not aesthetics. However, the latest generation of uPVC products provide a genuinely aesthetically-pleasing replacement for aluminium windows that requires the same level of maintenance, if not less, as aluminium, but far exceeds its thermal performance. Below we take a close look at uPVC and why it may be a game changer for energy-efficient building design.

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WHAT IS uPVC?

First produced in 1935, uPVC has been industrially manufactured in large quantities for over half a century. During that time, it has been developed into a building material that offers a wide range of architectural properties. It achieved commercial success in a variety of applications, including plumbing, insulation, construction, and later as a material for window frames, thanks to its biological and chemical resistance, ease of production and low cost, and flexible workability.

Polyvinyl chloride, also known as PVC, is a chemical compound made up of chlorine, carbon, and hydrogen. PVC is made up of components that are derived from salt and petroleum, two naturally occurring raw materials. The letter “u” stands for unplasticised (or

unmodified), and denotes that the material has not been softened by the addition of chemicals referred to as plasticisers.

The development of uPVC windows can be linked to the rise in popularity of double glazing in the 1970s. Along with windows, uPVC doors were also introduced to the market, and while they can visually mimic older timber-style doors, they are more practical, affordable, and durable. Due to its architectural benefits, uPVC windows continued to gain popularity into the 1990s. With improvements in manufacturing, uPVC windows’ aesthetics have evolved, becoming available in a wide range of colors and allowing for high-quality finishes that mimic the appearance of more refined materials.

HOW DOES uPVC HELP YOU ACHIEVE 7-STAR ENERGY PERFORMANCE?

For guidance in window design and material selection, designers can look towards Europe and elsewhere, where energy efficiency requirements are much higher. In Europe and the United States, where the emphasis on energy-efficient buildings started about 30 years ago, uPVC is the material that is most frequently used for windows. In Australia, we typically use aluminum window frames, which are less maintenance-intensive than timber but have poor thermal insulating properties, or timber frames, which can sometimes require more maintenance.

The material used to make contemporary uPVC windows is stiff and dense, and it is used all over the world for many different building applications. uPVC windows have excellent thermal performance and strength thanks to their multiple chamber construction, and the low conductivity of the frames, which reduces the flow of heat and cold. Compared to aluminum, uPVC has a heat conductivity that is about 1,000 times lower.³ A minimum 12mm air gap in the insulated glazing unit, which is frequently found in uPVC windows, further improves thermal performance.⁴ In addition, the tight seals offered by uPVC windows, and the ease with which they can be made for double and triple glazing make uPVC an excellent choice for modern buildings.

Since uPVC does not conduct heat well and less readily transfers temperatures from inside to outside or outside

to inside, it is unquestionably better than aluminum in terms of thermal performance. When compared to timber frames in this regard, uPVC performs in a similar manner.⁵ Both wood and uPVC significantly outperformed aluminum in a study that compared and evaluated the thermal performance of frames made of aluminum, uPVC, and timber.⁶

In a separate study of the life cycle energy consumption of different window materials, the window attributed to the least energy consumption and CO₂ emissions was the PVC window with 30% recycled material, followed by the PVC window without recycled material.⁷ The aluminium windows that had no recycled content and no thermal break had the highest energy use and CO₂ emission values.⁸

Under Australia's Window Energy Rating Scheme (WERS), uPVC windows consistently rate among the highest performers in its category, significantly outperforming most aluminium windows. Higher-performing window systems (where the U-value of the window is less than 2.5W/m²K) are now available in Australia that outperform basic double-glazed windows for a similar cost. Up to 40% more efficient than a typical aluminium window thanks to their built-in thermal efficiency, uPVC windows are a smart investment in today's energy-conscious world.⁹

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HOW LONG DO UPVC WINDOWS LAST?

Members of the uPVC Window Alliance say that high-quality uPVC windows are recyclable at the end of their useful lives and have a lifespan similar to that of aluminium.¹⁰ Modern uPVC windows have expected life spans of 35 years,¹¹ even when subject to adverse weather conditions. The extremes of heat, cold, wind, rain, and snow can be handled by uPVC without issues of warping, corroding, rotting, peeling, chipping, or flaking, unlike traditional framing materials.

Due to improvements in PVC formulations, including a “tropical” variant designed for hot and humid conditions, uPVC windows are a suitable choice for climates in Australia and New Zealand.¹² Low-maintenance uPVC

windows make a great alternative for coastal areas due to exceptional resistance to termites, salt corrosion, and weathering.¹³ In addition, high-quality uPVC windows are tested for UV resistance to ensure they will not fade or deteriorate under the Australian sun. In areas that are subject to bushfire, you can specify fire-resistant uPVC window systems that have been tested to the required bushfire attack level.¹⁴

The durability of uPVC is a clear advantage over timber as its maintenance requirements are significantly lower in comparison. Unlike timber, uPVC window frames do not require painting or sealing, and they are easily cleaned with water and detergent.¹⁵

IS uPVC ENVIRONMENTALLY FRIENDLY?

The best chance of reducing the environmental effects of windows is anticipated through the optimisation of the design with uPVC. The material's key sustainability features include durability, thermal performance and low maintenance requirements. With an expected lifespan of 35 years, uPVC provides a long period of time to amortise the environmental and economic costs that were incurred by using it.

In addition, uPVC can withstand repeated recycling without losing any of its strength or insulating properties. In Australia, waste materials and off-cuts from the production of uPVC windows are already being recycled. When their initial service life is over, uPVC windows can also be fully recycled and used to make new uPVC profiles.



AESTHETIC BENEFITS OF uPVC WINDOWS

Today, uPVC windows not only function well but also look attractive, coming in a variety of colours, finishes and profiles. Modern uPVC windows come in more than just white, from timber-look finishes to contemporary shades and tones. A wide range of models are also available, including tilt and turn designs, sliding windows, and top hung windows, providing designers significant freedom in terms of functionality and style.

The tilt-and-turn opening system, which is widely used in Europe, offers excellent versatility for ventilating the home and convenience for cleaning from within the structure. In tilt mode, the top of the window tilts

forward into the space, allowing hot air to escape while containing cool air closer to the floor. The tilt function also allows ventilation at night without sacrificing security.

Leading uPVC window systems come in a range of styles and customisation options. Slim-line uPVC profile frames, such as those available from BINQ Windows, are a recent innovation that provide the same performance advantages as regular uPVC but are aesthetically consistent with modern design trends. Unlike traditional uPVC profiles, these new slim-line profiles do not require steel reinforcement, making them some of the most sustainable window systems in the world.



BINQ WINDOWS

World standard uPVC windows

European designed and engineered, BINQ's uPVC windows are some of the highest performing windows in the world. Unlike traditional uPVC windows, these uPVC profiles are a slimline design which minimises the amount of framing material and maximises the amount of glass, leaving you with a room full of light and an enhanced view of your outdoors.

With a state of the art, European made, fully automated production line to be installed in their new manufacturing facility, BINQ can ensure that the highest quality of windows are made on time, every time. Available in a range of colour and textured finishes, there isn't a look that can't be achieved.

Much like timber, uPVC provides optimal thermal efficiency, which will far surpass the performance of aluminium, in some cases by over 70%, and BINQ's uPVC window systems are capable of achieving U-values of below 1. Fire rated to up to BAL40 in certain systems, BINQ's uPVC profiles can withstand the harshest environments.

As the requirements for better energy ratings continue to increase, BINQ sees uPVC as being the natural replacement for aluminium. Coupling uPVC with their timber offering will make BINQ the only manufacturer in Australia to offer both timber and uPVC materials.

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- ¹⁴ Above n 11.
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All information provided correct as of November 2022