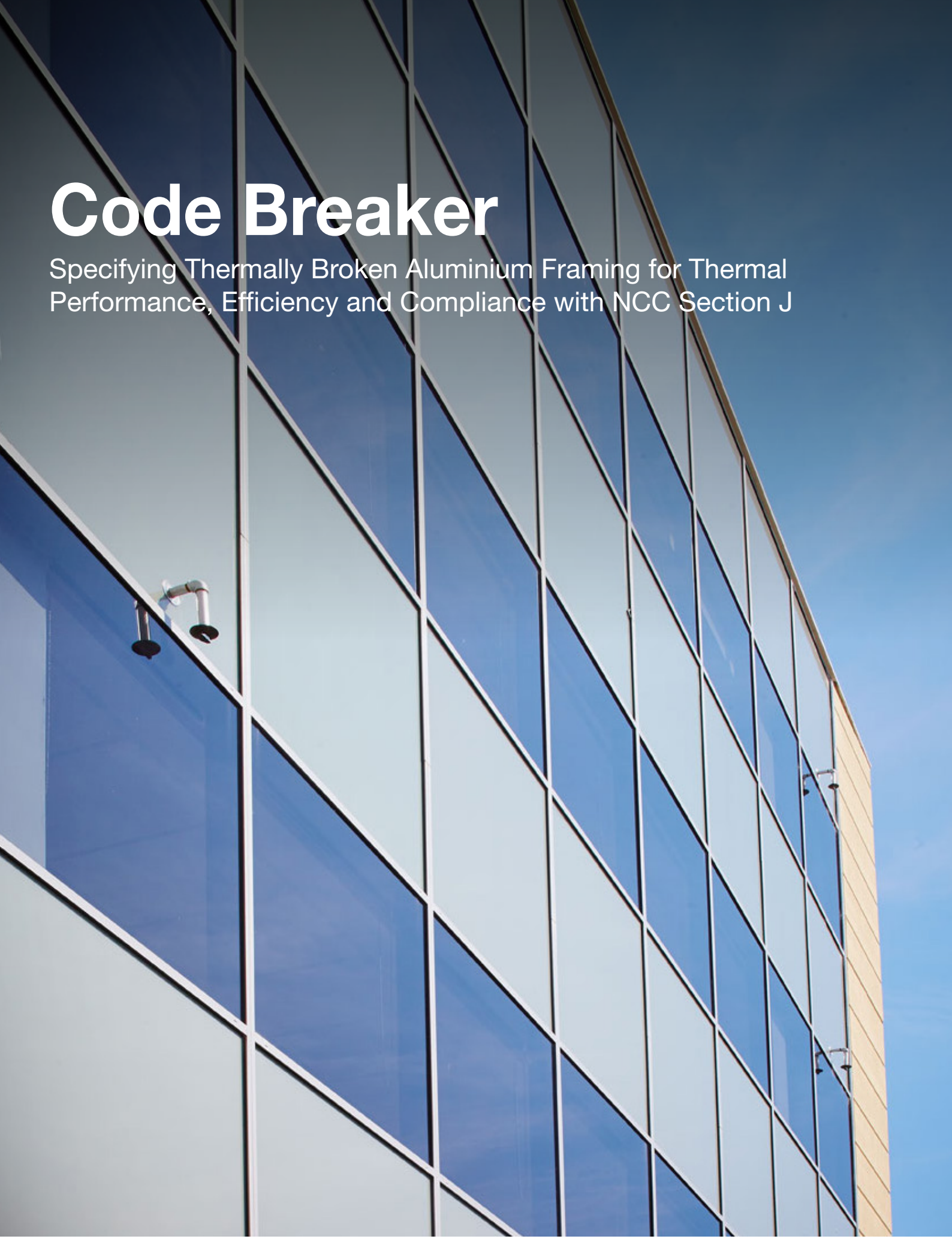

# Code Breaker

## Specifying Thermally Broken Aluminium Framing for Thermal Performance, Efficiency and Compliance with NCC Section J

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ALUMINIUM SYSTEMS SPECIALISTS

“A thermal break is a material of low thermal conductivity placed in an assembly between two conductive materials to prevent the flow of heat energy between them.”

## Introduction

In Australia, the environmental impact of the built environment is undeniable. The building sector alone accounts for approximately 19% of total energy consumption and 23% of greenhouse gas (GHG) emissions.[1] The GHG emissions associated with this energy use represents 6% of Australia’s total net emissions.[2]

Much of the problem can be attributed to buildings that do not effectively manage heat loss or gain, which increases our dependence on mechanical heating and cooling to regulate indoor temperatures. Excess heat loss and gain can occur through a standard aluminium window or door frame, which are excellent conductors of heat. This effect is called “thermal bridging”, where an area or component of an object has higher thermal conductivity than the surrounding materials, creating a path of least resistance for heat transfer.

One of the major changes to the National Construction Code (NCC) in 2019 is the increased requirement for thermal performance in Section J, which significantly impacts the design of the wall-glazing construction. The updated Code recognises that thermal bridges created by a standard aluminium frame can significantly reduce a building’s efficiency and overall thermal performance. As a result, designers and specifiers face an increased risk of non-compliance when using individual, low performing frame components. The solution: thermal breaks.

In this whitepaper, we take a closer look at thermal breaks in relation to the framing of windows and doors, how they work and the benefits they provide to building performance. We also consider thermal breaks in the context of recent changes to Section J and how it impacts window and door design and specification.

# Understanding Thermal Bridging and Thermal Breaks

### WHAT IS THERMAL BRIDGING?

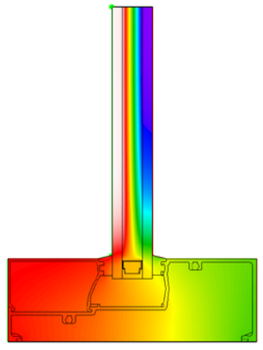
In order to understand thermal breaks, you must understand thermal bridging. In simple terms, a thermal bridge is a pathway along which heat can travel along unmitigated by insulation. A thermal bridge is formed when the insulation layer is bypassed by a very conductive material (such as aluminium), allowing heat to transfer through a wall, ceiling or floor.[3] A standard aluminium window or door frame is often the conductive material that provides a pathway through the building envelope, which may otherwise be well insulated and airtight.

As it provides a path for heat to escape unmitigated from inside to the outside of a building, the thermal bridge created by an aluminium frame is especially problematic. If you are attempting to keep a building warm during colder months, heat leaking to the outside of a building means that additional mechanical heating is required to regulate indoor temperatures. Conversely, during warmer months, a non-thermally broken window can result in unwanted heat gain that requires additional space cooling.

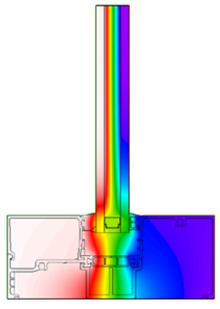
### WHAT IS A THERMAL BREAK?

If a thermal bridge creates a pathway of least resistance for heat to escape out of a building, a thermal break is used to block that pathway. A thermal break is a material of low thermal conductivity placed in an assembly between two conductive materials to prevent the flow of heat energy between them. It acts as a continuous barrier that prevents thermal transfer.

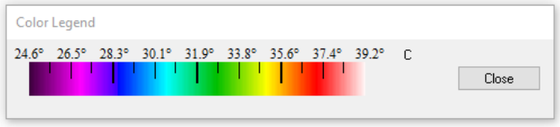
“Thermally broken” is a term which relates to window or door frames. A thermally broken frame is one that includes a reinforced polyamide strip fixed between the inside and outside aluminium profiles to create an insulated barrier within the window frame. The polyamide strip is a material of low thermal conductivity that dramatically reduces heat transfer through the window frame.



Non-Thermally Broken Aluminium Frame



Thermally Broken Aluminium Frame





# Benefits of Thermally Broken Windows

### REDUCES ENERGY CONSUMPTION (AND SAVES MONEY)

Thermal bridges created by aluminium window and door frames result in a significant reduction in thermal performance. Up to 49% of the heat lost during winter, and as much as 87% of the heat gained during summer, can come from windows.[4] An inefficient window system can therefore result in higher energy consumption and electricity costs. Heating and cooling already accounts for 20-50% of energy used in Australian homes.[5]

If we consider a traditional aluminium frame as the baseline, a design that utilises thermally broken frames with double glazing (insulated glazing units or IGUs) can reduce heat conductivity by 50 to 75 per cent.[6] In practice, this improvement provides greater control over heat loss and gain inside a home, and reduces the dependence on mechanical heating and cooling, which in turn means lower household energy consumption.

Switching to thermally broken window frames can result in significant cost savings for property owners. A home with 60m2 of glazed windows and doors could save up to 0.42kwh with thermally broken frames, which translates to savings of approximately $500 per year.

### REDUCES RISK OF CONDENSATION

Condensation occurs when water vapour within indoor air meets a cold surface. A standard aluminium window frame is susceptible to condensation due to its ability to readily transfer heat – when the outdoor temperature drops, the window frames also become colder. When warm indoor air comes in contact with the cold window frame, there is a potential for condensation to form on the frame.

Poor condensation management is a costly building issue. Often invisible until the damage is already done, excess moisture within a building can lead to dampness, mould and building decay. As moisture damage is difficult to detect early, it is often expensive to rectify especially when structural damage has occurred.

A thermally broken window frame significantly reduces the risk of condensation. The reinforced polyamide strip acts as a thermal barrier to keep the interior surfaces of the window or door frame similar to the room temperature. This minimises the incidence of warm moist indoor air meeting cooler surfaces, thus preventing the formation of condensation on the frame’s surface.

### IMPROVES INDOOR COMFORT

Thermally broken windows act as extra insulation which contributes to thermal comfort all year round. An effectively insulated building delivers cooler interiors in the summer, and warmer interiors in the winter; the feeling of comfort is easier to achieve without significant heat loss.

Reducing the effects of thermal bridging also makes it easier to achieve a warm and dry indoor environment, which can have a positive effect on indoor air quality. Untreated condensation can lead to ill health and respiratory issues from mould growth or excess humidity.

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## Section J Compliance: Thermal Bridging

In the NCC 2019, the revised Section J sets out new energy efficiency requirements for commercial buildings. The new requirements include considerably increased stringency of thermal performance for the wall-glazing construction. The whole wall-glazing construction is now calculated as a Total-System U-Value, using area weighted averages for the individual components (windows, doors and walls). A minimum backstop R-Value is also required for spandrel sections, which encourages the use of thermally broken frames.

How does this impact design and specification of window and door frames? The Total System U-Value can be greatly diminished by using inefficient individual components. Windows and doors will almost always have a higher U-Value (lower efficiency) than the wall construction. Lower performing components may potentially reduce the allowable Window-to-Wall Ratio of the building, while still meeting the U-Value requirements.

Thermally broken windows and doors can improve thermally efficiency by up to 35% (over non-thermally broken systems). By improving the performance of your framing systems, you could increase the Window-to-Wall Ratio of your building.

## ThermAFrame

### THERMALLY BROKEN ALUMINIUM FRAMING SYSTEMS

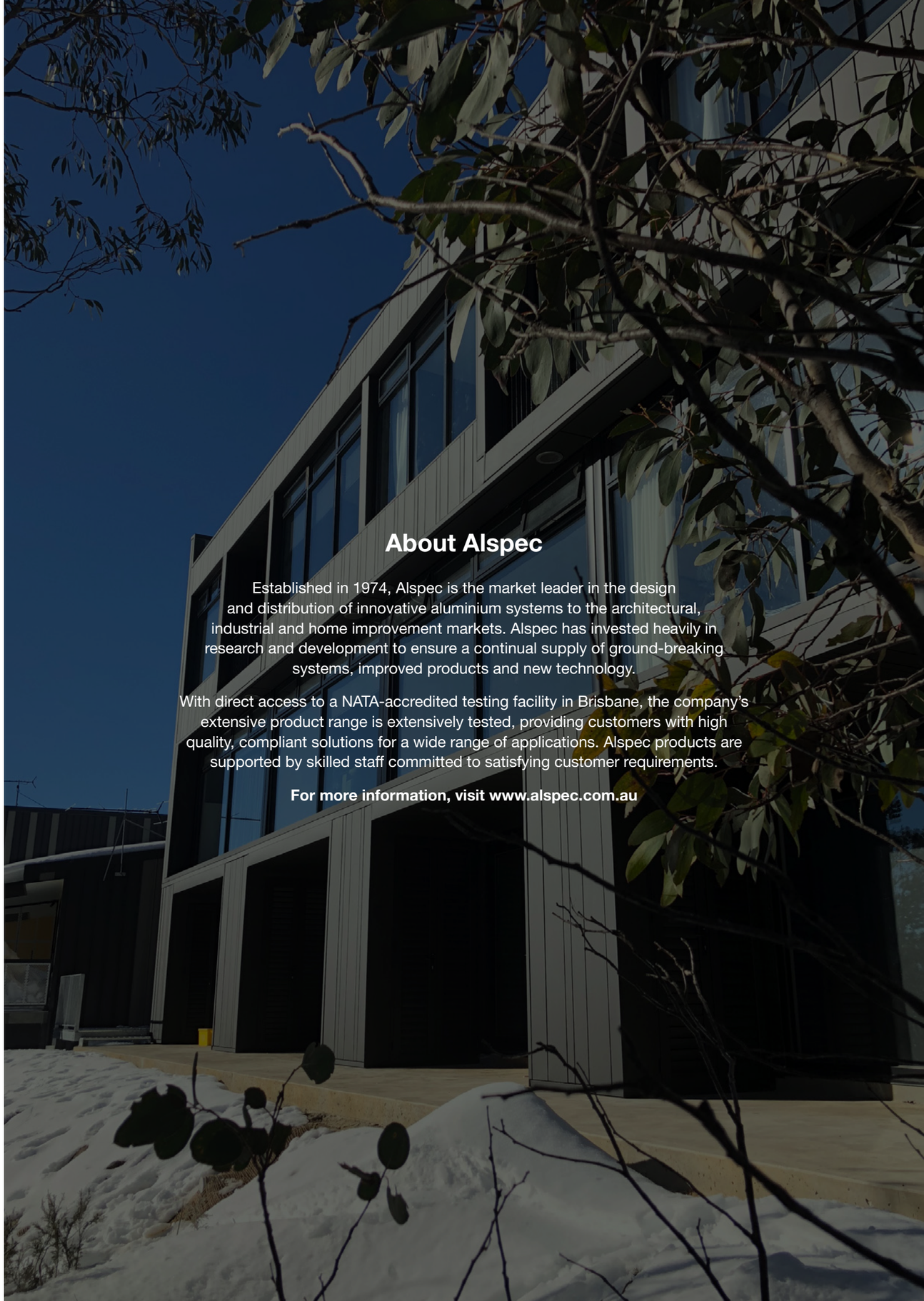
Alspec’s® ThermAFrame® is a energy efficient window framing system that utilises the latest in European Polyamide Thermal Break technology combined with Australian design principles to achieve the best possible results in energy rating in a system that is easy to fabricate and install.

The innovative framing system allows for seamless integration across ThermAFrame Centre Pocket and Flush Glazed Systems. ThermAFrame has also been designed to accommodate high performance double glazed units that can maximise the performance of the building envelope. This versatility enables designers to achieve the most challenging structural and energy requirements, with  excellent Uw values down as low as 1.7 for some models.

ThermAFrame has also been extensively performance tested (acoustic, thermal, wind load and water pressure) to deliver maximum reliability and performance under demanding conditions. A range of models are available to suit any project or application.

### AVAILABLE MODELS

- Thermally Broken Awning & Casement Window
- 101.6mm Flush Glazed Thermally Broken Framing
- 150mm Flush Glazed Thermally Broken Framing
- 101.6mm Centre Glazed Thermally Broken Framing
- 150mm Centre Pocket Thermally Broken Framing
- Thermally Broken 50mm Commercial Door
- Thermally Broken Sliding Door



## About Alspec

Established in 1974, Alspec is the market leader in the design and distribution of innovative aluminium systems to the architectural, industrial and home improvement markets. Alspec has invested heavily in research and development to ensure a continual supply of ground-breaking systems, improved products and new technology.

With direct access to a NATA-accredited testing facility in Brisbane, the company’s extensive product range is extensively tested, providing customers with high quality, compliant solutions for a wide range of applications. Alspec products are supported by skilled staff committed to satisfying customer requirements.

**For more information, visit www.alspec.com.au**

## REFERENCES


1 JVictoria Government. “Energy Efficient Office Buildings: Transforming the Mid-Tier Sector.” Sustainability Victoria. https://assets.sustainability.vic.gov.au/susvic/Report-Energy-Commercial-buildings-Energy-Efficient-Office-Buildings-Nov-2016.pdf (accessed 12 April 2021).

2 Department of Climate Change and Energy Efficiency. “Baseline Energy Consumption and Greenhouse Gas Emissions in Commercial Buildings Australia.” energy.gov.au. https://www.energy.gov.au/publications/baseline-energy-consumption-and-greenhouse-gas-emissions-commercial-buildings-australia (accessed 12 April 2021).

3 Connection Magazines. “Thermal bridges.” Build. https://build.com.au/thermal-bridges (accessed 12 April 2021).

4 Australian Window Association. “Efficient Glazing.” Efficientglazing.net. http://www.efficientglazing.net/EGhome.aspx (accessed 12 April 2021).

5 Australian Government. “Heating and cooling.” Energy.gov.au. https://www.energy.gov.au/households/heating-and-cooling (accessed 12 April 2021).

6 Turner, Lance and Dick Clarke. “Windows: In the frame.” Sanctuary Magazine. https://renew.org.au/sanctuary-magazine/building-materials/windows-in-the-frame (accessed 12 April 2021).


All information provided correct as of April 2021

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