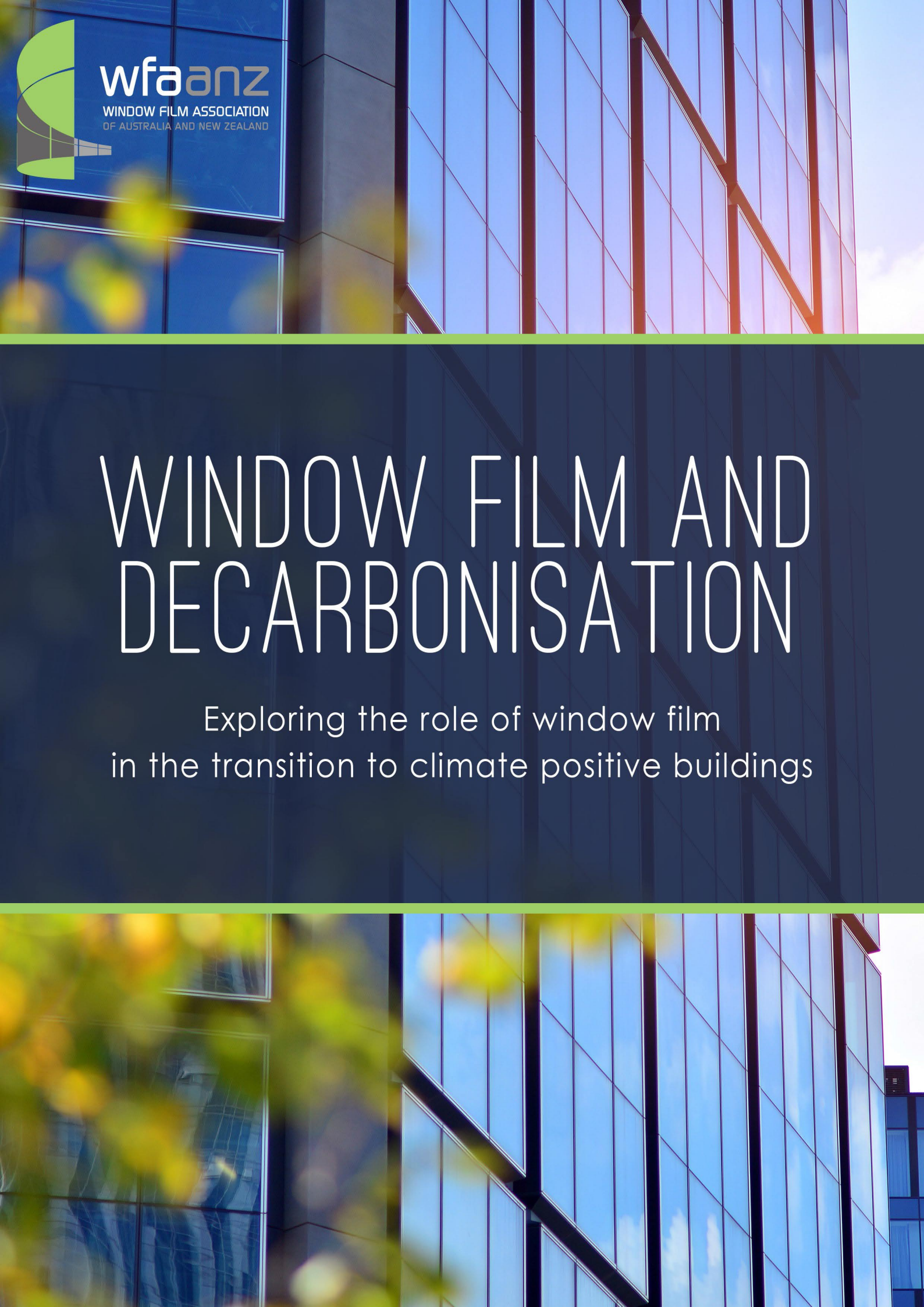

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WINDOW FILM ASSOCIATION
OF AUSTRALIA AND NEW ZEALAND

WINDOW FILM AND DECARBONISATION

Exploring the role of window film
in the transition to climate positive buildings

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CURRENT CLIMATE

In recent years Australia has experienced record-breaking temperatures and devastating weather events. Our floods, bushfires, storms and droughts made global news. According to a 2021 report from the International Panel on Climate Change, Australia can expect even more heat and cold extremes, longer and more intense fire seasons and increased flooding in the years to come.[1]

A by-product of extreme weather is peak demand on energy, as we try to regulate the temperature within buildings, This exponentially impacts carbon emissions.

In October 2021 the federal government declared Australia's commitment to becoming carbon neutral by 2050. The announcement was made in the lead up to the COP26 Climate Change Conference in Glasgow, where governments of the world were asked to set significant carbon reduction targets to slow climate change.

Australia has committed over the next three decades to implement a strategy to eliminate or substantially reduce carbon emissions, and/or remove the same amount that is produced, while at the same time ensuring we establish resiliency systems to deal with the effects of climate change.

Fundamental to these decarbonisation efforts is the identification of the most high-impact, immediate and cost-effective ways to upgrade existing buildings to improve their energy efficiency and reduce electricity and gas consumption.

THE NEED IS CLEAR

Commercial and residential Australian buildings, by way of operational emissions, are responsible for around one fifth of total national emissions (approximately 100 million tonnes of CO2-e/annum).[2]

PowerHousing Australia states that: "Almost eight million pre-energy rated Australian homes are now well past their use by date, contributing up to 18 per cent of Australia's greenhouse gas emissions and are a real liability when it comes to hitting our... commitments for net-zero emissions."[3]

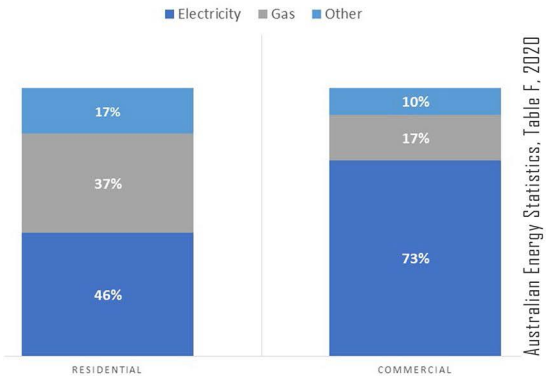
For Australian residences, electricity accounts for 46% of total energy consumed, and gas comes in second at 37%. In commercial buildings, electricity is responsible for 73% of total energy consumption and gas 17%.[4]

Once dubbed 'thermal holes', badly designed or inappropriate windows can be a major source of unwanted heat gain in summer and heat loss in winter – two factors directly influencing energy usage.

Up to 87% of a home's heating energy can be gained and up to 40% lost through windows[5], which is why a building's electricity and gas consumption is explicitly linked to the performance of its glazing systems.

To save energy, moderate peak usage and decrease the cost of living, the thermal performance of existing windows in residential and commercial settings must be improved.

ENERGY SHARES, AUSTRALIA FY2020 (%)



Australian Energy Statistics, Table F, 2020

WFAANZ acknowledges and pays respect to the past, present and future Traditional Custodians and Elders of this nation and the continuation of cultural, spiritual and educational practices of Aboriginal and Torres Strait Islander peoples.

"...a building's electricity and gas consumption is explicitly linked to the performance of its glazing systems."

WINDOW FILM AND DECARBONISATION OF THE BUILT ENVIRONMENT

Heat energy always follows a simple rule – it flows from higher temperatures to lower temperatures. When the sun hits a normal window on hot days, most of the heat transmits through the glass to the inside of the building. The reverse is also true, with heat from inside a room lost through glass on cold days.

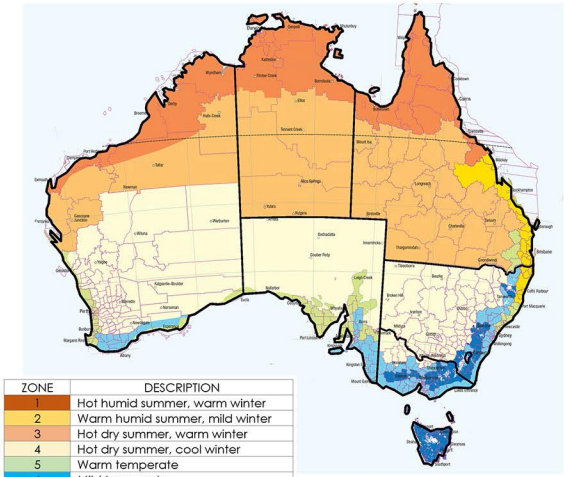
In new buildings, high performance glazing is specified to ensure compliance with National Construction Code energy requirements, and in line with carbon neutral policy. For existing buildings, however, the expense of window replacement on the scale required to meet net zero emission goals is cost prohibitive. Window films can dramatically boost the energy efficiency of existing windows at a fraction of the cost of window replacement.

Up to 85% total solar energy, 99% UV radiation and 95% glare can be blocked by window film.

The ability of some window films to "...halve the overall SHGC* of the window by absorbing and/or reflecting solar radiation"[6] make them ideal for hot and mixed climate zones (1 ,2, 3, 4, 5 and 6).

In colder climate zones (7 and 8), Low E window film's ability to retain heat inside a room on cold days reduces that building's need for 'space heating'. Victoria and New South Wales combined account for 80% of residential and 83% of commercial sector gas usage[2], and both feature mixed and cold climate zones.

Considering that nationally 61% of residential gas usage is for space heating[2], Low E window films when applied to low energy buildings have the potential to reduce the level of gas consumed.



ZONE	DESCRIPTION
1	Hot humid summer, warm winter
2	Warm humid summer, mild winter
3	Hot dry summer, warm winter
4	Hot dry summer, cool winter
5	Warm temperate
6	Mild temperate
7	Cool temperate
8	Alpine

Source: Australian Building Codes Board

COMMON TERMS

***SHGC**, solar heat gain coefficient, measures how well a product blocks heat caused by sunlight. It is the fraction of solar radiation that enters a building as heat gain, expressed as a number between 0 and 1. The lower the SHGC, the less solar heat transmitted..

U value measures heat transfer due to differences in temperature inside the building versus outside. The lower the U value, the greater a window's resistance to heat flow and better its insulating value.

VLT, visible light transmission, refers to how much light transmits through the glass. VLT is expressed as a percentage - the lower the percentage, the darker the glass.

ACKNOWLEDGEMENT

Acknowledgement is given to the contributors, authors and editors of this white paper, which was revised by a technical committee and reviewed by the industry prior to publication.

KEY RECOMMENDATION

As noted by the Green Building Council of Australia and the Property Council of Australia in *Every Building Counts: A Practical Plan For Emissions Reduction In The Built Environment For State And Territory Governments*:

"Mid-tier buildings – those classed as non-A Grade or non-Premium Grade – account for around 80% of Australia's office buildings and 50% of floor space. These buildings lag significantly behind in implementing energy efficiency upgrades and retrofits. Given the size of the sector, mid-tier buildings present one of the largest untapped policy opportunities for governments, and research has shown that the savings potential in mid-tier office buildings is significant and feasible."[7]

WFAANZ supports the pathway to achieve net zero carbon buildings by 2050 outlined in *Every Building Counts*. The recommendations under Theme 2, 'Incentive High Performance'[7], if adopted by State and Federal governments, will in the view of WFAANZ incentivise increased adoption of existing proven technologies such as window film by mid-tier buildings and residential homeowners. Adopting technologies such as window film will support efforts to achieve Australia's target of net zero emissions by 2050, while generating Australian jobs.

ABOUT WFAANZ

As the peak body for the Trans Tasman window film industry, the Window Film Association of Australia and New Zealand (WFAANZ) represents close to 200 installers, manufacturers and distributors of window film, serving as a unified voice advocating for the benefits of window film technology and the interests of our members.

Established in 1992 as an independent, non-profit association, WFAANZ sets performance guidelines for its members, with a strict code of conduct and compliance with all relevant Australian and New Zealand regulations and standards. Through a series of communication channels, training programs and industry engagement activity, WFAANZ seeks to educate property owners, facility managers, energy assessors, architects and engineers on the many benefits and applications of window film and how it can enhance energy efficiency and reduce carbon emissions of the built environment.

[1] IPCC, 2021. SIXTH ASSESSMENT REPORT, Working Group I – The Physical Science Basis; Regional Fact Sheet: Australasia; Common regional changes. www.ipcc.ch/report/ar6/wg1/

[2] ASBEC Discussion Paper, Rapid and Least Cost Decarbonisation of Building Operations, 14th February 2022, pages 5, 10 and 13

[3] PowerHousing Australia, 2022 PowerHousing Australia CoreLogic Standard House Report, www.powerhousingaustralia.com.au/resources

[4] Australian Energy Statistics, Table F, 2020

[5] Dr Peter Lyons, Bernard Hockings, Department of Industry Science & Resources, Your Home - Australia's Guide to Environmentally Sustainable Homes, Australian Government, 6th Edition 2021, page 168

[6] Dr Peter Lyons, Bernard Hockings, Department of Industry Science & Resources, Your Home - Australia's Guide to Environmentally Sustainable Homes, Australian Government, 6th Edition 2021, pp 171

[7] Green Building Council Australia and the Property Council of Australia, Every Building Counts: A Practical Plan For Emissions Reduction In The Built Environment For State And Territory Governments, page 23

Mount Hotham residence, VIC.
Image source: Alpine Tint

MODELLING THE POTENTIAL RESIDENTIAL ENERGY SAVINGS

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) was commissioned by a leading window film manufacturer to model the potential residential heating and cooling energy savings using a range of different window films across diverse climatic zones in Australia.

The study used building simulation software AccuRate and two different residential house designs, a four-bedroom single-storey house and a two-storey townhouse to model the performance of different window films.

The house design, size, window glazing characteristics, heating and cooling systems used in the AccuRate simulation software were selected to achieve a four-star NatHERS Energy efficiency rating, which was considered to be representative of medium performance homes found in Australian capital cities.

CSIRO concluded that in temperate, warm and hot climate zones such as Perth, Sydney, Brisbane and Darwin, applying window films to clear glazing windows facing east, north and west may reduce the total heating and cooling energy requirement and its related energy costs. Depending on the space heating and cooling systems used, the total annual energy cost saving may be in the range of 10-20% by using some particular window films. Using average energy costs of $0.25/kWh for electricity and $0.018/MJ for natural gas, the potential annual savings for a four-bedroom single-storey home may be around $100 to $200 a year in temperate and warm climates and up to $450 a year in hot climates.

Where the most appropriate window film for the climatic zone was selected, the simulation results showed that a potential reduction of 10 - 30% in the energy required to cool the house during the hotter months may be attainable. Reducing the demand on the electricity grid during the hotter months is imperative as it reduces the potential for grid outages during the peak load periods.

The simulation results are indicative only and actual energy savings will vary based on the local climate, the design of house, orientation, glazing characteristics, HVAC efficiency, window to wall ratio and type of window film.[8]

SOLAR CONTROL WINDOW FILM

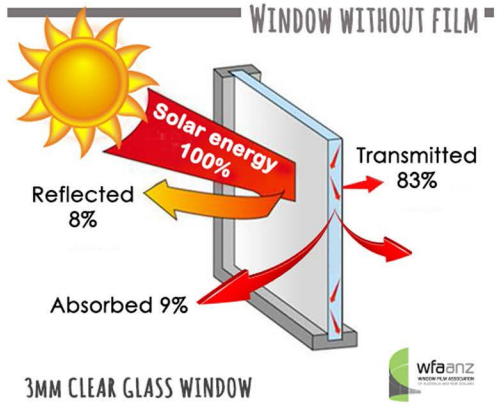
One of the most distinctive traits of window film is its ability to regulate solar energy passing through glass.

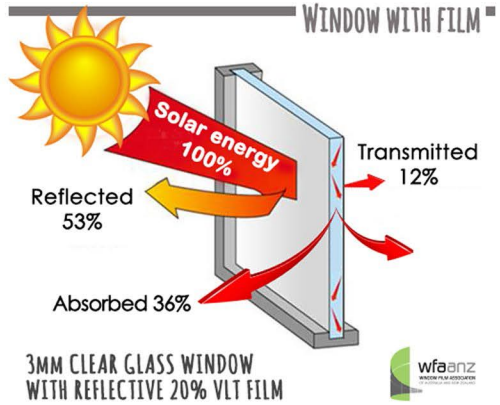
Three things happen when sunlight hits glass – it passes through (transmittance), is reflected away, or absorbed. Window film reduces transmittance while increasing the percentage of absorbed and reflected heat.

The diagrams right demonstrate a typical before and after scenario, where reflective 20% VLT window film is applied to 3mm clear glass. Here, the 83% of solar energy that once entered the window is reduced to 12% after film is applied.[9]

WFAANZ distributor members who supply window film provide verified performance figures for U value and SHGC. These values can be inserted into building energy analysis software, e.g. AccuRate, to calculate the real energy efficiency gains that can be made.

While improving a building's carbon footprint, solar control window film has the ability to:





- Lower utility costs, which eases the cost of living
- Help moderate peak energy usage through interior climate control
- Regulate hot/cold spots
- Decrease demand on HVAC system – reduces (carbon and dollar) cost of HVAC maintenance and creates redundancy opportunities if the system can run more often on fewer chillers

> *The Cooperative Research Centre for Low Carbon Living*: "Homes in warmer climates or with overheating issues caused by large west facing windows may benefit from the addition of films to window glass to reduce the solar heat gain in summer. These films can substantially reduce the SHGC, and thereby the amount of heat flowing through a window in direct sunlight."[10]

COMPARING SHGC: WINDOW FILM AND DOUBLE GLAZING[9]

SHGC of double pane glass (clear 6mm/12mm air gap/clear 6mm) is 0.70.
SHGC of 3mm clear single pane glass with no film is 0.86. With different films...

01	02	03	04
Reflective 20%: 0.20	Non Reflective 20%: 0.34	Neutral 40%: 0.41	Spectrally selective 70%: 0.45

> *The Australian Energy Foundation*: "One of the biggest advantages of window films is their cost."[11]

The cost of standard solar control films compare favourably to other treatment types, such as shading devices, which can cost between $90 to $560 per square meter. According to *Rawlinsons Construction Cost Guide 2019*[12], the cost of a double glazed awning window with two panes of 6mm clear float glass, aluminium frame, is between $514 - $602 per square meter. In many cases, electricity savings mean that window film pays for itself within five years.

CARBON NEGATIVE

Full life cycle analysis (LCA) of window films that have been conducted by WFAANZ distributor members entail a 'cradle to grave' assessment of a product's raw materials, manufacturing, distribution, use, disposal and recycling. LCA analysis has found certain window films to be carbon negative, in that over the course of their lifetime they will save more carbon emissions from entering the atmosphere than those created during their manufacture, transportation and installation.

A solar control window film LCA and resulting environmental product declaration (EPD) published in December 2020[13] found that:

A model simulated the carbon impact of a good-performing window film installed on a generic, four-storey office building in locations across Australia and New Zealand. The net benefit, per one square metre of film, was calculated by taking the difference of the carbon cost from the LCA and the carbon savings from the resulting reduced electricity/HVAC use.

In a real-world application there will be a different performance benefit depending on the type and size of the building, window type, film type, etc. but in each scenario the modelling and simulation found that there is a low carbon payback time. The breakeven point of carbon cost to having a carbon negative impact can be a fraction of a year, after which there is a continued carbon emissions saving for the rest of the film's life.

> *Tasmanian Climate Change Office*: "A great deal of heat can be lost through windows even whilst closed. Double-glazing traps heat between two layers of glass, helping to prevent heat loss while allowing the sun to warm the inside of the house. As double-glazing can be expensive, more economical options include installing a window film that mimics double-glazing..."[14]

INSTALLATION

Window film is an ultra-thin polyester-based material that is suitable for almost any glass surface - windows, doors, skylights, balustrades, screens, etc.

Typically applied to the interior surface of the glass, the professional installation of window film can be done quickly, easily, and with minor disruption to building occupants or business operations. Installation does not entail complex construction set-ups and results in minimal construction waste.

Exterior films are also available, and can be used when interior installation is deemed impossible or unsafe, or for particular glazing units.

Immediate impact, cost and ease of installation are three key factors connecting window film to a 'rapid and least cost' net zero emission pathway.

LOW E WINDOW FILM

The 'E' in Low E stands for 'emissivity', and for window film that relates to a film's ability to absorb and emit (or reflect) radiant thermal energy. Low E window film can reflect or 'bounce back' more radiant energy (heat) than other products, which results in less heat transmission through the glass.

Best suited for the Australian mixed and cold climate zones (zones 4, 5, 6, 7 and 8), Low E window films offer year-round energy performance, essentially keeping heat out of a building on hot days and retaining it inside on cold days.

In cold climates, warmth is lost through plain glass because objects within a room are warmer than the temperature outside. Those objects radiate heat towards the cooler outdoors, and that heat escapes through the glass. A Low E film prevents the glass from absorbing a significant portion of radiant heat, and instead reflects much of it back into the room.

Low E film also works on hot days, blocking the sun's heat from entering the glass from the outside.

Low E films that achieve a WERS star rating in cooling and heating do so because they have been independently tested and rated to demonstrate benefits in both thermal conditions.

The VLT of a Low E film can be as high as 70%, allowing the light in while limiting the heat.

LOW E FILM IN ACTION

Plain glass has an emissivity of 0.84. When objects in the room try to radiate heat to the outdoors on a cold day, the plain glass absorbs 84% of this heat, most of which is lost outside. Applied Low E film with an emissivity of 0.35 will mean only 35% of the room's radiant heat is absorbed by the glass and lost outdoors, and 65% is reflected back into the room.

A QUESTION OF PASSIVE HEAT

If a film blocks heat from entering a building, what happens in winter when solar heat gain is favourable?

Each building is different. Factors like location, orientation, design, layout, surroundings, size, building materials and window type determine the suitability of window film in each situation.

High heat rejecting films would be specified in hot climates, or for example, a west facing room with minimal open ventilation where cooling is a year-round problem.

The government's *Your Home* guide advises some films "...can be particularly beneficial in hotter climates where cooling is the main concern, or on east and west elevations directly exposed to long periods of sunshine ."[15]

Most commercial buildings cool year-round for at least some of the day due to a large amount of glass in the façade, and internal heat generated by people and electronic equipment. For this reason, heat rejecting films are more often specified for commercial buildings, not Low E films.

For cool/mixed climates where both cooling and heating at certain times of the year is required, a lower heat rejecting film or a Low E film would be recommended, which offers both heat rejection and retention.

The Australian climate, even in colder regions like Canberra and Melbourne, sees such extremes in temperature that the ability to reject and retain heat is ideal.

There is a trade-off during heating periods, where free heat from the sun to help heat the building is desirable. However, the sun is only on part of the building at any given time, so while one side/s may miss out on free heat, the other side/s of the building do not, plus, those windows are working to reduce heat loss through low emissivity performance.

The insulation from Low E films also occurs at night and on cloudy days when there is no sun.

Overall, the net effect is a positive for a building by using a Low E film, which is why these films achieve a WERS For Film star rating in both cooling and heating.

A 2013 ConSol energy analysis examined the cost-effectiveness of window film applications on residential homes and commercial buildings in four climate zones in California. The study found that window films were more energy efficient and cost-effective to install on existing buildings than new furnaces, new air conditioning, installing more ceiling insulation, or by improving the sealing of the building envelope.[16]

DUAL PURPOSE

Certain films can provide both solar control and safety/security performance. They create a membrane that holds the glass together in the event of breakage - so instead of shards flying from a broken window, they stay in place on the film. With safety film, glass can be brought up to meet safety standard AS/NZS 2208:1996, *Grade A safety glass in human impact situations*.

Solar control + safety film is specified in government buildings, schools, hospitals, daycare centres, shopping centres, hotels, play centres, children's bedrooms and high traffic areas, or to accommodate a Grade A safety glass requirement.

The US Department of Energy had 8,000m^2 of solar control safety film installed to reduce energy consumption and protect occupants from broken glass in the event of severe weather, accident or bomb blast.

The Beach Club, Collaroy, NSW
Image source: TintFX

[8] White paper: Enhancing the energy efficiency of Australian homes and lowering household energy bills using 3M Sun Control Window Films, Joe Miller, 3M Application Engineer Specialist, 2022

[9] BERKELEY LAB WINDOW NBNL report, 140622, https://www.wfaanz.org.au/wp-content/uploads/2022/06/BERKELEY-LAB-WINDOW-NBNL-report-140622.pdf

[10] Low Carbon Living Guide to Implementing Low Carbon Retrofits for Social Housing, June 2019, page 31

[11] Australian Energy Foundation, www.aef.com.au/for-home/windows/how-about-window-films/

[12] Rawlinsons Construction Cost Guide 2019 For Housing, Small Commercial And Industrial Buildings, 37th ed. Perth, Western Australia: Rawlinsons Publishing

[13] Environmental product declaration, 3M™ Sun Control Window Film, EPD registration no.: S-P-00994, ECO Platform no.: 00001287, Version 2.0, Publication date: 2020-12-17, Revision date: 2021-10-19

[14] Tasmanian Climate Change Office, What you can do/Homes/Tips for your home, www.dpac.tas.gov.au/divisions/climatechange/what_you_can_do/homes/tips/

[15] Dr Peter Lyons, Bernard Hockings, Dept. of Industry, Science, Energy and Resources, Your Home 6th Edition, page 171, Commonwealth of Australia, 2021. Your Home is licensed under CC BY 4.0

[16] ConSol, 2012. Energy Analysis For Window Films Applications In New And Existing Homes And Offices. Stockton, CA, USA: International Window Film Association. www.wfaanz.org.au/wp-content/uploads/2022/03/IWFA-Energy-Study-FINAL-1.pdf

WERS FOR FILM

WERS stands for the Window Energy Rating Scheme, an annual energy performance tool that helps consumers accurately compare glazing products. WERS For Film is a stand-alone program within WERS.

Managed and administered by WFAANZ, WERS For Film acts as a rigorous and credible system for testing performance claims of different window films. Participating manufacturers have their products simulated by an Australian Fenestration Rating Council (AFRC) accredited laboratory.

There are four parts to the program:

1. Applied window film products are rated and labelled for their annual energy impact on a whole house, in any climate of Australia. These ratings can be used to accurately compare films from different film manufacturers.

2. Window film installers are WERS For Film accredited through a training program implemented by WFAANZ.

3. End users refer to WERS For Film ratings when selecting film products, and they can select from a list of accredited installers.

4. When a WERS For Film accredited installer uses a WERS-rated film, an energy certificate is issued, helping the building owner achieve the highest possible energy rating.

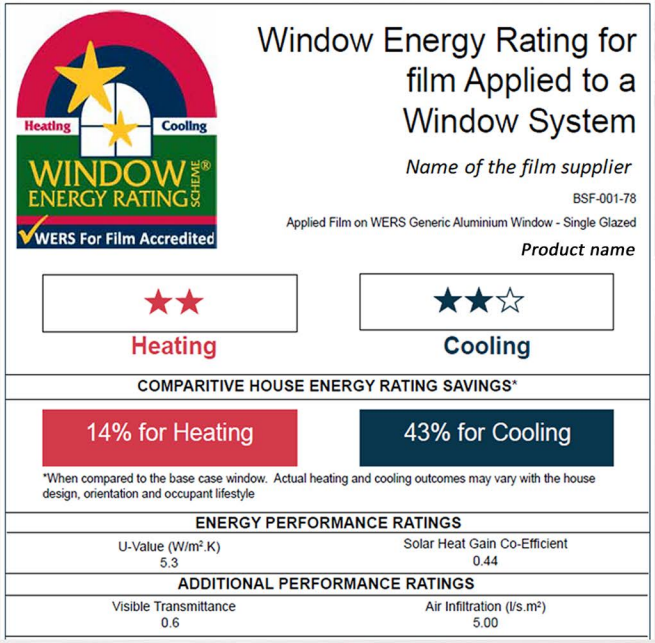
WERS RATINGS

Pictured right is a WERS For Film certificate, issued for a project in Sydney, NSW.

The BASIX specification was for: 'Single pyrolytic low-e glazing with a U value of 5.70 and a SHGC value of 0.47'

The builder incorrectly installed non Low-E clear glass.

Instead of purchasing new windows, a Low E window film was identified in the WERS tables that would ensure compliance with BASIX (U value 5.3 and SHGC 0.44).



Heating Cooling
WINDOW ENERGY RATING SCHEME®
WERS For Film Accredited

Window Energy Rating for film Applied to a Window System

Name of the film supplier

BSF-001-78

Applied Film on WERS Generic Aluminium Window - Single Glazed

Product name

★★ Heating

★★☆ Cooling

COMPARITIVE HOUSE ENERGY RATING SAVINGS*

14% for Heating

43% for Cooling

*When compared to the base case window. Actual heating and cooling outcomes may vary with the house design, orientation and occupant lifestyle

ENERGY PERFORMANCE RATINGS

U-Value (W/m².K)	Solar Heat Gain Co-Efficient
5.3	0.44

ADDITIONAL PERFORMANCE RATINGS

Visible Transmittance	Air Infiltration (l/s.m²)
0.6	5.00

In this instance, the installation of a WERS-rated Low E film saved the home owner the cost of replacing the windows/glass.

ENERGY RATING TOOLS

The WERS testing and rating system conforms to the alternative solution path for energy efficiency within the National Construction Code, originally endorsed by the federal government's previously named Australian Greenhouse Office.

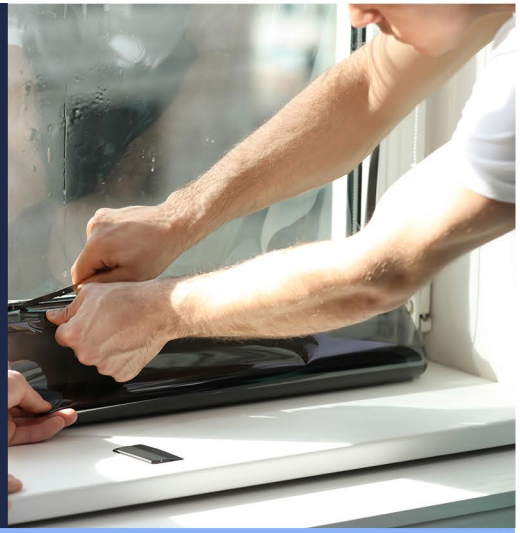
WERS For Film ratings are designed to 'plug in' to NatHERS, Australia's Nationwide House Energy Rating Software.

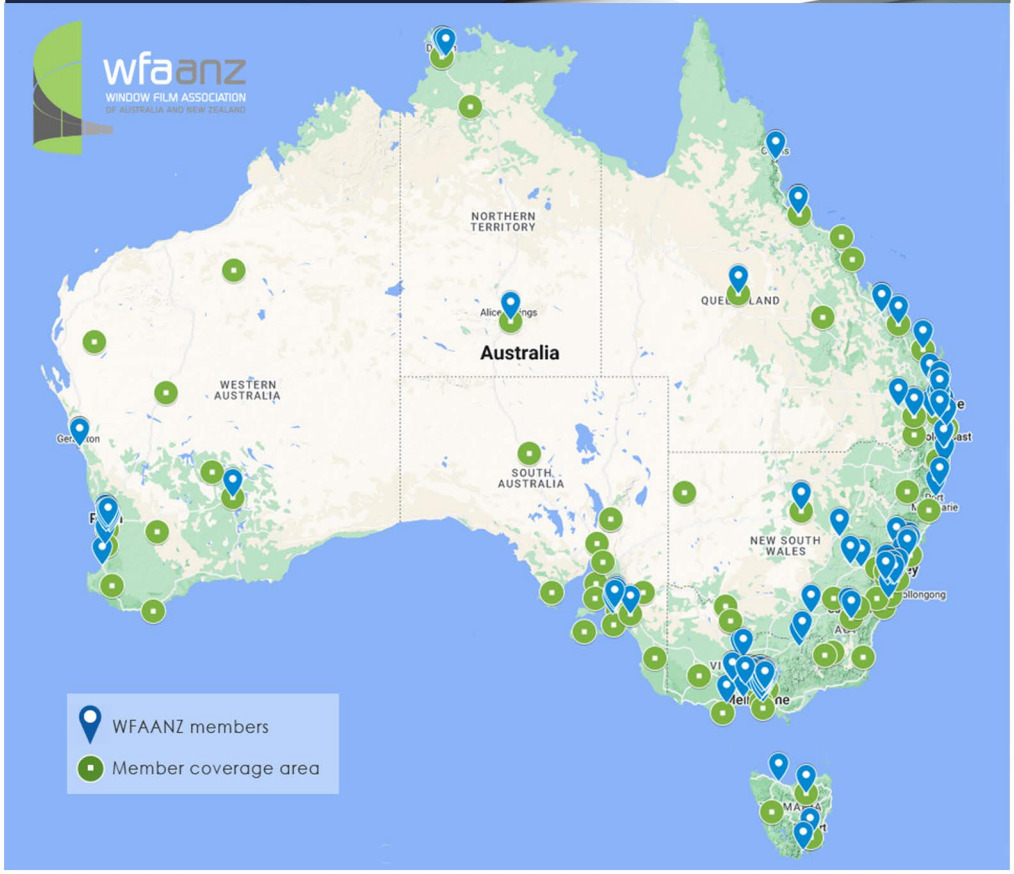
As updated ratings are released through the NatHERS Softwares, WERS For Film ratings are included in the material library for versions of Accurate, FirstRate and BERS. This means that when energy calculations for a house are done using these programs, film can be included.

WFAANZ FILM INSTALLERS

WFAANZ represents a network of window film installers in every State and Territory, whose membership proves a commitment to quality and adherence to industry best practice.

In joining the association, these window film installers sign to a strict code of ethics and code of practice. Through membership, they have access to training, technical information and assistance which ensures industry-wide communication and education.





TAFE NSW

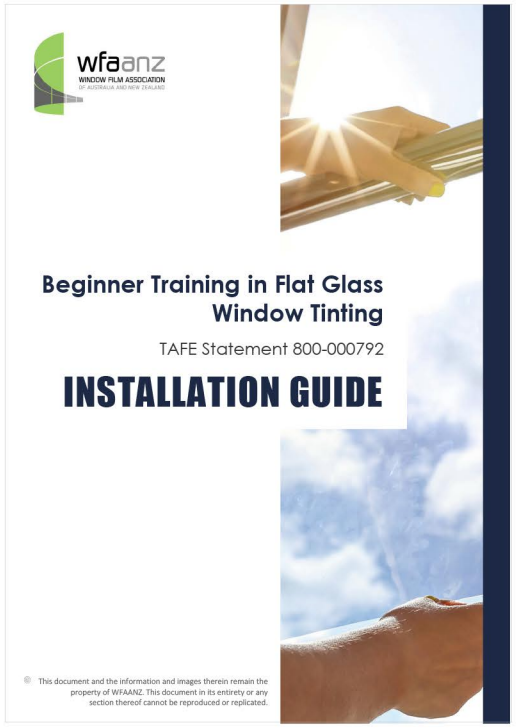
In partnership with TAFE NSW, WFAANZ has introduced beginner and advanced training modules for the installation of flat glass window film.

Available to WFAANZ members and non members, the courses provide both a practical and theoretical foundation in flat glass window film installation.

Currently operating through training facilities in NSW, the program is well placed for a national roll-out.

WFAANZ FILM DISTRIBUTORS

Australian distributors of window film that are WFAANZ members commit to a code of conduct and comply with all Australian standards. In many cases, these distributors have films tested and rated through WERS For Film, and listed on the the International Glazing Database (IGDB).



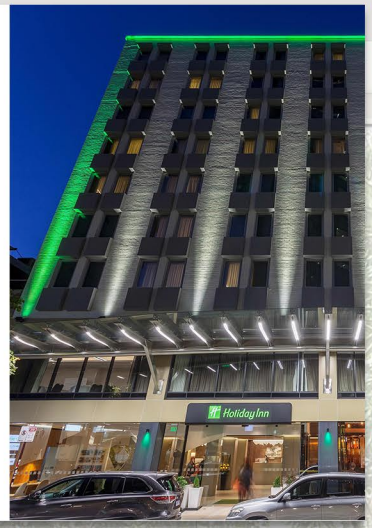
LINKS

WERS For Film: https://www.wfaanz.org.au/wers-for-film
WERS For Film accredited individuals: https://www.wfaanz.org.au/werslicencees
WERS For Film rating tables - residential: https://www.awawers.net/en/filmres
WERS For Film rating tables - commercial: https://www.awawers.net/en/filmcom
WFAANZ distributor members: https://www.wfaanz.org.au/about
WFAANZ training: https://www.wfaanz.org.au/training

CASE STUDIES

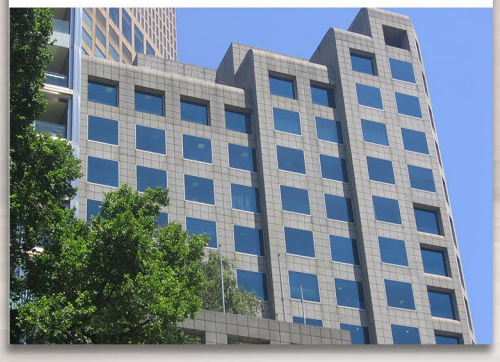
HOLIDAY INN, PERTH, WA

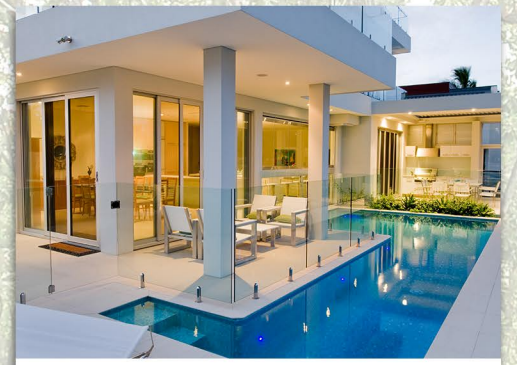
- Engineers wanted to address heat, glare and fading issues in the north facing rooms and high energy consumption from an ageing HVAC system
- Dual-reflective film was installed in 56 hotel rooms
- Films would deliver 76% reduction in solar energy, 85% glare reduction, 99% UV block
- Energy modelling showed savings of over 24,000 kWh a year on cooling costs
- Room temperature was taken in one room with and one room without film. The interior temperature of the room with film was reduced by around 10 degrees
- Thanks to energy savings, the payback period was less than a year



COLLINS STREET, MELBOURNE, VIC

- 17 storey commercial building in Melbourne's CBD
- Installed solar film to address the building's energy, heat and glare issues
- Before and after analysis showed a payback of less than 4 years
- "As a result of film installation, the operation of one chiller is now sufficient for most of the year. Because of the reduced load, chiller replacement can now be done in an orderly fashion."
  Marty Byrne, Facility Manager
- Occupants reported a significant comfort improvement as temperatures stabilised



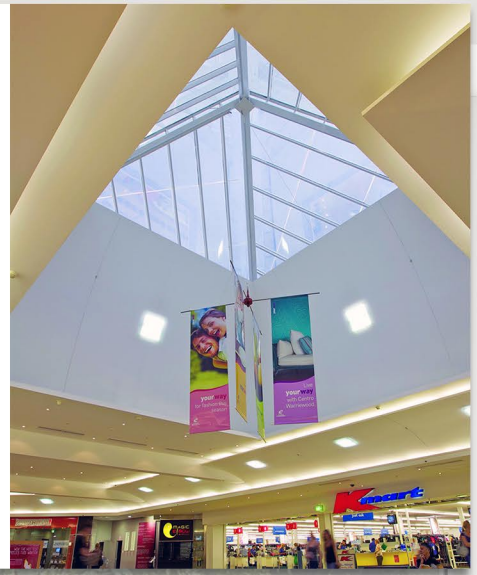


RESIDENCE, SURFER'S PARADISE, QLD

- Owners of this Surfer's Paradise home wanted the benefits afforded by their large windows – light, ventilation and views – but needed protection from heat, glare, UV and fading
- Security and daytime privacy were also issues
- A dual-purpose solar control + security film was installed
- The film had low interior reflectivity so interior views at night remained clear
- Up to 71% solar heat rejected, up to 99% UV

CENTRO SHOPPING CENTRE, WARRIEWOOD, NSW

- A 15m high pyramid shaped skylight is a prominent architectural feature of the Warriewood shopping centre
- Heat, UV and glare were an issue for patrons and shop owners
- "Patrons say the food court is far more comfortable now. Plus, we already have a 10% reduction in our energy bill for the winter quarter and that saving will increase as we head into summer."
  T O'Sullivan, Centro Shopping Centre management



CASSELDEN, LONSDALE STREET, MELBOURNE,VIC

- Owned by ISPT, this 39-floor office tower is situated in the Melbourne CBD
- The ISPT ESG (environmental, social and governance) strategy is to target an average 5.5 star NABERS Energy rating and 5.5 star NABERS Indoor Environment rating across its property portfolio
- Strategy is to achieve this target through efficient energy consumption and management, while maintaining and optimising customer comfort
- To cut heat loads in summer and heat loss in winter, a low reflective solar film was installed on the eastern façade, to maintain the views and minimise aesthetic changes
- 3,400 square metres of solar film was installed
- The film increases Total Solar Energy Reduction (TSER) by 64% and reduces glare by 55%
- Window film contributed to the achievement of the energy targets, 5.5 star NABERS Energy and 5.5 star NABERS Indoor Environment

Treasury Building, ACT.
Image source: About Windows

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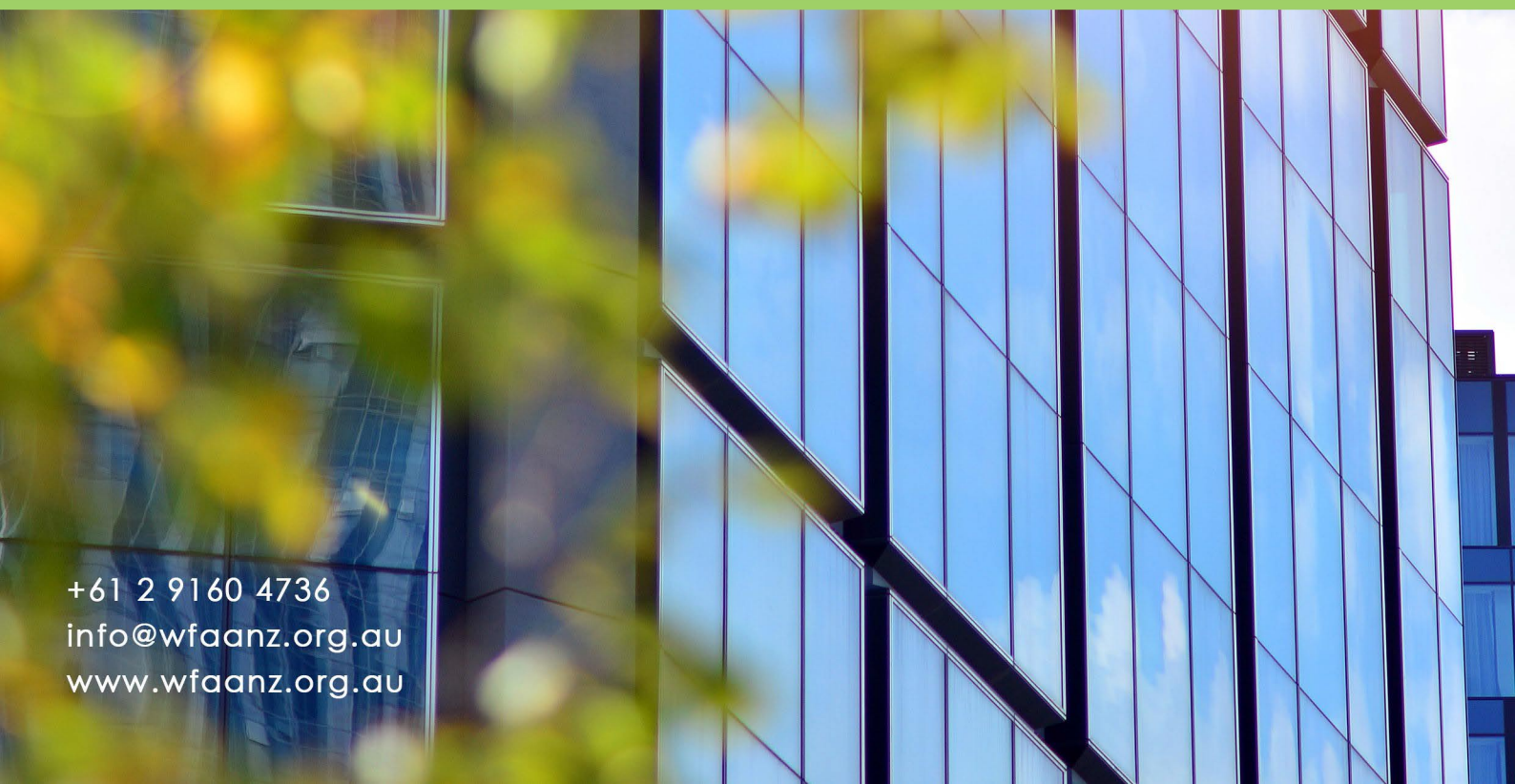
WINDOW FILM ASSOCIATION
OF AUSTRALIA AND NEW ZEALAND



+61 2 9160 4736
info@wfaanz.org.au
www.wfaanz.org.au