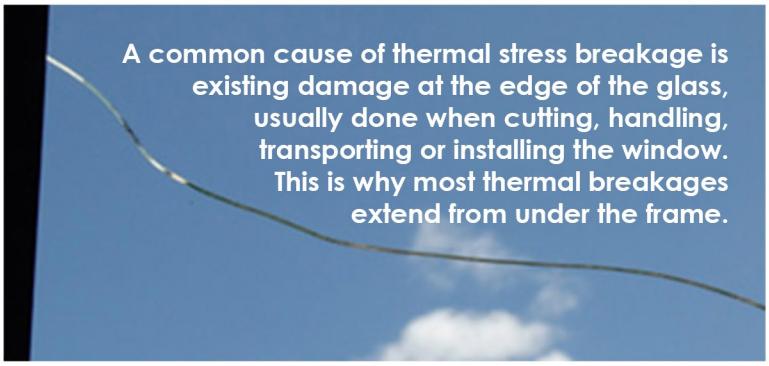
TECHNICAL BULLETIN
Thermal Stress part one

wfaanz
WINDOW FILM ASSOCIATION
OF AUSTRALIA AND NEW ZEALAND

What is thermal stress?

Windows are heated and cooled by the sun, wind, HVAC vents, shading and contact with other materials. The differential expansion and contraction of the hot and cold areas within a single pane of glass can create thermal stress which, if excessive, can cause breakage.



Thermal stress and window film

The extra absorbed and reflected heat from the presence of window film can raise the temperature of the main part of the glass, while the edge under the frame remains cooler. This can cause thermal stress (although breakages caused by window film are rare in Australia).

Nearly all films should be suitable for clear float/annealed single pane glass. As solar control windows like Low E or double glazing are more susceptible to thermal stress issues, care must be taken when installing film on these glass types so tinters are advised to seek advice from their film suppliers in these instances.

Low E

Identifying Low E glass and understanding the types of film suitable for these applications is vital.

Low E coatings are found on double glazed or single glazed glass. On a double glazed Low E window, the Low E coating is usually inside the airspace, so adding film will not affect the coating's performance. On single glazed glass with a Low E coating on the interior surface, applying a film over the Low E coating will stop it from working so you may want to consider an external film. In both these glass types, the wrong film could increase the risk of thermal stress.

When confronted with Low E glass, WFAANZ recommends you consult your film supplier to ensure the correct film is chosen, for example, an external film may be suitable in these instances to avoid direct contact with the coating.

Early identification of Low E Glass is also critical to prevent damaging the coating during the cleaning process, as scraping can result in scratching and discolouration. You can purchase a Low E Surface Coating Detector, or carefully and gently slide a non-scratch scourer over the glass surface - if it 'grabs' and is difficult to move, it's usually Low E glass. With experience you can usually feel the surface with your hand, it feels different to untreated glass.

Double Glazing

Double glazing is one of the most complex glass types to analyse.

Double glazed windows are good at reducing heat flow, so with film on the inside of the glass any absorbed heat finds it harder to escape to the outdoors. The inner pane in particular can present a higher stress risk than single pane glass. Whether or not the double glazed unit has an internal coating will also affect the thermal stress risk, so it's important to determine the exact make and type of glass you're dealing with.

There are film options available for double glazed glass units. Once you have the relevant window data, WFAANZ recommends talking to your film supplier about the types of film that would work in this scenario. Double glazing is something WFAANZ distributor members commonly get asked to conduct thermal stress checks on, and it's rare a film solution cannot be found.

Laminated Glass

Laminated annealed glass is common in residential and commercial windows where safety glass is required. Low to medium absorption films will work on these windows, but care must be taken with typically darker films. The best options are generally energy reflecting films over energy absorbing films, as the absorption is what leads to thermal stress. If the glass is tinted, the risk of thermal stress increases. This greatly reduces the types of films you can use as tinted glass is usually a high heat absorber and poor energy reflector.

'Normal' thickness and sized glass has been assumed here. Unusually thick glass or large panes are excluded from this generalisation, as the risk of stress increases with the dimensions of the glass.



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Assumptions

Energy control window films are installed in Australia by the millions of square meters annually, and breakages are rare. Window film manufacturers are well aware of the physics of thermal stress and know how films will act on different glass types. Consultation with the film manufacturer is always advised when there is potential of thermal stress.

When installing film, installers have no way of knowing the condition of the glass behind the frame, so some assumptions must be made that significant edge chips are not present and the glass has been installed to a professional glazing standard.

Installers can reference these points in their quote or agreement template, to make them clear to all parties from the outset of the job.



Risk assessment

Understanding solar control glass, window film options and thermal stress indicators is critical when recommending films.

Professional window film installers utilise computer programs to select an appropriate film to mitigate the risk of thermal stress breakage. WFAANZ distributor members can assist with these thermal stress calculations if you require an estimate of the risk.

Next steps

In the event of suspected thermal stress breakage, the window film installer is often contacted by the client. WFAANZ advises its members to be present when the glass is removed from the frame. That way, you can inspect the edges and look for chips and identify issues with the glass installation by the glazier, like frame protrusions pushing against the window.

WFAANZ members can also contact the association for further advice.

Examples of potential thermal stress breakage conditions:

- Clear or tinted float glass thicker than 6mm
- Single pane of clear or tinted float glass larger than 4m2
- Low E, double glazed or laminated glass
- Partial application of film to a single pane of glass
- Existing damage to the frame
- Existing chips or cracks
- Wired, textured or patterned glass
- Building with a history of broken glass
- External heating and/or cooling factors – shading, orientation, vents, etc.

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