Thermal stress breakages

SAINT-GOBAIN 350 DE MOTIVE PENTRU A CREDE ÎN VIITOR

CUPRINS

SAINT-GOBAIN 350 DE MOTIVE PENTRU A CREDE ÎN VIITOR

1.

General

General

Thermal stress breakage occurs when:

- **There is a temperature variance in different parts of the glass, ΔT**
- **The stress caused by ΔT is greater than the strength of the glass.**

As thermal stress breakage is the result of a set of conditions that a pane of glass is exposed to, it is generally not covered by glass supplier's warranty!

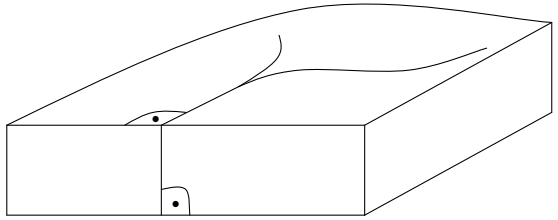
2.

Identifying thermal stress breakage

Identifying thermal stress breakage

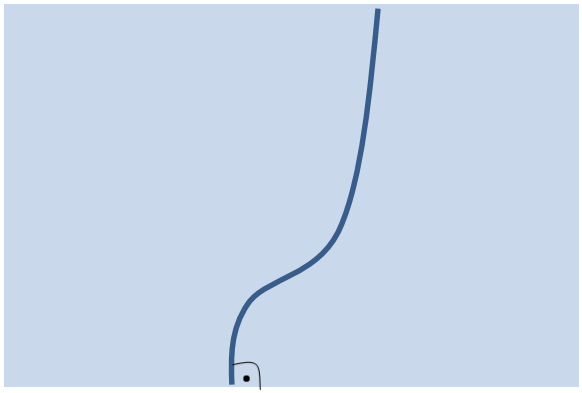
The start of crack is at 90º to both:

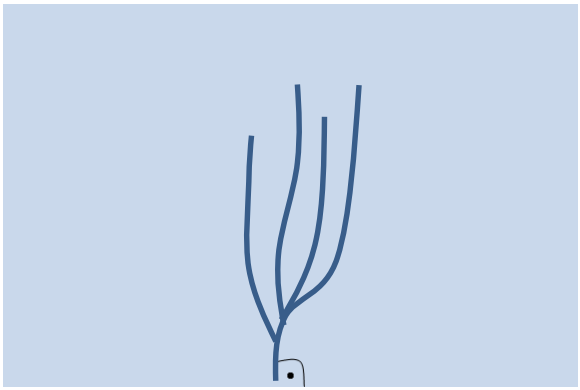
- **Edge of the glass**
- **Face of the glass**



It can be:

- **Low stress breakage → mainly due to poor edge quality**
- **High stress breakage**





3.

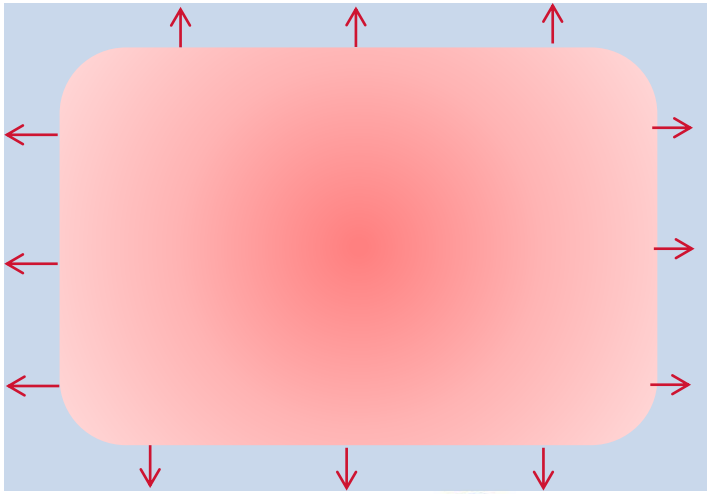
Thermal stress mechanism

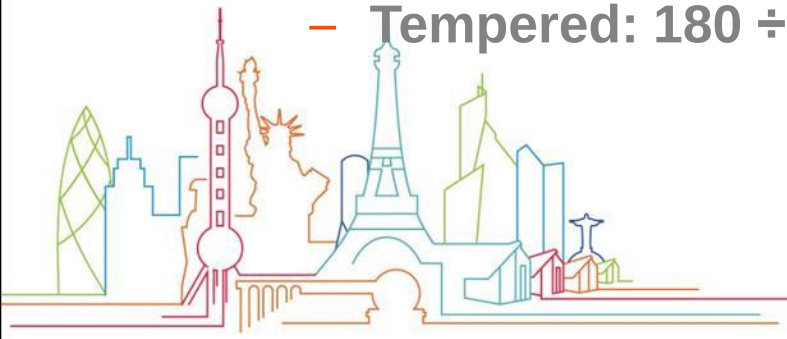
Thermal stress mechanism

Let's consider the absorption of sun's energy…

- **Exposed glass heats up**
- **Hot glass expands…**
  - **If the cool area isn't strong enough to withstand with imposed forces → thermal breakage**

- **ΔT = 1K → 0.62 Mpa…**
  - **Float: 30 ÷ 40 K**
  - **Heat strengt: 100 ÷ 120 K**
  - **Tempered: 180 ÷ 200 K**





4.

Thermal stress risk factors

Thermal stress risk factors

Any situation or factor that increases ΔT or decreases the glass's strength:

- **Edge condition**
- **Energy absorption level**
- **Glass size**
- **Exterior shading**
- **Interior shading**
- **Heating & Cooling**
- **Glazing method**

Thermal stress risk factors

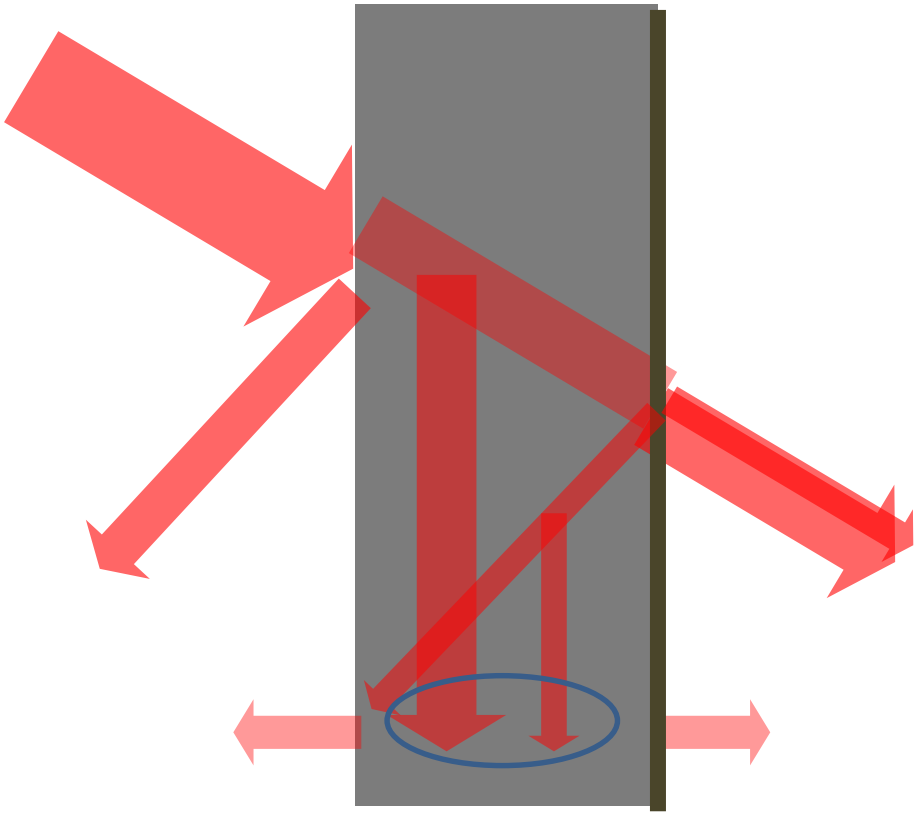
Edge condition

- Glass edge quality is very important to the resistance of the glass under thermal loading…
- The main cause for low stress thermal breakage
- Poor edge quality → can reduce the glass strength by 50%

Thermal stress risk factors

Energy absorption level

- Body tinted glass
- Reflective coatings

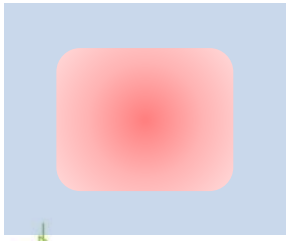


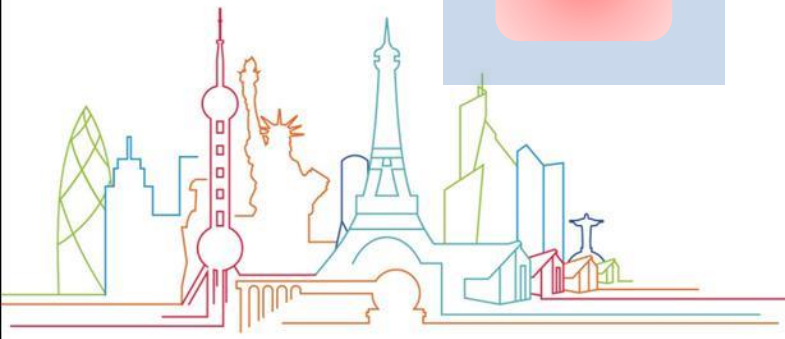
- A > 50% → tempering

Thermal stress risk factors

Glass size

- The larger glass pane → the greater hot area (compared to its relatively narrow colder edges)
  - Higher thermal stress in the edges…





Thermal stress risk factors

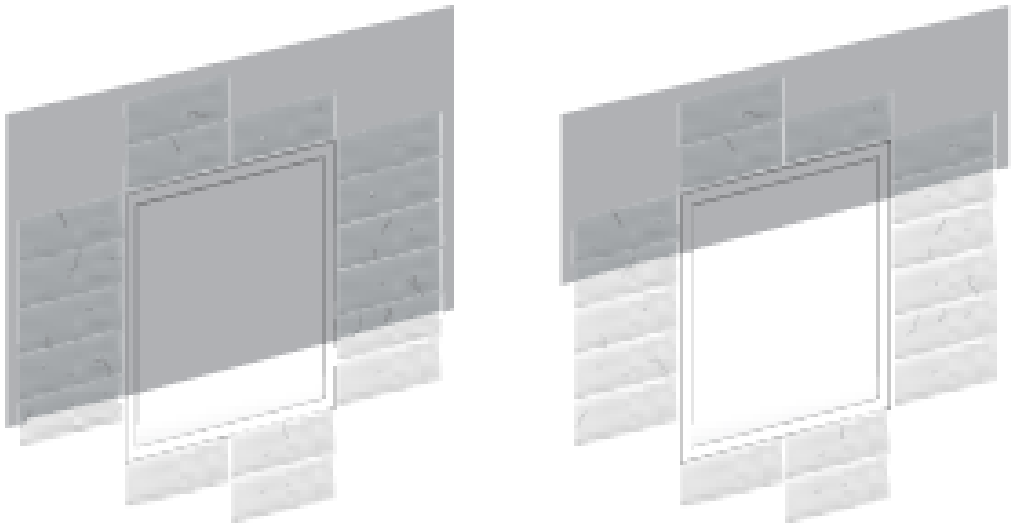
Exterior shading

- External shading devices (blinds)
- Neighboring buildings, trees, …
- Size, shape, location
- Sun’s position changing around day, season…

Thermal stress risk factors

Exterior shading

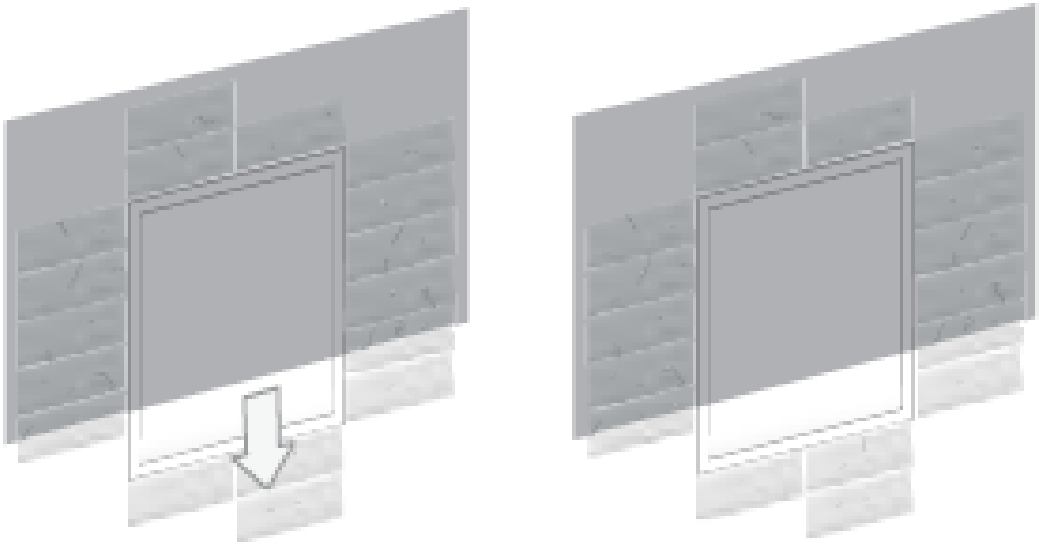
- Shading coverage < 50% is worse than greater…



Thermal stress risk factors

Exterior shading

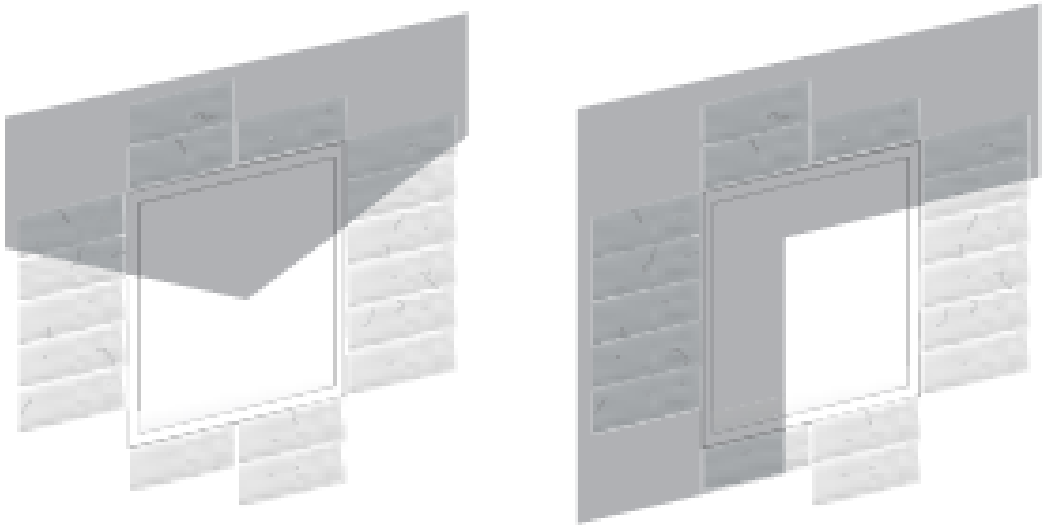
- Static shading is more unfavorable than mobile one…



Thermal stress risk factors

Exterior shading

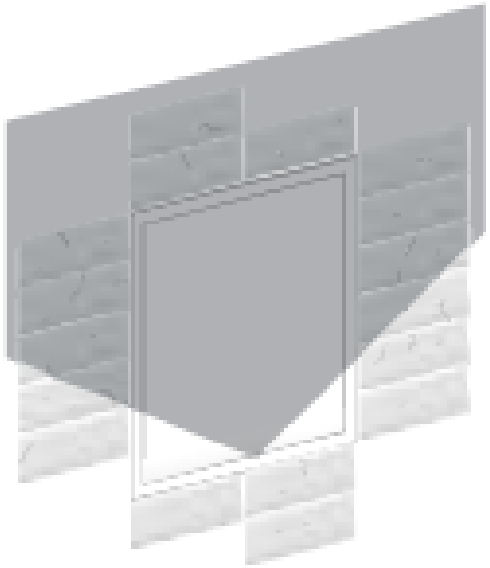
- “V” or “L” shape induces higher thermal stress



Thermal stress risk factors

Exterior shading

- Particularly “V” shape with the point of “V” falling on the edge of glass induces very high thermal stress.



Thermal stress risk factors

Interior shading

- The impact that blinds and curtains depends on the color, type, how much energy they reflect back onto the glass…

- The space between the glass and shade must be at least 50mm (preferably 150mm)
- Ventilation must be assured by leaving a gap between the blinds and the walls, or frame, of 50mm at the head and 25mm at the sill.

Thermal stress risk factors

Heating & Cooling

- Devices should be positioned so that they do not blow hot or cool air directly onto the glass surface, nor into the space between the glass and the curtains.

Thermal stress risk factors

Glazing method

- Care should be taken when using any glazing method that
  - either encourages the transfer of heat away from the glass
  - or covers unusually large amounts of the edges of the glass.
- Commonly used glazing methods do not significantly affect the risk of thermal stress…

5.

Managing the risk of thermal stress

Managing the risk of thermal stress

The risk of thermal stress breakage can be significantly reduced / eliminated by:

- **Managing the factors outlined above**
- **…or… by tempering the glass**