



Thermal stress in glass

Thermal Stress is the term used to describe the internal stresses created when glass is subjected to variations in temperature across its area. It particularly relates to solar control glass. Glass in the vision and non-vision areas of a façade expands in response to the heat of the sun. The more absorbent the glass the greater and quicker its response to solar radiation.

The edges of the glass, however, are encased within the rebate of the frame and are therefore protected from the direct heat of the sun, they heat up more slowly and expand less.

If the safe temperature difference between the main area of the glass and the edges is exceeded, the glass may crack. This is referred to as thermal breakage.

Thermal breakage is generally recognised by the fact that it starts perpendicular to the edge of the glass and results in a 'lazy/meandering' crack. Other factors, which affect thermal safety, include the presence of blinds, internal heat sources, external shading and geographic location.

Damaged edges may cause cracking at a lower than expected temperature differential. When a risk of thermal breakage exists, glass must be heat-treated to ensure thermal safety.

Thermal safety risk analysis checklist (see downloads)

Any glass that is either already toughened or heat strengthened does not require a thermal safety check.

Any glass that has a floor slab, or any other solid material/back-up immediately behind it should be automatically toughened, (if there is a safety requirement), or heat strengthened, (no safety requirement).

LOCATION (e.g. London):	
DIMENSION OF OVERHANG / MULLION: (See Diagram B & C opposite)	
DIMENSION OF SHORT SIDE OF LARGEST PANE (mm):	
PITCH (90° vertical, 0° horizontal):	
OUTER GLASS TYPE & THICKNESS:	
CAVITY SIZE (mm)	AIR / ARGON / SF6
INNER GLASS TYPE & THICKNESS:	
BLINDS: (tick as appropriate) * this is the worst case scenario if in doubt use it. See diagram A for explanation.	None Ventilated / light colour Non-ventilated / light colour* Ventilated / dark colour Non ventilated / dark colour Ventilated venetian blinds Non ventilated venetian blinds
FRAMING MATERIAL: ** this is the worst case scenario when using metal framing. If in doubt use it.	Metal/light colour/non thermal** Metal/dark colour/non thermal Metal/light colour/thermal break Metal/dark colour/thermal break Concrete Wood Plastics or rubber

Diagram A. (sectional) For the void between the inside face of the glass and the blinds to be classed as ventilated there must be a minimum of 50mm space between the glass and the blinds, and at least 50mm space between the blinds and the reveals at the top and bottom of the window/curtain wall opening.

Diagram B. (sectional) The shaded area created by the overhang (*) will create a cooler band within the glass, thereby accentuating the temperature differential within the glass. (*Shading can be caused by other parts of the building such as cano-pies, brise-soleil and deep framing).

Other buildings can also cause shading - adopt worst case if in doubt)

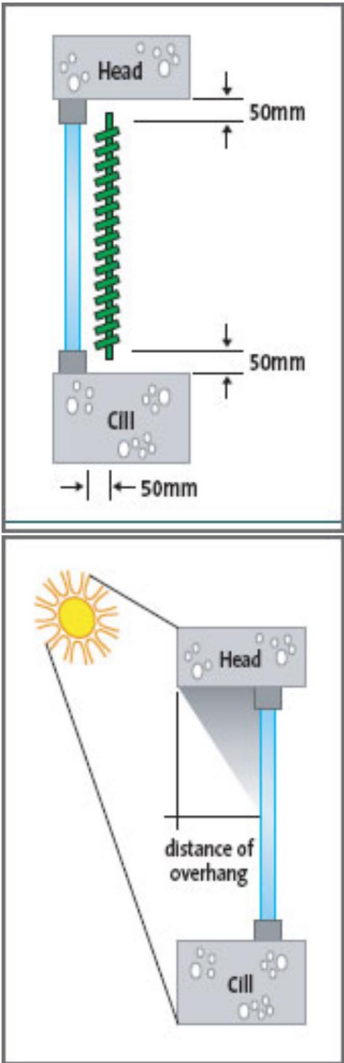


Diagram C. (sectional) Just as with diagram B glazing set deep within vertical reveals or deep framing sections may accentuate the temperature differential within the glass.

