

## Technical Note No. 65 Thermal fracture of glass

*Thermal fracture of glass may occur when the glass is heated creating temperature differences across the surface of the glass. Thermal fracture may occur as a result of solar heating or fire. This Technical Note covers the thermal fracture that occurs as a result of solar heating of glass. It explains the principle of thermal fracture, features that predispose glass to thermal fracture and the selection of glass to avoid thermal fracture. Calculations to assess the risk of thermal fracture are outside the scope of this Technical Note. The purpose of this Technical Note is to make readers aware of the phenomenon so that they can recognize the failure and take steps to prevent its occurrence.*

*This Technical Note is one of eight describing the use and performance of glass. They are:*

*TN61 Glass types*

*TN62 Specification of insulating glass units*

*TN63 Glass breakage*

*TN65 Thermal fracture of glass*

*TN66 Safety and fragility of glazed roofing: guidance on specification*

*TN67 Safety and fragility of glazed roofing: testing and assessment*

*TN68 Overhead glazing*

*TN69 Selection of glass to prevent falls from height*

### Introduction

If the temperature of part of a glass pane is raised, that area will expand relative to the cooler areas of the pane. The cooler area of glass attempts to restrain the expansion and thermal tensile stresses develop in the cooler area. If the temperature difference is sufficiently great the glass can fracture.

The glass temperature may be raised as a result of:

- Solar radiation
- Space heating devices

The intensity of direct solar radiation incident on an individual pane will depend on its location, slope, orientation and any shading. The pane may also receive reflected solar radiation.

Solar radiation across the UK ranges from 750 - 800 W/m<sup>2</sup> on a plane orthogonal to the sun's rays. Solar radiation on sloping surfaces is greater than on vertical surfaces and roof glazing is more prone to thermal fracture.

Space heating devices may cause thermal fracture if they are in very close proximity to the

glass. They may also add to the heating effect of solar radiation.

Vertical uncoated clear annealed glass and clear annealed glass with a low absorption coating do not usually suffer from thermal fracture in UK conditions when there is a ventilated space behind the glass. However it may fracture if there are extreme shadow patterns, if the incident solar radiation is increased as a result of reflection from other building surfaces or if the glass is less able to lose heat. Uncoated clear glass may suffer from thermal fracture as a result of:

- Using the glass as part of an opaque spandrel or shadow box
- Internal fit-out behind the glass
- Reflected solar radiation
- The presence of internal heating and cooling sources
- Furniture or goods placed close to the glass
- Use in sliding windows and doors which are left open
- Filming the glass