ISOLAR® Compass 1/2021

GLASS BREAK

NO GLASS BREAKAGE OCCURS WITHOUT EXTERNAL INFLUENCES

ISOLAR® GLAS

MEHR AUS GLAS

INTRODUCTION

The loads acting on the glass panes can be distinguished into two types, both of which can lead to stresses in the glass and even cause it to break.

The first is mechanical load, for instance, loads produced by wind, snow, shock, impact and climate. The second is thermal stress, caused by, for example, solar radiation, coverings in the interior side, stickers or furnishings, as well as radiant heaters and other strong heat sources in the vicinity of the glass. Superposition of different types of loads is possible in practice. There are a large number of breakage patterns that look different depending on the type of glass, the type of load, duration of load and stress intensity.

It is not always easy to distinguish between them. However, there are some typical characteristics that can be used to distinguish between mechanically induced and purely thermally induced glass breakages.

Unfortunately, a breakage does not occur by slowly indicating it in advance, but happens "spontaneously" when the stress limit is exceeded.

PRESSURE JUMP (CLIMATIC LOAD)

This type of glass breakage occurs when the amount of gas hermetically sealed in the space or cavity between the glass panes of the insulating glass unit expands or contracts dramatically. As the width of the space between the panes increases, this double-pane or insulating glass effect becomes more pronounced. It is most noticeable in triple insulating glass units with two very wide spaces between the panes. The decisive factors for such jumps are changes in air pressure and temperature and the difference in altitude between the production site and the installation site of the glass pane.

Inward deflection of insulating glass always occurs when the temperature drops (e.g. in winter) and at the same time the air pressure is higher than it was on the day the glass was manufactured.

In contrast, outward deflection of panes occurs at very high outdoor temperatures, at lower atmospheric pressure than at the production site, and when the insulating glass is installed in considerably higher altitude regions than the production site.

Different glass thicknesses and pane formats have an additional negative influence on this. In addition, very narrow and long formats are more likely to be affected because they are exposed to considerably more loads than large-format panes.

Pressure jumps can occur in all non-tempered glass such as float glass, laminated safety glass made of float glass or ornamental glass.

THERMALLY INDUCED BREAKAGES

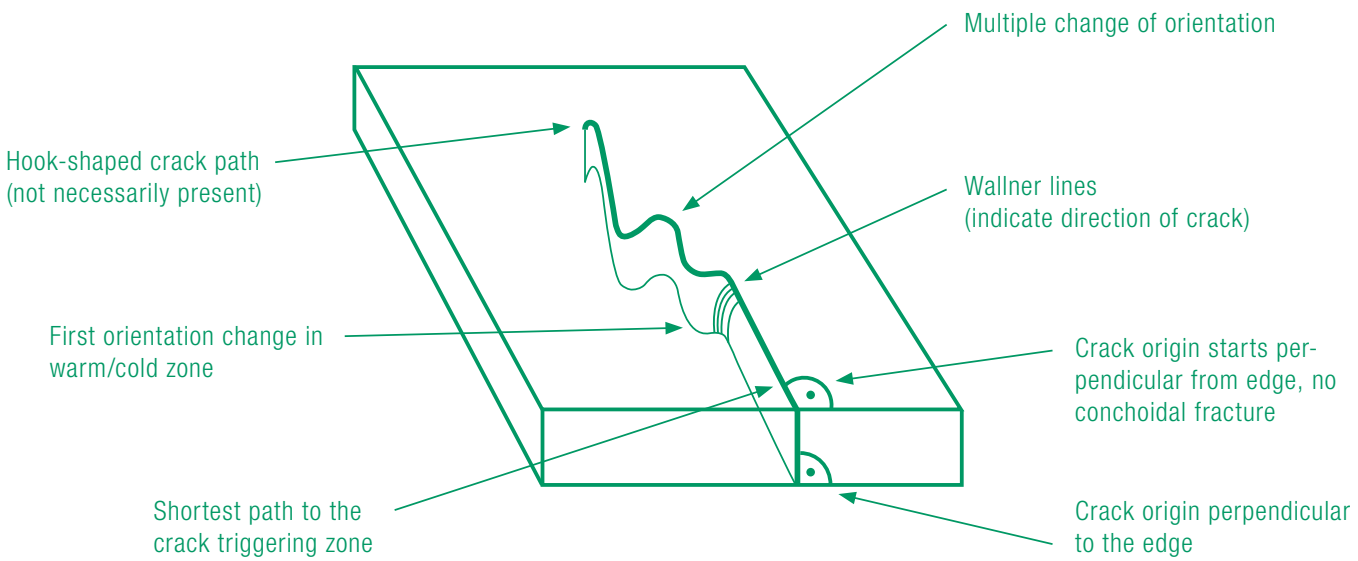
In the case of glass breakages that occur due to mechanical overload, the assessment is often very difficult, since a large number of distinguishing features must be taken into account, such as: breakage pattern, crack initiation angle, crack propagation angle, point of impact, crack origin point and material-specific properties (tempered safety glass, heat strengthened glass, float glass).

Compared to this, the assessment of purely thermally induced breakages, i.e., those caused by excessive partial heating of a pane surface, is much easier. A mere glance at the edge of the glass is sufficient for this. The edge of the glass is where one can see the typical characteristics of a thermally induced glass breakage: a crack origin that is perpendicular to the edge of the glass and runs perpendicular from the edge to the glass surface. If both these characteristics are present, it can be said with absolute certainty that this is a thermally induced glass breakage. This type of breakage can occur in float glass, laminated safety glass made of float glass as well as with ornamental glass. However, this does not occur in heat strengthened glass or tempered safety glass as these types of glass are much more resistant to changes in temperature.

The perpendicular path of the crack starting from the edge of the glass is characteristic of a breakage pattern due to thermal stress.

OTHER CHARACTERISTICS OF THERMAL CRACKS

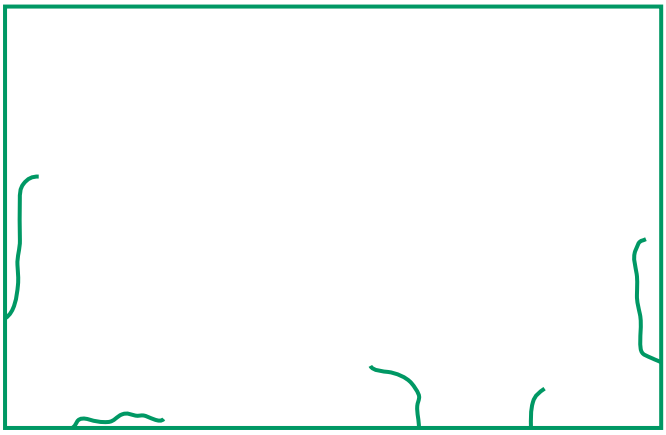
- Often occur in the second half of the year, in winter.
- Occur very often on the interior-side of the pane, especially where there are highly insulating thermal barrier coatings.
- Always start from the edge, never directly from the corner of the pane.



CLAMPING CRACK

Clamping cracks occur, for example, due to incorrect use of glazing blocks or excessive clamping, when changes in the length of the glass and frame are not considered, when the glass weights are very high or when the glazing blocks are too small.

Identifying such cracks is not easy because they do not have typical fracture paths. Therefore, detailed on-site investigations of the situation need to be carried out to determine the causes of the breakages.



A clamping crack can occur in float glass, heat strengthened glass, laminated safety glass made of float glass/ heat strengthened glass or in ornamental glass. However, it is very rare in heat strengthened glass. Tempered safety glass withstands much higher compressive stress than non-tempered glass, which is why clamping cracks don't occur in it.

TO AVOID GLASS BREAKAGE, YOU SHOULD ENSURE THE FOLLOWING POINTS

- Protecting the glass edges not only during transportation or during installation, but also throughout the period of use (correct edge protection).
- Ensuring structural calculations of the glass thickness according to the expected loads by a structural engineer.
- Avoiding excessive temperature differences within a glass pane, caused by
  structural measures or occupant behaviour.
- Installation according to the manufacturer's glazing guidelines.
- Choosing the most suitable type of glass (float glass, heat strengthened glass, tempered safety glass, laminated safety glass)

Source: Ekkehard Wagner, Glasschäden – Oberflächenbeschädigungen, Glasbrüche in Theorie und Praxis (Glass Damage - surface damage, glass breakage in theory and practice), Holzmann Medien, 5th Edition 2020

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