



What causes the spontaneous breakage of toughened safety glass?

Toughened glass is a type of safety glass processed by controlled thermal or chemical treatments to increase its strength compared with normal glass.

Toughening puts the outer surfaces into compression and the interior into tension.

Toughened glass is commonly used as a **Grade A Safety Glass** it is **5 x stronger than ordinary float glass**.

In the case of breakage toughened safety glass commonly explodes into small cubes, which is less likely to cause serious injury, however it can cause small lacerations to the skin if the body was to encounter the glass.

Common causes of toughened glass breakage as a result other than impact is.

- Chipped or nicked edges during installation.
- Stress caused by binding in the frame.
- Internal defects such as nickel sulphide inclusions.
- Thermal stresses in the glass from internal & external temperature.
- Inadequate thickness of glass used to resist high wind loads.

What is Nickel Sulphide Inclusion?

Visually, you will not be able to see these tiny particles of metal, but they can still be present in the glass, benign until they are aggravated.

Nickel Sulphide Inclusions have two main states, these are stable at high temperatures and stable at lower temperatures. When glass is heat soaked, the heat converts the Nickel Sulphide Inclusion to the high temperature state, however the glass is cooled rapidly which doesn't allow the Nickel Sulphide Inclusion to change to the lower temperature state. The transformation to the lower temperature state can occur over time, therefore a glass breakage caused by a Nickel Sulphide Inclusion can happen if the inclusion is large enough and if it is located within the tensile (central) portion of the toughened glass.

How can I tell if a glass breakage is due to Nickel Sulphide Inclusion?

The 'Butterfly Effect' pattern on glass is a sign of breakage where the implosion will centre around a singular point on the glass and will fan out in a butterfly wing formation. However, you can't for certain unless the glass is analysed.