

# Spontaneous Glass Break?

## Thermal Stress Crack

### What causes thermal stress cracks?

Several factors can cause thermal stress cracks, including:

#### **Extreme changes in temperature.**

Rapid temperature changes are the primary cause of thermal stress cracks in windows. If the temperature outside is significantly different from the temperature inside, the glass may not be able to adjust to the changes, leading to cracks.

#### **Poor installation.**

Poorly installed glass may not have enough room to expand and contract, leading to thermal stress cracks.

#### **Low quality glass.**

Lower quality glass is more prone to thermal stress cracks than high quality glass.

#### **Sun exposure.**

Direct exposure to sunlight can cause the temperature of the glass to rise, leading to thermal stress cracks.

### How to prevent thermal stress cracks?

There are several ways to prevent thermal stress cracks in your windows.

#### **Proper installation.**

Ensure glass edge have an arris or polished edge to prevent stress occurring.  
Ensure that your windows are properly installed and have enough room to expand and contract.

#### **Window film.**

Applying window film can help regulate the temperature of your windows and prevent thermal stress cracks.

#### **Ventilation.**

Proper ventilation can help regulate the temperature inside your home and reduce the temperature difference between the inside and outside of your windows.

#### **Avoid direct sunlight**

Avoiding direct sunlight on your windows can help reduce the risk of thermal stress cracks.

#### **Thermal stress cracks conclusion.**

Thermal stress cracks are a common problem that can affect any property owner. They can be frustrating, and the cause of it might not be obvious at first.

Unlike the window being at direct impact, stress cracks seem to appear out of nowhere.

By understanding what causes thermal stress cracks and how to prevent them, you can ensure that your windows remain intact and functional.



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## Toughened Glass Explosion

**One key reason toughened safety glass breaks is due to nickel sulphide inclusion.**

### **What is nickel sulphide inclusion?**

Nickel sulphide inclusion is the unintentional incorporation of nickel sulphide, an impurity, into the glass-making process.

Almost all of them are harmless. Nickel sulphide, however, can cause the glass to spontaneously shatter, weeks, months or even years after installation.

### **How does nickel sulphide inclusion lead to breakage?**

Breakages occur because of the change in the size of nickel sulphide following the thermal process by which glass is toughened.

To toughened glass, panes are loaded into a large oven with a temperature between 600 and 700 degrees Celsius.

The glass becomes soft, at which point it is blasted with cold air, also known as quenching.

Because glass is a poor conductor of thermal energy, when the surface layers of the glass are rapidly cooled to put them into a state of compression, the inner region cools much more gradually, solidifying, contracting and squeezing the outer surfaces to increase compression further.

Compression is what makes the glass strong.

The result is, therefore, a pane of glass that has a very strong outer layer, supported by a very tensile inner region.

But the nickel sulphide is located within the inner region, the tensile region.

At low temperatures, nickel sulphide has a greater volume than at high temperatures.

Because the toughening process does not allow the nickel sulphide to return to its larger cold-temperature state, it does so afterwards, usually over several years.

When glass is soft, it can accommodate the increase in the volume of nickel sulphide.

But when it is hard, the nickel sulphide can cause fractures, which lead to sudden shattering.

Think of nickel sulphide as glazing's Trojan horse.

Troy had strong outer defences but was vulnerable within.

It is within the glass's defences that nickel sulphide inclusion does its damage.

### **How to identify a nickel sulphide inclusion breakage?**

Implosion caused by nickel sulphide inclusion will centre around a singular point flanked by two pentagonal or octagonal-shaped fragments. If the destruction wasn't so frustrating, its pattern would be very pretty, and is often compared with a butterfly or a figure-of-eight. The nickel sulphide stone will be tiny, measuring between 0.06 and 0.5 millimetres and often only visible under an electron microscope. Identification of nickel sulphide inclusion breakages is often made trickier by the fact that the pane of glass could be in a thousand pieces on the floor.

