Atkinson's MIRROR & GLASS

Thermal Stress

Thermal stress is expansion that occurs when the temperature of the center of the glass is warmer than the peripheral of the glass.

What causes thermal stress?

Window Location: The location of the window on the building plays a huge factor in the amount of thermal stress it will experience. For example, think of a window that is placed under an awning. During part of the day half of the window will be in the shade while the other half is potentially exposed to a large amount of sunlight and therefore rising temperatures. Just as pouring cold water into a hot cup can cause it to crack, so exposing your windows to different temperatures. When building your home, office, or anything else remember to consider how the architectural elements will play into the windows temperature.

Low-E coatings: Low-E coatings do a great job making buildings more energy efficient, but low-E coatings as well as body-tinted glass absorb more energy aka heat in daytime conditions. This can lead to an increased risk of a stress crack.

Previous Chips or Damages: Small chips or other weakened areas of your windows also increase the risk of a stress crack. When a large amount of thermal stress is placed on a window, the window is only as strong as its weakest point. Make sure you are vigilant about small repairs that can be made to your windows. By taking care of small chips you may be able to prevent having to replace the entire window.

Environmental Factors: While you cannot completely control the environment your windows will be in, there are somethings you can look for. Notice where trees and shading naturally occur in the environment. These natural elements can be a friend or foe. Even something like a new home or building be built next to you can be a potential source of thermal stress.

Also consider the temperature inside your home versus the temperature outside your home. You cannot control the temperature outside your home, but you can control your thermostat and help negate the potentially damaging effects of a large amount of thermal difference. Make sure that you especially cognizant of these factors during season changes.

Another large consideration in the winter months is the use of heaters. More and more popular lately are the use of super hot outdoor heaters in the winter months. These are great and allow the outdoors to be utilized all winter long, but be considerate of the amount of heat they are putting out towards your windows. If you allow the heaters to heat up one part of the window and not the entire thing it will create extreme stress on the window and you will most likely end up with a thermal crack in your window.

Ways to prevent stress cracks

There is a vast well of information as to why stress or thermal cracks occur. Here are know ways to combat the occurrence of these fractures.

- Make sure to hang your drapes and blinds away from the window in order to decrease the risk of overheating.
-Make sure that there is a large amount of ventilation between your window dressings and the glass in your window.
-Don't have your vents between your window coverings and the glass. Instead install these on the interior side of the window covering.
- Considering installing thicker glass in areas of the house that you know are subject to extreme temperatures.
- If you are using solar control films be careful when installing them on the interior portion of the window since this could cause an uneven temperature fluctuation and cause a crack.
-Prevent a full fledged crack from happening by getting scratches and chips repaired as soon as possible.

High Altitude

Atmospheric pressure goes down with altitude and this can have a big impact on the structural stability of the insulated glass units in your building.

What is atmospheric pressure?

Atmospheric pressure is force exerted on an object by the weight of the air above. As you go higher up in altitude you experience less and less of this force, there is a drop in atmospheric pressure. When an insulated glass unit is created the two panes of glass are sealed airtight together creating an insulated glass unit. This small air cavity that has just been created is at a certain atmospheric pressure depending on what altitude, among other factors, it was manufactured. If an insulated glass unit is installed at a high altitude this can cause the window to bow out. When deciding whether a window can be installed at a certain altitude there are three main factors that play into the decision.

1. Will the high altitude cause glass breakage?
2. Will the bowing out cause damage to the insulated glass seal?
3. Will there be unacceptable visual distortion due to the bowing out?

Based on these three factors the glass thickness, glass type, and the size possible may have to be altered. For example say you wanted a window with its shortest dimension being 50" using 4.7 mm glass you could install that window up to 10,000ft safely,but a window with a 25" short dimension using 4.7mm glass would only be able to be placed safely at 5000ft.

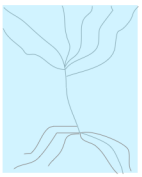
Them's the breaks...

Both thermal stress and high altitude can cause cracking in your windows. So how do you know what's causing the crack? Here is a nifty guide to cracks.

Impact Break Pattern: *This demonstrates the shatter pattern of a window when it has been struck. This pattern will occur in situations such as a baseball striking the window.*

Bending Break Pattern: *This type of pattern is seen when someone tries to open a locked window. It comes from racking of the sash when this action occurs it can cause a break.*

Thermal Stress Break Pattern: *This occurs when the center of the glass becomes warmer than the peripheral. When this difference exceeds the tensile strength of the glass it will break. It is easy to identify this pattern since the glass will break straight out for an inch or so then have a normal break pattern.*



Pressure Difference Break Pattern:*This pattern will occur when there is a large pressure differential between the inside of an insulated unit and and the outside atmospheric pressure. This is a break pattern usually only seen at high altitudes.*