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Solar, Safety and Security Window Films: Tech Bulletin

# Laminated Glass and Thermal Stress

### Scope:

The purpose of this document is to acquaint you with laminated glass and its ability or inability to handle thermal stress.

### General:

Laminated glass is constructed by using at least two or more panes of glass, which are bonded together using polyvinyl butyral (PVB) or polyurethane. Laminated glass has become increasingly popular in homes and commercial buildings, especially in the Sun Belt. This is mainly due to the concerns of glass breakage from violent weather, primarily hurricanes. There is also a growing market in commercial applications to deter burglary by reducing the ease of entry through the glass.

### Problem:

It is not always easy to determine what type of glass was used to produce the laminated glass. The panes could be annealed (ANN), heat strengthened (HS) or tempered (TTG). This can cause a problem in deciding which film to use on the glass since the type of glass you are dealing with may not be evident. In the past, it was pretty certain that if the glass had a "bug" on it, it was tempered or heat strengthened. The \*"bug" indicated that the glass met a safety glass standard such as ANSI Z 97.1 or CPSC CFR 1201. If there was a "bug" on the glass, almost any film was acceptable for installation since it indicated either heat strengthened or tempered glass. However, laminated glass can meet these standards regardless of the glass used since it will resist breaking or break safely due to the inclusion of the polyvinyl butyral (PVB) or polyurethane (PU) interlayer. This means it can have the "bug" even if it is annealed glass.

### Glass Type and Temperature Change Tolerance:

Thermal stress in glass is generated when there is a difference in temperature between the viewing area and the glass not in the viewing area such as in the frame. If the temperature difference between the two sections of glass is great enough, then glass breakage can occur. It is generally accepted that the following differences can be tolerated by the three aforementioned types of glass in a vertical position:

- Annealed.....50° F (10° C)
- Heat Strengthened.....100° F (37.8° C)
- Tempered.....200° F (93.3° C)

As you can well imagine, there are not many "livable" environments that would affect the heat strengthened or tempered glass. Since its tolerance for the temperature change is low, annealed glass can be affected by differences between the frame covered portion of the glass and the viewing area.

### Laminated Glass Constructions:

The construction or configuration of laminated glass can vary based on the manufacturer and/or its intended use. Some will use annealed only and others will use combinations of annealed, heat strengthened and tempered glass. Some manufacturers will mark the glass with an "ANN" for annealed glass, "HS" for heat strengthened and "TTG" or "TEMP" for tempered glass. Laminated glass can also have one or more panes which are tinted and/or have a low-e coating. To determine which films are acceptable to apply to laminated glass, you need as much information as possible. Sometimes the glass will have an Safety Glazing Certification Council (SGCC) number on it that can help determine the type of glass used in the construction. Many of the laminated glass manufacturers are member of this group and will apply their certification number to the glass. With the number, it is possible to get the construction of the laminated glass and the type of glass used.

### Summary:

When installing film on laminated glass, it is imperative to get as much information as possible about the glass. If it is not clearly marked, you should assume that it is annealed and choose a film that would be safe for a dual pane window. This would be any film that has a designation of "1" on the film-to-glass application chart for Clear Double Pane glass. If the laminated glass is tinted then you should look for a film that has a "1" for the Tinted Double Pane glass. If you are in doubt about the construction of the glass or need a film recommendation, please contact your sales representative or Technical Services.

\* The "bug" is a term used for the information describing the break-safe characteristics of the glass that is etched into the glass. This will indicate that it meets the requirements of ANSI Z97.1 or CFR 1201 or both. It is usually found in the lower left hand corner of the glazing and is necessary for products to be considered as safety glazing. Safety glazing or safety glass is normally tempered glass unless otherwise treated.

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