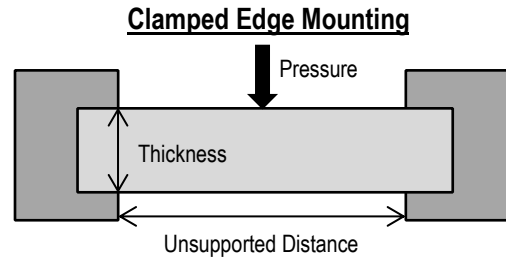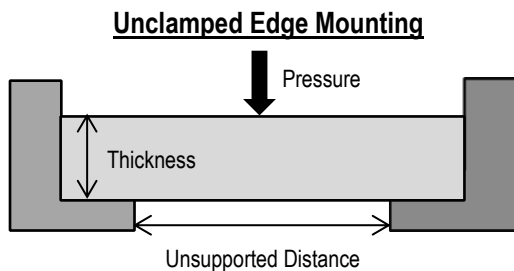# PRESSURE WINDOW DESIGN

Many variables determine how much uniform pressure a window will withstand before breaking. These range from the window material, to the geometry of the window, to rate of change in pressure, to the way the window is mounted, to the temperature differential, to the thermal coefficients of expansion of the window material and the mount material, to the surface finish of the main window faces and edges—and these are not the only factors.

However, assuming that pressure will be applied uniformly and that the window surface is free from subsurface damage and the window edge are free of defects, the following simplified models can be used to calculate required widow thickness using just a few variables:

Unclamped Edge Mounting

Pressure

Thickness

Unsupported Distance

Clamped Edge Mounting

Pressure

Thickness

Unsupported Distance

Circular Windows

$$t = r \cdot \sqrt{\frac{P \cdot K \cdot SF}{M}}$$

Rectangular Windows

$$t = l \cdot w \cdot \sqrt{\frac{P \cdot K \cdot SF}{2 \cdot M \cdot (l^2 + w^2)}}$$

Where:

t = window thickness

r = unsupported window radius (for circular windows)

l = unsupported window length (for rectangular windows)

w = unsupported window width (for rectangular windows)

P = pressure differential from one side of window to the other
For the case of vacuum windows, standard atmospheric pressure $P = 14.7\ PSI$ may be used

SF = Safety Factor, a value intended to encompass the many other factors not included in the model. Values used for safety factor vary. $SF = 4$ would be considered a modest value, sufficient for many applications, although values from $SF = 1.5$ to $SF = 7$ are recommended by different sources. Advanced Glass Industries advises consulting an engineer to determine what is required for your application.

M = Modulus of Rupture, a value specific to the window material

K = $\begin{cases} 0.75 & if\ mounted\ with\ clamped\ edge(s) \\ 1.125 & if\ mounted\ with\ unclamped\ edge(s) \end{cases}$ = empirical constant