

Comparison of Window Glass Sample Strength Estimates: Full Scale Versus Concentric Rings



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Abstract

...The principal objective of this research is to test the hypothesis that surface strength parameters, m and k , are independent of glass plate geometry. Surface strength parameters obtained from full scale tests and from concentric rings tests performed on the four samples are compared by using the parameters to predict glass plate strengths. If the hypothesis is valid, strengths obtained from the full scale tests and concentric rings tests for a common glass plate geometry will be similar, if not the same. While the precise values of surface strength parameters estimated from each methods will not be identical, resulting strength characterizations of common plate sizes should compare favorably....

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6 How Do Glass Windows Break? Each force causes a deformation that may leave a visible mark or fracture the glass. This can be used to determine the direction and amount of force. Glass acts initially as an elastic surface and bends away when a force is applied. When the force increases beyond its tensile strength, it cracks. Concentric cracks come later from continued pressure on the same side as the force applied. 8 How Does Glass Break? Edges of broken pieces of glass will show rib ("stress") marks. 16 Collection of Glass Samples The glass fragments should be packaged in boxes to avoid further breakage. If evidence is to be examined for glass fragments, it should be taken whole and each item individually wrapped in paper and boxed. Comparison of window glass sample strength estimates: Full scale versus concentric rings. Sheng-yung Hsu. Ref 10. It also describes strength testing of window glass at the Institute for Research in Construction of the National Research Council of Canada using three quite different testing machines. (i) A dynamic glass testing rig, with a large 2.35 m diameter piston, applies dynamic air pressures to large panes of glass in the vertical position. Compared to other structural materials, for instance concrete, knowledge about mechanical properties and structural behaviour of glass is less. The result of this lack of knowledge has led to failure of several glass structures during the last years, [13]. In construction, the standard (elastic) design method is called the maximum stress approach, [16]. Heat strengthened glass is produced similarly as fully tempered glass, but the cooling rate is lower. The resulting residual stress is lower, and thus the tensile

strength is lower than for fully tempered glass. At fracture, the fragments are larger than for fully tempered glass. On the other hand, the larger glass fragments allow for a greater post-breakage load capacity than for fully tempered glass, [16].