

An experimental investigation has been completed which studied the breaking of window glass by fire. The experiments were carried out in a specially designed compartment to achieve two-layer flows characteristic of normal building fires.

The experimental data is collected from two test groups: the first for windows with their edges insulated from the fire (edge-protected) and, the second for windows uniformly heated by the fire edge-unprotected.

The results of the edge-protected window tests indicated that the glass breakage was caused by a critical temperature difference between the central heated portion of the pane and the glass edge.

The experimental work showed the critical value to be approximately 90° C. After the material properties of the glass were determined, the theoretical findings of Keski-Rahkonen were used to obtain a value of 70° C; the difference attributed to radiative heating.

The test results also demonstrated a distinctive loss of integrity by the windows. When breakage occurred, the cracks spread throughout the glass, joined together and caused at least partial collapse of the pane.

The results from the edge unprotected window tests were quite different. There were relatively few cracks developed and almost no propagation across the glass. Consequently, there was no window collapse in any of these cases. The breakage did initiate at a consistent glass temperature value, however, the mechanism for these tests is now known.