

Experimental and numerical study of glass facade breakage behavior under fire conditions: fire safety engineering: doctoral thesis accepted by the Chinese Academy of Sciences, Beijing, China

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Abstrak

This book presents the comprehensive results of experimental and numerical investigations of glass façade breakage behavior under fire conditions. First of all, full-scale frame and point-supported glass facades, incorporating single, double and coated glazing, were tested under pool fire conductions. The results determined the effects of different glass frames, types of glass, and thermal shocks on breakage behavior. Small-scale tests, using the Material Testing System (MTS) 810, Netzsch Dilatometer and FE-SEM, were also performed at different temperatures to determine the basic mechanical properties of glazing.

In addition, a three-dimensional dynamic model was developed to predict stress distribution, crack initiation and propagation, and has since been employed to identify the breakage mechanisms of different types of glass facade. The numerical results showed very good agreement with the experimental results and verified the models ability to accurately predict breakage. Lastly, a theoretical model based on incident heat flux was developed to predict the breakage time and heat transfer in glazing, which served to reveal the nature of interactions between fire and glass.