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Full-Scale Experiments for Point-Fixing Frameless Laminated Glass

Francesco Freddi and Gianni Royer-Carfagni*

Department of Civil-Environmental Engineering and Architecture, University of Parma, Viale Usberti 181/A, I-43100 Parma, Italy

Mirko Silvestri

Stazione Sperimentale del Vetro, Via Briati 10, I-30141 Murano, Italy

An innovative point-fixing device of laminated glass for frameless glazing has been conceived of, where the polymeric interlayer, slightly extending beyond the edge of the glass plies in the proximity of the borders, is bent at right angle, and directly attached to metal clamps *via* the lamination process. This technology is made possible by a high-performance ionoplastic polymer with high elastic moduli, low viscoelasticity, and high glass transition temperature. Here, we record the results of destructive tests on full-size specimens under pressure loading. During the tests, one or even both of the glass plies of the laminated panels were broken to study their postcritical performance. In all cases, a noteworthy load-bearing capacity is maintained and sudden collapse is avoided (fail-safe response) because, remarkably, the point-fixing devices firmly hold the interlayer even after complete glass breakage. The experimental evidence has been confirmed by a full three-dimensional (3D) viscoelastic finite-element-method modeling.

Introduction

In order to improve the ultimate performance of structures made of glass, and consequently, increase the structural-safety level, an effective technology is to bond together glass plies with polymeric sheets to maintain the resulting fragments coherent after glass breakage and avoid sudden collapse.[1,2] The postcritical (postbreakage) response of laminated glass is a complex topic because it is influenced by many factors, such as glass thickness and type (annealed, heat strengthened, tempered), polymeric interlayer (polyvinyl butyral PVB or ionoplast), polymer/glass adhesion, polymer aging, temperature, nature of loading, rate of loading, and load duration. The reliability of laminates is basically associated with the mechanical properties and resistance of the polymeric materials and the glass-interlayer adhesion, but if

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gianni.royer@unipr.it