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Quasi-static bending and low velocity impact performance of monolithic and laminated glass windows employing chemically strengthened glass

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Abstract

In this paper, firstly the quasi-static bending performance of chemically strengthened alumina silicate glass plates is investigated for different glass thicknesses: 2.2, 4.0 and 6.0 mm. The flexural strength is measured using coaxial double ring experiments. The 3D Digital Image Correlation (DIC) technique is employed to measure the strain at failure. The failure probability is then assessed using the Weibull statistical distribution.

Secondly, the performance of the laminated glass windows made of these chemically strengthened glass plates is evaluated quasi-statically under concentrated and distributed loadings. The effects of polymer interlayer thickness, glass and polymer type and multi-layering the polymer interlayer on the structural performance are investigated. The type and thickness of the polymer interlayer, as well as the type of loading are found to influence the fracture sequence in the glass plates and consequently the post fracture safety of the structure. The response of laminated glass specimens is then assessed under low velocity soft impacts, for velocities up to 3.3 m s^{-1}, using a drop tower facility. Laminated glass with a polyvinyl butyral (PVB) interlayer shows the greatest improvement in terms of peak force and absorbed energy.