Thin Glass Composite Panels – Analytical and Experimental Assessment of Out-of-Plane Bending Stiffness

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Abstract

This research investigates the structural performance of thin glass composite panels with additively manufactured core structures. This novel type of glass construction promises a very lightweight yet stiff façade element. It provides high potential to safe resources, energy and emissions during production and offers new architectural design possibilities. However, predicting the mechanical response to external loads, such as wind or snow, is a challenge due to the versatile geometry and anisotropy, multiple design options and the variety of materials used. This research focuses on the out-of-plane bending stiffness of thin glass composite panels, which is investigated by means of a four-point bending tests. First, theoretical considerations regarding the influence of the core density are made. A solid core is compared to a honeycomb core structure. Second, an analytical sensitivity study investigates the influence of the core thickness, core material stiffness, core density and adhesive material stiffness on the total bending stiffness and its ratio of pure bending and pure shear. Further, experimental four-point bending tests were carried out on three thin glass composite panels with different core thickness and compared to the analytical results.

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Keywords

Thin glass, Composite panels, Additive Manufacturing, Bending stiffness

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