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Mechanism of Pull-out Performance in Lagscrewbolted Timber Joints II

Development of a theory of pull-out properties parallel to the grain

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Abstract: Lagscrewbolts were developed as a simple and economical moment-resisting connector for glulam frame constructions. This new type of connector is expected to show high pull-out resistance due to the shear resistance between the top of the thread and the glulam. In order to quantify this performance, a theory of pull-out resistance of an embedded lagscrewbolt parallel to the grain direction was developed on the basis of Volkersen theory, which was originally developed for the shear stress analysis of rivet joints. The applicability of our theoretical approach was verified based on experimental results. Shear strength f_v and shear stiffness Γ, both necessary parameters of the theoretical formula, were determined by pull-out tests of thin 15-mm glulam specimens, assuming that in thin specimens the shear stress distribution would be almost uniform. Verification experiments were conducted using three kinds of Lagscrewbolts, with top thread diameters of 25, 30 and 35 mm, and the influence of various embedment depths ranging from 60 to 450 mm on the pull-out properties was examined. The developed theory predicted maximum pull-out load and slip modulus well.

Keywords: Lagscrewbolt, pull-out resistance, Volkersen model, thin plate specimens

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