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Failure Analysis of Laminated Veneer Bamboo Dowel Connections

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Abstract : Laminated veneer bamboo (LVB) is a structural engineered composite made from glued layers of bamboo. A relatively new building product, LVB is currently employed in similar sizes and applications as dimensional lumber. This study describes the results of a 3D elastic Finite Element model for halfhole specimens when loaded in compression parallel-to-grain per ASTM 5764. The model simulates LVB fracture initiation due to shear stresses in the dowel joint and predicts displacement at failure validated through comparison with experimental results. The material fails at 1mm displacement due to in-plane shear stresses. The paper clarifies the complex interactive state of in-plane shear, tension perpendicular-to-grain, and compression parallel-to-grain stresses that form different distributions in the critical zone beneath the bolt hole for half-hole specimens. These findings are instrumental in understanding key factors and fundamental failure mechanisms that occur in LVB dowel connections to help devise safe standards and further LVB product adoption and design.

Keywords : composite, dowel connection, embedment strength, failure behavior, finite element analysis, Moso bamboo
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