Finite Element Models of Effects of Moisture on Bolt Connection Properties of Glulam

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Summary:

Connections are critical parts of timber structures, transmitting static and dynamic forces between structural elements. Extensive experiments were conducted and detailed Finite Element (FE) models were developed. The experimental results showed that the stiffness and load-bearing capacity of the joints is reduced by post-fabrication wetting and is increased by post-fabrication drying. It was clear from those test results that changes in mechanical properties were greater than could be explained by effects moisture content changes have on material properties. Three-dimensional (3-D) continuum FE models for connection loaded parallel to grain were successfully developed based on analysis of connections having a single ½ inch (12.7 mm) or ¾ inch (19.1 mm) diameter bolt. The model included the nonlinearity of material and contact analysis between wood and steel and revealed that the connection capacity can be well predicted by using FE techniques.

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