Modeling Wood in Transverse Compression

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Abstract
A plane-stress, finite element model has been developed to predict the stress distribution in wood members subject to perpendicular-to-grain compression. This model exploits linear-strain, isoparametric triangular elements used in sufficient number to achieve a convergent solution. Model verification was achieved through comparison of numerically obtained deformation predictions with corresponding experimental data obtained from actual test specimens. Twenty-seven specimens were instrumented to determine their deformations at numerous locations. Test materials were sampled from three logs (two engelmann spruce, one western hemlock). Specimens were fabricated with three widely different orthotropic ratios, three geometries (length/depth ratios), and three loading geometries (uniformly distributed load across the entire length, one-half length, and one-quarter length). In total, 377 experimental measurements on 27 specimens were compared to finite element predictions. The results showed that on average the model predicted local deformation to within 5%.