Effect of Cracking on Lag Bolt Performance

by

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(ABSTRACT)

This dissertation presents the results of testing to determine the load-slip characteristics of single-shear single lag screw connections subjected to monotonic lateral loading parallel to grain. Of particular importance was the comparison of experimental capacity and 5% offset yield load resistances to load resistances as predicted by the American Forest & Paper Association's (AF&PA) publication *General Dowel Equations for Calculating Lateral Connection Values, Technical Report 12* (*TR-12*). Additionally some other tests were conducted, including fracture, tension strength perpendicular-to-grain, lag screw connection inking, dowel embedment, specific gravity and moisture content. The results for the testing program are presented.

Four hundred and forty eight lateral tests were conducted on lag screw connections. Each connection was comprised of a 2 x 6 x 14 in. long wood main member, 1/4 in. thick steel side plate, and a single lag screw. The parameters of interest were specific gravity, lag screw diameter, and pilot hole diameter. Two species of wood, Douglas-fir and spruce-pine-fir, three lag screws diameters, and three pilot hole diameters for each species of wood were implemented.

Models were developed to predict lag screw connection capacity and 5% offset yield and are contained herein. Models were based on results from connection and inking tests and mechanical analysis. Recommendation for *ASD* and *LRFD* design values were derived

from connection test results for connections that used AF&PA's *National Design Specification for Wood Construction* (*NDS*®) specified pilot holes. Using fracture mechanics results, work was performed to determine the effective load required to crack and separate fracture surfaces of wood main members due to the installation of lag screws with varying pilot hole diameters.