Block Shear Testing of CLT Panels: An Exploratory Study

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Summary:

A study was conducted with the primary objective of examining the efficacy of a standard block shear test method to assess the bond quality of cross-laminated timber (CLT) products. The secondary objective was to examine the effect of pressure and adhesive type on the block shear properties of CLT panels. The wood material used for the CLT samples was Select grade nominal 25 x 152-mm (1 x 6-inch) Hem-Fir. Three adhesive types were evaluated under two test conditions: dry and vacuum-pressure-dry (VPD), the latter as described in CSA standard O112.10. Shear strength and wood failure were evaluated for each test condition.

Among the four properties evaluated (dry and VPD shear strength, and dry and VPD wood failure), only the VPD wood failure showed consistency in assessing the bond quality of the CLT panels in terms of the factors (pressure and adhesive type) evaluated. Adhesive type had a strong effect on VPD wood failure. The different performance levels of the three adhesives were useful in providing insights into how the VPD block shear wood failure test responds to significant changes in CLT manufacturing parameters. The pressure used in fabricating the CLT panels showed a strong effect on VPD wood failure as demonstrated for one of the adhesives. VPD wood failure decreased with decreasing pressure. Although dry shear wood failure was able to detect the effect of pressure, it failed to detect the effect of adhesive type on the bond quality of the CLT panels.

These results provide support as to the effectiveness of the VPD block shear wood failure test in assessing the bond quality of CLT panels. The VPD conditioning treatment was able to identify poor bondline manufacturing conditions by observed changes in the mode of failure, which is also considered an indication of wood-adhesive bond durability. These results corroborate those obtained from the delamination test conducted in a previous study (Casilla et al. 2011).

Along with the delamination test proposed in an earlier report, the VPD block shear wood failure can be used to assess the CLT bond quality. Although promising, more testing is needed to assess whether the VPD block shear wood failure can be used in lieu of the delamination test. The other properties studied (shear strength and dry wood failure), however, were not found to be useful in consistently assessing bond line manufacturing quality.

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