Structural Capacity of One-Way Spanning Large-Scale Cross-Laminated Timber Slabs in Standard and Natural Fires

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Summary:

This paper describes selected observations, measurements, and analysis from a series of large-scale experiments on cross-laminated timber (CLT) slabs that were exposed to fire from below, using four different heating scenarios, with a sustained mechanical loading of 6.3 kN m per metre width of slab. The deflection response and in-depth timber temperatures are used to compare the experimental response against a relatively simple structural fire model to assess the load bearing capacity of CLT elements in fire, including during the decay phase of natural fires. It is demonstrated that the ventilation conditions in experiments with a fixed fuel load are important in achieving burnout of the contents before structural collapse occurs. A mechanics-based structural fire model is shown to provide reasonably accurate predictions of structural failure (or lack thereof) for the experiments presented herein. The results confirm the importance of the ventilation conditions on the fire dynamics, burning duration, and the achievement of functional fire safety objectives (i.e. maintaining stability and compartmentation), in compartments with exposed CLT.

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