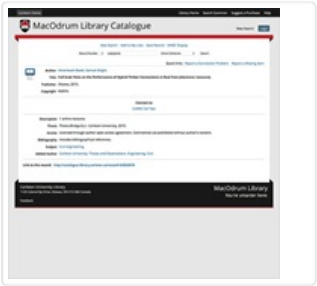

Full Scale Tests on the Performance of Hybrid Timber Connections in Real Fires

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Author:	Boadi, Samuel
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Summary:

Connections form an integral part of any building system. A hybrid building system is created when two or more structural construction materials are involved in its construction. There are concerns when using hybrid connections especially when they are exposed to fire. This is because different materials with varying ambient and thermal properties must perform together to ensure a safe and stable structural system.

This research seeks to present the fire behavior and resistance of unprotected hybrid connection systems involving a glulam timber beam and steel columns in typical real fires referred to as nonstandard fires, and their comparison to performance under temperatures defined by CAN/ULC S101. Three different shear tab connection systems: Concealed, Exposed and Seated were studied. These connection systems transfer beam end reactions to the columns. Each connection system was tested for two load ratios of 60% and 100% with a 12.7 mm Grade A325 bolts.

The time to failure of each assembly under the modelled non-standard fire curve reduced with increasing load ratios. Lower load ratio of 60% resulted in an increase in the times to failure by 50% - 75%. Fire resistance ratings in the modelled real fire curve were low, with a higher resistance time of 21 minutes recorded for the Seated Connection Assembly under 60% load ratio. Using the cumulative radiative energy area method to predict the severity of the standard CAN/ULC-S101 and real fire curves gave good results. The method predicted conservative equivalent times of failure for the Seated Connection Assembly under both load ratios of 60% and 100%.

Online Access: Free

Resource Link

https://curve.carleton.ca/system/files/etd/fd55ff1a-30b6-4ee1-8499-a9a75160d6be/etd_pdf/662b3e641017cf65d17be2a74cca9e14/amankwahboadi-fullscaletestsontheperformanceofhybridtimber.pdf