



Fire Safe Glued Massive Timber Members Adhesive Bonding Performance under Elevated Temperature -Tests Report

<https://research.thinkwood.com/en/permalink/catalogue169>

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Organization: Forestry Innovation Investment

Year of Publication: 2013

Country of Publication: Canada

Format: Report

Material: Solid-sawn Heavy Timber

Topic: Fire
Mechanical Properties

Keywords: Temperature
Adhesives
Bondlines
Polyurethane
Douglas-Fir
Hemlock
SPF
Phenol-Resorcinol Formaldehyde
Epoxy

Language: English

Research Status: Complete

Summary:

This project was conducted to quantify the performance of adhesives bond lines under shear load subject to elevated temperature. The results add to the understanding of the performance of polyurethane adhesive bond lines under elevated temperatures to address areas of fire safety concern under the current building codes.

The project focused on studying the shear bond capacity of three wood species by using 3 types of adhesives with/without nanoclay treatment at 4 temperature levels. The three wood species are Douglas-Fir, Hemlock and SPF. The adhesives are polyurethane (PU), Phenol-Resorcinol-Formaldehyde (PRF) and Epoxy. PU and PRF specimens were also tested with nanoclay treatment and without nanoclay treatment. Epoxy specimens were tested without nanoclay treatment only. The temperature levels considered were room temperature (about 20 °C), 60°C, 80°C and 100°C. The results indicate that the influence of elevated temperature on the shear bond strength of PU and PRF adhesive was in the range of 20 to 30% regardless of nanoclay treatment. Regardless of species, PU or PRF, with or without nanoclay, the average shear strength for 100°C oven temperature treatment ranged from 6.0 to 7.5 MPa. In the case of SPF PU specimens treatment with nanoclay reduced the variability of shear strength significantly from 12% at room temperature to 5% after 100°C oven treatment. This is an important aspect that needs further verification for enhancement of performance. Finally the data in this study can be used to support modeling of timber component subjected to elevated temperature.

Online Access: Free

Resource Link

<http://www.bcfii.ca/system/files/reports/public/fii405-2012-13-ubc-cawp-fire-safe-glued-massive-timber-members-adhesive-bonding-performance-under-elevated-temperature.pdf>