

## UQ Fire Project #2020.11

# FIRE PERFORMANCE OF ADHESIVES USED IN LAMINATED TIMBER

### Advisory Team

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### Keywords

Laminated timber, fire safety, adhesive, delamination, composite behaviour

### Background and motivation

The use of modern, engineered timber products and design of novel structures is becoming rapidly popular in Australia and worldwide. The performance of load-bearing timber structures during and after a fire is a challenging within the context of ensuring the structural stability of a building structure.

In its most basic definition, engineered timber is based on using adhesives to adhere various lamellas (i.e. layers) of timber together working in composite action; the concept imitates the combined use of materials for obtaining a single material that behaves as a “composite”. The behaviour of the material as a composite is challenged when the adhesive use reduces its capacity to transfer load between the various lamellas. This is a mayor challenge for assuring integrity of a timber structure during and after fire. Although considerable research has been done on adhesives and timber separately, not much has been done to understand when “composite action” in the system is lost.



### Research objectives

- 1) Design and construct a simple ad hoc experiment for evaluating the influence of loss of adhesion resulting in loss of composite action of a laminated timber structure. This experiment will be simple, yet novel.
- 2) Study a range (3 or 4) of adhesives types/brands used in manufacturing of timber.
- 3) Model and analyse the stresses of the adhesive during the ad hoc experiment (optional).

### Methodology

This project will be based on experimental testing, data analysis, and simple FE modelling (optional).

### Recommended literature

Buchanan A. 2014. *Fire Resistance of Timber Structures*, report for the National Institute of Standards and Technology (NIST)

[https://www.nist.gov/sites/default/files/documents/el/fire\\_research/NIST-Timber-Report-v4-Copy.pdf](https://www.nist.gov/sites/default/files/documents/el/fire_research/NIST-Timber-Report-v4-Copy.pdf)

Klippel M, Frangi A, and Fontana M. 2011. Influence of the Adhesive on the Load-Carrying Capacity of Glued Laminated Timber Members in Fire. *Fire Safety Science* 10.

<http://www.iafss.org/publications/fss/10/1219>