

UQ Fire Project #2019.08

PROTECTIVE LAYERS FOR ENHANCING FIRE PERFORMANCE OF MASS TIMBER – AN EXPLORATORY STUDY

Advisory Team

Dr Andres F Osorio (a.osorio@uq.edu.au)

Keywords

Timber, fire performance, parametric analysis

Background and motivation

Mass timber products such as cross laminated timber (CLT), glulam, and laminated veneer lumber (LVL) have led to a renewed interest in timber construction. Despite their many advantages, fire safety of mass timber elements remains an issue of concern. Mass timber allows a great degree of flexibility of the materials, features of the materials, and the way they are used to manufacture a given product. One potential way to manage the fire risk of mass timber is the inclusion of protective layer which could limit heat transfer into the main section of a given element. During a fire, this protective layer could be responsible for delaying ignition or possibly, eliminating ignition of the load bearing components of the panel. The flexibility of mass timber construction would allow the inclusion of this protective layer provided there is enough benefit from the protective layer.

Research objectives

This research will evaluate if the inclusion of a protective layer benefits the fire performance of mass timber elements. This project will explore the feasibility of a protective layer in enhancing the overall fire performance of engineering timber by parametrizing material properties, geometrical features, etc. within the protective layer.

Methodology

This project will conduct a series of sensitivity analysis for different parameters in order to identify the ideal configuration of a protective layer. Numerical heat transfer analyses will be used to evaluate the effectiveness of the protective layer in enhancing the fire performance of mass timber elements. The student in collaboration of the advisor will develop a list of parameters to be included in the analysis. Permutations of parameters will be used to formulate different versions of a protective layer and determine if including a sacrificial layer is a viable method to manage fire safety considerations in mass timber.

Recommended literature

- [1] Osorio, A.F., Hidalgo, J.P. and Evans P. (2018). Enhancing the fire performance of mass timber and its implications to the fire safety strategy. 2018World Conference on Timber Engineering (WCTE 2018), Seoul, Republic of Korea, 20 -23 August 2018.
- [2] Emberley, R. (2017) Fundamentals for the Fire Design of Cross Laminated Timber Building. PhD Thesis. University of Queensland. <https://doi.org/10.14264/uql.2017.163>
- [3] BS EN 1995-1-2:2004 Eurocode 5: Design of timber structures – Part 1.2: General – Structural fire design. (2004).