UQ Fire Project #2020.06

IGNITION AND HORIZONTAL FLAME SPREAD OF CROSS-LAMINATED TIMBER IN A CEILING CONFIGURATION

Advisory Team

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Keywords

ignition, flame spread, cross-laminated timber, experimental, analysis

Background and motivation

The study of fire dynamics in compartments is an area of research key to the analysis of the structures under fire conditions. Research on open-floor plan compartments fire has grown significantly since this is the norm in tall buildings, with large open spaces and increased ventilation. This research has led to the definition of three flame spread modes as a function of the fire front spread velocity (Vs) and the burnout front spread velocity (Vb). Understanding of these modes may enable the definition of adequate fire scenarios for tall buildings.

The transition between flame spread modes in open-plan compartments has been demonstrated to be influenced by the presence of combustible materials on the ceiling, e.g. insulation or exposed cross-laminated timber slabs. In recent years, the use of exposed cross-laminated timber for ceiling in office buildings with open-plan compartments has increased significantly. Understanding of the criteria for ignition and flame spread of combustible materials used as ceiling slabs is fundamental to complete tools used to define the fire behaviour in these compartments.

Research objectives

This project aims at experimentally studying the ignition and flame spread of cross-laminated timber slabs in the horizontal orientation when exposed to different heating conditions. The objective of this project is to establish the conditions under which sustained ignition and flame spread is attained for combustible materials under this particular configuration.

Methodology

This project will develop a series of small or medium-scale ignition and flame spread experiments on CLT slabs. The bottom surface of CLT slabs will be exposed to varying thermal boundary conditions induced by a radiant heat source (radiant panels) and a buoyancy-driven flow (gas burner). Ignition and flame spread will be measured and compared to classical theories to describe these phenomena. In order to design the experimental method, numerical simulations will be carried out as a preliminary study.

Recommended literature

[1] Torero et al., Revisiting the Compartment Fire, Fire Safety Science 11:28-45, 2014, https://doi.org/10.3801/IAFSS.FSS.11-28

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