Project:

FIRE PERFORMANCE OF STRUCTURAL INSULATIVE PANELS

Keywords: prefabricated structures, modular systems, fire performance

Background and motivation

The concept of “prefabricated” refers to a part of a building that is manufactured in a certain place and then transported to another site for its final use. A product is considered “modular” when it is produced in a way such that its configuration may be suited for use in different projects, or for various purposes. The popularity of pre-fabricated modular products in residential and commercial construction is increasing in Australia and all over the world due to many reasons, including an increased quality control, reduction of construction time, decrease of construction waste and improved conditions for onsite worker’s safety. Timber, steel and polymers are examples of the wide variety of materials that are used in prefabrication. Taking that into account and considering that there are several configurations for those products, including Structural Insulated Panels (SIPs), each will behave and perform differently when subject to loading, heating and environmental stresses. Nonetheless, their performance in fire scenarios is constantly overlooked.

Research objectives

Determine and study the failure modes of a structural insulated panel when subject to different loading configurations. Understand the mechanical and fire performance material properties involved in such process. Characterize and describe the heat transfer process within the SIP and how it can affect the fire safety performance of a structure composed by those panels.

Methodology

This project combines laboratory testing and processing of data. The student will be required to use analytical and programming software to analyse and present the outcome of the tests.

1. Literature review to fully comprehend the scope of use of prefabricated modular panels, their application in construction and the variables involved in their mechanical and fire safety design.
2. Testing for overall material properties. Execution of small and mid-scale bending, compression and shear tests on SIPs with varying widths, at ambient temperature and exposed to different heat fluxes.
3. Create a model of heat transfer through the layers of the panels. Describe the variation of properties such as thermal inertia as heat transfer takes place and evaluate the system’s overall fire safety performance.

Recommended literature
