UQ Fire Project #2019.14

FLAME SPREAD IN MODERN BUILDING FAÇADES

Advisory Team
Dr Martyn S. McLaggan (martyn.mclaggan@uq.edu.au)

Keywords: Flame spread, façades, experimental, intermediate-scale

Background and motivation

There are a huge variety of modern façade systems available all of which aim to fulfil a range of goals. These systems aim to reduce energy consumption, provide weather protection, and deliver the aesthetic visions desired by architects amongst other things. This has led to the introduction of an air gap in façades, along with using flammable materials on the exterior of buildings. These breach the existing fire safety engineering strategies in buildings and so fire engineers require the tools and data to be able to predict the potential for fire spread in these modern configurations.

Full-scale tests are hugely costly and deliver little useable knowledge, while small-scale tests are not sufficient to capture global phenomena. Thus, medium-scale tests provide the bridge to analyse how the introduction of an air cavity and combustible materials affects the flame spread behaviour. This research is required to be able to understand these interactions and quantify the key parameters to enable engineers to use these designs.

Research objectives

This project aims to investigate flame spread in modern façades which contain an air gap to investigate the key parameters. This will provide the necessary knowledge to be able to start to develop models capable of predicting flame spread in basic façade configurations.

Methodology

This project will primarily use an already designed and proven medium-scale (1.8 m high) experimental setup at the UQ Fire Lab. A series of tests will be performed with different sizes of air gaps to investigate the influence that this has on the flame spread behaviour, as measured by relevant fire science metrics. This will tie into the high-impact work on the Material Library of Cladding Materials project which has built a database of all cladding materials containing fundamental data and material properties.

Recommended literature

[1] M. Bonner, G. Rein, Flammability and Multi-objective Performance of Building Façades: Towards Optimum Design, *International Journal of High-Rise Buildings*. 7 (2018) 363–374.

[2] K. Livkiss, S. Svensson, B. Husted, P. van Hees, Flame Heights and Heat Transfer in Façade System Ventilation Cavities, *Fire Technology*. 54 (2018) 689–713. doi:10.1007/s10694-018-0706-2.

[3] K. Livkiss, B.P. Husted, P. van Hees, T. Beji, Numerical study of a fire-driven flow in a narrow cavity, *Fire Safety Journal*. 108 (2019) 102834. doi:10.1016/j.firesaf.2019.102834.

[4] Garvey, B. (2018). Experimental Study on the Interaction of Cladding Materials in the Fire Performance of Facades. Masters thesis: *The University of Queensland, Australia*.