

## UQ Fire Project #2019.02

# DETERMINING EMPIRICAL CORRELATIONS FOR UPWARD FLAME SPREAD OF FAÇADES

### Advisory Team

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### Keywords

Flame spread, façades, experimental, bench-scale

### Background and motivation

There are a huge variety of modern façade systems available all 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 flammable materials onto the exterior of buildings which falls out with the classic fire safety strategy. Compartmentation is breached in the event of vertical flame spread and this means that fire engineers must be able to quantify and assess this fire risk to be able to enable effective mitigation strategies. Flame spread in lateral conditions can currently be obtained using the standardised ASTM E1321 Lateral Ignition and Flamespread Test (LIFT) which adopts a series of simplifications to obtain a flame spread parameter allowing for calculation of flame spread velocity. The empirical correlations used in this test however are not directly applicable to the upward concurrent flow conditions in façade fires. Thus, research is required to find whether these correlations can be modified for use in the vertical configuration or decide whether a completely novel approach is instead required.

### Research objectives

This project aims to determine flame spread velocities for vertical configurations using a simplified approach based on existing lateral spread correlations. This will act as a feasibility study to evaluate whether upward flame spread can currently be adequately determined using bench-scale methods.

### Methodology

This project will primarily use the Lateral Ignition and Flamespread Test (LIFT) apparatus in the UQ Fire lab. Experimental test series will be performed in both the horizontal and vertical orientations, and the latter may require development or improvement to facilitate determination of the relevant properties. Other equipment in the lab can be used to extract global properties relevant for the analyses of vertical flame spread. This will tie into work on the Material Library of Cladding Materials project which builds a database of all cladding materials.

### Recommended literature

- [1] ASTM International, E1321-13: Standard Test Method for Determining Material Ignition and Flame Spread Properties, (2013) 1–16. doi:10.1520/E1321-13.1.
- [2] J. Quintiere, A simplified theory for generalizing results from a radiant panel rate of flame spread apparatus, *Fire Mater.* 5 (1981) 52–60. doi:10.1002/fam.810050204.
- [3] A.C. Fernandez-Pello, T. Hirano, Controlling Mechanisms of Flame Spread, *Fire Sci. Technol.* 32 (1983) 1–31. doi:10.3210/fst.2.17.
- [4] J. P. Hidalgo et al., Protocols for the Material Library of Cladding Materials – Part I: Framework. University of Queensland (2018).