

DEVELOPMENT OF A BESPOKE TEST METHOD FOR FAÇADE FIRE TEST

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Facade fire testing is a critical component of modern building safety, as it enables the assessment of the fire performance of exterior wall systems and cladding materials under representative fire conditions. With the growing number of skyscrapers worldwide and the widespread use of new construction materials, many of which are combustible or composite, the risk of fire spreading along building facades has become a major concern for architects, engineers, fire authorities, and building owners. The primary purpose of facade fire testing is to understand how different facade configurations and material combinations respond when exposed to fire, determine the likelihood of flame spread and propagation in both horizontal and vertical directions, and support effective fire-safe design decisions.

A few established international fire testing standards, such as BS 8414 (United Kingdom) and NFPA 285 (United States), have been developed to determine the fire resistance and flame spread characteristics of facade systems. These standards require large-scale test setups to replicate real fire exposure conditions, including combustible materials, openings, insulation, and fastenings. However, such comprehensive tests are often impractical in developing countries due to economic constraints, limited testing facilities, and a lack of technical expertise. In resource-limited nations like Sri Lanka, where the construction sector is evolving with the introduction of new materials, there is a strong need for a cost-effective, scalable, and scientifically sound alternative.

The present study recommends developing a customised methodology for assessing facade fire behaviour in the Sri Lankan context. The proposed approach integrates small-scale fire experiments with computer-based fire simulations using PyroSim software, a graphical interface for the Fire Dynamics Simulator (FDS). The research begins with a systematic survey of facade types commonly used in Sri Lankan buildings. Based on prevalence, material properties, and flammability, a representative facade design is selected for detailed experimental investigation. Controlled small-scale fire tests are then conducted to evaluate key fire parameters such as ignition time, flame spread rate, heat release, and smoke production.

Experimental data obtained from the scientific tests are used to develop and validate a numerical model in PyroSim. The model incorporates detailed input parameters such as material properties, fire source characteristics, environmental conditions, and boundary geometries. The simulation is validated by comparing its results with experimental observations to achieve a realistic representation of fire spread behaviour.

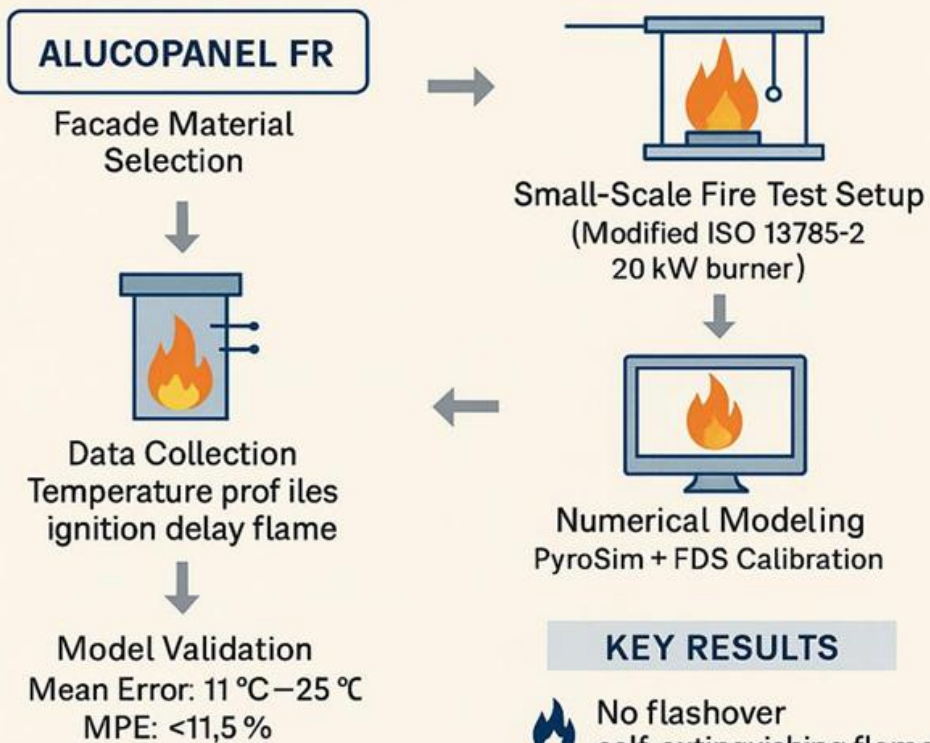
The developed methodology will serve as a valuable guide for Sri Lankan engineers, architects, and fire safety officials to evaluate facade system performance at lower costs without relying on expensive testing. It supports safer building design, informed material selection, and alignment with performance-based fire safety approaches. Ultimately, the study bridges a critical knowledge gap in Sri Lanka and other developing regions by providing a cost-effective, validated, and adaptable solution for facade fire performance assessment.

Keywords: Facade fire testing, Fire safety, Numerical modelling, PyroSim, Sri Lanka

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METHODOLOGY WORKFLOW



CONCLUSION

- ✓ A validated small-scale test + simulation model offers a low cost, alternative to full-scale facade fire testing suitable for local fire safety assessments in Sri Lanka

KEY RESULTS

- 🔥 No flashover
self-extinguishing flame
- 📏 Flame spread limited
to lower half
- ✓ Excellent agreement
between simulation &
experiment
- 🌡️ ALUCOPANEL FR met
ISO 13785-2
fire resistance criteria