Title: **Does A Large-Scale Fire Propagation Test Ensure A Fire-Safe Cladding?**

Author: Abhishek Chhabra, Market Development Manager, Thomas Bell-Wright International Consultants

Subjects: Façade Design
Fire & Safety

Keyword: Fire Safety

Publication Date: 2019

Original Publication: CTBUH Journal 2019 Issue I

Paper Type:
1. Book chapter/Part chapter
2. **Journal paper**
3. Conference proceeding
4. Unpublished conference paper
5. Magazine article
6. Unpublished

Ask a CTBUH Expert: Abhishek Chhabra

Does A Large-Scale Fire Propagation Test Ensure A Fire-Safe Cladding?

Abhishek Chhabra, *Thomas Bell-Wright International Consultants*

Substantial tall-building façade fires have continued to take place, even after the world was shocked by the Grenfell Tower tragedy in London in 2017. Much attention has been paid to determining to what degree certain cladding types are at fault in such fires, but it's equally important to examine the means of testing cladding for fire performance. We asked a CTBUH Expert, "Does a large-scale fire propagation test ensure a fire-safe cladding?"

Performance testing has been a well-established approach to validate how custom-designed systems will operate, behave and perform. Several tests can be done to validate desired, functional and performance parameters. The performance of a matrix of smoke detectors, sprinklers and alarm systems on one hand, and cladding systems on the other, could be tested independently. There are many published standards available to validate if a cladding system lives up to performance requirements on weather-tightness, acoustics, sustainability and fire.

Over the years, various world regions started relying on different large-scale mock-up tests to validate the fire performance of cladding system designs before installation. These include the NFPA 285(USA), BS 8414(UK), JIS A 1310 (Japan), LEPIR II (France) or PN-90/B-02867 (Poland). These tests are usually considered the last hurdle in the sequence set by authorities, codes or specification documents. But there are other, equally critical aspects of ensuring the fire performance of cladding systems.

Several materials are used to arrive at a cladding system. These range from weather-resistant barriers (WRBs); insulation materials, fixing mechanisms, sealants, panels and even air (specific gap widths), among others. Stakeholders often assume that each of these, once supplied to the construction site, will perform accurately as declared. It is less known that manufacturing relies on processes, measuring instruments, machines and people for repeatability of production. Along with the inherent possibility of errors, there are many decisions taken on the shop floor that can easily lower the accuracies of materials' declared properties. For ensuring the fire safety of cladding, the key properties of reaction to fire (ignition temperature, calorific values, flame and smoke behavior), need to be established with high accuracy and repeatability.

Global standards ISO 17025 and 17065 provide the basis of creating independent and reliable third-party testing and certification bodies. Manufacturers utilize their services (certification marks) to demonstrate traceability of their products' manufacturing and repeatability of properties. This helps create a high degree of confidence among stakeholders of an independently-verified production process. The established certification bodies create this traceability by witnessing the production of the tested sample. This helps ensure reliable test data of a representative sample, and also provides the reference points to enable them to audit the factory production to check these. Choosing a reliable third-party body is as important as choosing suppliers.

Correct understanding of certification empowers the site-based stakeholders to ensure they get what is defined on the drawings. This is critical, as the façade engineer bases the knowledge of reaction to fire properties of individual materials to design a fire-safe system. This is challenged and validated by fire consultants, who want one or more sections to be mocked-up on a large-scale fire propagation test. It is difficult to precisely replicate the cladding system on standard test rigs. The mock-up tests provide the evidence to validate that the risk mitigation measures work. Once this is established, the most onerous part of the complete exercise arises: ensuring the proven system is installed at the site exactly as-is. Changes of materials and designs require repeating the exercise. A small error overlooked can get repeated all over the cladding system, and could balloon risk to uncontrollable levels.

The three pillars of establishing a fire-safe cladding system are: (1) establishing that materials arriving on site are the same as validated (using certification and listing); (2) ensuring all risk-mitigation techniques have been validated using correctly designed mock-up fire tests; and (3) eligible, independent and empowered inspectors are used to ensure correct replication of the installation on site. ■

About the Author

Abhishek Chhabra is the market development manager for Thomas Bell-Wright International Consultants in Dubai. The 24-year old organization runs the world's only facility to offer BS 8414, NFPA 285 and dynamic curtain wall tests for weather-tightness at the same location. The firm also operates three fire-resistance furnaces and a range of testing equipment; all accredited to offer tests as per British, American, and European standards.