PREVENT FIRE SPREAD - DEVELOPMENT AND EXPANSION OF FIRE ON CLADDING RELATED TO TESTS AND CERTIFICATIONS

Structural Adhesives in Ventilated Façades and Fire Performance

Using structural adhesive systems to apply façade panels requires a clear understanding of the contribution of the façade system to the development and spread of fire. In this article we explain the relevance of fire tests, classifications and practical behaviour of bonded façade systems.

TWEHA® structural adhesives have been tested according to the SBI test (Single Burning Item test – EN 13501-1) and achieved classification B-s1,d0. In addition, in 2024 CTEC BG performed fire classification testing in accordance with EN 13501-1:2018, further confirming the reaction-to-fire performance of the TWEHA® adhesive system. However, the classification of an individual component by an SBI test does not automatically define the fire performance of the complete façade construction. Fire classification should not be interpreted purely as a material property, but rather as a property of the total construction assembly.

The SBI test only evaluates the behavior of a façade element when exposed to fire radiation from the front side. It does not provide information about the behavior of connections to surrounding structural components such as:

- supporting frames,
- cavity barriers,
- insulation,
- edge details,
- junctions with floors or roofs,
- or fire exposure from within cavities.

For this reason, the fire performance of the complete façade assembly must be evaluated as a system. Large-scale façade fire tests such as BS 8414 are therefore essential to establish realistic fire behavior.
In 2019, a ceramic cladding façade using the TWEHA® StoneMate system was successfully tested according to BS 8414 by the Fire Protection Association in Gloucestershire, United Kingdom, meeting the required classification criteria.

Fire Behavior Depends on the Entire Façade Construction

To correctly understand the risks related to the development and spread of fire on façades, multiple factors must be considered. The cladding panel itself is only one part of the total system.
Important influencing factors include:

- the supporting structure,
- insulation materials,
- vapor permeable membranes,
- water-resistant barriers,

- cavity dimensions,
- cavity ventilation,
- fixing methods,
- and open joints.

Each of these components can influence the overall fire behaviour of the façade assembly. It is also important to understand that combining materials with individual fire classifications does not guarantee the same classification for the complete façade system. For example, several products individually classified as Class B can together result in a façade assembly classified as Class C or even D. Fire classifications therefore cannot simply be “stacked”.

The Difference Between Testing and Reality

In practice, tested configurations often differ from real construction situations.
A façade panel that achieves Class A performance on a non-combustible substrate cannot automatically achieve the same classification when installed on combustible backgrounds such as:

- pinewood battens,
- timber frame constructions,
- or combustible insulation materials.

The influence of open joints and cavity fire propagation also plays a major role. Fire spreading over the external façade surface can often be visually detected and extinguished. Fires developing inside the ventilated cavity are much more dangerous because:

- the fire is hidden,
- temperatures can increase rapidly,
- and extinguishing becomes extremely difficult while the cladding remains intact.

Furthermore, façades tested according to BS 8414 may still behave differently in real fires. Real fires often create significantly higher thermal loads than those applied during standardized tests. Under these conditions:

- Aluminium substructures may reach melting point faster,
- mechanical deformations become larger,
- and connections behave differently than during laboratory testing.

Nevertheless, testing remains extremely valuable because it provides insight into realistic fire behaviour and greatly improves understanding of façade fire performance.

Contribution of Bonded Non-Combustible Façade Panels

Ventilated façades finished with bonded non-combustible façade panels can contribute positively to fire safety.
Certain façade panels remain remarkably stable under severe fire exposure. In many cases, these panels remain in position until the supporting structure itself is almost destroyed. Only after prolonged exposure to full fire conditions will the cladding panels detach under their own weight.
This behavior differs significantly from more combustible cladding materials, which may fail much earlier and contribute more actively to fire spread.

The Role of Adhesives During Fire

Practical fire experience shows that the influence of the adhesive bead itself is generally negligible.

The reasons are:

- the adhesive volume is relatively small,
- the adhesive is encapsulated between panel and substructure,
- and oxygen availability is extremely limited.

As a result, the adhesive contributes minimally to fire propagation and, in tested systems, does not reduce the fire classification of the façade assembly.

A notable example is a façade fire involving bonded HPL cladding in 2006. Observations from that fire demonstrated that cladding sections located closest to the pinewood framework remained attached the longest, without adhesive failure. This practical evidence supports the conclusion that the adhesive connection itself is not the critical factor in façade fire propagation.

Conclusion

Fire safety in ventilated façades cannot be judged solely by the fire classification of individual materials. The complete façade build-up, including supporting structure, insulation, cavity design and detailing, determines the actual fire behavior.

SBI testing according to EN 13501-1 provides valuable information about reaction-to-fire performance of individual products, while large-scale system testing such as BS 8414 gives a more realistic understanding of façade fire propagation.

The additional 2024 fire classification testing by CTEC BG in accordance with EN 13501-1:2018 further supports the fire performance of the TWEHA® adhesive system within bonded façade applications.

Testing and certification remain essential tools for improving façade fire safety and for understanding the contribution of bonded cladding systems to the development and expansion of fire.