

PREVENT FIRE SPREAD - FIRE DEVELOPMENT AND FAÇADE CONSTRUCTION: BUILDING SAFER STRUCTURES THROUGH INTELLIGENT DESIGN

Modern architecture demands more from façade systems than ever before. Today's buildings must combine aesthetics, energy efficiency, durability, and — above all — fire safety.

As ventilated façades and advanced cladding systems become increasingly common, understanding the fundamentals of fire development and façade behavior is essential for architects, engineers, developers, and contractors.

A properly designed façade does far more than enhance a building's appearance. It plays a critical role in controlling fire spread, protecting structural integrity, and safeguarding lives.

The Core Objectives of Fire Safety Regulations

European fire safety regulations are built around one central goal: limiting the consequences of fire and maximizing occupant safety.

To achieve this, façade systems must help ensure:

- Structural stability during a specified fire resistance period
- Limited production and spread of flames and smoke
- Reduced risk of fire spreading to neighboring buildings
- Safe evacuation or rescue of occupants
- Improved safety for firefighting and emergency response teams

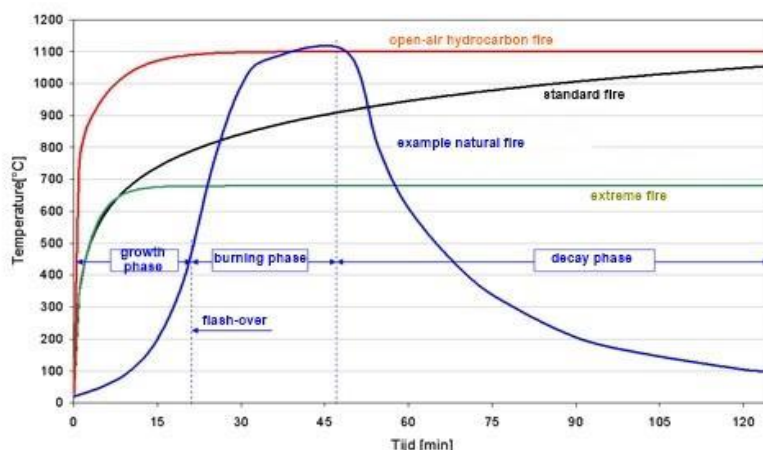
These objectives form the foundation of modern fire-safe façade engineering.

Understanding Fire Development

Fire behavior inside a building evolves in different stages. Understanding these phases is essential for designing effective façade systems and fire compartmentation strategies.

The Growth Phase

A fire typically starts as a localized event. During this stage, temperatures vary significantly throughout the compartment, and the fire is still relatively contained.



Flash-over: The Critical Turning Point

As the fire develops, temperatures rise rapidly until the entire compartment ignites almost simultaneously. This phenomenon is known as **flash-over**.

At this point:

- Flames spread aggressively
- Temperatures become uniformly high
- Fire can break through windows and façade openings
- The façade system becomes directly exposed to intense thermal attack

Preventing or delaying flash-over is one of the most important objectives in passive fire protection.

The Decay Phase

Once combustible materials are largely consumed, the fire begins to diminish. However, by this stage, structural damage may already be severe.

Why Fire Resistance in Façades Matters

Façade constructions are tested and evaluated as complete systems. Their fire resistance determines how long they can maintain structural integrity and compartmentation during a fire.

In many buildings, façade systems are expected to provide at least **60 minutes of fire resistance**.

This critical time window:

- Helps prevent fire spread between compartments
- Allows occupants sufficient time to evacuate
- Supports emergency intervention
- Delays structural failure

Attention must also be given to windows and façade openings, as these are often the first points where flames break through during a fire.

The Role of Building Materials in Fire Safety

Every material used in a façade system influences the development and spread of fire.

This includes:

- Cladding panels
- Insulation materials
- Substructures
- Sealants and adhesives

The reaction-to-fire classification of these materials determines how they contribute to flame spread, smoke production, and burning droplets.

High-Performance Adhesive Technology

Advanced façade adhesive systems play an increasingly important role in safe façade construction.

Testing according to EN 13823 (SBI Test) has shown that façade adhesives developed by TWEHA® make only a minimal contribution to fire growth and smoke production.

These systems can achieve classification: **B-s1,d0**

- Very limited contribution to fire
- Minimal smoke production
- No flaming droplets or particles

This performance helps support safer façade assemblies without compromising design flexibility or structural performance.

Fire Compartmentation in Façade Systems

One of the most effective ways to limit fire spread is through intelligent compartmentation. By continuing horizontal fire partitions into the façade cavity and wall construction, vertical fire spread can be significantly reduced.

This approach:

- Limits the chimney effect inside ventilated cavities
- Slows vertical flame propagation
- Protects adjacent compartments
- Extends evacuation time

Properly integrated fire barriers and cavity compartmentation are therefore essential components in modern façade engineering.

Preventing Fire Spread to Neighboring Buildings

Fire safety does not stop at the property line.

When flashover occurs, flames and radiant heat escaping through windows can ignite nearby buildings. Regulations therefore require minimum separation distances between structures to reduce the risk of fire spread through radiation.

Careful façade design helps:

- Reduce radiant heat transfer
- Limit external fire spread
- Improve urban fire resilience
- Protect surrounding properties

The Reality of Structural Fire Exposure

As temperatures increase during a severe fire, building materials begin to lose strength rapidly.

At approximately:

- **400°C:** structural strength decreases significantly
- **800°C:** only about 10% of structural capacity may remain

At this stage, the building structure can no longer be considered reliable. The primary objective then becomes preventing fire spread to neighboring buildings and protecting surrounding areas.

Safer Façades Start with Smarter Design

Modern façade fire safety is about more than meeting regulations — it is about protecting lives, preserving structures, and reducing risk.

An intelligently designed façade system:

- Delays fire spread
- Improves evacuation safety
- Maintains structural stability longer
- Supports firefighters during intervention
- Reduces damage to adjacent buildings

By combining tested materials, fire compartmentation, certified systems, and expert installation, today's façade industry can deliver buildings that are not only visually impressive, but fundamentally safer.

Because in façade engineering, fire safety is not an option — it is the foundation of responsible construction.