SAFETY APPROACH IN RELATION TO LIFESPAN

Understanding Design Life, Structural Safety, and Long-Term Façade Reliability
In modern façade engineering, the concept of "lifespan" is often misunderstood. Different types of lifespans are regularly confused, while each represents a completely different aspect of building performance and structural reliability.
At TWEHA®, we believe that understanding these distinctions is essential for creating safe, durable, and future-proof ventilated façade systems.

Different Types of Lifespans in Façade Construction
When discussing façade durability and safety, several lifespan concepts must be distinguished.

- **Economic Lifespan**
  The economic lifespan refers to the period during which the future revenues or benefits of a building exceed its future costs.
- **Functional Lifespan**
  The functional lifespan defines the period during which the building continues to meet the functional requirements and expectations of the user.
- **Aesthetic Lifespan**
  The aesthetic lifespan concerns the period during which the architectural appearance of the building remains visually acceptable and desirable.
- **Technical Lifespan**
  Technical lifespan is particularly important in façade engineering. It describes the period during which a façade system or product can continue to safely and reliably fulfill its intended technical function.
  A façade construction consists of many different components, each with its own technical lifespan. As a result, the technical lifespan of a façade system is never completely uniform or unambiguous.

Eurocode Requirements for Façade Systems
According to Table 2.1 of **EN 1990:2002 Eurocodes**, replaceable façade structures and components should comply with:

- **Design Life Category 2**
- **Working Life Category: Normal**
- **Reference Period: 25 years**

Within bonded façade systems, long-term adhesion performance has already been demonstrated through nearly **50 years of practical experience**, proving the reliability and durability of properly engineered adhesive technologies.

What Is Design Lifespan?
The concept of design lifespan is based on the structural safety philosophy defined within the Eurocodes for new construction.
This design philosophy is based on theoretical static calculations using:

- Load factors
- Material factors
- Reliability classes
- Consequence classes
- Reference periods

Through these calculations, engineers can theoretically assess the probability of structural failure over a predefined period — typically 50 years for new construction projects.

The Eurocode Safety Philosophy: LRFD

Modern structural safety calculations are based on the **LRFD concept** (Load and Resistance Factor Design).

This approach uses partial safety factors for both:

- Structural load
- Material resistance

The Eurocode first determines characteristic values for both loads and material strength. These values are then modified using calibrated safety factors to create safe design values.

The principle is straightforward:

The calculated structural resistance must always remain greater than or equal to the calculated load effects during the reference period.

This method provides a practical and reliable way to define the desired safety level of a façade system over its expected design lifespan.

The Importance of Representative Values

In practice, representative values are often used instead of purely statistical characteristic values. These values are conservatively estimated to ensure at least the same level of safety within the design calculations.

For this reason, TWEHA® recommends using a representative or usage value of:

Representative Adhesion Value = 1 MPa

for static verification calculations within bonded façade systems.

This practical engineering approach helps ensure reliable structural performance and long-term façade safety.

Critical Parameters for Structural Safety

The desired safety level within a façade system depends on the correct selection of several calibrated parameters, including:

- The applicable consequence class
- Characteristic structural loads
- Prescribed load factors
- Combination factors
- Material properties
- Material safety factors

These parameters collectively determine the reliability level of the structure throughout its design lifespan.

Reliability Classes and Consequence Classes

The Eurocode defines different reliability levels depending on the consequences of structural failure.

For new construction, EN 1990 establishes reliability indices (βn values) linked to consequence classes and loading conditions.

Consequence Class 1

- Small or negligible consequences of failure
- Lower reliability requirements

Consequence Class 2

- Significant consequences of failure
- Commonly applicable for many façade systems

Consequence Class 3

- Very large consequences of failure
- Highest reliability and safety requirements

For situations where wind load governs the design, the Dutch National Annex to EN 1990 indicates that adjusted reliability values better reflect realistic façade behavior.

Long-Term Safety Requires More Than Calculations Alone

While static calculations are essential, true façade reliability also depends on:

- Correct detailing
- High-quality materials
- Proper substrate preparation
- Professional installation
- Proven bonding technology
- Long-term durability testing

This is why façade safety can never rely on calculations alone. The complete façade system — including the bonding technology — must be engineered and validated as a total solution.

Why TWEHA® Focuses on Long-Term Reliability

At TWEHA®, we combine:

- Proven bonding technologies
- Advanced engineering knowledge
- Practical façade expertise
- Long-term adhesion performance
- Compliance with modern Eurocode principles

Our bonding systems are designed not only to meet today's structural requirements, but also to deliver reliable long-term performance throughout the complete design lifespan of the façade system.

Building with Confidence
Modern ventilated façade systems demand a careful balance between structural safety, durability, sustainability, and architectural freedom.
By combining advanced bonding technologies with sound engineering principles and proven long-term performance, TWEHA® helps façade professionals build safer, more reliable, and future-proof façade constructions.

Would you like to know more about structural verification, design lifespan, or the engineering of bonded façade systems?
Our specialists are ready to support your project with reliable technical expertise and high-performance bonding solutions.