SERVICE LIFE CONCEPTS AND DESIGN RELIABILITY

When discussing longevity or service life, several concepts are often confused. It is important to distinguish between the following definitions:

- Economic service life
  The period during which the expected revenues exceed the associated costs.
- Functional service life
  The period during which a building continues to meet the functional requirements and expectations of the user.
- Aesthetic service life
  The period during which the visual appearance of the building satisfies user expectations.
- Technical service life
  The period during which a façade or applied product can reliably fulfill its intended function.

A façade system consists of multiple components, each with its own technical service life. As a result, the overall technical service life of the system is not a single fixed value but a combination of different performance durations per component. This makes the concept inherently complex and often misunderstood.

Eurocode Framework and Reference Periods

According to EN 1990, structural components and products must be maintained at a level that ensures proper performance throughout their intended use.
For typical façade applications, the Eurocode defines:

- Design life category 2
- Working life category: Normal

These correspond to a reference period of 25 years for components that may require replacement during the building's lifetime.
Bonded façade cladding systems have demonstrated reliable performance over more than 40 years of practical application, confirming their suitability well beyond this reference period.

Design Life and Structural Safety Philosophy

The design life as defined in NEN-EN 1990 applies to new construction and is based on modern structural safety principles.
This approach follows a probabilistic safety philosophy, where structural performance is verified using:

- Load factors
- Material (strength) factors
- Defined reference periods for loads and material behavior

For example, using a reference period of 50 years, the required reliability level of a structure can be assessed in terms of the probability of failure over time.

LRFD Design Methodology

The Eurocode adopts the Load and Resistance Factor Design (LRFD) approach. This method ensures structural safety through a calibrated balance between applied loads and material resistance.

The process consists of:

1. Determination of characteristic values
   These represent conservative statistical limits:
   - Strength values: typically 5% lower bound
   - Load values: typically 95% upper bound
2. Use of representative values
   In practice, representative (or usage) values are often applied. These are safe, experience-based values that provide at least the same level of reliability as statistically derived characteristic values.

For bonded façade systems, we recommend a representative tensile strength value of 1 MPa for static verification.

3. Application of partial safety factors
   The representative strength value is:
   - Divided by a material safety factor
   - Combined with load factors

This results in design values (calculation values) for both strength and load.

Safety Verification Principle

The fundamental design criterion is:
Design resistance ≥ Design load effect
In other words, the calculated strength of the system must always exceed the calculated load effects under defined conditions.
By applying this methodology, the structural safety of a façade system can be quantified in terms of the probability of failure over a specified reference period.

Added Value for Bonded Façade Systems

By combining:

- Proven long-term performance (40+ years)
- Representative strength values based on real-world behavior
- Advanced testing and validation methods
- Full alignment with Eurocode safety principles

we ensure that bonded façade systems deliver predictable, reliable, and verifiable performance over their intended service life.
This approach goes beyond theoretical compliance, providing clients with confidence in both safety and durability under real operating conditions.