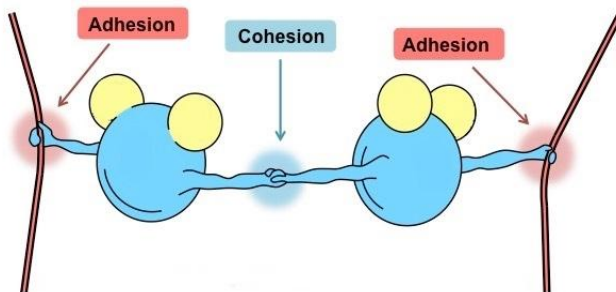


ADHESION AND COHESION EXPLAINED

In adhesive bonding technology, two terms are essential to understand: **adhesion** and **cohesion**. Although both originate from the concept of “sticking together,” they describe two completely different mechanisms that determine the reliability and durability of a bonded connection.

Understanding the difference is crucial when designing safe and long-lasting façade bonding systems.



What is Cohesion?

Cohesion refers to the **internal strength of the adhesive itself**. It is the force that keeps the adhesive material together at a molecular level.

In simple terms:

- cohesion is the strength *within* the adhesive,
- it is a fixed material property,
- and it determines how much tensile or shear stress the adhesive can withstand before tearing apart internally.

A cohesive failure occurs when the adhesive itself breaks while remaining attached to both substrates.

What is Adhesion?

Adhesion refers to the **bonding force between two different materials**.

For example:

- the adhesion between an adhesive and aluminum,
- the adhesion between an adhesive and a façade panel,
- or the adhesion between TWEHA® Bonding Systems and various cladding materials.

Unlike cohesion, adhesion is not a fixed value. It depends heavily on:

- the substrate type,
- surface treatment,
- cleanliness,
- environmental conditions,
- and correct application procedures.

Cohesive Failure

In the event of a cohesive failure:

- adhesive residue remains visible on both bonded surfaces,
- meaning the bond to the substrate was stronger than the adhesive's internal strength,
- and the adhesive layer itself became the critical factor.

This is the preferred and predictable failure mode in structural bonding applications. Because cohesive strength is a fixed material property, it can be determined and verified through standardized testing, such as according to EN standards and manufacturer declarations. These characteristic values can then be used in structural calculations and engineering models.

Why This Matters

A cohesive failure proves that:

- the surface preparation was effective,
- proper adhesion to the substrate was achieved,
- and the bonded connection performed as intended.

For façade bonding systems, this is exactly what engineers and designers aim for.

Adhesive Failure

An adhesive failure occurs when the adhesive detaches from the substrate surface.

In this case:

- one surface will appear almost clean,
- because the physicochemical bond between adhesive and substrate was insufficient,
- making the interface the weakest point in the connection.

This type of failure is undesirable in structural bonding systems because it is less predictable and highly dependent on substrate quality and preparation.

Why Testing is Essential

Unlike cohesive strength, adhesive performance cannot simply be calculated theoretically. There are currently very limited theoretical models available to accurately predict adhesive failure at the interface between adhesive and substrate. Therefore, practical testing remains essential.

For every substrate type, adhesion performance must be validated through:

- laboratory testing,
- pull-off tests,
- shear tests,
- and long-term durability assessments.

Only then can the characteristic adhesion strength be determined reliably.

The Key Principle in Structural Bonding

A bonded connection will fail in one of two ways:

1. **Adhesive failure**
The adhesive separates from the substrate.
2. **Cohesive failure**
The adhesive itself tears apart internally.

In the cladding and façade industry, the goal is always the same:

The bond must fail cohesively before it fails adhesively.

This ensures that:

- The adhesion to the substrate is stronger than the adhesive itself,
- the performance becomes predictable,
- and reliable structural calculations can be made.

The Foundation of a Durable Bond

The effectiveness of any bonded connection is ultimately determined by the adhesion to the substrate surface.

That is why:

- proper substrate preparation,
- cleaning,
- sanding,
- and validated testing

are critical steps in every professional bonding application.

When adhesion is optimized correctly, the bonded connection behaves predictably and safely — providing the long-term durability modern façade systems demand.

TWEHA®, 2026