WIND LOADS EXPLAINED

Why Wind Engineering Is Critical for Modern Façade Systems

Wind is invisible — but its impact on buildings is enormous.
Every façade, roof, and structural connection must be capable of resisting powerful and continuously changing wind forces throughout the entire lifetime of a building.
In modern façade engineering, understanding wind loads is not optional. It is essential for safety, durability, and long-term performance.
At TWEHA®, we understand that successful façade bonding and façade engineering begin with understanding the forces acting on the building envelope.

Term used	Beaufort scale	Speed in km/h	Speed in m/s	Speed in knots
Calm	0	Less than 1	0 to 0,2	Less than 1
Weak wind	1-2	1 to 11	0,3 to 3,3	1 to 6
Moderate wind	3-4	12 to 28	3,4 to 7,9	7 to 16
Strong wind	5	29 to 38	8 to 10,7	17 to 21
Strong wind	6	39 to 49	10,8 to 13,8	22 to 27
Very strong wind	7	50 to 61	13,9 to 17,1	28 to 33
Storm wind	8	62 to 74	17,2 to 20,7	34 to 40
Storm	9	75 to 88	20,8 to 24,4	41 to 47
Strong storm	10	89 to 102	24,5 to 28,4	48 to 55
Very strong storm	11	103 to 117	28,5 to 32,6	56 to 63
Hurricane	12	More than 117	More than 32,6	More than 63

How Wind Is Created

Wind originates because air naturally moves from areas of high pressure to areas of low pressure.
However, wind behavior near the Earth's surface is heavily influenced by friction caused by:

- Buildings
- Trees and forests
- Terrain roughness
- Urban environments

This friction slows down air movement in the lower atmosphere. As a result:

Wind speed increases significantly with height.

This explains why high-rise buildings experience much higher wind loads than low-rise structures.
It also explains why coastal regions generally experience stronger winds than inland areas. Over open water, there is far less surface friction, allowing wind to accelerate more freely.

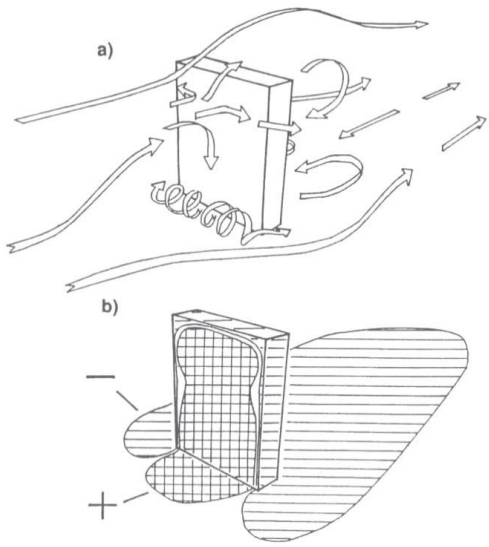
Wind Is More Than Just Pressure

Wind does not behave as a constant, uniform force.
Due to friction between air layers, turbulence, gusts, and vortices are created. These dynamic forces can generate highly variable and localized wind pressures on a building façade.
Especially in modern urban environments, wind behavior becomes increasingly complex.
Wind nuisance and turbulence can occur:

- Around tall buildings
- In narrow streets
- Between building complexes
- Near corners and roof edges
- Around entrances and pedestrian zones

This makes professional wind engineering an essential part of modern building design.

Wind Loads on Buildings



Wind creates both:

- External pressure
- External suction
- Internal pressure
- Internal suction

Depending on building shape, height, orientation, and surrounding structures, wind can either push against the façade or pull strongly away from it.
In many situations, wind suction becomes the governing design factor.
This is particularly true:

- Along façade edges
- At building corners
- Near roof edges
- In turbulent zones

Why Corners and Roof Edges Are Critical

One of the most important aspects of wind engineering is understanding that wind loads are not evenly distributed across a façade.
At corners and roof edges, wind flow accelerates and becomes highly turbulent.
This creates:

- Higher suction forces
- Greater localized pressure
- Increased stress on façade panels and fixings

For this reason, international standards provide special calculation rules for these critical zones.
In practice, the highest wind loads on a building are often found precisely at the façade corners and roof edges.

Eurocode 1 — The Basis for Wind Load Calculations

All professional façade calculations are based on recognized building standards such as:

Eurocode 1 (EN 1991-1-4)

This European standard defines how wind loads on buildings must be calculated.

The standard considers factors such as:

- Geographic location
- Terrain roughness
- Building height
- Building shape
- Surrounding structures
- Local climate conditions

Eurocode 1 calculates the expected wind forces during an extreme storm event statistically expected to occur once every 50 years.

The result is a design wind pressure value used for:

- Structural calculations
- Façade engineering
- Substructure design
- Adhesive bonding systems
- Mechanical fixings

Urban Development Changes Wind Behavior

An often-overlooked reality is that new buildings can significantly alter wind behavior around existing structures.

The interaction between buildings depends on:

- Height differences
- Building geometry
- Distance between structures
- Urban density
- Surface roughness

A new high-rise building can create:

- Increased turbulence
- Strong downdrafts
- Higher local suction pressures
- Unexpected wind acceleration zones

This can directly affect nearby façades and building performance.

Wind Tunnel Testing — Understanding Reality

In complex projects, standard calculations alone are not always sufficient.

That is why wind tunnel testing is often performed during the design phase.

Using scale models, engineers can accurately study:

- Local pressure effects
- Turbulence zones
- Pedestrian wind comfort
- Façade wind loads
- Building interaction effects

In many cases, wind tunnel studies reveal local wind pressures that are even more severe than standard Eurocode assumptions.
This information is extremely important for:

- Structural engineers
- Façade consultants
- Façade builders
- Architects
- Building owners

Wind Loads and Bonded Façade Systems

For bonded ventilated façade systems, wind engineering is especially critical.
Adhesive systems must withstand:

- Continuous suction forces
- Dynamic wind loading
- Thermal movement
- Structural deformation
- Long-term fatigue effects

This requires:

- Correct adhesive selection
- Proper panel dimensions
- Accurate structural calculations
- Professional installation
- Correct edge detailing

At TWEHA®, wind load engineering forms an essential part of every bonded façade solution.

Engineering Confidence into Every Façade

Modern façades are becoming:

- Larger
- Lighter
- More architecturally ambitious
- More exposed to environmental forces

This means façade systems must perform under increasingly demanding wind conditions.
At TWEHA®, we combine:

- Façade engineering expertise
- Adhesive technology knowledge
- Structural understanding
- Wind load analysis

to create safe, durable, and high-performance bonded façade systems worldwide.
Because understanding wind loads is not simply about resisting the weather —
It is about engineering confidence into every façade.

TWEHA®, 2026