

A VENTILATED FAÇADE IS MORE THAN AN INSULATED WALL WITH CLADDING

It is a thermally active building-envelope concept.

A ventilated façade should not be considered simply as an insulated wall covered by decorative cladding. It consists of two interacting layers: a protective, ventilated outer skin and the insulated building envelope behind it, separated by a continuous air cavity.

The ventilated cavity does not simply add to the calculated insulation value of the wall. Its role is different — and in practice it is highly valuable. It helps to reduce, moderate and control the thermal and moisture loads acting on the insulated construction.

The thermal principle

A typical ventilated façade consists of:

- the structural wall;
- thermal insulation;
- a ventilated air cavity;
- the supporting substructure;
- and the exterior façade panels.

The calculated thermal performance of the wall, expressed as a Rc- or U-value, is determined mainly by the insulation and the other building layers behind the ventilated cavity.

This distinction is important. In thermal calculations, material layers and air layers are both considered. However, a strong or fully ventilated cavity is treated differently from a sealed or only slightly ventilated air layer.

For that reason, the outer cladding and ventilated cavity of a rainscreen façade cannot simply be counted as additional insulation.

But that certainly does not mean they have no thermal function.

Quite the opposite: they change the conditions to which the insulation and underlying building envelope are exposed.

Summer: the façade as a first thermal shield

Under direct solar radiation, the surface temperature of a façade panel can become considerably higher than the outdoor air temperature.

The actual temperature depends on factors such as:

- color and solar absorption;
- panel material;
- façade orientation;
- solar intensity;
- wind;
- and local climate.

With a non-ventilated façade, a larger proportion of this solar energy can eventually be transferred to the building structure. A ventilated façade behaves differently:

solar radiation → façade panel → ventilated cavity → moving air → heat released to the exterior

The façade panel first absorbs the solar radiation. Part of this heat is released directly back to the outside through radiation and convection, while another part is transferred from the rear surface of the panel into the ventilated cavity.

As the air inside the cavity heats up, it becomes lighter and rises. When sufficient openings are present at the bottom and top of the façade, this creates a natural upward airflow — often referred to as the stack effect or chimney effect. Wind pressure/suction can further strengthen this air movement.

As a result, part of the absorbed heat is removed from the cavity before it can be transferred to the insulation and internal building structure.

This leads to one of the most important principles of a ventilated façade:



The ventilated cavity does not primarily increase the insulation value of the wall; it reduces the thermal load acting on the insulated building envelope.

What temperature does the insulation actually “see”?

A practical way to understand the effect is to look at the conditions directly in front of the insulation.

Imagine an outdoor temperature of 30 °C. Under strong solar radiation, a dark façade panel can become substantially hotter than the surrounding air.

Without a ventilated cavity, more of that additional solar heat would be transferred directly towards the underlying construction.

In a ventilated façade, however, part of this heat is already removed by the airflow behind the panel.

The insulation therefore does not have to deal directly with the combined effect of the outdoor temperature plus the full solar load on the exterior panel.

In simple terms:



the façade panel acts as a thermal shield, while the ventilated cavity helps remove the heat absorbed by that shield.

This can reduce temperature peaks and moderate the heat flow towards the insulated wall.

Winter: protection rather than additional insulation

The principle changes during colder conditions. The façade cladding still forms a protective outer skin, shielding the insulation and underlying structure from direct rain, wind and weather exposure.

On sunny winter days, solar radiation may also warm the façade panels and temporarily increase the temperature inside the cavity. Under these conditions, the actual heat loss from the building may be reduced to some extent.

However, a ventilated cavity is deliberately connected to the outside air. Without solar radiation, the cavity temperature will therefore generally move towards the outdoor temperature. It should consequently not be regarded as a thick layer of stationery insulating air.

Its main benefit lies in creating a more protected and moderated environment around the insulated building envelope rather than in providing additional calculated insulation resistance.

Moisture management: an equally important function

Thermal performance cannot be considered separately from moisture. The cavity in a ventilated façade also helps remove:

- penetrating rainwater;
- water vapor;
- construction moisture;
- and condensation.

It provides drainage and allows the rear side of the façade construction to dry.

This has an important indirect thermal benefit. Insulation performs best when it remains within the moisture conditions for which its declared thermal conductivity has been determined.

A well-designed ventilated cavity therefore helps maintain the conditions under which the insulation can continue to perform as intended throughout the life of the building.

Or, more simply:



**The cavity does not replace insulation; it helps the insulation perform as intended.
The façade panel has several functions at once.**

Within a ventilated façade system, the exterior panel is therefore much more than an architectural finish.

It contributes to several aspects of building performance:

- **Solar shielding** The façade panel absorbs the first impact of direct solar radiation instead of exposing the insulated wall directly to it.
- **Ventilative cooling:** Part of the absorbed heat is transferred to the moving air behind the panel and carried away.
- **Weather protection:** The underlying insulation and building structure are protected against direct rain, wind and environmental exposure.
- **Moisture management:** The open cavity supports drainage and drying of the façade construction.
- **Thermal buffering:** Rapid temperature peaks at the outside surface are not transferred one-to-one to the insulated structure.
- **Durability:** By reducing direct exposure to weather, more stable hygrothermal conditions can be created for the insulation and supporting construction.

Do not forget the supporting structure

There is one further factor that can have a major influence on the actual thermal performance of a ventilated façade: the substructure.

Aluminium is an excellent structural material, but it also has very high thermal conductivity compared with insulation. Brackets, consoles and profiles that penetrate or interrupt the insulation layer can therefore create thermal bridges.

For this reason, the thermal optimization of the substructure — for example, through appropriate bracket design, thermal breaks and reduced metal cross-sections — can have a greater influence on the calculated U-value than the possible thermal benefit of the ventilated cavity itself.

A high-performance ventilated façade must therefore be considered as a complete system, not simply as insulation plus cladding.

A thermally active building envelope

A ventilated façade is more than an insulated wall with cladding.

The insulation remains primarily responsible for the calculated thermal resistance of the building envelope. The ventilated cavity should therefore not simply be added to the insulation value.

Its contribution is different.: During periods of strong solar radiation, the exterior cladding acts as a first thermal shield. Part of the absorbed heat is transferred to the ventilated cavity and removed by natural airflow before it reaches the insulated wall.

During colder conditions, the cladding protects the underlying construction from direct weather exposure and can moderate the conditions within the cavity.

At the same time, the cavity supports drainage and drying, helping the insulation and supporting structure remain in favorable operating conditions.

The real thermal value of a ventilated façade therefore lies not only in resistance to heat transfer, but in reducing and moderating the thermal and hygrothermal loads acting on the insulated building envelope.

That is what makes a well-designed ventilated façade a thermally active, durable and high-performance building-envelope concept.

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