THE WEATHERING PROCESS OF NATURAL STONE FAÇADE CLADDING

Why aging natural stone façades deserve increasing attention

Natural stone represents durability, prestige, and architectural quality. Yet at TWEHA®, we are frequently consulted when problems arise with natural stone façade cladding systems. And every time, we remain surprised by the sheer number of deteriorated façades and damaged stone elements we encounter.

To be completely honest, we sometimes ask ourselves: **how safe are older natural stone façades today?**

Perhaps this impression is influenced by the fact that we are usually involved only after damage has already occurred. Nevertheless, it is becoming increasingly clear that the aging of natural stone façades is an important issue — especially now that many buildings from the previous century are reaching a critical age.

Natural stone ages — and every stone behaves differently

Natural stone is not a uniform material.

Each stone type has:

- its own mineral composition,
- its own internal structure,
- and therefore, its own weathering behavior.

In addition, deterioration is strongly influenced by:

- climate,
- pollution,
- freeze-thaw cycles,
- salt exposure,
- moisture,
- and the architectural detailing of the building itself.

A façade that appears stable for decades may suddenly begin to show visible signs of degradation.

Different forms of stone deterioration

Material loss from natural stone façades can generally be divided into several categories.

- **Continuous surface erosion**
  A slow and ongoing process involving very small losses of exposed surface material, usually in the form of fine dust.
- **Small-scale edge and corner losses**
  The gradual loss of small fragments from edges, corners, ornaments, or decorative features.
- **Localized detachment of larger fragments**
  Occasional and unpredictable losses of parts of ornaments or façade panels, often from the underside of projecting elements.
- **Complete failure of stones or façade panels**
  Rare, but potentially catastrophic.

It is this final category that usually attracts media attention, especially when severe damage, injury, or fatalities occur.

The real concern often lies in the smaller failures

However, the smaller incidents are often the most concerning.

Why?

Because they are frequent:

- unnoticed,
- undocumented,
- or dismissed as insignificant.

These smaller detachments may represent early warning signs of more serious structural deterioration.

In recent years, we have increasingly observed:

- small falling fragments,
- weathered ornaments,
- deteriorating projecting details,
- and hidden façade degradation.

This trend is being accelerated by:

- changing architectural styles,
- taller buildings,
- harsher environmental exposure,
- and simply the aging of the building stock.

Taller buildings increase the risk

Until the 18th century, natural stone was primarily used for churches and monumental structures.

Only during the 19th and especially the 20th century did natural stone begin to appear extensively on:

- larger buildings,
- taller façades,
- and increasingly complex architectural structures.

And the taller the building: **the greater the potential hazard from falling stone fragments.**

Even small pieces of stone can become dangerous when falling from significant height.

Historical experience also shows that many façade problems only begin to emerge after **50 to 100 years.**

Many buildings constructed during the previous century are now entering precisely that critical period.

Problems are often discovered too late

In practice, façade deterioration is often only identified:

- during property transactions,
- ownership changes,
- or after visible damage has already occurred.

From ground level, many defects remain invisible.

Even binocular inspections are often insufficient.

Access systems such as:

- aerial platforms,
- scaffolding,
- or cranes

can be expensive, limited in reach, or even potentially damaging to the façade itself.

Professional façade inspection is essential

At TWEHA®, we therefore frequently use:

- façade maintenance units,
- suspended access systems,
- and specialist close-range inspection methods.

These systems allow every centimeter of the façade to be examined safely and closely without damaging the building.

In several cases, we have physically removed loose stone fragments that were close to falling, temporarily improving façade safety.

Often, however: **the damage was already far more advanced than expected.**

Why reporting and monitoring matter

Many smaller stone-fall incidents are currently never officially documented.

As a result, the industry still lacks sufficient understanding of:

- the true scale of the problem,
- incident frequency,
- and long-term deterioration trends.

We therefore strongly support:

- improved reporting systems,
- systematic monitoring,
- and preventive inspection programs.

Only through better data collection can future risks be properly understood and managed.

Assessing façade risk

In countries such as United Kingdom, discussions regarding aging natural stone façades began years ago.

Risk assessment methods have been developed that evaluate factors such as:

- stone type,
- building height,
- projections,

- ornamentation,
- building age,
- pollution,
- and environmental exposure.

These factors are translated into so-called “deformation points.”
The higher the score: **the greater the potential risk of façade deterioration and falling stone fragments.**
Although such methods cannot predict failures with certainty, they help identify façades requiring closer investigation and monitoring.

Some stone types are more vulnerable than others
Not all natural stones weather equally.

- **Igneous and metamorphic stones**

  such as:
  - granite,
  - slate,
  - quartzite,
  - and certain marbles

  are often relatively stable.
- **Sedimentary stones**

  such as:
  - limestone,
  - sandstone,
  - and softer natural stones

  may be significantly more vulnerable to:
  - moisture,
  - freeze-thaw cycles,
  - splitting,
  - and long-term material loss.

  Many older public and monumental buildings extensively use these stone types.
- **The well-known issue of white marble façades**

  The use of white Carrara marble as façade cladding has also raised major international concerns. Historical examples have shown that marble panels may:
  - warp,
  - expand,
  - and develop internal stresses around anchoring systems.

  Well-known cases include:
  - the Amoco Building,
  - and Finlandia Hall.

  These incidents triggered international investigations into marble façade behavior and long-term structural reliability.

Monitoring and destructive testing may become necessary

When façade panels begin to show:

- deformation,
- cracking,
- or other visible changes,

additional investigation may be required.

This can involve:

- destructive testing,
- anchorage assessment,
- strength analysis,
- and petrographic examination.

Only detailed technical investigation can determine whether:

- continued monitoring is sufficient,
- repair is possible,
- or full replacement becomes necessary.

A safer future requires awareness

Natural stone remains one of the most beautiful and prestigious façade materials available. However, aging, environmental exposure, and changing building conditions require a more critical approach toward existing natural stone façades.

Preventive inspection, monitoring, and technical understanding are becoming increasingly important to:

- identify risks early,
- prevent failures,
- and improve public safety.

Conclusion

The weathering process of natural stone façade cladding is a slow but very real phenomenon that deserves serious attention.

Many problems develop gradually and remain hidden until fragments unexpectedly detach from the façade.

Through:

- better inspection,
- improved awareness,
- technical investigation,
- and preventive maintenance,

Future risks can be better managed.

At TWEHA®, we remain committed to supporting safer, more durable, and technically reliable façade systems — both for new construction and for the aging natural stone façades that continue to shape our built environment.