



Preventive  
Conservation  
in Historic Houses  
and Palace  
Museums:  
Assessment  
Methodologies  
and Applications

SilvanaEditoriale

# **Preventive Conservation in Historic Houses and Palace Museums: Assessment Methodologies and Applications**

Conference of the National Museum of the Palace of Versailles (EPV), the Association of European Royal Residences (ARRE), and the Research Centre of the Palace of Versailles (CRCV)

In collaboration with the International Committee for Historic House Museums (DEMHIST), held at the National Museum of the Palace of Versailles and Trianon

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# Royal Palace of Caserta, Preventive Conservation of Stone Facings of Huge Facades

## Abstract

As a result of the collapse of some fragments of the stone cladding, recent restoration work began on the façades of the Royal Palace of Caserta. Work was carried out on over 64,000 m<sup>2</sup>, lasted for three years and cost 16 million euros. It has therefore become essential to define a strategy to prevent the causes of stone deterioration while at the same time monitoring the conditions of architectural mouldings, in order to avoid the risk of fresh damage or detachment as well as limiting future intervention costs.

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## Keywords

Caserta, Royal Palace, stone deterioration, monitoring system.

**D**iagnostic studies and tests performed during restoration work revealed that detachments were generally due to the infiltration of water into the limestone.

On the top of the outer wall there is a gutter built into the masonry, which collects rainwater from the roof. The growth of weeds, or even shrubs, on top of the outer walls had obstructed the gutter thus blocking the drainage system and has caused the penetration of rainwater into the joints between the blocks and the core of the stone. The water absorbed by the stone froze into ice in winter, thus damaging the limestone, consuming the calcite along the lines of the geological veins and causing both large and small fragments of masonry to break off and fall to the ground. In fact, most cracks were concentrated in the big projecting cornice immediately below the gutter.

Therefore it has proved necessary to define a strategy in order to protect cornices, pillars, columns, capitals and coatings from damage caused by water infiltration and to monitor the state of conservation of the stonework, in this way taking the first steps towards a general system of preventive conservation.

As an experiment, an automatically timed system was installed to spray the gutter at the base of the roof with an herbicide, to prevent the growth of weeds. The device is operating on the crowning of the southern and western external façades.

*Fig. 1*  
Before restoration:  
degradation of stone  
mouldings caused by rain  
water.



All horizontal surfaces of the mouldings of the façades, which are exposed to rain, have been covered with coatings of water repellent to prevent water infiltration into the stone material.

A monitoring system was installed in the corner of the main façade, one of the most critical areas of the building, to verify stability and measure the effect of external temperature variations and environmental vibrations on stone blocks. It consists of a series of sensors connected to some data loggers that transmit temperature values and any micro-routing to a peripheral device. The system monitors the most vulnerable stone blocks, with regards to geometric configuration, projecting dimension, rain exposure, and precise location in the architectural structure. Specialised software records the data and gives off alarm signals when the values exceed the safety threshold, allowing the control of the slightest deviation from the horizontal axis, which would in turn indicate the need to check the conditions of the façade stones using a basket lift.

All the information obtained during the restoration, through instrumental surveys such as 3D laser scanners, infra-red thermography and magnetometry, have been collected on a single platform (Integrated Diagnostic System).

The system will make it possible to compare the state of conservation of the façades before restoration with those that will be recorded after a few years, repeating the survey by use of a laser scanner. It will thus be possible to monitor the state of conservation of the façades and plan maintenance work in a timely manner to prevent the deterioration of building materials.

#### **Bibliography**

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