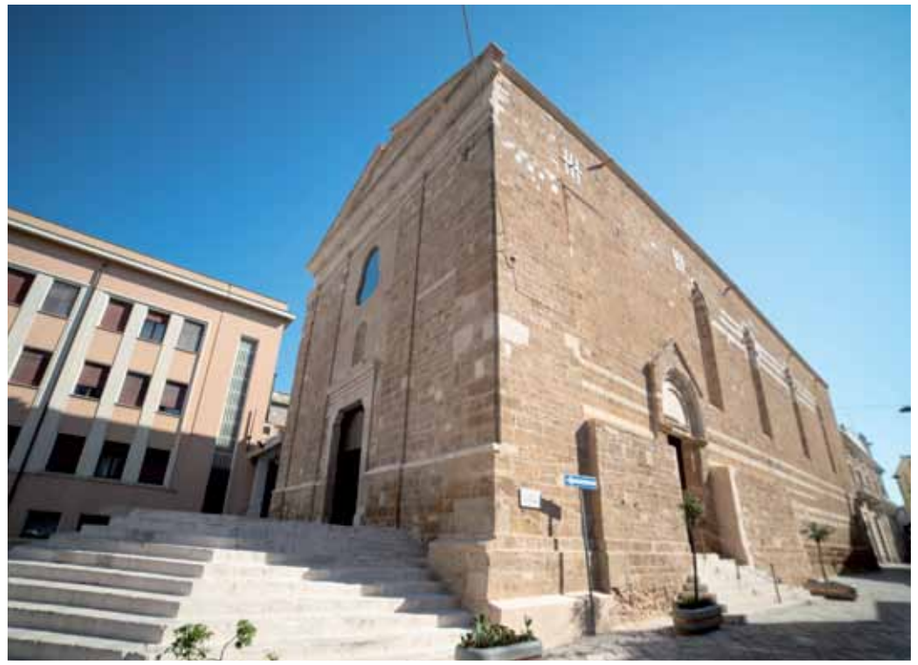

Brindisi (Italy)

CHURCH OF SAN PAOLO EREMITA

EFFECTIVE AND LONG-LASTING PRODUCTS FOR THE RESTORATION AND CONSOLIDATION OF A CHURCH BADLY DAMAGED BY THE PASSAGE OF TIME

Sunday, 28th October 2018 marked the reopening of the fourteenth century Church of San Paolo Eremita (St. Paul the Hermit), one of the most important sites of the city of Brindisi's cultural heritage.
Naples State Archive conserves the most ancient document making reference to the church: a solemn ordinance dating back to 2nd March 1284 whereby Charles I of Anjou, King of Naples, granted permission for Franciscan monks to build a monastery and church, which went on to be completed in 1322.
Work commenced in November, 2016 and it took two years to complete the conservative restoration and consolidation work on the interior and exterior of the church. The work also included an overhaul of the roof over the aisle, the replacement of the wooden trusses for the apse and the new pitched roof, a thorough cleaning of all the altars and consolidation of the stone features and elements of the altars.

Winning teamwork on site

The complex work commenced with a preliminary study carried out by Luigi Dell'Atti, a local architect who also guided the team of restorers. Right from the start of the design work, the team was assisted by Mapei Technical Services, with specialists from various product lines also involved. When more significant problems regarding static consolidation arose, Prof. Alberto Balsamo from the Federico II University of Naples was also called upon to provide his assistance.

Problems and solutions

The intervention ensured the conservative restoration and consolidation of the Church of San Paolo Eremita and the safeguard of its ancient walls.
Thanks to the MAPE-ANTIQUE line, it was possible to carry out the work without compromising the historical significance of the walls, while the MAPEWOOD line products, which are chemically and physically compatible with the original wood, were used to restore and repair the wooden roof trusses. Lastly, the entire structure was consolidated with the help of products from the Mapei Structural Strengthening line.


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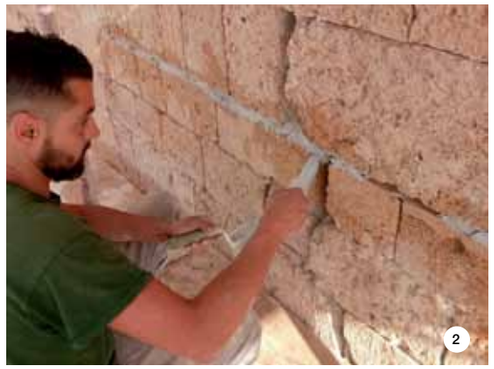
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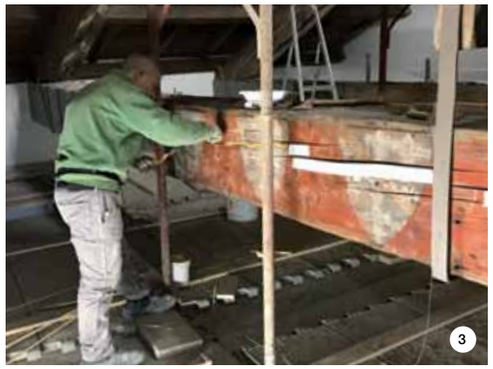
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This team-synergy approach also included the active participation of the main contractor Nicolì SpA, which enabled the product systems to be identified and perfectly modulated to overcome the problems that arose regarding the structural strengthening, dehumidification and protection of both the interior and exterior of the church.

Static consolidation of the stone structure

MAPE-ANTIQUE F21 binder was used to consolidate the stone structure and limestone vaulted ceiling of the church. This is a cement-free, salt-resistant product made from lime and Eco-Pozzolan used to make super-fluid, volumetrically stable slurries and was injected in the structure by using low-pression pumps.

For the installation layers and for pointing on the "natural finish" masonry of the church, on the other hand, the product chosen was MAPE-ANTIQUE ALLETTAMENTO salt-resistant masonry mortar, made from natural hydraulic lime and Eco-Pozzolan and available in 7 colours.

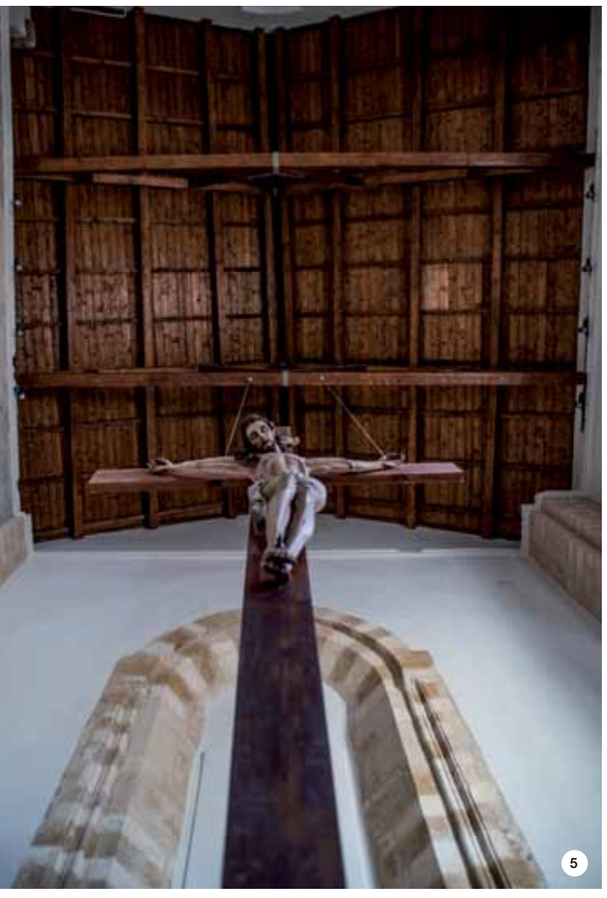
Consolidation of the surface of the masonry

The surface of the masonry was consolidated in several steps. The first step was to pre-consolidate the surfaces with PRIMER 3296, an acrylic primer in water dispersion.

The larger cracks in the surface were then stitched with CARBOTUBE C 170/10 (pultruded carbon fibre tubes impregnated with epoxy resin) in combination with INJECTORS Ø23+MAPE-ANTIQUE F21.

Consolidation of the vaulted ceilings

The vaulted ceilings were consolidated by capping them with MAPE-ANTIQUE STRUTTURALE NHL, a pre-blended, cement-free mortar for transpirant render and masonry work, based on natural hydraulic lime, Eco-Pozzolan, recycled materials, natural sands, micro-fibres, glass fibres and special admixtures. The use of this product, in combination with MAPENET EM 40 pre-impregnated, alkali-resistant glass fibre mesh (FRP) and MAPENET EM CONNECTOR 7 mm diameter and 200 mm long fibreglass connectors, formed a reinforced layer suitable to consolidate the extrados of sandstone vaulted ceilings.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1. MAPE ANTIQUE F21 super-fluid binder was injected through small tubes using low-pressure pumps to consolidate the stone structure.
2. For the installation layers and for pointing on the "natural finish" masonry of the church, the product chosen was MAPE-ANTIQUE ALLETTAMENTO salt-resistant masonry mortar, made from natural hydraulic lime and Eco-Pozzolan.
3. The wooden trusses were consolidated and restored using products from the MAPEWOOD SYSTEM (MAPEWOOD PRIMER 100 and MAPEWOOD PASTE 140).
4. The stone surfaces of the church were protected from the action of rain with ANTIPLUVIOL W water-repellent impregnator.
5. A view of the wooden trusses after completion of the works.

The joints were reinforced with 6 mm diameter MAPEI STEEL BAR 316, ultra high-strength, AISI 304 and AISI 316 stainless steel helical bars, used in combination with MAPE-ANTIQUE ALLETTAMENTO.

Consolidation and restoration of the wooden trusses

The wooden trusses were consolidated and restored using products from the MAPEWOOD SYSTEM. This line of products is made from special epoxy adhesives chemically and physically compatible with wood.

The surface of the wood was initially treated with MAPEWOOD PRIMER 100 – a fluid epoxy primer in water dispersion – and then with MAPEWOOD PASTE 140, a thixotropic epoxy adhesive for repairing wooden beams, trusses and columns.

The dehumidifying system

The macro-porous dehumidifying system for the interior masonry of the church consisted of a scratch-coat layer of MAPE-ANTIQUE RINZAFFO cement-free, salt-resistant, transpirant mortar made from lime, Eco-Pozzolan and recycled materials.

This product was followed by a layer of MAPE-ANTIQUE MC, a special salt-resistant, macro-porous, dehumidifying rendering mortar made from lime and Eco-Pozzolan.

Once this layer had cured, the walls were skimmed with MAPE-ANTIQUE FC GROSSO, a salt-resistant, large-grained, transpirant skimming mortar made from lime and Eco-Pozzolan for a rough finish on renders.

Strengthening the masonry

The masonry was strengthened by applying reinforced render made from MAPEWALL RENDER & STRENGTHEN, a high strength, fibre-reinforced, natural hydraulic lime-based transpirant rendering and masonry mortar with very low emission level of VOC (Volatile Organic Compounds) for making structural render, even "reinforced" (CRM). The product was used in combination with MAPEGRID B250 primed alkali-resistant basalt fibre mesh which was fixed in place with L-shaped MAPENET EM CONNECTOR L20 glass fibre fasteners anchored with MAPEFIX PE WALL styrene-free chemical anchor.

Protecting the stone surfaces

The stone surfaces of the church were treated to protect them from the action of heavy, driving rain with ANTIPLUVIOL W, a colourless, silane and siloxane-based water-repellent impregnator in watery emulsion which also improves the self-cleaning effect of the façade and reduces the capacity of moss and mildew from adhering to the material.

MAPE-ANTIQUE STRUTTURALE NHL

High-performance mortar for breathable render and masonry work, based on natural hydraulic lime, Eco-Pozzolan and recycled materials, particularly suitable for making reinforced render (CRM) and installation mortar.

FIND OUT MORE

TECHNICAL DATA
San Paolo Eremita Church, Brindisi (Italy)
Year of construction: 1322
Period of the Mapei intervention: 2017-2018
Client: Brindisi-Ostuni Archdiocese
Intervention by Mapei: supplying products for restoring and strengthening the building
Main contractor: Nicolì SpA
Design: Luigi Dell'Atti, Claudio Riotta, Giacomo Intiglietta
Works director: Luigi Dell'Atti
Mapei distributor: Nicolì SpA
Mapei coordinators: Giammario Dispoto, Achille Carcagnì, Danilo De Matteis, Alessandro De Luca, Mapei SpA (Italy)
Photos: Marco Cerra, Francesco Nicolì

MAPEI PRODUCTS
Static consolidation of the stone structure: Mape-Antique Allettamento, Mape-Antique F21
Consolidation of the masonry: Primer 3296, Carbotube C 170/10, Mape-Antique F21
Consolidation of the vaulted ceilings: Mape-Antique Strutturale NHL, Mapenet EM 40, Mapenet EM Connectors, Mapei Steel Bar 316, Mape-Antique Allettamento
Consolidation and restoration of the wooden trusses: Mapewood Primer 100, Mapewood Paste 140
Dehumidifying masonry: Mape-Antique Rinzaffo, Mape-Antique MC, Mape-Antique FC Grosso
Structural strengthening: Mapewall Render & Strengthen, Mapegrid B250, Mapenet EM Connector L20, Mapefix PE Wall
Waterproofing external walls: Antipluviol W

For further information on products visit mapei.com

Restoration work to recover the lost harmony

THE ARCHITECT AND DESIGNER LUIGI DELL'ATTI TALKS ABOUT THE WORK CARRIED OUT ON THE CHURCH OF SAN PAOLO EREMITA IN BRINDISI

What guidelines did you have to follow for the restoration work on this church and what problems, if any, did you encounter?
When tackling such complex restoration work (for the sheer size of the building, the various additions that had been made over the centuries and the years it had been left abandoned), the important thing is to listen. Listen to what the different voices have tried to express in that place over the years, their stories.
With restoration work, listening means getting up close to the various components to try "to recognise" them, so you can attribute their precise role within the context they find themselves, tuning them as it were as if they were the instruments of a symphony orchestra so, in the end, you are able to restore its lost harmony.
This site was really surprising. Every surface revealed its own hidden story. The difficulty in this case was to find the right balance between the various parts, managing to bring them all together, while at the same time conserving their distinct, individual identity.

What choices did you have to make when deciding upon the right balance between visually restoring the church to its original look at the expense of the ancient layers and vice versa?
The concept of balance is the basis for all restoration work. In the case of the San Paolo Church, the complexity derived from the sheer variety and heterogeneity of the components, but also from the gaps all over the surface of the walls, by a certain overall "coldness" due to the initial homogeneity of the colour scheme, a darkness that permeated inside the church which, on the other hand, had originally been created with an extraordinarily rich array of colours.
Balance was also the target we had set ourselves when restoring all the single components. Just think about the Baroque altars, which revealed surprisingly decorative motifs. In this case we had to find a balance with the many missing parts to regain its overall wholeness, leaving it possible to distinguish between the original parts and what had been integrated, to create a single, aesthetic unit.
The most difficult problems arose with the samples taken from the walls, which gradually revealed the presence of architectural motifs and parts of frescos beneath their surface. We had to make a clear decision: to interrupt the dismantling of the area in correspondence with any rare features from a later period that could have been compromised. There were numerous such cases and each one required its own dedicated solution, but always with the aim of maintaining an overall sense of wholeness.

Aesthetics, functionality and durability: with a restoration and consolidation project, how do you manage to combine these distinguishing features of every building?
With monumental restoration work, you have to operate with decision but also with subtlety. Good restoration work is "invisible". New technologies are a great help to us when carrying out static consolidation work and they also allow us to intervene without excessive trauma to the original construction.
Reversibility is one of the characteristics of restoration work which, however, isn't always possible to combine with static consolidation. In the case of the San Paolo Church, the rotation towards the outside of the longitudinal walls was overcome by recovering the chains that had been inserted when the church was restored in the 20th century and improving their effectiveness by inserting innovative dissipation systems. In other cases, we opted for traditional construction techniques, putting the walls back together with compatible materials with similar characteristics to the original materials. With restoration work, it is very important to do things gradually, which makes our approach to restoration stand out from the rest of the world. This is why the Italian school of restoration is of undisputed excellence.

What influence do increasingly advanced products and technologies specific for restoration work, conservation work and structural strengthening have when making design choices?
There is no doubt that the products chosen for the static consolidation work and to make the reinforced render using carbon fibre played an important role on site, which also gave me the chance to discuss the work almost on a daily basis with Mapei's experts such as Danilo De Matteis and Giammario Dispoto.