



CONSOLIDATING AMONGST HISTORY AND ART

DEDICATED TO THE PATRON SAINTS OF MATERA, THE CATHEDRAL HAS BEEN THE OBJECT OF DELICATE CONSOLIDATION AND STRUCTURAL STRENGTHENING WORK

Built in Apulian-Romanesque style, Matera cathedral is dedicated to the Madonna dell Bruna and St. Eustachio and sits on the highest spur of the city, which splits the Sassi cave dwellings into two halves. Completed in 1270, the church was built by raising its rocky foundations by more than six metres so that it would overlook the surrounding territory. The façade of the cathedral is dominated by a rose window and a main entrance door with a round arch.

Upon entering the cathedral, visitors immediately notice the contrast with the style of its exterior: all that remains of the original interior of the church are a few frescoes and the capitals of the columns; stuccoes and gold leaf décor were added in the seventeenth century, while the trussed ceiling was covered in 1719 with a wooden suspended ceiling. The layout of the church is a typical Latin cross style with three aisles and is 54 m long, 23 m high and 18 m wide.

WORKING IN A HISTORICAL SETTING

A series of interventions inside the cathedral was launched in 2014 to consolidate and strengthen its structure and to renovate its decorative features. Mapei Technical Services was con-



PHOTO 1. The MAPEWOOD system was used for the wooden roof beams and trusses and the MAPEWRAP system was applied to strengthen the structure.



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PHOTO 2. TOPCEM PRONTO was used to build heated screeds.

PHOTO 3. Slabs of marble were installed in the interiors with GRANIRAPID.

PHOTO 4. Repairing the beams with MAPEWOOD PASTE 140.

tacted and, for the static consolidation and structural strengthening work on the dome over the presbytery and the smaller timbered vaults, they advised using a combination of the latest generation of inorganic matrix composites from the FRG SYSTEM and polymer matrix, fibre-reinforced composites from the FRP SYSTEM.

Consolidation of the wooden beams and trusses.

The first phase of the work consisted in consolidating the surfaces of the wooden trusses over the lateral and central naves. Once the wooden structural elements had been catalogued, numbered and dismantled, they were treated to protect them from woodworm and dry rot and then primed with two coats of MAPEWOOD PRIMER 100 fluid epoxy impregnator. A layer of MAPEWOOD PASTE 140 epoxy adhesive pigmented in the colour specified by the Works Director was then applied. This phase was completed by bonding wooden slats to some of the areas treated with MAPEWOOD PASTE 140 thixotropic adhesive which, while still wet, had been broadcast with QUARTZ 0.5 quartz sand.

The second intervention involved consolidation of the wooden beams and trusses over the central nave by fastening two CARBOPLATE E170/50 plates near to the intrados of the chain with MAPEWOOD PRIMER 100, MAPEWOOD PASTE 140 and MAPEWOOD GEL 120. Metal inserts were added to the arches in the presbytery using 5 mm titanium threaded rods, which were fastened into the arches by drilling a series of holes and anchoring them with MAPEFIX EP 470 SEISMIC pure epoxy resin-based chemical anchor.

Intervention on the dome over the presbytery. To strengthen the extrados of the dome, the Mapei FRP system was proposed, which involves the use of MAPEWRAP G UNI-AX 300/30 uni-directional, high strength, glass fibre fabric, applied with a line of epoxy resins such as MAPEWRAP PRIMER 1, MAPEWRAP 11, and MAPEWRAP 31.

This strengthening system was applied on the properly prepared substrate with PLANITOP HDM RESTAURO. The system was linked to the perimeter walls with MAPEWRAP G



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FIOCCO glass fibre cord, anchored with MAPEFIX VE SF resin-based chemical anchor.

Consolidation of the vaulted roofs.

When consolidating the three limestone vaults unearthed during the archaeological digs MAPE-ANTIQUE ALLETTAMENTO was used for sealing the joints between the bricks. After the application of PRIMER 3296, a cap was made with PLANITOP HDM RESTAURO fibre-reinforced mortar and MAPEGRID G



PHOTO 5. Static structural strengthening work on the dome over the presbytery using the MAPEWRAP system. **PHOTO 6.** The flooring, made up of slabs of Carrara marble and Bardiglio inserts, was installed using ELASTORAPID two-component cementitious adhesive.

220 glass fibre mesh.

For the new structural renders in the transepts and in the Sacramento and Annunziata chapels, it was recommended to use MAPE-ANTIQUE STRUTTURALE special mortar with MAPE-GRID G 220 glass fibre mesh embedded in the mortar.

Interventions on the interior:

Wall plasters were restored by starting with a thorough mechanical cleaning. They were then consolidated with a series of micro-injections of a cement-free, lime-based hydraulic binder (MAPE-ANTIQUE I-15), filling the surface cracks, and then applying a coat of lime-based paint.

Dehumidifying renders were created using salt-resistant lime-based, cement-free products with MAPE-ANTIQUE RINZAFFO (applied in a 5 mm thick layer) and MAPE-ANTIQUE MC (in a 20 mm thick layer). MAPE-ANTIQUE LC, MAPE-ANTIQUE FC GROSSO and MAPE-ANTIQUE FC ULTRAFINE were also applied thereupon.

As for the interior floors, an aerated flooring system was also created to counteract rising damp from the substrate. This structure was made up of modular formworks and a screed

made from TOPCEM PRONTO, a product which is ideal to build heated screeds thanks to its high thermal conductivity ($\lambda = 2 \text{ W/mK}$). The slabs of marble were installed on the screed using GRANIRAPID adhesive in its white shade. The joints were then sealed with MAPESIL LM sealant.

The Carrara marble and Bardiglio grey inserts were installed using ELASTORAPID adhesive in its white shade.

**IN THE SPOTLIGHT
MAPEWOOD PASTE 140**

It is a solvent-free epoxy adhesive used for bonding new timber parts to existing timber structures after the removal of damaged parts, as well as for filling holes both in the existing timber structural elements and in the new wood elements in order to anchor connecting reinforcing rods

and/or plates. MAPEWOOD PASTE 140 can be easily applied both on vertical and horizontal surfaces. It hardens without shrinkage and has excellent mechanical strength.



TECHNICAL DATA

Madonna della Bruna and Saint Eustachio Church, Matera (Italy)

Period of construction: 1226-1270

Period of the intervention: 2014-2016

Intervention by Mapei:

supplying products for structural strengthening, consolidating the wooden beams, building screeds, renovating masonry, and installing marble slabs

Client: Matera and Irsina Archdiocese

Project Manager: Laura Montemuro

Architectural design:

Renato D'Onofrio, Leonardo Nardis, Francesca Contuzzi

Structural design: Andrea Giannantoni

Works Direction: Renato D'Onofrio, Antonello Pagliuca, Francesca Contuzzi

Scientific consultant: Paolo Rocchi

Supervision: Francesco Canestrini, Antonio Persia, and Renato Di Marzio (Basilicata Region Department for Archeology, Fine Arts and Environment)

Main contractor:

D'Alessandro Restauri Srl
Mapei distributors: Edil

Loperfido Srl, Edil Sud Srl

Mapei coordinators: Michele Mirco Malvasi, Francesco Dragone, Achille Carcagni, Gianmario Disposto, Davide Bandera, Mapei SpA (Italy)

MAPEI PRODUCTS

Repairing wooden elements:

Carboplate E170/50, Mapewood Primer 100, Mapewood Paste 140, Mapewood Gel 120, Quartz 0.5

Structural strengthening: Mape-Antique Allettamento, Planitop HDM Restaura, MapeGrid G 220, Primer 3296

Static strengthening: Mapefix

EP 470 Seismic, MapeWrap 11, MapeWrap Primer 1, MapeWrap 31, MapeWrap G UNI-AX, MapeWrap G Fiocco, MapeWrap S Fiocco

Building screeds: Topcem Pronto

Installing marble: Granirapid, Elastorapid

Sealing expansion joints: Mapesil LM

Renovating internal walls: Mape-Antique Rinzafo, Mape-Antique MC, Mape-Antique LC, Mape-Antique FC Grosso, Mape-Antique FC Ultrafine

For further information on products see www.mapei.com