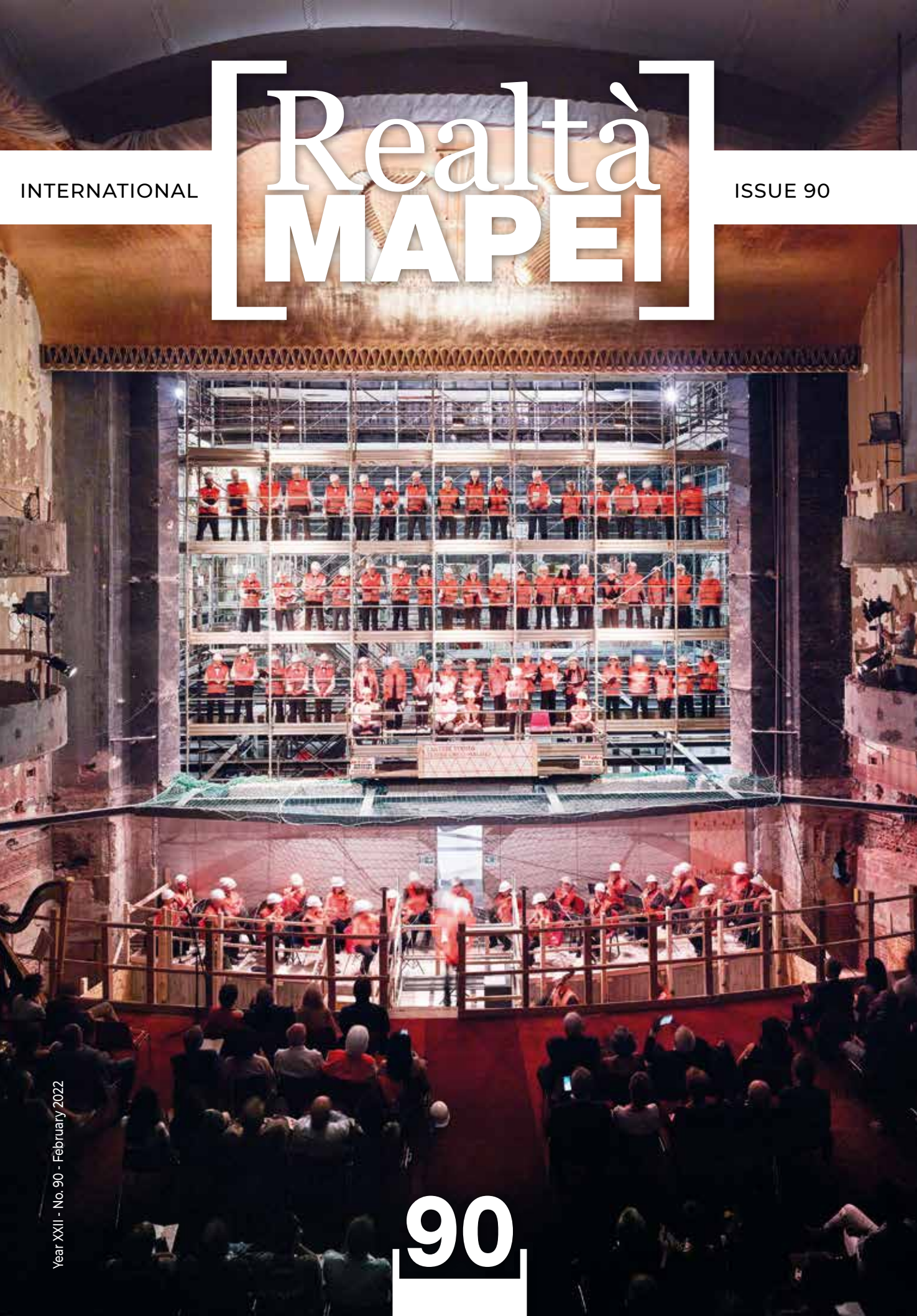
INTERNATIONAL

Realtà MAPEI

ISSUE 90



Year XXII - No. 90 - February 2022

90

GUIDO PALMIERI
Realtà Mapei International's
Editor-in-Chief

Mapei, an industrial enterprise for 85 years

Mapei is celebrating its 85th anniversary. An industrial (and family) enterprise that Rodolfo Squnizi set up in February 1937 and is now run by the third generation of the Squinzi family. During this long journey, Mapei has been able to move beyond Italy's borders without ever forgetting its roots, something the company has always been proud of. With one aim in mind: to look ahead, improve and achieve new goals.

The results of a "philosophy" in which family values are intertwined with the company's goals focused on continuous growth and internationalisation that can be summed up by just a couple of figures: 84 operating manufacturing plants in 35 countries, 91 subsidiaries in 57 countries, and 32 Research & Development centers in 20 countries. Progress that has not stopped even in the face of the most profound global crisis since the post-war period (connected with the Covid-19 pandemic).

MAPEI INNOVATIVE SOLUTIONS FOR RESTORING HISTORIC BUILDINGS

International diversification combined with production diversification (the acquisition in France of Resipoly Chrysor and its subsidiary Eurosyntec happened just recently) have contributed contributed to reach a turnover of 2.8 milion Euros in 2020.

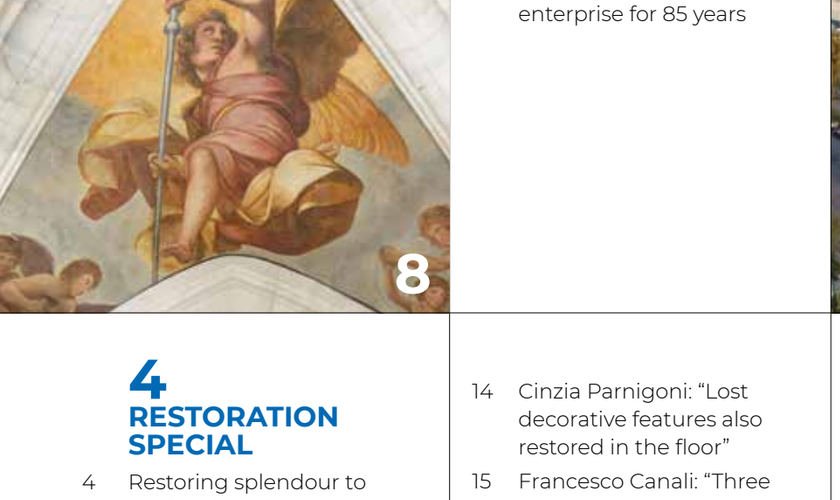
If the past is indeed something to be treasured, then it is now more important than ever to broaden our horizons in order to envisage and invent solutions to the increasingly rapid (and unpredictable) changes we have become accustomed to in modern-day society. In this kind of situation, the pillars of Mapei's strategy (innovation, internationalisation, specialisation, sustainability) are the trump cards for being a leading player on markets all over the world. Global markets in the building industry are, indeed, forecast to consolidate growth in 2022 but forecasts for the recovery are subject to the effects of the war in Ukraine, the pandemic, and the rise in the cost of raw materials being contained.

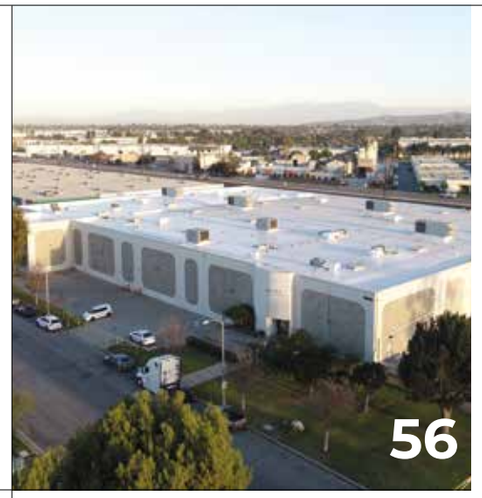
New technologies and sustainability in line with tradition are the specific means by which Mapei renovates and restores historic buildings. The 'Restoration Special' enclosed in this issue is dedicated to its innovative range of products for this field, including a review of important building projects Mapei has been involved in (starting with Aquilonare Sacristy in Milan Cathedral) together with interviews and contributions from leading exponents from the world of culture, experts and professionals.

As regards anniversaries, this year Polyglass USA is celebrating 30 years in operation on the North American market. The various stages in growth and new expansion plans of this US subsidiary, acquired by Mapei in 2008, can be found in the "Teamwork" section of this issue of *Realtà Mapei International*.

Enjoy your reading

SUMMARY





Cover story
This issue encloses a special devoted to restoration with interviews with restorers, architects, Local Heritage authorities and Mapei experts, as well as a portfolio of the most recent projects carried out with Mapei solutions. In the photo, the restoration site of Giorgio Gaber Theatre in Milan.

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When the ancient goes back to its splendour

CHURCHES, PALACES, CASTLES: A TREASURE TO BE PROTECTED AND PRESERVED. THE SPECIAL DEDICATED TO RENOVATION AND RESTORATION INCLUDES AN OVERVIEW OF THE MOST IMPORTANT PROJECTS MAPEI HAS CONTRIBUTED TO

*Available from the 1st of April, 2022

by **Davide Bandera**

That mix of “old” materials, technology and sustainability

FROM MAPEI, GUIDANCE TO IDENTIFY THE MOST SUITABLE PRODUCTS AND SYSTEMS FOR REFURBISHING AND RESTORING HISTORIC BUILDINGS

What are the main characteristics of the product line aimed specifically at masonry buildings and how has it evolved over the years?
In 1992 Mapei launched a product Range called MAPE-ANTIQUE to offer specific solutions for interventions on ancient buildings, including those of artistic and architectural value.
These products are lime-based formulations with zero cement content and have similar chemical-physical and elastic-mechanical characteristics to masonry and rendering mortars used in the past.
Over the years this range has grown and has also evolved thanks to the experience gained on site while working on numerous historic buildings, both in Italy and abroad.
Since the first products were launched in the 1990’s, many others have been added to the range to meet every specific need in the restoration field.
Today, this Mapei Line, called “Refurbishment and Restoration”, includes an extensive range of technologies and systems, some of which are specific for the refurbishment and restoration of quality buildings.
The aim of all this is to provide increasingly precise guidance to product specifiers/designers and applicators when selecting the most suitable technical solutions for their needs.

What approach should be adopted when restoring a building of historical and architectonic significance?
The first fundamental phase is a “fact-finding” phase, which means accurately pinpointing what caused the deterioration or the current state of conservation of the structure by carrying out a thorough and complete visual analysis. The next phase is to carry out, if needed, a diagnostic analysis to determine, for instance, the composition of the original mortars, finishes, etc. In the third phase, the most suitable materials and the correct procedures for each phase of the work need to be identified based on the specific performance requirements. The most suitable product has to be chosen according to the actual problem that has emerged while, at the same time, making sure it is compatible with the characteristics of the substrate it will be applied on.
When carrying out the actual work, the final phase, but certainly no less important than the previous phases, is to define the application procedures and methods. These depend on the type of product chosen, which must be applied correctly by skilled personnel according to the recommendations supplied by the manufacturer.

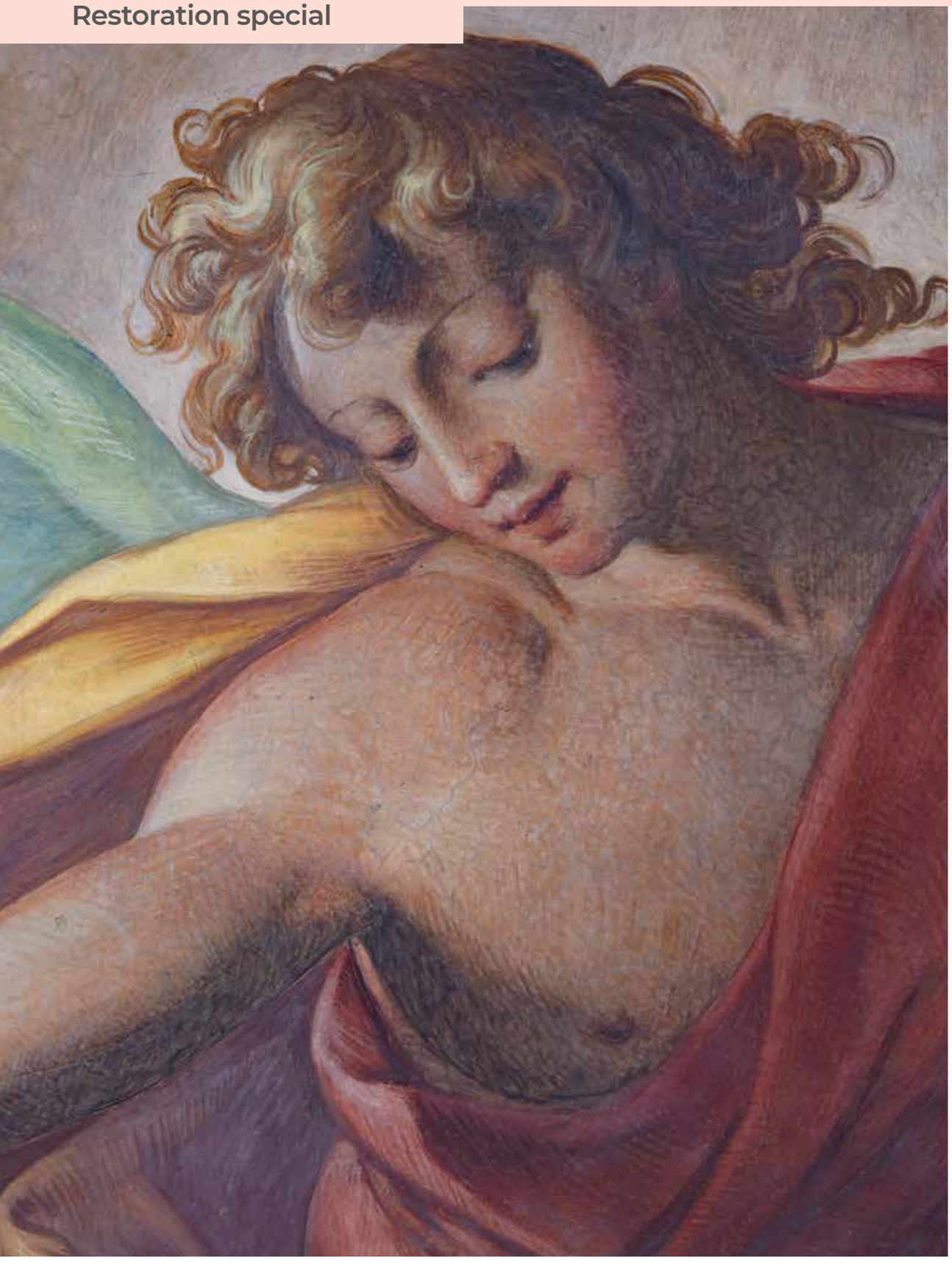
Safeguarding, conservation, appreciation and prevention are the key words that define the interventions on historic and architectural heritage

Restoration work follows various principles such as reversibility, distinguishability, and a minimum intervention. And last but not least, compatibility. How can Mapei products help to solve these issues?
Safeguarding, conservation, appreciation and prevention are the key words that define the aim of a conservative restoration project on our historic and architectonic heritage. It is very important, however, to understand what they mean and their implications right at the very start of the development of a project so that, once all the work has been completed, it will last and, above all, will be shared by whoever takes charge of the monument to pass it on to future generations.
A small glossary of terms helps us get a better understanding of the sector we operate in and allows us to avoid confusion between different terms that are often used ambiguously or out of context. An example of this confusion is the difference between “restoration” and “refurbishment”. Restoration refers to any intervention carried out on monuments, architecture, works of art and other objects of artistic, historic or anthropological significance following their completion. The reasoning and purpose behind these interventions has varied quite significantly over the centuries from, on the one side, simply maintaining the efficiency of a monument, to modifying or upgrading a monument to suit contemporary tastes, on the other. A clear wish to conserve and preserve a monument can also coexist with the need to maintain a certain state or condition for future generations, such as in the case of restoration work on a fresco or façade, for example.
With “refurbishment”, on the other hand, we mean the resolution of one or more problems and the work carried out does not necessarily have to be conservative.
The term “reversibility” is usually used to identify a process that can be inverted and, as far as a product is concerned, it means it may be removed without causing any damage to a structure or to a construction element in general.
The term “compatible”, on the other hand, is associated with the properties of a product and identifies its chemical-physical and elastic-mechanical affinity with the characteristics of the original materials.
“Distinguishability” means the ability of those that admire a restored monument or feature to clearly distinguish between the restored part and the part that was not included in that particular restoration work.

Sustainability is one of the cornerstones of the Mapei philosophy. How is this principle applied and expressed within the refurbishment and restoration line?
Sustainability and environmental issues in general are a primary objective of the building process, thanks to the increasing level of awareness and sensitivity of public opinion, governments and all those involved in the process, from clients to designers and construction companies.
The use of materials with a high content of recycled materials, that have a low impact on the environment and very low emission of volatile organic compounds (VOC), manufactured in efficient production plants powered by renewable energy, are the at the heart of the journey Mapei has undertaken in the name of sustainability. Thanks to its Research and Development activities, Mapei combines the study of materials from the past and cutting-edge technology with all issues regarding sustainability, the aim being to supply materials of the highest quality that remain durable over time, and that have less impact on site thanks to more simple waste management procedures and a reduction in the amount of time and effort required to create product systems.
A concrete example of this journey are the products from the new MAPE-ANTIQUE NHL Range, and especially MAPE-ANTIQUE NHL ECO RISANA and MAPE-ANTIQUE ECO RESTAURA (available from the 1st of April, 2022). The former is a one-component, cement-free, salt-resistant, dehumidifying eco-render made from pure natural hydraulic lime, which is particularly recommended for historic buildings, as well as for more recent builds.
The latter is a breathable, cement-free, pure natural hydraulic lime and Eco-Pozzolan mortar for restoring and levelling substrates and render.

Mapei systems have been applied during redevelopment work on both ancient and modern masonry buildings. What are the main differences?
There are no substantial differences between restoring an ancient masonry building and a more modern one. Once the causes of the problem or deterioration have been identified for one or the other type of building, Mapei’s strength lies in having such an extensive Range of products available to help prescribers-designers and applicators identify the most suitable product for the refurbishment and conservative restoration of each type of building.
All this is the result of a constant commitment to Research & Development that, for Mapei, is one of the cornerstones of its strategy and routine approach to work. Research makes it increasingly necessary and important for us to involve a wide spectrum of people who have the ability to oversee every phase of the analysis and study of our historic and architectural heritage, to guarantee that a restoration project is executed correctly, from start to finish.
A concrete testimony of this virtuous synergy between all the stakeholders involved are the recent restoration works on the Baptistery in Piazza Dei Miracoli in Pisa and the Aquilonare Sacristy in Milan Cathedral and the Giorgio Gaber Theatre, also in Milan, which you can read more about on the next pages, as well as the Santa Maria Annunciata Church designed by Giò Ponti in Milan.

Corporate Manager, Restoration Line for Masonry Building, Mapei SpA (Italy)



Milan (Italy)

Aquilonare Sacristy in Milan Cathedral

A COMPLEX RESTORATION INTERVENTION ON THE PORTAL, THE MARBLE FLOORS AND THE FRESCOES BY CAMILLO PROCACCINI

To find the origins of Milan Cathedral, you have to look at the Sacristy: this was the first area to be built after the foundation stone had been laid towards the end of the 14th century, and it is here that the first chapel and altar where services were celebrated can be found. The building of the Aquilonare Sacristy – the term "aquilonare" comes from the late-Latin word *aquilonaris* (northern) – started in 1386, on the very spot where St. Ambrose himself was baptised just a few days before becoming Bishop of Milan.

The restoration of the Aquilonare Sacristy is one of theprojects the Veneranda Fabbrica del Duomo (the organization in charge of preserving Milan Cathedral) was particularly passionate about. Restoration work started four years ago and involved the frescoed vaulted ceilings, the pointed portal, and the marble floors

Painted by Camillo Procaccini in the late 16th century, the frescoes on the vaulted ceiling were created during the rebuilding work following the fire on Christmas Eve in 1610.

Dating back to 1389, the portal was designed by Giacomo Da Campione and is the oldest sculptural work in the Milan Cathedral.

The restoration work also included the marvellous inlaid floor in white and pink Candoglia marble, black Varenna marble and red Arzo marble, in which a six-pointed Star of David symbol is the dominating feature.

Restoring the frescoes on the vaults and marble ashlars: the contribution by Mapei

Mapei, which became a Golden Donor and a member of the "Get a Spire" club of Milan Cathedral (see *Realtà Mapei International* no. 69), wished to contribute once again in the restoration work on this symbol of Milan and provided all its technical knowledge and expertise to help overcome a number of complex problems. Mapei products and systems were used to consolidate cracked substrates, restore the frescoed render, grout joints and rebuild render.

As for the frescoes, once the scaffolding had been erected, the restoration company (Centro di Restauro di Paola Zanolini e Ida Ravenna), along with Works Director Francesco Canali, found that, in the past, the frescos by Camillo Procaccini had been pulled off from one of the two spans using the "strappo" (tearing) technique and that the frescos, transferred onto canvas, had been bonded directly to the render, but inadequately. The situation was very serious because the parts they inspected were in an advanced state of deterioration that wasn't visible from floor level, with all the surfaces covered by a film of dirt from the smoke given off by candles, as well as widespread fading of several portions.

After studying the archives, it emerged that the documentation available only mentioned the two most recent restoration works on the frescoes. The first one, dating back to the middle of the 18th century by the painter, Giuseppe Knoller included the demolition of the frescoed render on the eight segments of the ribs, re-rendering them with lime mortar and then painting rather unrefined frescoes depicting angels and cherubs. The second restoration intervention dates back to 1964 and was carried out by the restorer Tino Anselmi, who was commissioned to pull off the frescos from the four ribs of the first span in the Sacristy, which had also been damaged by infiltrations of water and had salts coming through, causing the colour to become "crumbly". After putting the pulled frescoes back in place, Anselmi then repainted and blended in a lot of different parts of the vaulted ceiling.

<u>Work carried out on the 1st span</u>

After pulling off the frescoes in the 1960s, they were bonded to very thin canvas with caseinate (casein and lime putty) which, over the years, had lost its bonding power, with serious consequences for the stability of the colour; the missing areas were patched up with pieces of canvas and then covered with tempera applied directly on the canvas without any base grout. After pulling off the frescoes, the original render had been demolished and then rebuilt using cementitious render. The frescoes, which at this point were attached to canvas, had then been repositioned on the new render using contact adhesive but were not laid flat and large blisters and creases appeared in the canvas. Over the years, the adhesive lost its properties and the frescoed canvases started to detach from the render, putting the stability of the entire feature at great risk.

After removing all the dusty and crumbling material and then laying on a thin layer of washi paper, the restoration

company (Centro di Restauro di Paola Zanolini e Ida Ravenna) proceeded to detach the frescoed canvases and, once they had been taken down to ground level, the adhesive was removed from the back of the canvases using sprayed water and an iron. All the portions of fresco then had a new canvas backing applied and the layer of washi paper was removed. Then, skilful, expert hands restored all the frescos which were later bonded back to the ceiling in their original position using ULTRAMASTIC 5, a special ready-to-use, white paste adhesive. The joint lines between the different portions were filled and blended in by carefully painting them to mask the joints. The method adopted to reintegrate the paintwork meant that small and medium-sized areas of missing paintwork could be touched one by one, while the larger areas were blended in with the colours of the fresco around them without carrying out any further repair work.

The portions of frescoes had new canvas backing before being re-attached to the ceiling

While restoring the frescos, the company also restored the marble ashlars, especially the ribs of the two cross-vaulted ceilings and the two large, central keystones. The marble elements had become completely blackened by an extremely compact, thick layer of dust, smoke and particulate matter. The joints between the ashlars had been sealed in the 1970s with conglomerate made from sand, marble powder and dark pigmented epoxy resin to match the colour of the blackened marble, which was applied in large quantities and spread roughly over the surfaces so that large portions of the marble ashlars were also covered.
The cleaning phase consisted of repeatedly applying meerschaum and arbocel compresses with ammonium carbonate and, due to the sheer thickness and toughness of the layer of dirt, they were left in place for several days. Removing the grouts from the joints proved to be much more complex and time consuming. Heat and hand and power tools were used and gave an excellent result.
The joints grouted with cementitious mortar were cleaned by the specialised craftsmen from the Veneranda Fabbrica del Duomo and then filled with MAPE-ANTIQUE ALLETTAMENTO cement-free, natural hydraulic lime-based mortar. They were then coloured, a little at a time, to blend them in with the various shades of the marble. This mortar was chosen for its chemical-physical and elastic-mechanical compatibility with the properties of the mortar originally used and is also resistant to soluble salts, so does not suffer "attack" by soluble salts present in the structure from previous restoration works using cementitious mortars.

<u>Work carried out on the 2nd span</u>
The frescos in the second span, also the work of Camillo Procaccini, were more fortunate from a conservation point of view than those in the 1st span, in that they had not been damaged by infiltrations of water from the roof above. The painted render, however, had also been removed from the segments in these ribs in the 19th century and, in this case, had been restored with cementitious mortars and then frescoed by Knoller using the only two remaining segments, on the eastern side, as models. The problem regarding the conservation of this vaulted ceiling was the stability of the frescoed render, with almost half of the entire surface worryingly detached from the underlying masonry structure. The first operation by the restorers was to consolidate the frescoed render by inserting fibreglass studs to "tie" the render to the masonry.
Then, MAPE-ANTIQUE F21 cement-free, lime-based hydraulic binder, which doesn't contain any type of polymer and has no way of releasing soluble salts, was injected to re-establish the bond between the frescoed render and the substrate. Some portions of render on some of the segments without any type of decoration were completely demolished and then rebuilt using mortars from the MAPE-ANTIQUE Range, a family of cement-free, lime-based products with the capacity to resist chemical aggression by salts present in the underlying substrate from the cementitious mortars used previously and infiltrations of water. The skilful experts of Veneranda Fabbrica del Duomo then applied a scratch-coat to even out the absorption of the substrate (MAPE-ANTIQUE RINZAFFO) followed by a layer around 2 cm thick of macro-porous de-humidifying render (MAPE-ANTIQUE MC). It was decided to use this render because, in the underlying substrate, there was a high content of soluble salts and moisture. MAPE-ANTIQUE MC facilitates the expulsion of moisture while, at the same time, because of its particular formulation, chemically resists the aggressive nature of the salts themselves. To blend in the portions of new render with the old render, the craftsmen from the Veneranda Fab-

ABOVE. A rib of the Aquilonare Sacristy before (left) and after (right) the completion of the restoration intervention.

THE JOY OF BRINGING NEW LIGHT TO THE FRESCOES

WE SPOKE WITH RESTORATION EXPERT PAOLA ZANOLINI, OWNER OF CENTRO DI RESTAURO

The research work undertaken before restoring the Sacristy was lengthy and challenging. What preliminary work was carried out?
First of all, we studied the archives of the Veneranda Fabbrica del Duomo to get a clearer picture of the various components and the restoration works that had been carried out over the years between 1610 and today. We found three interventions that had really affected the overall appearance of the Sacristy.
The first one dates back to 1610 to remediate the deteriorated frescos in correspondence with the segments of the two vaulted ceilings. Martin Knoller removed the areas of render with frescoes and painted new angels on lime-cement render. Over the years, this mortar released a large amount of salts that went on to cover and damage all these new frescoes.
In 1964 the restorer, Tino Anselmi, was commissioned to pull off the frescoes from the western span that were being damaged by infiltrations of water. Once they had been transferred onto canvas, the frescoes were repositioned on the vaulted ceiling, but without too much care and using really poor quality adhesive. In the 1970s, the Fabbrica's Works Director at that time decided to try a new way of sealing the joints in the marble ashlars of the walls and in the ribs of the vaulted ceilings and used a mix made from sand and epoxy resin which proved to be the completely wrong choice, both colour wise and for its totally irreversible consistency, and it also covered parts of the surface of the marble.
Scientific analysis was then carried out on all the materials used in the various restoration works and on the crystallised surface salts and the temperature and level of humidity of the Sacristy were measured.

What problems did you encounter during the restoration work?
The problems can be divided into two main areas: operational problems due to deterioration of the various elements and aesthetic problems. The worst damage was to the frescoes because of the way they had been pulled off; apart from being abraded and damaged, they had become hard and deformed with blisters and creases, as well as being soaked in different types of adhesive used to reposition them on the substrate. We had to remove all the layers of unsuitable, hardened adhesive and all the layers of paint that had been added over the years when the frescoes were repainted.
The extraordinary collaboration with Mapei meant we were able to overcome the problem of repositioning the frescoes on the substrates of the walls thanks to the excellent product we were supplied with (ULTRAMASTIC 5) which, even though it gave us all the time we needed to reposition the frescoes, guaranteed an accurate and rapid bond.
The vaulted ceiling in the second span also had serious problems regarding its stability because most of the surface of the render had become detached from the facing wall. Again, we were able to overcome this problem with a product supplied by Mapei (MAPE-ANTIQUE F21) which, together with fibreglass studs, guaranteed excellent stability for the frescoed render without unduly loading the surface.
The problem that caused us most

1. The frescoes on the canopies of the west bay after restoration.
2. Application of the CONSOLIDANTE 8020 mix on the frescoes on the canopies.
3. Re-establishing the adhesion of the frescoed surfaces with MAPE-ANTIQUE F21.

problems was the removal of the resin mixes used to fill the joints. By applying heat and using power tools, we managed to clean more than 5,000 m of joints and recover large portions of marble, replacing the resin mixes with MAPE-ANTIQUE ALLETTAMENTO mortar. A difficult problem we came across during the cleaning operation was when we discovered that all the new parts frescoed by Knoller had been blended in with the colour of the heavily blackened surfaces. We were faced with a difficult decision: if and how to conserve them because there was such a marked geometric and chromatic contrast with the originals. Together with the Works Director and the Local Heritage Authority (Laura Paola Gnaccolini), we discussed various possible approaches. Because of the sheer size of the newly frescoed portions, it was decided we wouldn't highlight just the original parts by removing the areas that had been restored previously, but to conserve these portions and to blend in their colours with the original ones to give a sense of unity to the frescoes and offer the vision of an area of the Cathedral as it would have appeared originally: a particularly light ambience decorated in bright colours.

In the case of this important project for the city of Milan, how important were emotions in achieving this wonderful result?

Throughout my professional career I have always strived to achieve excellent results and encourage the use of innovative techniques that guarantee the best state of conservation over time while achieving just the right compromise with the actual result in terms of aesthetics and historical significance. There is no doubt that, as a Milanese who considers the Cathedral not just a symbol of my city but the 8th wonder of the world, the emotive factor has been a constant companion throughout these two years of work, during which I strived constantly to achieve the best result possible.

brica applied a fine-textured skim coat (MAPE-ANTIQUE FC CIVILE) followed by a coat of mineral finish.
From the first cleaning tests carried out by the restoration company to remove the salts, they found that the rebuild of the cementitious base render was not limited to just the segments, but also interested vast areas of the backgrounds of the ribs. Fortunately, the four marvellous figures depicting angels were well preserved and intact. At this point the team was faced with a difficult decision on how to intervene: whether to conserve them or not but, more importantly, how to intervene, since there was a marked geometric and chromatic contrast with the originals. The Works Director and Laura Paola Gnaccolini, an official from the Local Heritage Authority appointed to safeguard the Sacristy, discussed the various possible approaches to restoring this historic feature. They finally decided to conserve the previous restorations by adapting them to the original colours to bring back a sense of unity and legibility to the entire frescoed décor while, at the same time, offering the vision of an area of the Cathedral as it would have appeared originally: a particularly light ambience with vaulted ceilings entirely decorated in bright colours.The frescoes were cleaned in two stages: firstly, the salts which had made the large, repainted areas so noticeable were removed, followed by the removal of the dirt, fixatives and smoke by applying compresses and, in the tougher areas, with the help of scalpels.
Once they had been cleaned, the frescoes were found to be in a good state of conservation and their colours only needed to be touched-up slightly, whereas the restoration work by Knoller was found to be very patchy with vast areas missing. Restoration of the paintwork in these portions of the vaulted ceiling was long and complex because they were faced with two challenges: numerous, large areas of the paintwork were missing and had to be recreated and all these parts had to blend in with the original.

The aim was to bring back a sense of unity and legibility to the entire frescoed décor

Work carried out on the walls of the Sacristy
The walls of the Sacristy, which have three large glass windows, were built from blocks of overlapping marble, apart from the southern wall in the second span and the western wall which were painted to look like marble ashlars.
All the surfaces had been blackened by smoke and deposits of particulate matter and had drips of grey lead paint and cement from work carried out on the metal parts of the windows. Also, the northern wall had marks where water had run down the surface and deposits of crystallised salts. These blocks of marble had also been filled in the 1970s by a mix of aggregates and epoxy resin. The joints in the southern wall, on the other hand, had been grouted with cementitious mortar.
The restoration work on the walls was very similar to the procedure adopted for the large ribs of the vaulted ceiling, with the removal of the grouts from the joints and then re-filling them with MAPE-ANTIQUE ALLETTAMENTO pigmented to suit. Also, a special consolidation treatment was used for both the render and the colour consisting in the application of CONSOLIDANTE 8020, a polymer-based, reversible consolidating product. The restoration company repainted the areas of bare render, the same intention as at the beginning of the 20th century to create a kind of trompe l'oeil, while the walls were painted to look like marble ashlars, similar to the other walls.

Find out more
MAPE-ANTIQUE F21

TECHNICAL DATA
Aquilonare Sacristy, Milan Cathedral, Milan (Italy)
Period of construction: 14th century
Period of the intervention: 2019-2021
Intervention by Mapei: supplying products for restoring the frescoes, render, marble ashlars and floors
Owner: Veneranda Fabbrica del Duomo
Works direction: Francesco Canali, Veneranda Fabbrica del Duomo
Superintendency for Archaeology, Fine Arts and Landscape, City of Milan: Antonella Ranaldi, Paola Gnaccolini
Main contractors: Veneranda Fabbrica del Duomo, Arte Rosa Restauro di Cinzia Parnigoni, Centro di Restauro di Paola Zanolini e Ida Ravenna (Alessandra Oliva, Silvia Clerici, Benedetta Bertacca, Milena Monti), Magistri Srl di Eros Zanotti
Mapei coordinators: Davide Bandera, Mapei SpA (Italy)

MAPEI PRODUCTS
Renovating frescoes:
Consolidante 8020, Mape-Antique Allettamento, Mape-Antique F21, Ultramastic 5
Sealing joints: Mape-Antique Allettamento
Renovating renders: Mape-Antique FC Civile, Mape-Antique MC, Mape-Antique Rinzaffo

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Lost decorative features also restored in the floor

by **Cinzia Parnigoni**

FROM THE INITIAL CLEAN TO THE FINAL POLISH: ALL THE PHASES TO REPAIR DAMAGE DUE TO DETERIORATION AND WEAR CAUSED BY FOOTSTEPS

Restoration work on the floor in the Aquilonare Sacristy covered an area of around 75 m² of marble slabs, engraved and embellished with coloured marble inlays forming various patterns, with the predominant one being the Star of David, a pattern of symbolic significance in Jewish culture, but at times also found in decorative features in Christian churches.
The floor was generally in a very poor state of conservation and varied from area to area, depending on how much the floor had been subjected to the wearing effect of footfall from users of the Sacristy.
The most compromised area was around the entrance and then continued towards the main areas which, for hundreds of years, had been those most visited.
In the most worn area, consumption from footfall had reached a depth of around 2.5 cm.
This varying state of conservation in the floor was due to it having been restored several times using lithotypes of various nature, with each one having more or less resistance to wear. Candoglia, black Varenna and red Verona were the types of marble originally chosen for the floor but, during the various restoration works carried out over the years, other materials had been added, such as Apuane and Botticino marble, Vicenza limestone, Oira serpentine and Costozza stone.
Other damage derived from the presence of a dense network of cracks, irregular yellow stains and a greyish layer of general dirt and old, oxidised wax.
Restoration work got underway at the beginning of 2021 and was carried in the following steps:

- A general initial clean with rags and neutral detergent followed by a second clean using a steam-cleaner to get rid of the most stubborn grease deposits.
- The yellow stains were lightened by applying absorbent wood-pulp compresses and degreasing detergent.
- Consolidation of microcracks by injecting liquid epoxy resin.
- Removal of areas patched up with old concrete using hammers, chisels and small hand-cutters.
- Demolition of the areas of floor judged to be too badly damaged.
- Localised consolidation of an area of the floor detached from the substrate using slurry made up with MAPE-ANTIQUE F21. The bond between the two parts was re-established by allowing the slurry to soak down into the floor and fill the air-gaps through a network of tubes.
- Preparation of the substrate to reposition the new marble elements to reintegrate the demolished areas. The support bed was restored by eliminating any loose material and pouring new cementitious mortar with mineral aggregates with a medium particle size. The new tiles were then positioned using lime-based mortar strengthened with resins.
- Recreating the patterns that had been lost in areas where there was a lower level of wear that didn't put people at risk while walking on the floor and didn't justify replacing those parts. After sculpting the original slabs, new tiles were inserted by shaping them, one by one, to suit their respective seats and bonding them in place with two-component fluid epoxy resin.
- Fracture lines, cracks and small areas of missing material spread all over the floor were filled with two-component, pigmentable polyester resin with excellent mechanical strength.
- The final polish was carried out in different ways, using polishing disks or damp abrasive sponges. This was done very gradually using pads and disks of increasingly finer grades until the floor was nicely polished, but not too much otherwise it would be too slippery and hazardous.

ABOVE. Close-up view of the restored floor.

Restorer, Owner of Arte Rosa Restauro

Three spirits, three ideas with a common objective

by **Francesco Canali**

THE AQUILONARE SACRISTY WAS A VIRTUOUS EXAMPLE OF THE COLLABORATION BETWEEN THE CLIENT, DESIGNERS AND CONTRACTORS

The construction side of architecture has a rather unusual characteristic compared with other industrial activities: every project is animated by at least three different spirits, with each one having its own perspective on the process it is involved in. These three spirits are represented by the one of who is ultimately responsible for the project, that is, the client; the one of who is commissioned to design and manage the project; and the one of who actually carries out the work. And obviously all with the same common objective: to complete the project. But with three different viewpoints: to respect the economic and cultural conditions that have been created and stipulated in order to create the possibility of performing the work and meet a given need (the client); to pursue the technical and design content that have inspired the project (design team); the concrete possibility of carrying out the work envisaged (the contractor). So, three spirits; like three captains on the bridge of the same ship that need to learn how to govern it in perfect harmony.
This three-way navigation approach becomes even more complex in the case of restoration work: because the stretch of sea to be crossed is even more challenging, due to the fact that any existing architecture that needs to be worked on will always have hidden setbacks and problems, which depend on the complexity of the construction history behind it. The accepted meaning of restoration nowadays, on the other hand, allows us to acknowledge this discipline as being an almost scientific activity, one in which design work is an automatic consequence of in-depth knowledge of the structure and of the support that modern technology allows us to exploit. The restoration work on the Aquilonare Sacristy in Milan Cathedral also, and inevitably, presented similar characteristics to the ones just discussed, albeit with subtle differences that the maintenance work on the Cathedral implies. The most significant differences were the synergy between all the key players, first and foremost between the Veneranda Fabbrica del Duomo and the Local Heritage Authority. This approach favoured the process enormously. But we also need to remember that resources had to be optimised as much as possible and that there were technical problems which are a characteristic of restoration work on ancient monuments. One of the toughest problems the craftsmen from the Fabbrica and the restorers had to overcome was the totally unstable equilibrium of the salts that had become crystallized over the years in the dry filler materials in the vaulted ceilings, in the beds of mortar and in the brick and stone elements. Over the years crystallization, which in this case was triggered by the numerous infiltrations of water the Cathedral suffered from, reaches a very fragile and precarious balance and even the smallest amount of extra water (such as in the mortars used for the preparatory work required for the restorers, or in the injections and structural seals carried out by the Veneranda Fabbrica) can disturb this balance, resulting in the appearance of saline efflorescence on restored surfaces for months and even years. And so, all of a sudden, with the scaffolding installed and the restorers already at work, faced with the unexpected, widespread and rapid migration of salts on the surfaces being restored, you need industrial support with the ability to provide a timely remedy to the problem and enable the work to progress correctly: a solvent-based, isopropyl, copolymer consolidating agent in the first case and a super-fluid, fillerized hydraulic binder in the second case.
Products that are available on the market or which are easily combinable and previously tested in other cases and shown to be suitable for solving similar problems, with no margins for experimentation, suggested from a technical-commercial team used to working quickly: this was the invaluable contribution from Mapei and its mortars. To which I would also like to add the enthusiasm and availability of all the personnel involved: from the technical team right on up to the sales agents and warehouse operatives. The industrial support, and the use of tried and tested products, proved to be decisive in overcoming the problems associated with infiltrations of water.

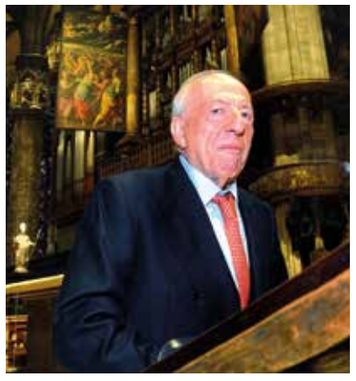
The industrial support, and the use of tried and tested products, proved to be decisive in overcoming the problems caused by infiltrations of water

Director of Sites, Veneranda Fabbrica del Duomo

Every detail reveals a new piece of history

FEDELE CONFALONIERI, PRESIDENT OF THE VENERANDA FABBRICA DEL DUOMO: THE SACRISTY INSPIRED THE CATHEDRAL'S FORMS AND FEATURES

Restoration work on Aquilonare Sacristy continued even during the closures due to the pandemic. At this historic moment in time, what can art and beauty offer ordinary people?
The pandemic has had a dramatic impact on such institutions as the Veneranda Fabbrica del Duomo, which live off tourism. In 2019, there were over 2.8 million visitors to the Monumental Complex in Milan, which incudes the Milan Cathedral, but only just over 600,000 in the whole of 2020. In 2021 things went better, but there is still a long way to go to get back to normal.
This is not just a health emergency; it is also a cultural crisis. Thanks to the proceeds from visits, the Veneranda Fabbrica can afford to carry out the restoration and renovation work the Cathedral always needs. Like the work on Aquilonare Sacristy that once again allows the faithful and visitors to enjoy a place of extraordinary, hidden beauty and great value to the Cathedral.
We have worked throughout the pandemic to take the Cathedral into the homes of the people of Milan and citizens from all over the world. This has been possible thanks, for example, to the power of digital technology, the Milano Duomo Card, new 3D tours and even with music streamed live that is so popular with the public, featuring such leading performers as Andrea Bocelli, the Verdi Orchestra or the Cameristi della Scala. I would like to note that the pandemic has provided the opportunity to experiment with new ideas and innovative ways of enjoying them. But that is not all. As soon as we could, we finally made spaces available to visitors that had previously been closed to the public, such as Candoglia Quarry on Lake Maggiore, where the Veneranda Fabbrica has been extracting marble for the Milan Cathedral for over six centuries. As well, of course, as Aquilonare Sacristy. In short, the Milan Cathedral has responded to the closures by making its artistic heritage even more accessible.



The work carried out by our restorers has confirmed the information we have in our archive records

Restoration work has brought to light some startling features, showing us what the Cathedral might have looked like in its early days. What fresh prospects are opened up by the recently completed project?
This place, where the construction of the Cathedral began back in 1386, is of great civic and religious importance to Milan. Here we can get an idea of the clarity with which Milanese people from the 14th century planned their Cathedral. By creating this Sacristy, they were outlining the shape and distinctive features that make the Cathedral and its distinctive outline such an unmistakable landmark for the city worldwide.
I am referring, for example, to the beautiful Gothic portal that alludes to the upward thrust of the spires.
It was most probably within these walls that Gian Galeazzo Visconti was invested as Duke of Milan, and it was here that the very first Masses were celebrated in the Cathedral.
Procaccini's magnificent frescoes, which the mists of time had hidden from view, have been uncovered and we can once again walk across the splendid inlaid floor, whose stones have survived for over six centuries. Every detail of this place poses questions and perspectives not only for scholars but for everybody who loves the Cathedral. Our restorers have made many discoveries directly in the field during the restoration operations, confirming the information we have had in our archive records since the 14th century. Mapei technicians, who assisted us with this project, are well aware of all this, and I would like once again to thank them and also Veronica and Marco Squinzi, CEO of the Mapei Group, for their crucial support.

For over 600 years, the Veneranda Fabbrica del Duomo has been working for the conservation, restoration and enhancement of Milan Cathedral. What are the next projects?
The Milanese say "Lungh' me la Fabrica del Domm" (as long as it took to build the athedral) to refer to something never ending. And that is exactly what we are trying to achieve here. Focused on keeping building work going and making the Cathedral an organism that will never die (vindicated, for example, by such tragedies as the devastation that Notre-Dame Cathedral suffered in Paris), the Fabbrica is carrying out various projects for precise purposes and on tight schedules that we have managed to keep to even during lockdown. For example, the restoration of the Cathedral Organ continues on its over 15,800 pipes: the largest instrument in Italy and one of the first organs in the world. We expect work to be completed in the coming months. And, most importantly, major work on the Main Spire that supports the Madonnina (the golden Statue of the Virgin Mary standing on top of the Cathedral), including the completion of restoration work on the lantern. Even the famous danseur Roberto Bolle wanted to help us with this project by organizing a show held at Sforza Castle in conjunction with Intesa Sanpaolo bank. Let me also thank the institutions that are supporting us throughout this colossal enterprise, first and foremost the Italian Ministry of Sustainable Infrastructures and Mobility and the Lombardy Region, whose support we need more than ever during such difficult times as these, so we can continue our work and preserve the timeless beauty of the Cathedral for posterity.

Since its origins, the Cathedral has been generously supported by the people of Milan. This spirit lives on in the Veneranda Fabbrica del Duomo

The Cathedral is the symbol of Milan: how does the private sector contribute to the preservation and enhancement of this heritage?
Since its origins, the Cathedral has always been spontaneously supported by the people of Milan. It was not a few important families that built the Cathedral, but the generosity of many: women and men from all ages and also those corporations that were the forerunners of today's businesses.
This distinctly Lombard spirit still lives on in the Veneranda Fabbrica, thanks to all those supporters who help with our fundraising initiatives such as "Get Your Spire" that Mapei has also been involved in, and also the generosity of the unforgettable Giorgio Squinzi, Mapei Group's former CEO, or the "Adopt a Statue" project, proof of how the private sector continues to be of great importance for the present and future of the Cathedral.

An enterprise that began over 630 years ago

The Veneranda Fabbrica del Duomo di Milano is the famous organization in charge of conserving and enhancing Milan Cathedral. It was originally set up by Duke Gian Galeazzo Visconti in 1387, who at the time ruled over the city of Milan, for the specific purpose of designing and construct the monument. For over 600 years the Veneranda Fabbrica has been working with a great sense of civic duty and responsibility on conserving, restoring and repairing Milan Cathedral. Veronica Squinzi, CEO of the Mapei Group, is a member of the Advisory Board responsible for promoting the Milan Cathedral right across the globe: a network of "ambassadors" for Milan's most distinctive landmark promoting numerous projects concerning the Cathedral.

by **Antonella Ranaldi**

This is how they have preserved originality and antiquity

KNOWING SOME OF THE MOST PRECIOUS PARTS OF THE CATHEDRAL NEEDED TO BE RESTORED CALLED FOR HIGHLY SPECIALISED WORK

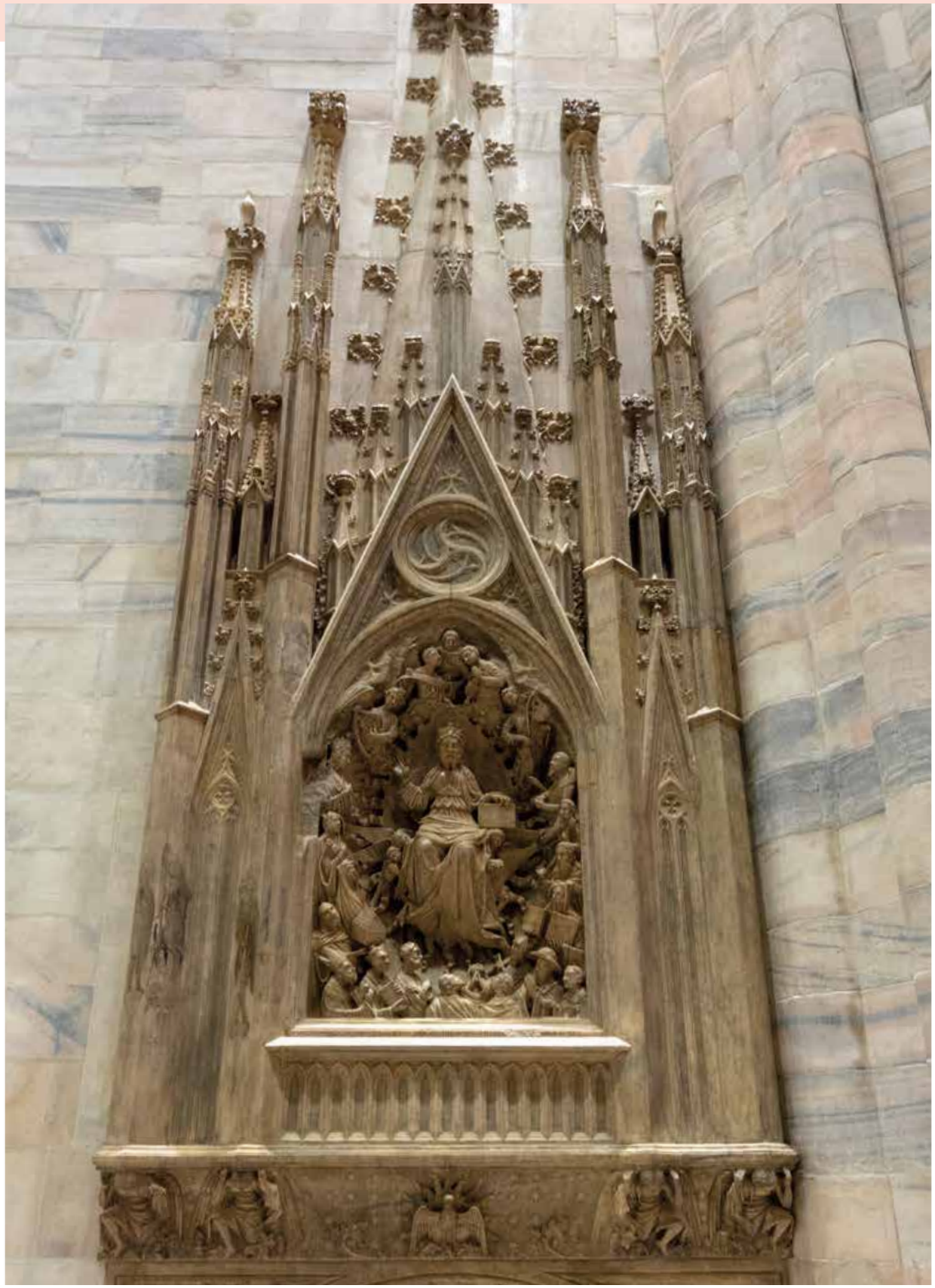
The restoration of the north Sacristy, known as the Aquilonare Sacristy, was particularly complex and challenging. Work was carried out in parallel on the sculptures on the portal and on the floors, finishes, masonry, and frescoes.

The Veneranda Fabbrica Del Duomo is an ongoing site that focuses on restoration and maintenance. In the case of the Aquilonare Sacristy, knowing that restoration work was required on some of the most ancient and precious parts of the Cathedral, highly specialised work was called for in order to preserve their originality and antiquity, such as the highly precious floor where craftsmen from the Veneranda Fabbrica Del Duomo worked in complete synergy and harmony with the Local Heritage Authority, both when making the initial decisions and when carrying out the actual work.

The Sacristy, situated to the north near the open apse with its large glass windows, was erected right at the start of construction of the new Cathedral. It rises up in two spans with tall, cross-vaulted ceilings. At the entrance, the magnificent portal by Giacomo Da Campione and Giovannino De' Grassi was built just a few years after opening the site of the new Cathedral, a particular wish of Gian Galeazzo Visconti, first Duke of Milan.

Completed by the end of the 14th century, and reaching an impressive height over several levels, the portal with its crown of soaring spires was a precursor to the development of the future building. At the same time, on the opposite side, the southern Sacristy was built. While construction work progressed from the east-facing apse, the two areas had to be completed and put into use quickly.

Working on the portal also provided the opportunity to examine the remains of the lost décor more closely, which brought colour and light to the features and architecture, embellished by a rich polychromy of gold leaf, blue lapis lazuli, cinnabar and even green earth and white lead, confirmed by documents conserved in the Archives of the Veneranda Fabbrica Del Duomo and by analysing the various layers of the traces of décor still visible on the stone. The main intervention was the cleaning of the portal and the removal of deposits that, over the years, had discoloured the portal. Then, with a light veil of watercolour wash, the restorers worked to exalt the plasticity of the stone reliefs against their background and make them easier to see.



The high-quality restoration work on the portal is testimony to the drive behind the early years of the site and of Gian Galeazzo Visconti's desire to leave his mark

The portal is the best testimony to the drive behind the early years of the construction of the Cathedral and of the Visconti family's desire to leave its mark. As far as the pink Candoglia marble floor was concerned, it was during the restoration work that they realised it was made from large blocks the size of several tiles. It was, again, the original, made by stonemasons at the beginning of the 14th century and an illustration of the craftsmanship that had gone into it. The floor is made up of thick slabs with a sculpted Star of David formed by two intersecting triangles, with inlays in softer, more workable black stone. Thanks to the skill of the restorers, in the areas where the wear in the floor was more evident, they were able to re-work some of the thicker slabs of Candoglia marble and re-position the inlays that had been lost over the years.

Work was completed with the restoration of the frescoes by Camillo Procaccini. The new decorations replaced the previous ones damaged by the fire that broke out on Christmas day in 1610. The restorers managed to reach the top level of the scaffolding where they found that the ribs of one of the two vaulted ceilings with frescoes had been ripped off and transferred onto canvas. Skilled restorers worked in parallel for almost two years under the guidance of the Works Director from the Veneranda Fabbrica and the Local Heritage Authority. This wonderful outcome is the result of the discussions, the detailed study of the involved issues and of the discoveries made while carrying out the restoration work that enriched everyone's knowledge of the Sacristy.

Superintendent of Archaeology, Fine Arts and Landscape for the City of Milan.

This article was taken from the book "Colour and stone. The Aquilonare Sacristy", edited by the Veneranda Fabbrica Del Duomo, whom we thank for their kindness.

Milan (Italy)

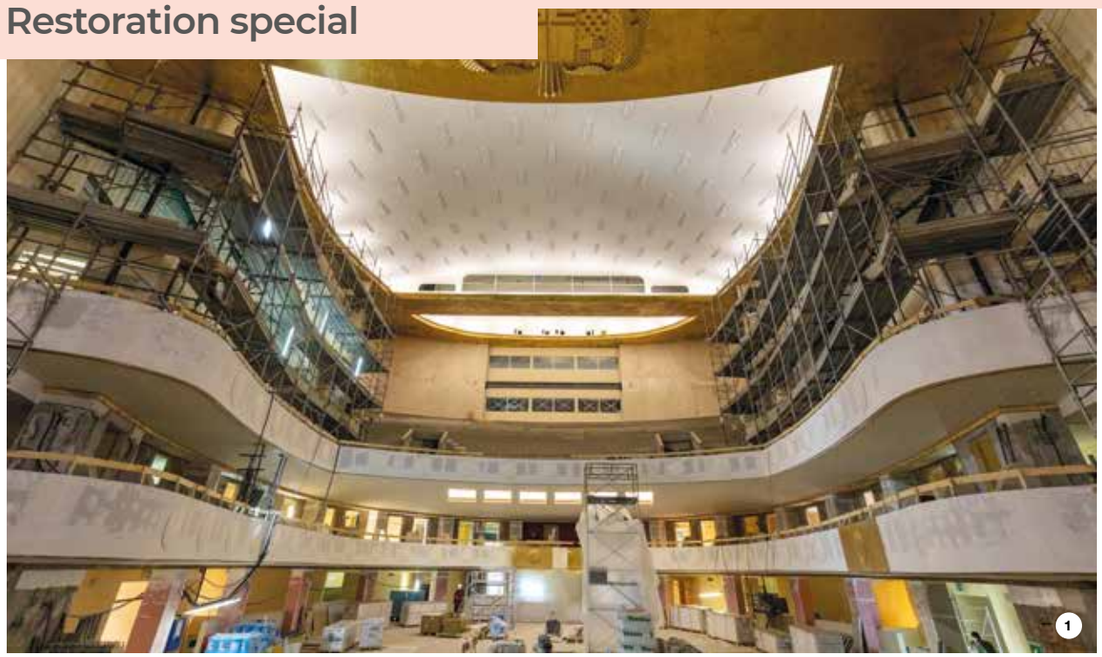
Giorgio Gaber Theatre

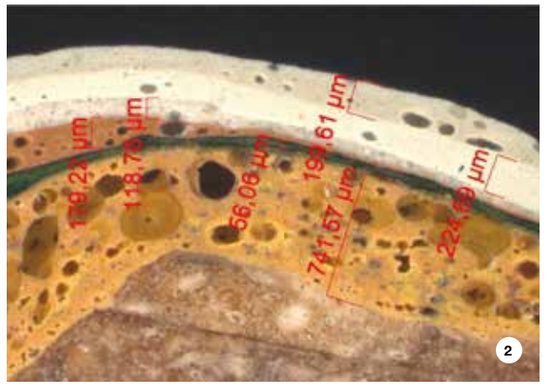
GRAND REOPENING 22 YEARS AFTER ITS CLOSURE. MAPEI'S CONTRIBUTION TO THE RESTORATION WORKS IN THE INTERIORS AND EXTERIORS

Inaugurated in 1796 and originally named Teatro Della Cannobiana, the building hosting this theatre was designed by Giuseppe Piermarini in 1776. The original structure (with four rows of boxes, a gallery and two upper circles) was later modified following restoration work in 1893 and 1932, and especially after the fire that partially destroyed the theatre in 1938. When it was rebuilt by the architects Cassi and Ramelli following the fire, the boxes were eliminated.
The theatre, which is now called the Teatro Lirico Giorgio Gaber, reopened its doors to the public last December after being closed for 22 years. Following the rebuilding work to bring the theatre back to its previous condition after the bombardments in 1943, apart from the second overhanging central gallery, the current theatre is much the same as it was back in 1940.

Renovation of the interior and exterior

The conservative restoration project, funded entirely by Milan City Council, included renovation work on both the interior and exterior of the structure. Inside the building, theatregoers can now find new gilding on the large, shell-shaped vaulted ceilings and other decorative features, herring-bone oak parquet flooring in the stalls, and red, black and white marble in the foyer. The walls are covered with pink granite and marmorino plaster while the ceilings are adorned with decorative features in gypsum which were recently restored.
Outside the theatre, works included restoring and reintegrating the render in the same colour as the original. This included the application of both mineral-based coatings on the neoclassic façade in front of Via Larga and coloured paste plasters on the remaining prospects. Restoration also involved a thorough cleaning and the water repellent treatment of the parts in pink granite and ornamental stone. The conservative restoration works also included the large porch, the fly tower and the dressing rooms/service unit and rehearsals rooms.
The biggest chunk of work, however, is hidden from view from visitors and included structural strengthening work on several sections of the building, the removal of asbestos, anti-seismic upgrading of the structure and an upgrade of the services equipment and acoustics.





1. The interior of the theatre during the restoration. The gold leafing on the vaulted ceiling was also restored.
2. A view of the layers of paint that were found on the golden finish of the vaults.
3. The walls in all the corridors, stair wells and stalls were finished off with SILEXCOLOR MARMORINO.
4. Before applying the render and skim coat, the masonry was consolidated by applying a coat of PRIMER 3296.

Working together with the local Heritage Authority, designers and contractors

As Technical Sponsor from the start of the project in 2016, Mapei participated in the conservative restoration work and in the upgrading of the structure by supplying products and providing on-site support. The solutions supplied for the project were defined after carrying out in-depth chemical and physical analyses, testing and sampling procedures approved by Milan City Council and the designers. The analyses were all carried out in the Mapei Research and Development laboratories and accurately pinpointed the root cause of the problems that caused deterioration phenomena, the composition of the mortars and finishes originally used, or different restoration works carried out previously that had overlapped one another. In the case of the conch vaulted ceiling, for example, the analysis carried out proved to be indispensable in showing the Works Director that, underneath a good five layers of white paint, there was a finish similar to gold leaf. This meant that the original décor could be conserved and today may be viewed in its entirety. Testing and sampling were carried out on each and every system and technology employed to verify what had been proposed and to receive the approval of the Works Director from Milan City Council and all the designers involved.

Numerous Mapei products and systems were used in the various stages of the work, such as :

- CONSOLIDANTE ETS WR was used to consolidate the surface of weak, crumbling substrates, the ideal product for the conservative restoration and consolidation of porous stone, brick, terracotta and renders. Beside consolidating substrates, it also has high water repellent properties, which make it ideal on surfaces that might come in contact with rainwater. PRIMER 3296 was also used on most masonry substrates before applying renders and skim coats. This is an acrylic polymer-based water dispersion primer, with high penetration characteristics, even on surfaces with low porosity.
- SILANCOLOR CLEANER PLUS mould- and algae resistant solution was used to provide a hygienising treatment for the damaged render on the brick, stone and tuff masonry.
- To strengthen the extrados of the floor slabs with steel joists, the connection of the joists to the walls was improved by anchoring the ends in the walls around the floors with MAPEFIX VE SF and applying a coat of EPORIP resin and PRIMER 3296 along each steel joist.
- An FRP strengthening system was proposed to strengthen the reinforced concrete beams. After protecting the reinforcing rods with MAPEFER 1K and integrating their surface with PLANITOP SMOOTH & REPAIR R, the concrete beams were strengthened by applying a coat of MAPEWRAP PRIMER 1 on the surface of the intrados of the beams followed by a layer of MAPEWRAP 11. The next step was to apply CARBOPLATE plates on the intrados of the beams. To increase the shear strength of the beams, and at the same time minimise the potential "debonding" effect in the longitudinal carbon-fibre strengthening, MAPEWRAP C UNI-AX unidirectional, high-strength carbon fibre fabric was applied around the supports.
- The extrados of the masonry vaulted ceilings was strengthened by applying MAPE-ANTIQUE STRUTTURALE NHL natural hydraulic lime- and Eco-Pozzolan-based mortar, which is physically and mechanically compatible with the substrates, and MAPEGRID G 220 glass fibre mesh along the extrados of the areas to be strengthened.
- Restoration of damaged and deteriorated render was carried out by firstly applying MAPEWALL INTONACO BASE natural hydraulic lime-based base render. Then, after skimming the surfaces with PLANITOP 510 fine-graded, lime-cement based skimming compound, the surfaces were painted with SILEXCOLOR BASE COAT and SILEXCOLOR PAINT in the colour shade chosen by the Works Direction.
- Restoration of damaged and deteriorated render was carried out by applying MAPE-ANTIQUE INTONACO NHL cement-free, natural hydraulic lime-based breathable base render. MAPE-ANTIQUE FC CIVILE salt-resistant, fine-grained lime and Eco-Pozzolan based transpirant skimming mortar was then used to skim the surface, followed by SILEXCOLOR BASE COAT and SILEXCOLOR PAINT to paint the surfaces in the colour shade chosen by the Works Direction.
- The concrete was repaired using various products: MAPEGROUT 430 thixotropic mortar; MAPEGROUT HI-FLOW mortar and MAPEGROUT T40 thixotropic mortar, all mixed with MAPECURE SRA.
- The joints in the new marble floors in the corridors and foyer were grouted with ULTRACOLOR PLUS grout chosen in different shades in order to match the colour of the existing joints.
- The integration and restoration of the finishes on the steps of the staircases was carried out by applying ULTRATOP LOFT SYSTEM: firstly, the substrate was mechanically prepared, with the consequent removal of the dust, and primed with PRIMER SN, which was fully blinded, while still fresh, with QUARTZ 0.5 quartz sand. After the hardening of the primer and the elimination of the excess quartz, ULTRATOP LOFT W, one-component, fine-textured cementitious paste, was applied with a flat metal trowel, to create (up to 2 mm thick) decorative floor and wall coatings with a trowelled or mottled finish. After its hardening, the surface was sanded and dust was removed before applying PRIMER LT, one-component, acrylic adhesion promoter, diluted with water at a ratio of 1:1 by weight. After the complete hardening of PRIMER LT, the second coat of ULTRATOP LOFT W was applied with a flat metal trowel. The surfaces were then sanded and vacuumed before applying ULTRATOP BASE COAT, one-component acrylic formulation in water dispersion. The final finish was created by applying a coat

5. PLANITOP 510 fine-textured, lime-cement skimming mortar was applied on the external surfaces before painting them.
When the render was made of lime, the product chosen was MAPE-ANTIQUE NHL ECO RASANTE CIVILE fine-grained, breathable, smoothing and levelling mortar.

of transparent MAPEFLOOR FINISH 58 W, two-component, aliphatic, matt polyurethane finish in water dispersion with a mohair type roller.

- The external render was restored by applying MAPE-ANTIQUE STRUTTURALE NHL natural hydraulic lime-based mortar with high ductility and MAPEGRID G 220 glass fibre structural mesh around the extrados of the span of the vault requiring strengthening. The render was then finished off by applying two coats of MAPE-ANTIQUE FC GROSSO cement-free, large-grained, lime-based skimming mortar, followed by a coat of SILEXCOLOR BASE COAT and then two applications of SILEXCOLOR TONACHINO textured silicate coating paste with high breathability, for internal and external surfaces, in the same colour as the original.
- Conservative restoration of the neoclassic façade in Via Larga was carried out by removing the deteriorated render, reintegrating it with MAPE-ANTIQUE INTONACO NHL, applying a coat of SILEXCOLOR BASE COAT to even out the substrate and then applying SILEXCOLOR PAINT silicate-based paint in the same colour as the original.
- Conservative restoration of the finishes in the main vault and in the foyer by applying MALECH base coat and COLORITE PERFORMANCE protective acrylic paint, with high resistance to UV rays, in the same colour as the original finishes.
- The conservative restoration of the finishes on the walls in the corridors, in the stair wells and the auditorium with a "plaster-effect" finish included the removal of the plastic coating, the application of PRIMER 3296 to even out the absorption of the substrate, PLANITOP 560 lime-cement mortar to smooth over the surfaces, SILEXCOLOR PRIMER to even out the substrate, and SILEXCOLOR MARMORINO silicate-based plaster in the same colour as the original.

TECHNICAL DATA
Giorgio Gaber Theatre, Milan (Italy)
Original design: Giuseppe Piermarini
Period of construction: 1776-1796
Period of the restoration intervention: 2015-2021
Intervention by Mapei: supplying technical support on site and products for structural strengthening, restoring and rebuilding renders, restoring existing coatings and applying new coatings
Owner: Milan City Council, Councilor for Public Works and House – Technical Area for Culture
Project manager: Massimiliano Papetti, Milan City Council
Executive design and works direction: Pasquale Francesco Mariani Orlandi, Milan City Council
Superintendency of Archeology, Fine Arts and Environment: Antonella Ranaldi, Paolo Savio
Main contractor: Impresa Garibaldi - Fragasso
"Cantiere evento" coordinator: Francesco Maggiore, Fondazione Dioguardi
Mapei coordinator: Davide Bandera, Alberto Arosio, Mapei SpA (Italy)

MAPEI PRODUCTS
Consolidating substrates Consolidante ETS WR, Eporip, Primer 3296
Grouting joints in marble floors: Ultracolor Plus
Applying cementitious coatings on steps: Primer SN, Primer LT, Quartz 0.5, Ultratop Loft W, Ultratop Loft F, Ultratop Base Coat, Mapefloor Finish 58W, Primer SN
Structural strengthening: Planitop HPC Floor, Mapefix VE SF, Mapefer 1K, Planitop Smooth & Repair R, MapeWrap Primer 1, MapeWrap 11, Carboplate, MapeWrap C UNI-AX System, MapeGrid G 220, Mape-Antique Strutturale NHL, Mape-Antique FC Grosso
Wall coatings: Silexcolor Base Coat, Silexcolor Paint, Malech, Colorite Performance, Planitop 560, Silexcolor Primer, Silexcolor Marmorino
Refurbishing renders: Mapewall Intonaco Base, Planitop 510, Mape-Antique Intonaco NHL, Mape-Antique FC Civile, Silancolor Cleaner Plus
Concrete repair: Mapegrout 430, Mapecure SRA, Mapegrout Hi-Flow, Mapegrout T40

For further info on products visit mapei.com

Three-dimensional models to rebuild the past

WE SPOKE WITH THE ARCHITECT PASQUALE FRANCESCO MARIANI ORLANDI, HEAD OF MILAN CITY COUNCIL DESIGN UNIT

What project guidelines were the drivers behind this conservative restoration project?
In-depth research carried out by the local Heritage Authority confirmed a rather complex background to the stratigraphic layout of the theatre, starting from February 1776 with the fire in the Regio Ducale Theatre and the urgency to build two new theatres in Milan: the La Scala and the Cannobiana, both designed by architect Giuseppe Piermarini. Time and the economic and political crisis the country was experiencing transformed the theatre into a cinema and assembly hall, but it was the fire in 1938, and the successive rebuild, that most radically transformed the appearance of the theatre. Research into its stratigraphic layout confirmed the historic and architectonic significance of the structure and the need to carry out conservative restoration work, but above all that it should return to its original use as a theatre.

The project identified four types of activity: entertaining, commercial, polyfunctional and other kind of activities

In which of these cases was it decided to go back to its original forms and structural features?
It was decided to restore the interior to its original architectonic form with three groups of stalls, an orchestra pit and a fly tower which had been modified over the years by adding raised areas, partitions, balconies and galleries. It was also decided to restore the external facades.

What were the most significant new features of this intervention?
From an interior aesthetic and architectonic point of view, the new features included the restoration of the imitation gold leafing, the vaulted ceilings in the gallery and the cornices running along the sides covered with five layers of paint, the gypsum sculptures in the foyer on the first floor, the "ears" on the vaulted ceiling of the stalls and gallery and the restoration of the original colours. Conservative restoration work was also carried out on the render and on the stone surfaces of the historic façade. "Milan yellow", the historic colour used to identify the most important buildings in Milan, was re-proposed.

The structure was quite badly deteriorated. What steps had to be taken before proceeding with the actual work on site?
A detailed survey on most of the architectonic and construction features was initiated to determine the chemical and physical composition of samples taken from them and to draft a complete report on the nature of the materials originally used, in order to decide on the most suitable products and methods to restore the substrates.

What are the biggest problems you came across?
The presence of asbestos was, without a doubt, the problem that slowed down work and it cost a lot in terms of time and money for its removal and disposal just as the site was getting under way. A survey needs to be carried out on complex, historic buildings undergoing restoration to understand their real current state: this theatre had more than 13,000 m² of decorative stucco reliefs. Laser-scanning technology was used to measure their sizes and profiles accurately and to make three-dimensional models. This enabled us to provide proposals for the internal finishes and to create a databank of the history of the materials.

In restoration work, safeguarding the past and innovative techniques can guarantee interesting results. How important were the new materials?
New materials and work techniques contribute to maintaining the structural and aesthetic integrity of historic monuments. Strengthening structures by adopting non-invasive consolidation methods was, without a doubt, the most important result, which was achieved by using carbon fibre composites on the reinforced concrete trusses of the fly tower and for the internal masonry of the historic façades of the porch in Via Larga. Materials with fire-resistance properties were also used so that the existing historic features remained unaltered.

You have been quoted as saying that the theatre "Wasn't created to be used just during a show, but also before a show, at any time". Is the new panoramic restaurant a way of opening it even more?
The introduction of commercial activities was one of the objectives of the project, but there have always been kiosks in theatres: theatre mask sellers, wine bars and cake stalls. In this specific case, we managed to recover a space on the second floor and turn it into a restaurant. The spaces in the theatre are also polyfunctional: the stalls on the ground floor can be turned into an events hall, while the open spaces around the dressing rooms can be used as rehearsal areas for singers and musicians.

by **Francesco Maggiore**

The building site as a theatre, renovation as a spectacle

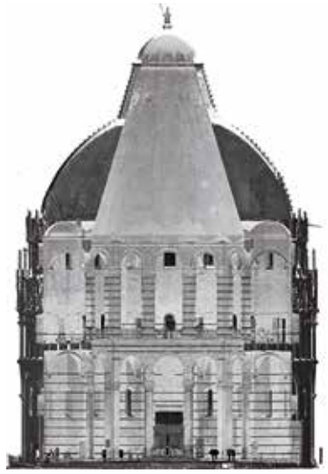
A PROJECT THAT TURNS NEIGHBOURHOODS INTO PLACES FOR SOCIALISING AND CULTURE

It was 1993 when a company called Dioguardi France was commissioned to build a seven-storey underground car park in the square outside Théâtre des Célestins in the heart of Lyons (France): an extremely imposing building project that took over the entire square for the entire duration of the works from June 1993 to June 1994. To cater for the disruption to everyday life the works would inevitably cause, Gianfranco Dioguardi, CEO of Gruppo Dioguardi Costruzioni, thought out and experimented with the first “Chantier-événement (Construction Site-Event)” aimed at turning this ‘wound’ on the cityscape into a unique opportunity to learn, interact, enhance and promote the civic setting involved in the building works. The idea was to get local people, schools and shopkeepers actively involved in the project by promoting the building works as a temporary part of the architectural-cultural landscape.

Fashion shows, concerts and exhibitions in the area involved in the works on the Giorgio Gaber Theatre

More recently, the Dioguardi Foundation has carried out new experiments with "Construction Site-Events" in Italy: particularly significant is the one that took place between 2017 and 2021 during the renovation of Giorgio Gaber Theatre in Milan, where an extensive schedule of cultural events was created with the involvement of big players on the local scene: the building contractor itself under the supervision of the architect Beppe Fragasso, Milan City Council and Mapei acting as the technical-scientific consultant.
The theatre’s role as an "event site" began in September 2017 with a dreamlike fashion show by the fashion designer Antonio Marras, which saw the building site transformed into a Fellini-style set animated not only by models but also trapeze artists, band players, dancers and performers. Since then, over almost four years of activities, the site has seen used by over three thousand people and numerous activities have made it a highly engaging site: educational visits with schools and universities, photography workshops, artistic performances, film screenings, exhibitions, concerts, fashion shows, workshops, presentations and conferences have provided the opportunity to track how the construction site has progressed, while offering a key location for promoting art and culture.
Works created on-site included two maxi-installations: "Com’è bella la città" (How beautiful the city is), a canvas of over 600 m^2 made by Antonio Marras out of fabrics and textiles for the front of the theatre located along Via Larga, and "Tredici icone per Milano" (Thirteen Icons for Milan), a hand-drawn work by Vincenzo D'Alba, a designer from Kiasmo, for the shell enveloping the scaffolding on the building front along Via Paolo da Cannobio.
The "Construction Site-Event" process led to an important line of communication being opened up with the locals and retailers by projecting an image of it being a "building site that communicates". The construction site event has been transformed into information for the community by constantly visualising all the operations in progress. The renovation site for the theatre has, thereby, has been democratically engaged in, shared and visited thanks to communication operations aimed at involving the widest possible audience: from young people to the elderly, from artists to shopkeepers, from schools to theatres, from families to associations.
In addition to the role played by the City Council of Milan, the contribution made by both Garibaldi-Fragasso and Mapei was also decisive: two enterprises that got the chance to supply totally innovative services that showcased them as authentic "companies serving city" - as Dioguardi described them - capable of "listening" to real and potential local needs and spreading a new form of urban culture.
"Construction Site-Event” is a project within a project that demonstrates that it is possible to turn otherwise inaccessible building sites into places for socialising and culture (even during the executive phase of building work) both during the day and night, as has been the case throughout the history of architecture, particularly during the Renaissance, when "workshops" were carefully incorporated in urban development so that arts, crafts and knowledge could be passed on to others.

President of Dioguardi Foundation



LEFT. .A section of the Baptistery showing the truncated pyramid cupola and external semi-spherical canopy over the cupola.
IN THE FACING PAGE. Piazza Del Duomo (also called "dei Miracoli) has been a UNESCO World Heritage site since 1987.

Pisa (Italy)

Baptistery of St. John

RENDER INSIDE THE CUPOLA RESTORED TO ITS ANTIQUE SPLENDOUR.
AN EFFECTIVE RESTORATION INTERVENTION THAT RESPECTS AESTHETICS

With a circumference of 107 m and a height of 55 m, the monument rising in front of the western façade of Santa Maria Assunta Cathedral in Piazza dei Miracoli is the biggest Baptistery in the whole of Christendom. Construction of the building started in the 12th century but the work was only finally completed after more than two centuries. As testified by an inscription on two pillars inside the building dated 1153, construction work was initiated by the architect Deotisalvi:
MCLIII, MENSE AUGUSTI FUNDATA FUIT HAEC ECCLESIA; DEUSTESALVET MAGISTER HUIUS OPERIS (In August 1153 this Church was founded, Diotisalvi was the designer of this work).
Work on the Baptistery started again, after an interruption of one century, thanks to Nicola and Giovanni Pisano. The façade in Pisan Romanesque style is richly adorned with sculptures, many of which were transferred to the nearby Museo Dell'Opera Del Duomo. Inside the Baptistery, a women's gallery overlooks the central space, providing an enchanting prospective to observe the baptismal font in which Galileo Galilei was baptised in 1564. The roofing system of the monument is characterised by a double cupola: an internal one in the form of a truncated pyramid with a dodecagonal base and an external one in the form of a semi-spherical canopy. This architectural workaround gives the Baptistery excellent acoustics, but

Problems and solutions

The objective of the owner was to restore the deteriorated and damaged render inside the cupola of the Baptistery and bring it back to its original splendour. Restoration of the inside of the cupola required particular care for both the consolidation of the existing render, for which it was decided to leave in place, and for the new render. This required the use of products guaranteeing excellent compatibility and an excellent bond with the original substrates, while at the same time ensuring a colour and texture with a beautifully balanced final finish in line with the original look of the cupola. MAPE-ANTIQUE STRUTTURALE NHL and the other products from the MAPE-ANTIQUE Line, enabled this excellent result to be achieved.

LEFT. The gaps and voids from the putlog holes were repaired by filling and plugging them with the original bricks and MAPE-ANTIQUE ALLETTAMENTO.
RIGHT.
Rebuilding the render on the intrados of the dome.

leaves the upper cupola more exposed and provides less protection from meteorological and climatic conditions, which led to its deterioration clearly visible from inside the building prior to the restoration work. The render on the intrados of the cupola showed clear signs of physical damage caused by external and anthropic factors: areas of missing render, portions of detached render, surface stains, cracks and the reappearance of putlog holes.

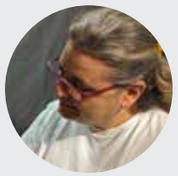
Winning teamwork

The restoration work, which got under way in the spring of 2021, was an excellent example of collaboration between the design team, technical support provided by Mapei to help choose the most suitable materials and technology, and perfect execution of the work by the restoration team. The complex design work coordinated by Roberto Cela, Technical Director of the Opera Della Primaziale Pisana organisation, had the assistance of Mapei Technical Services to help plan remedial work in line with the principles of restoration work and in full respect of the aesthetics of the monument.
Impresa Cellini, a contracting company involved in restoration work on historic monuments and buildings since the end of the 19th century (with which Mapei also collaborated in restoration work on the Baptistery of St. John in Florence), was also part of this synergy. It was very important to use materials which were chemically-physically and elasto-mechanically compatible with the original substrates, and products from the MAPE-ANTIQUE line played a key role as they are all completely cement-free and made from lime and Eco-Pozzolan, and developed specifically for consolidation, repair and restoration work on masonry of buildings of historic and artistic interest.

Restoration work on the render

All the render in poor condition and any loose material were carefully removed. The masonry was then cleaned until a sound, compact substrate was obtained. The gaps and voids from the putlog holes were repaired by applying MAPE-ANTIQUE ALLETTAMENTO cement-free, salt-resistant mortar made from natural hydraulic lime and Eco-Pozzolan. For the new render, a layer of MAPE-ANTIQUE STRUTTURALE NHL was applied by trowel. This is a cement-free, fibre-reinforced mortar, made from natural hydraulic lime and Eco-Pozzolan, which is used to make breathable render compatible with the mechanical performances of the existing masonry. Once the mortar had cured, it was skimmed with a coat of MAPE-ANTIQUE NHL ECO RASANTE GROSSO, a coarse-grained, breathable mortar made from pure natural hydraulic lime with the same texture as the original render to create a balanced finish.

COMPATIBILITY OF MATERIALS: RESPECT FOR THE PAST AND NEW TECHNOLOGIES

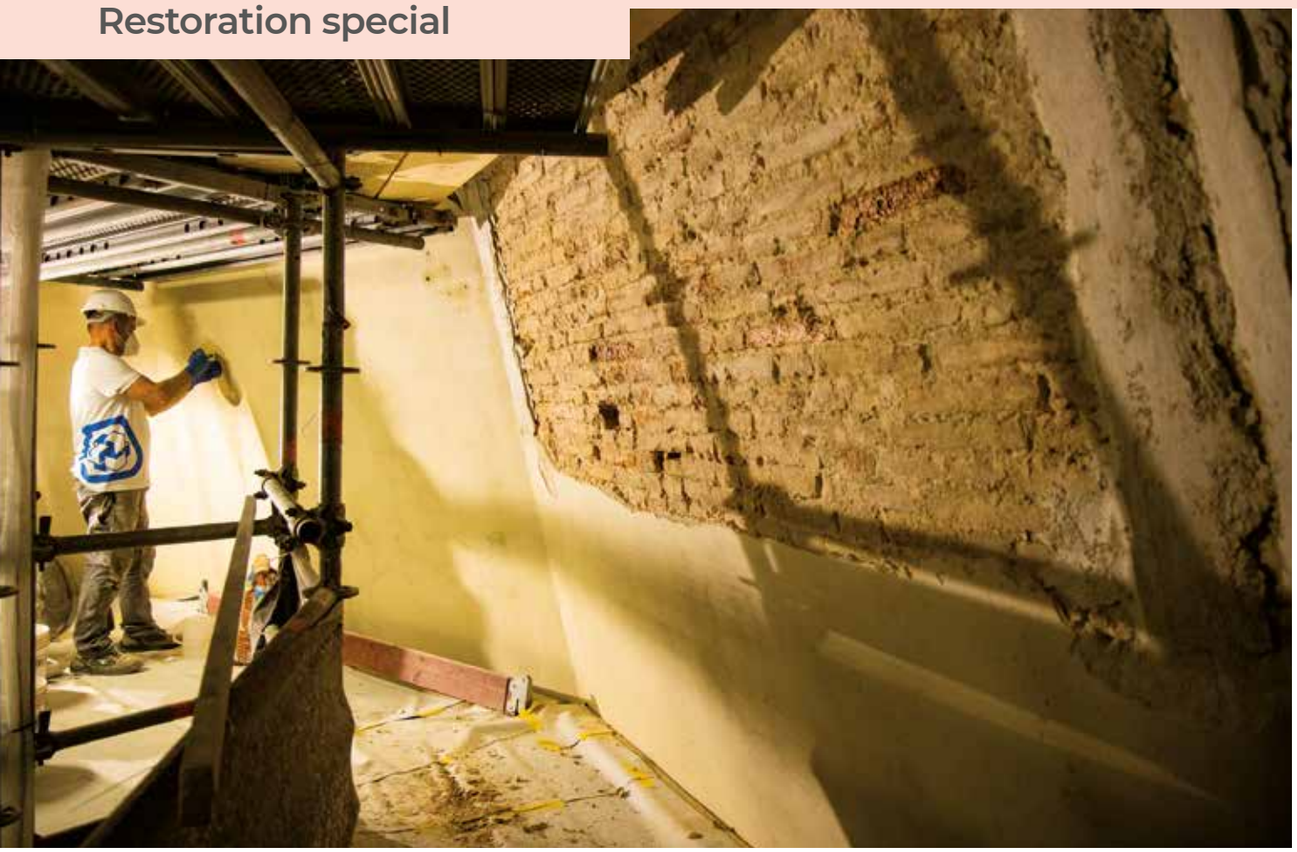


WE SPOKE WITH ILARIA CELLINI FROM IMPRESA CELLINI SRL, THE COMPANY THAT CARRIED OUT THE RESTORATION

Your company has been working in the restoration field for years and you even have a branch of the family tree that leads to Benvenuto Cellini. Is it important to be familiar with construction techniques used in the past to have the correct approach to restoration work?
Yes, it is very important. I would go as far as to say that it is indispensable to be familiar with the construction techniques and materials they used in the past. Just as important, however, is to carry out an in-depth analysis of the structure you intend working on to identify any restoration work carried out previously and what materials and techniques were used. This allows you to intervene with the maximum respect for the "structure", which is particularly important nowadays where schedules for restoration work are more and more compressed and there are so many materials available on the market, many of which appear to be the same but actually differ enormously in terms of what they are made from and their performance. The right product needs to be chosen very carefully, first and foremost according to the type of problems you encounter. Also, it is important that the products are chosen in such a way that they are compatible, in chemical-physical and elasto-mechanical terms, with the materials originally used. Choosing a product that is not compatible with the materials and construction techniques used in the past can result in an intervention being unsuccessful or its sudden deterioration. Even though the materials we use nowadays are modern, they are the result of continuous research work that "uses" the past as a starting point, but which represents a point of strength in the present. Another aspect is the application method adopted: this is where the experience and, above all, the expertise of the restorer comes into play, a prerequisite for successful conservative renovation and restoration work.

What were the most challenging technical problems you encountered during the restoration work on the Baptistery of St. John and how did you tackle them?
I wouldn't call them difficulties as such, but rather the optimisation of all the phases of site work to comply, on the one hand, with the requirements of the client and, on the other hand, to respect the schedule required by the material chosen. The client required all the preparation work of the materials to be carried out outside to prevent dust building up inside the structure. This meant that every phase of the intervention had to be carefully planned so that the materials, once they had been prepared, were applied within the timeframe specified by the manufacturer, bearing in mind also that the work was carried out in the hottest time of the year, which accelerates the setting time for any product. To achieve this, we set up a kind of "assembly line" which involved various personnel: once the products had been mixed outside, they were taken into the structure and delivered to the various teams working on the scaffolding so that they arrived at the level required for their application.
Similarly, when removing and transporting the damaged and deteriorated render and mortar down to ground level, this was carried out before the operations mentioned previously to create as little dust as possible.

Nowadays, paying particular attention to innovative materials is a fundamental requisite. Mapei always starts from the traditions and knowledge of the past when developing products. How much does it help to be able to rely on innovative products such as those proposed by Mapei?
Nowadays it is very important to use products with the same characteristics as the original materials used to build historic structures and which, at the same time, help accelerate the actual execution time of works.
For work such as that of the Baptistery in Pisa, if we had used traditional materials such as slaked lime and sand, we would have had to wait more than three months for the mortar to cure correctly, which would have been incompatible with the schedule for that site.
With the mortars supplied by Mapei we were able to optimise the curing time for the rendering and masonry mortars and, as a result, reduce the overall execution time of the work to meet the requirements of a client that is always very cost-conscious, and also optimise hire charges for scaffolding which nowadays has quite a significant impact on overall work costs for conservative renovation and restoration work.



ABOVE. Portions of render detached from their substrates were consolidated and re-bonded by injecting MAPE-ANTIQUE F21.

Consolidation of the existing render

The render that had become detached from the masonry, for which it was decided to leave in place, was consolidated and re-bonded to the masonry by injecting super-fluid, lime-based slurry. The first step was to drill a series of holes. All traces of dust were removed from the substrate with a hand-pump and then syringes were used to inject a slurry made up with MAPE-ANTIQUE F21. This injection slurry was developed by Mapei for another project: the consolidation work on the frescoed vaulted ceilings by Giotto and Cimabue in the Upper Basilica of San Francesco in Assisi, which was damaged by an earthquake in 1997 (see *Realtà Mapei International* no. 5). On that occasion Mapei developed MAPE-ANTIQUE F21, a super-fluid, cement-free, salt-resistant fillerized hydraulic binder, made from hydrated lime and eco-Pozzolan, ideal for injection slurries for consolidating masonry and render, including the frescoed ones. MAPE-ANTIQUE F21 may be applied without having to wet the substrate beforehand: the water-retention additives contained in the binder prevents water contained in the product from staining the surface of high-quality finishes. Also, because there are no soluble salts or free lime in the slurry, the product cures perfectly with no efflorescence phenomena. Indeed, free lime inside masonry to be consolidated, not being able to find any air (CO_2) for carbonation, could remain as a paste for a very long time and temporarily compromise the effectiveness of the structural consolidation work.

Find out more
MAPE-ANTIQUE NHL ECO-RASANTE GROSSO

TECHNICAL DATA
Baptistery of St. John, Pisa (Italy)
Period of construction: 12th-13th century
Original designers: Deotisalvi, Nicola and Giovanni Pisano
Owner: Opera Della Primaziale Pisana
Year of the restoration intervention: 2021
Intervention by Mapei: supplying products for restoring and rebuilding render
Works direction: Roberto Cela (Technical Director, Opera della Primaziale Pisana)
Main contractor: Impresa Cellini
Mapei distributors: Lupetti Renato Srl
Mapei coordinators: Giacomo Maestrelli and Alessandro Giari, Mapei SpA (Italy)

MAPEI PRODUCTS
Mape-Antique Allettamento, Mape-Antique Strutturale NHL, Mape-Antique NHL Eco Rasante Grosso, Mape-Antique F21

For further info on products visit mapei.com

THE IMPORTANCE OF EXPERIENCE AND SOFTWARE SYSTEMS

ROBERTO CELA, TECHNICAL DIRECTOR OF OPERA DELLA PRIMAZIALE PISANA

Piazza Dei Miracoli in Pisa is one of the most important artistic and tourist attractions in the world. What kind of monitoring work does the Opera Della Primaziale Pisana organisation carry out in order to conserve the integrity and functionality of the monuments in the square?

Piazza Del Duomo and its monuments has been a UNESCO World Heritage site since 1987 and the task of the Opera Della Primaziale Pisana organisation is to conserve the entire square so that is can be enjoyed by future generations. The craftsmen working for the organisation are the first line of defence and a kind of "emergency service" if any conservation work needs to be carried out, in that they are specialised in various aspects of restoration work and are on site on a daily basis. Some of them have been trained to work at height suspended from cables so they can also check the features at the top of the monuments, otherwise they would not be able to reach them. Nothing gets past the eye of an experienced professional and their knowledge of buildings when assessing the state of conservation of our monuments. Software tools are also a fundamental help in reducing the level of risk. In fact, we are currently validating a software system that associates direct observation with specific algorithms that are able to define the level of risk and, as a result, the level of alarm in order to programme the successive inspection or prioritise targeted conservation work. And the aim of this activity is to safeguard the monuments, but also to ensure the safety of tourists and worshippers.

What critical areas have you identified within the cupola of the Baptistery?

The Baptistery is around 55 m high and has a diameter of 45 m. The roof is made up of a truncated pyramid-shaped cupola partially surmounted by a semi-spherical inner cupola. This "void" is extremely large if we consider that the one in Pisa is one of the largest Baptistery in the world. The intrados is covered with render that has not been decorated and, over the years, it has been showing signs of deterioration and detachment, caused mainly by water infiltrating through the roof. When it was decided to intervene on the render, the main problem was how to erect an enormous scaffolding structure suspended from the women's galleries that would allow us to reach the entire surface of the intrados of the cupola.

What technical aspects did you concentrate on and what factors were the most challenging?

First and foremost, chemical-physical and elasto-mechanical compatibility with the materials used for the masonry structure below and with the old mortar, which goes "arm-in-arm", as with most work carried out on historic monuments, with the need to work on a medium to long-term basis and, as a result, guarantee the durability of the work undertaken.

Choosing and applying materials should be viewed on a medium to long-term basis

The final aesthetic aspect of the restoration work is surprising. What part did Mapei Technical Services play in the work?

We had support from Mapei experts right from the design phase to identify the most suitable products and methods for specific work, and they also worked alongside us during all the various site activities to validate the choices we had made by carrying out analyses in the laboratory to verify the compatibility of the products with both the old mortar and the ancient substrates, suggesting coating products and their composition and texture, as well as providing support to the craftsmen so that everything was applied and installed to perfection.

RIGHT.
New abrasion-resistant cementitious floors were created in the Museum with ULTRATOP LOFT system.

Pisa (Italy)

Sinopie Museum

ELEGANT CEMENTITIOUS SURFACES FOR THE REDEVELOPMENT OF THE MUSEUM IN PIAZZA DEI MIRACOLI

The architectonic majesty and perfection of Piazza Del Duomo in Pisa is the most important example of the Pisan Romanesque style, a harmonious fusion of Classic, Early Christian, and Oriental motifs.
The buildings maintain a highly elegant stylistic unity and, together, the Cathedral, Tower, Baptistery and Cemetery represent the allegory of human life.
Apart from these four monuments, which the Italian poet Gabriele D'Annunzio defined as "miracles" (hence the more common, but incorrect, name of Piazza Dei Miracoli as it became known after the Second World War), there is also space for other buildings considered just as important in the piazza. One of these is the Sinopie Museum, situated in the ancient 13th century hospital to the south of the piazza. The subject of recent redevelopment work, since 1979 the Museum has been home of "sinopie", the large preparatory designs found under the frescoes that adorn the Cemetery: the first fresco was painted in 1360 and the last one around three centuries later.
On 27th July, 1944 a grenade launched by the US artillery hit the roof of the Cemetery and set it on fire, causing molten lead to drip over the frescoes adorning the walls. The only feasible remedy at the time in order to conserve the frescoes was to detach them from the walls using the "tear" technique. This operation led to the discovery of the "sinopie" for the frescoes on the walls of the Cemetery, drawings traced on the first layer of render by using a brush to spread on a red clay-like pigment (sinopite) mixed with water.

Keyword

SINOPIE
Sinopie are the large preparatory designs found under the frescoes that adorn the Cemetery of Pisa. They are drawings traced on the first layer of render by using a brush to spread on a red clay-like pigment (sinopite) mixed with water. They were discovered after tearing away the frescoes damaged during the Second World War.

Durability, functionality and aesthetic quality

In the spring of 2020, after removing the old carpet covering an area of around 1,300 m², work commenced to create new floorings using the cementitious-based system ULTRATOP LOFT. It was decided to choose this system for its ease of application, versatility, performance characteristics and because only relatively thin layers need to be applied. And, last but not least, these highly aesthetic interior design surfaces by Mapei are also able to withstand intense levels of foot traffic.
After the mechanical preparation of the surfaces and the treatment with PRIMER SN (immediately fully blinded with QUARTZ 0.5), the excess quartz sand was eliminated from the hardened surfaces by vacuuming them. The next step was to apply a coat of ULTRATOP LOFT F, a coarse-textured, trowellable cementitious paste: the ideal product for creating internal decorative floor and wall coverings with a marked materic effect finish. In between the first layer of ULTRATOP LOFT F and the next layer made up of ULTRATOP LOFT W, one-component, trowellable, fine-textured cementitious paste, the surfaces were sanded, cleaned and then treated with PRIMER LT, an acrylic adhesion promoter used to improve adhesion between different layers of ULTRATOP LOFT and of Mapei cementitious skimming compounds on all types of absorbent and non-absorbent surfaces.
Before applying the protective finish, the surfaces were treated with a coat of ULTRATOP BASE COAT, a one-component acrylic formulation in water dispersion used to even out absorption and to seal pores before applying the final transparent protective treatment.
The product used for this last phase of the work was MAPEFLOOR FINISH 58 W, a two-component, transparent, aliphatic, polyurethane finish in water dispersion with a matt-effect finish.
Apart from enhancing the aesthetic qualities of flooring, once hardened, MAPEFLOOR FINISH 58 W also improves the mechanical properties of surfaces, such as their resistance to wear and scratches.

Find out more
ULTRATOP LOFT SYSTEM

TECHNICAL DATA
Sinopie Museum, Pisa (Italy)
Year of construction: 1337
Period of the renovation: 2020
Intervention by Mapei: supplying products for laying cementitious floors
Owner: Opera della Primaziale Pisana
Design and works direction: Giuseppe Bentivoglio, Roberto Cela
Flooring contractor: Tekno Pav Srl
Mapei coordinators: Roberto Migliorini, Alessandro Giari and Francesco Falciani, Mapei SpA (Italy)

MAPEI PRODUCTS
Preparing substrates
Primer SN, Quartz 0.5, Primer LT
Laying cementitious floors:
Ultratop Loft F, Ultratop Loft W, Ultratop Base Coat, Mapefloor Finish 58 W

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Assorestauro: the excellence of Made in Italy

ASSORESTAURO: AMBASSADOR IN THE WORLD OF CULTURAL AND TECHNICAL KNOWLEDGE AND THE ART OF GOOD BUSINESS

To be ambassador for cultural and technical knowledge in Italy and around world and for the art of good business in Italy. This was the strategic objective set by Assorestauro at its founding almost 20 years ago, the Italian architectonic, artistic and urban restoration association headed by President Alessandro Bozzetti.

Today, hundreds of companies representing the entire restoration chain are registered with Assorestauro, from design to the restoration and maintenance of listed buildings and decorated surfaces, including topics such as analysis and diagnostics, the manufacture of materials and technologies and service companies promoting cultural sites and archaeological digs. The chain plays a vital role in innovating materials and technology used for the monitoring, knowledge and compatibility with traditional materials. Innovation that encounters the issue of the sustainability of materials and technologies more and more frequently. The development of eco-compatible products using nanotechnology for mortars, or for the application of enzyme-based products, is increasingly taking into consideration not only the impact of manufacturing and durability, but also the health and safety of those who work on sites where restoration work is carried out.

Diagnostic analysis carried out during restoration work.

The awareness of environmental impact is increasing throughout the chain. Proof of this is the fact that Italy was the first country in the world to issue a protocol for the sustainable building sector that targeted historic buildings, developed by Green Building Council (GBC) Italia, and specifically aimed at buildings of historic and monumental significance built in the pre-industrial period (before 1945). Assorestauro works with the GBC Italia network to help promote an increase in the level of skill amongst architects, engineers and those who work on restoration sites, from restorers to more technical operators, by organising training courses and workshops certified by professional bodies.

Professional training is a fundamental theme for our association and in 2021 Assorestauro developed two important training programmes:

- Post-earthquake reconstruction – an annual course organised in conjunction with the agency for the reconstruction of the Emilia Romagna Region (Central ItalY), presented by local design studios and building companies, to illustrate best-practice restoration processes adopted following the earthquake that hit this region in 2012.
- New legislation to safeguard cultural works – a refresher course aimed at personnel from the Italian Ministry of Culture.

Assorestauro received an important recognition from the Italian Ministry of Foreign Affairs and International Cooperation with the approval of the "Made in Italy Restoration programme", a tool to help transmit the eccellence of the Italian restoration sector and promote the internationalisation of Italian companies operating in this field.

One of the Directors of the association, Andrea Griletto, told us about some of the promotional activities created by Assorestauro in collaboration with the Italian Ministry of Foreign Affairs and International Cooperation: *"Through a series of dedicated training-information programmes we focused attention on how to carry out good restoration work, highlighting the importance of combining the Italian restoration school's approach with the culture of the host nation. We have opened new sites and carried out very important works in collaboration with authoritative institutions from several countries. In Turkey, with Vgm, General Directorate of the Turkish Foundations, we carried out work on the Sheikh Süleiman Mosque, the Imarhor Mosque and on the ancient Studion Monastery in Istanbul: a project that dozens of Italian companies took part in, in cooperation with Assorestauro and local bodies"*.

Sonia Vallese. Technical Director, Assorestauro

MAPEI IN ASSORESTAURO

Mapei participates in many of the activities undertaken by the Association both in Italy and abroad. Stefano Donato, Specialist for Mapei's Restoration Systems for Historic Buildings line, is member of the Board of Directors for the two-year period 2021-2023.

Ibiza (Spain)

City walls

SOLUTIONS FROM THE MAPE-ANTIQUE LINE USED FOR VARIOUS OPERATIONS AND DIFFERENT SECTIONS OF THE TOWN'S FORTIFICATIONS

The city walls of Ibiza, one of the most important examples still standing of bulwark fortifications that characterised the Mediterranean in the second half of the 16th century, were added to the UNESCO list of World Heritage Sites in 1999.
The old part of the town, or "Dalt Vila", is enclosed within a wall with a perimeter of around 1800 m (130 of which is formed by cliffs), built mainly from "marés" sandstone, a type of stone very similar to Neapolitan tuff, along with several types of mortar which were used at various times over the years to repoint the joints.
In 2018, as part of a project by the local council for the conservative restoration of the Ibiza city walls, a masterplan was drawn up to identify the problems with the walls, the interventions required to overcome these problems and the technologies and methods that would need to be adopted. For many of these operations products from the MAPE-ANTIQUE line were used, which are made from lime and Eco-Pozzolan and have been specifically developed for the restoration of masonry buildings, including those of historic and/or artistic interest.

Rebuilding and repointing the joints and consolidating the masonry walls
For the reconstruction and repointing of the joints and the consolidation of various sections of the "marés" stone walls, the product used was MAPE-ANTIQUE ALLETTAMENTO salt-resistant, cement-free masonry mortar made from natural hydraulic lime, eco-Pozzolan, natural sand, additives and micro-fibres.

MAPE-ANTIQUE ALLETTAMENTO has a very low level of hygrometric shrinkage which dramatically reduces the risk of cracks appearing. It also has properties which make the product resistant to various chemical-physical aggressive phenomena, such as soluble salts, freeze-thaw cycles, the leaching action of rainwater and alkali-aggregate reactions.
The surfaces of the lower parts of the masonry were protected against the action of seawater and aggressive atmospheric agents by applying the water-repellent impregnator ANTIPLUVIOL W, which has the ability to form a hydrophobic layer within the pores and capillaries of the "marés" stone.

Dehumidifying render for the mixed masonry
The render on the damaged and deteriorated sections of masonry, which had been refurbished in the past by applying various types of mortar over the mixed substrates, was reconstructed using the lime and Eco-Pozzolan-based binder MAPE-ANTIQUE LC mixed with local aggregates. This product enables macro-porous render to be made which is resistant to soluble salts and various chemical and physical aggressive phenomena.

Rebuilding and protecting the uppermost section
The various damaged and deteriorated sections of the uppermost part of the city walls needed to be reconstructed and protected with MAPE-ANTIQUE ALLETTAMENTO and coated with MAPE-ANTIQUE ECOLASTIC cement-free, lime-based, protective, elastic, waterproof coating. The latter of these two products, which also protects masonry against salts, UV rays and particularly aggressive chemical agents, was applied over the entire surface of the restored city walls, in the areas where the vertical walls come together and on other elements and features of the masonry structure, such as the external roofs of the pyramid watch towers on the San Jaume bulwark.

Strengthening the vaulted roofs in the pillboxes
The surfaces of the vaulted roofs of the bulwark pillboxes were fragile and uneven and had various cavities so, on these substrates, a layer varying in thickness from 2 to 10 cm of MAPE-ANTIQUE STRUTTURALE NHL, high-performance mortar for breathable render and masonry work, based on natural hydraulic lime and Eco-Pozzolan, was

IN THE FACING PAGE. The walls of the Ibiza old city centre dates back to the 16th century and are made of "marés" stone, similar to Napolitan tuff.
ABOVE. MAPE-ANTIQUE ALLETTAMENTO salt-resistant, cement-free masonry mortar was used for rebuilding and repointing the joints and consolidating various sections of the walls.

ABOVE. The surfaces of the vaulted roofs of the bulwark pillboxes were restored with MAPE-ANTIQUE STRUTTURALE NHL.
LEFT. The external roofs of the pyramid watch towers on the San Jaume bulwark and other elements were protected with MAPE-ANTIQUE ECOLASTIC lime-based, elastic, waterproof coating.

applied, which is particularly recommended for making "reinforced" render. This mortar, which guarantees mechanical and chemical-physical characteristics similar to those of the original masonry, was "reinforced" in various sections with MAPENET EM 30 or MAPENET EM 40 meshes. The strengthening system also included the use of MAPENET EM L-shaped glass fibre fasteners, which were anchored to the substrate using MAPEFIX VE SF chemical styrene-free vinylester anchor. In the bulwarks, the floors were also in an advanced state of deterioration and were restored with MAPE-ANTIQUE STRUTTURALE NHL mixed with various aggregates in different particle sizes.

Find out more
MAPE-ANTIQUE ECOLASTIC

TECHNICAL DATA
City walls, Ibiza (Spain)
Year of construction: 16th century
Year of the restoration: 2018
Owners: Ibiza City Council, Ibiza Council for World Heritage, Fundatur
Design: mipimari arquitectura I disseny S.L.P.
Contractors: UTE Tecopsa, Hnos Parrot, Alebus
Mapei coordinators: Joan Lleal and Antonio Siles, Mapei Spain

MAPEI PRODUCTS
Restoration of masonry: Mape-Antique Allettamento, Mape-Antique LC
Waterproofing and protecting: Mape-Antique Ecolastic, Antipluviol W
Strengthening vaults: Mape-Antique Strutturale NHL, Mapenet EM 30/40, Mapenet EM Connector, Mapefix VE SF

For further info on products: mapei.com, mapei.es

Singapore

Raffles Hotel

A HOST OF SOLUTIONS TO RESTORE THE MASONRY AND FLOORS OF THE OLDEST HOTEL IN SINGAPORE

The Raffles Hotel is Singapore's oldest and most iconic hotel. Named after the founder of modern Singapore, Sir Stamford Raffles, it was opened in 1887 and has gained both local and international recognition, hosting famous guests such as Charlie Chaplin, Rudyard Kipling, Elizabeth Taylor and Michael Jackson. Its structure reflects neo-Renaissance architecture with tropical touches added like high ceilings, extensive verandahs, electric lights and powered ceiling – a first for any hotel in the region back in the 19th century. The hotel was declared a National Monument by the Singapore Government in 1987 and underwent two restoration interventions in its 132 years: in 1989 and 2017.

The latest renovation works

The meticulous restoration of the latest intervention was led by acclaimed interior designer, Alexandra Champalimaud, and Aedas, a leading global architecture and design firm. The main aim of the restoration was to infuse technology for modern conveniences and update the interior while ensuring its unique historic charm would be preserved. Three new suite categories increased the hotel's current suite count from 103 to 115. The other 9 suite categories were upgraded as well. More than 30 retail, dining and lifestyle brands were revamped and opened. New restaurants were introduced. The former Jubilee Hall, was converted into a 300-guest ballroom for weddings and events. The interior now has a new marble floor in the lobby and walkways. After a two-year revamp, the hotel opened on 1 August 2019. This project has won the AHEAD Asia award, the hospitality awards programme celebrating hotel design.

Restoring the façades and masonry structures with MAPE-ANTIQUE SYSTEM

Mapei Far East, the Group's subsidiary in Singapore, was called upon to contribute to restore the building's structure due to its mother house's experience in restoration works and its own experience and success with numerous restoration projects in Singapore including the Victoria Theatre and Concert Hall and the Church of Saints Peter and Paul (the oldest church in the country).

The paint on the masonry structure and façades was painstakingly stripped back by hand to minimize damage and existing plasters were removed to the brick surface. For the first phase of restoring old brickwork, MAPE-ANTIQUE ALLETTAMENTO salt-resistant masonry mortar was applied to fill in the cavities in between the bricks to create a solid foundation. MAPE-ANTIQUE F21 super-fluid, salt-resistant cement-free hydraulic binder was injected to fill up cavities and consolidate masonry in the old wing.

For brickwork without cavities, a different product system was chosen, made up of MAPE-ANTIQUE RINZAFFO cement-free scratch-coat, MAPE-ANTIQUE MC macroporous de-humidifying render and MAPE-ANTIQUE FC CIVILE

The masonry walls of the hotel were restored with products from the MAPE-ANTIQUE line. The external walkway and courtyard were covered with granite installed by using KERAFLEX MAXI S1 adhesive and KERACOLOR GG grout.

The balustrades were restored using MAPE-ANTIQUE INTONACO NHL base render, which is ideal for application on masonry in historic buildings.

Several stone and marble floors in the hotel were renovated using Mapei adhesives and grouts for joints.

transpirant skimming mortar for a smooth finishing coat. For the washroom areas, two layers of MAPE-ANTIQUE STRUTTURALE NHL mortar for breathable render, reinforced with MAPENET 150 fibre glass mesh, were applied, to consolidate the masonry. This system was proposed as it required a resistant, mechanically strong solution to hold the ceramic tile covering in place.
The restoration of the hybrid brick structures within the hotel required the application of MAPE-ANTIQUE INTONACO NHL transpirant base render based on natural hydraulic lime and Eco-Pozzolan. The same product, which is ideal for use in existing masonry buildings, including those of historical interest, was also used for patching artisan works/decorative motifs and balustrades.

Renovating stone coverings
Mapei adhesives and grouts for joints were also used to renovate stone coverings in several areas of the hotel. In the main lobby and walkway, new white marble floors were installed with KERAQUICK S1 and joints were grouted with KERACOLOR SF. In the bathrooms, KERABOND T + ISOLASTIC system was used to install marble on the walls and floors before joints were grouted with KERACOLOR SF. The kitchen's floor and wall coverings were installed with KERAFLEX adhesive while KERAPOXY epoxy grout was chosen for the joints, considering that the environment is exposed to foods and variant thermal temperature and subjected to frequent washing.
The white marble floor at the staircases situated along the perimeter of the hotel was installed with KERAFLEX MAXI S1 and joints were grouted with KERACOLOR FF. The external walkway and courtyard were covered with granite using KERAFLEX MAXI S1 and joints were grouted with KERACOLOR GG.

Find out more
MAPE-ANTIQUE STRUTTURALE NHL

TECHNICAL DATA
Raffles Hotel, Singapore
Period of construction: 1870s
Period of restoration: 2017 – 2019
Period of the Mapei intervention: 2017-2019
Owner: Raffles Hotel
Architecture and design: Aedas
Interior design: Alexandra Champalimaud
Restoration consultant: Studio Lapis
Intervention by Mapei: supplying products and technical assistance for restoring masonry, installing ceramic tiles and stone, grouting joints
Main contractor for restoration works: Sunray Woodcraft Construction Pte Ltd
Sub-contractor for artisan works: PQ Builders Pte Ltd
Sub-contractors for installing stone and ceramic tiles: Zhong Ren Construction Pte Ltd, Bai Li Renovation Contractor Pte Ltd
Mapei coordinators: Evelyn Tay, Lawrence Chong, and Lincoln Lim, Mapei Far East (Singapore)
Photos: Sunway Woodcraft Construction Pte Ltd, Mapei Far East Pte Ltd

MAPEI PRODUCTS
Restoration of masonry: Mape-Antique Allettamento, Mape-Antique F21, Mape-Antique FC Civile, Mape-Antique Intonaco NHL, Mape-Antique MC, Mape-Antique Rinzaffo, Mape-Antique Strutturale NHL, Mapenet 150
Installation of stone coverings: Keraquick S1, Keracolor SF, Keraflex, Keracolor FF, Kerabond T + Isolastic , Keraflex Maxi S1, Kerapoxy, Keracolor GG

For further information on products: mapei.com, mapei.com.sg

From Croatia to Peru

HISTORICAL BUILDINGS, CHURCHES, CITY WALLS: MAPEI SOLUTIONS FOR RESTORING MASONRY BUILDINGS AROUND THE WORLD

Ćipiko Palace
Trogir (Croatia)

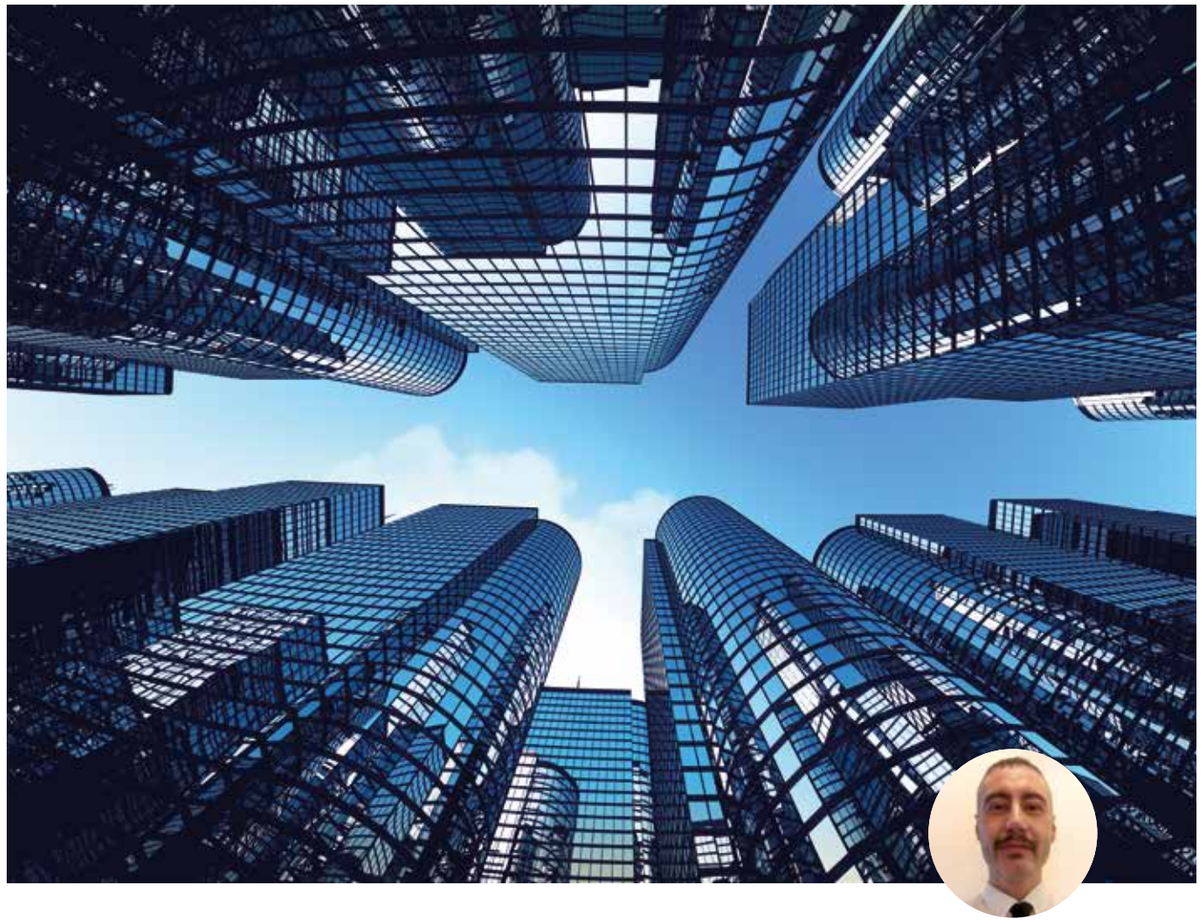
This palace includes several units dating back to different times, from the early Middle Ages to the 15th century. The walls made up of stone blocks in the lobby were in extremely poor condition, damaged by rising damp and salts. After demolishing the render and repointing the joints between the stones with MAPE-ANTIQUE MC mortar, holes were drilled in the masonry to inject MAPE-ANTIQUE I-15 which ensured proper consolidation of the structure. In order to guarantee proper protection and durability, a dehumidifying system made up of MAPE-ANTIQUE RINZAFFO and MAPE-ANTIQUE MC was applied on the masonry walls which were then finished with MAPE-ANTIQUE FC CIVILE to complete the restoration intervention.

City walls
Mladá Boleslav (Czech Republic)

The ancient walls of this city were recently restored using several Mapei products. STABILCEM was used to make slurries to create new anchor points. The fibre-reinforced, thixotropic mortars MAPEGROUT T40 and MAPEGROUT T60 were used to restore the areas made of concrete. The masonry surfaces were then treated with MAPE-ANTIQUE ECOLASTIC, the first two-component, 100% cement-free, salt resistant waterproofing coating made from lime, Eco-Pozzolan and recycled materials, which was chosen also due to its colour similar to sandstone. MAPE-ANTIQUE ALLETTAMENTO was employed to rebuild and finish off the missing areas of the masonry, in line with the requirements of the local authorities, and ANTIPLUVIOL was applied to make sure the surfaces remained water-repellent.

Churches of Santa Rosa de Lima e La Recoleta
Lima (Peru)

On the occasion of the bicentennial of the Independence of Perù, these churches, which date back to the 17th and 18th centuries, underwent careful restoration work, which involved the adobe-brick masonry. The work was carried out using MAPE-ANTIQUE F21, which was injected to consolidate the masonry, and MAPE-ANTIQUE RINZAFFO to form the first layer of the breathable, salt-resistant de-humidifying system before applying MAPE-ANTIQUE MC, MAPE-ANTIQUE LC and MAPE-ANTIQUE INTONACO NHL. Breathable skim coats were formed on the masonry using MAPE-ANTIQUE FC ULTRAFINE, MAPE-ANTIQUE FC CIVILE and MAPE-ANTIQUE FC GROSSO. Breathable, siloxane-based coloured coatings from the SILANCOLOR line were then applied, such as SILANCOLOR PRIMER PLUS and SILANCOLOR PAINT.



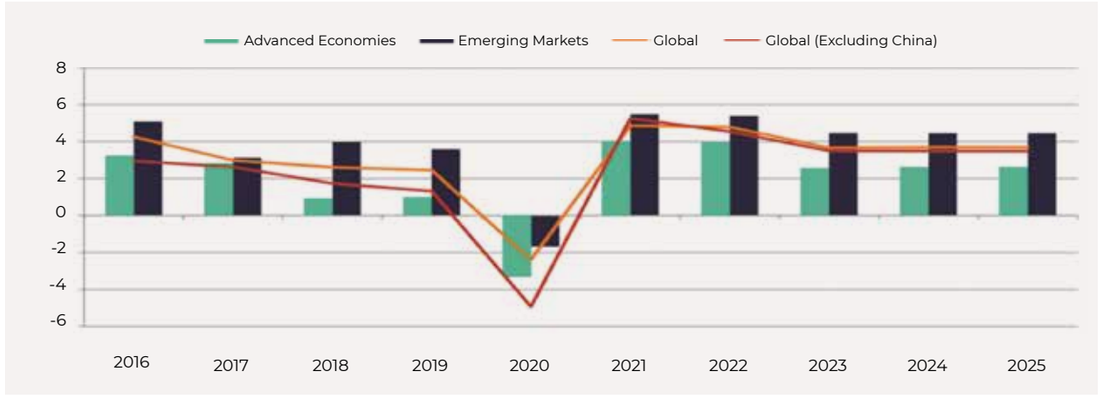
by **Francesco Doria**

Building industry, unknowns on the road to recovery

POSITIVE FORECASTS FOR GLOBAL INVESTMENT IN THE BUILDING INDUSTRY IN 2022 HAVE TO CONTEND WITH DEVELOPMENTS IN THE WAR IN UKRAINE, HIGH PRICES OF RAW MATERIALS AND THE PANDEMIC

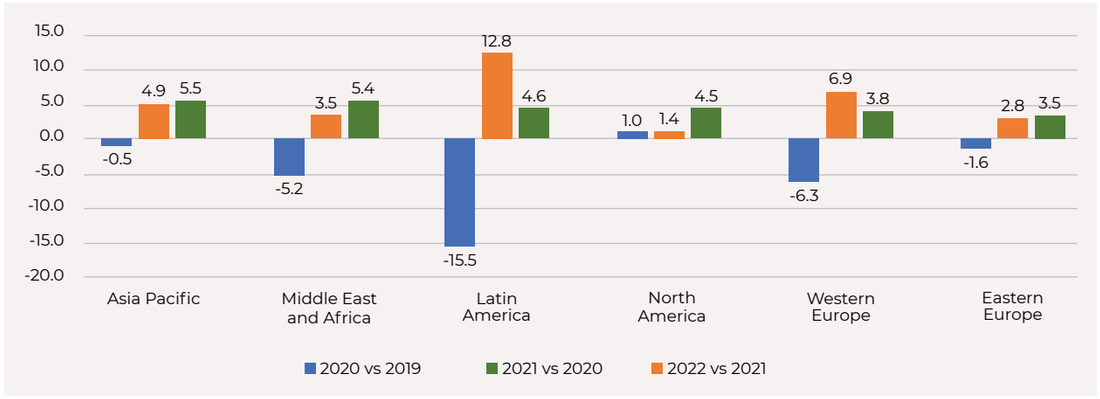
In 2021 the global construction market registered an estimated growth of 4.8%, and in so doing achieved a net recovery compared with 2020 which, penalised by the pandemic, closed with a drop in investments of 2.4%. The growth in the construction sector was slightly inferior with respect to the global economy which last year, according to the World Bank, grew by 5.5%.
Last year the advanced economies showed an increase in value in the construction sector of around 4%, while the emerging nations achieved a rate of growth in the construction market of 5.5%.
The forecasts for 2022 point to an overall growth of 4.9% in the global construction sector, driven by the expansive dynamics of both the emerging markets (+5.4%) and the more developed economies (+4.1%). The rate of development hypothesised for the global construction sector should exceed that of global GDP, estimated to be around 4.1%.
The situation of the global construction market should continue to remain positive in the following three-year period, when the average annual increase in investments is expected to be 3.7%, with an estimated increase of 4.5% in emerging nations and 2.6% in the more developed countries.

Trend of global output in the construction sector
(Variation in % on previous year)



Source: GlobalData

Positive trend in the construction sector confirmed for 2022
(Variation in % on previous year)

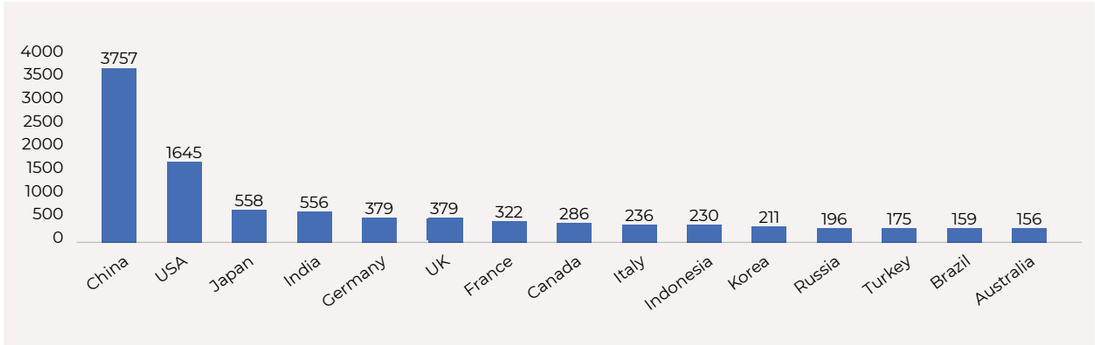


Source: GlobalData

The forecasts shown in this article were formulated before the start of the war in Ukraine and are obviously subject to the evolution of the conflict with Russia, which could, in fact, have repercussions that are difficult to quantify, especially on the European economy. Furthermore, the estimates are obviously dependent on containing the pandemic, which would mean not having to take drastic measures to reduce infections which, in turn, would have a negative impact on both the manufacturing sector and on consumption levels. Other risks for growth in the economy and in the construction market are represented by the shortage and the increase in the price of raw materials and the persisting constraints in the logistics sector.

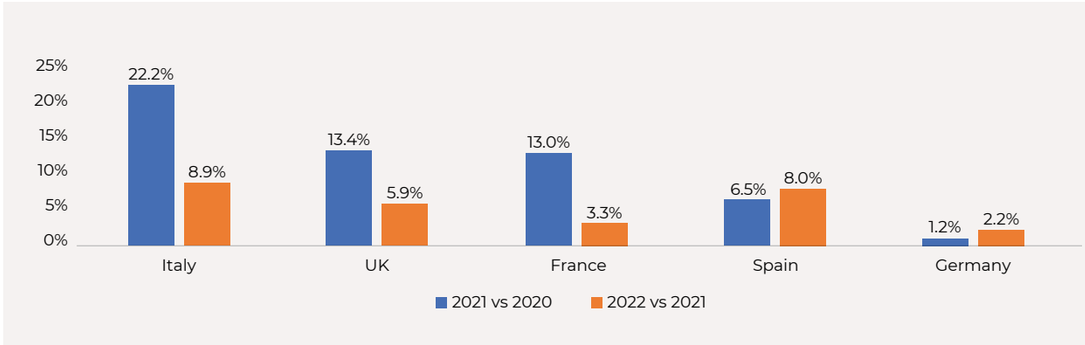
Asia Pacific
In 2021 this region, which accounts for 48% of the global construction sector value, recorded an estimated growth in construction output of almost 5%. The result follows on from the results for 2020 when the value of investments in construction, in spite of the pandemic, remained more or less stable. Forecasts for the next year point to a strengthening in the rate of growth in the construction market, which is estimated to be +5.5%.
In China, the leading nation in the world in terms of investments in the construction sector, the construction sector continued to grow in 2021 by 4%, slightly higher than in the previous year. Estimates for 2021 indicate growth will be around 5%. A cooling down in the residential sector should be contrasted by a very positive trend in the infrastructure industry. Last year witnessed a strong recovery in the Indian construction market, with an estimated growth rate of around 17%. India was one of the nations most severely hit by the pandemic, which in 2020 drove the construction sector into a deep slump. It is thought that the construction market should continue to grow this year at a more "sustainable" rate, around an estimated 6%.
In Japan, the leading mature market in Asia, the construction sector grew by around 4% in 2021, recovering a lot of lost ground after the recession in 2020. The outlook for this year is moderately positive and a growth in the market of more than 3% is expected.
Last year the Australian construction sector recovered the fall in output experienced in 2020, recording growth

China, construction market leader
(Figures in billions of dollars)



Source: GlobalData

In Western Europe, weak growth in Germany
(Variations are based on "constant values" and exclude the effects of inflation on the construction sector)

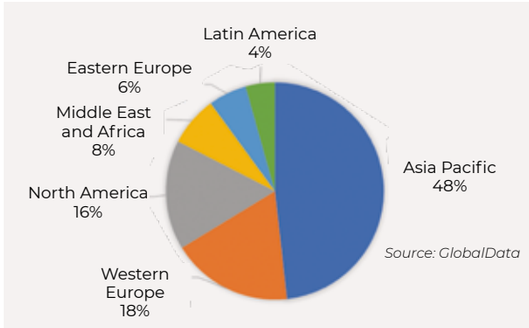


Source: GlobalData, Prometeia and European Commission

of around 2%. For 2022, it is estimated that investments in the construction sector could grow by as much as 4.7%, which would represent a better trend compared with the average for the more mature markets.

Western Europe
In 2020 the European construction sector recorded a drop of more than 6%, with the crisis generated by the pandemic hitting the region even harder compared with the average in the more advanced nations. Last year was very positive for the European construction sector, with investments growing by around 7%. In 2022, total construction output should confirm the dynamic nature of the market; the estimated rate of investments for the construction sector is, in fact, around +4%, while in 2023 market growth is expected to be more moderate.
The five strongest economies in Europe generate more than 3/4 of the continent's construction output.

Almost half of all global investments in the Asia Pacific Area
(Figures in %)



Source: GlobalData

The best performances are expected to come from the Asia Pacific area where investiments (+5.5%) will be higher than in 2021

Last year, investments in the Italian construction sector recorded the highest growth at European level. In fact, it is estimated that 2021 closed with a rate of growth of more than 22%, an increase more than three times higher than the estimated growth in GDP. The home renovation sector (backed by a tax-relief incentive system, particularly Superbonus 110) and the infrastructure sector were the main drivers behind this market growth. The forecasts for 2022 and 2023 are very positive; the estimated growth in investments for this year is around 9%, while the rate forecast for 2023 is +7%.
In 2021 the British construction sector recorded a net recovery following the recession in 2020; in fact, the estimated growth in investments in the construction sector was more than 13%, twice that of GDP. The forecasts for this year are positive and the market is expected to grow by 6%.
2021 was characterised by a year of recovery in the French construction sector as well and output increased by 13%. The estimates for 2022 point to more moderate growth which should be in line with the forecast growth in the domestic economy.
In 2020 Germany was the only large European country that manged to avoid a recession in the construction sector, while last year investments recorded a modest increase. Estimates for 2022 point to moderate growth in the construction sector (+2.2%), which contrasts the strong growth forecast for the German economy (+4.5%).
It is estimated that, in 2021, the Spanish construction sector grew by 6.5%, only partially recovering the net drop in output the previous year. In 2022 investments in the construction sector have excellent growth prospects (+8%), motivated by the recovery in the residential sector.

Eastern Europe
Last year this region recorded an estimated growth in investments in the construction sector of around 3%, enabling the sector to fully recover the slight drop experienced in 2020. The forecasts made last January reported a growth in the construction industry close to 3% in 2022. The military escalation in Ukraine will obviously have negative effects on the markets of this region, for which the forecasts are therefore highly uncertain.
The Russian construction sector is the 12th largest in the world by size and in 2020, in spite of the exploding pandemic, the value of investments remained constant. Last year this sector grew by more than 4%, a distinctly better result compared with the average for Eastern Europe. Recent events in Ukraine make it impossible to estimate the performance of the Russian economy and construction industry.
For a number of years, the Polish market was one of the most dynamic in the whole of Europe and, in 2021, the crisis was only moderately felt, with a fall of around 2% in investments in the construction sector. In 2021 the growth rate in the Polish construction sector was around 3%, favoured by growth in the residential sector. The outlook for 2022 is positive and the Polish market is expected to grow by 4%. In Turkey, investments in the construction sector grew by 2.7% last year, only partially recovering the net recession in 2020. This year the dynamic trends in the construction sector should remain positive and the market is expected to grow by around 3%.

North America
In 2020, in spite of the pandemic, the North American construction market managed a moderate increase in its overall value, recording the best performance at a global level. It is believed that, in 2021, investments in the construction sector recorded a moderate increase, estimated to be 1.4%. This low rate of growth can be put down to a cooling-off in the United States construction sector which, in spite of a generally good trend in the residential sector, suffered the fall in the non-residential sector. The forecasts for 2022 point to a net improvement in the situation for the North American construction sector, with forecasts indicating a growth of 4.5%.
In the United States the main driver behind this growth will be the infrastructure sector, which will benefit from the massive multi-year investment programme planned by the Biden administration and a planned investment of 1,200 billion dollars worth of works in the transport and energy sectors. Overall, the USA construction sector is expected to grow in 2022 by an estimated 4.5%, with a growth rate of between 3% and 4% hypothesised for next year.
The Canadian construction sector grew by almost 5% in 2021, recording a positive trend in all market sectors and particularly high growth in the residential sector. The forecasts for this year indicate growth of 4.6%.

Middle East and North Africa
In 2021, the construction sector in this region recorded 3.5% growth and managed to only partially recover the recession in investments in 2020 (-5.2%).
While the main markets in the Middle Eastern and North African region recorded significant growth in the construction sector, the Sub-Saharian construction sector had more modest growth, just slightly more than 1%. This area suffered the effects of the stagnating South African market and modest growth in the Nigerian construction industry. Estimates for the two-year period 2022-2023 point to average growth of more than 5% in investments in the construction sector. The dynamic trends in the Middle Eastern and North African construction sectors should be joined by a recovery in investments in South Africa and in other Sub-Saharian nations.

Market Research Manager, Mapei SpA (Italy)

30 years of Polyglass USA

New plants and new markets: projects to promote further growth

NATALINO ZANCHETTA, CEO OF POLYGLASS USA, OUTLINES THE COMPANY'S DEVELOPMENT PLANS

Natalino Zanchetta, CEO of Polyglass USA.

"The Power of Innovation - 3 Decades Strong!" is the theme of the Polyglass' 30th anniversary in the USA. What is the secret of the Polyglass' success in the roofing industry?
Our 30 years of success has been largely due to our commitment to constant innovation and new product solutions for the industry. The real secret to our success is our people, the entire Polyglass community.
Our success could never be complete without our customers, partners, vendors, and the entire roofing industry. It is altogether that we succeed.

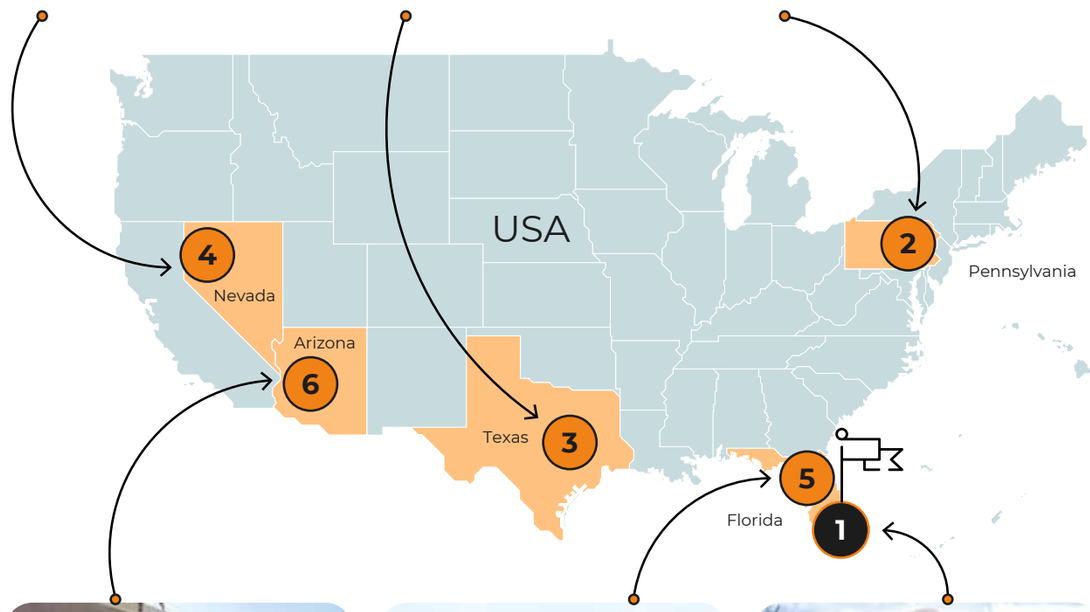
What are the company's plans for expanding on North American markets and what strategies will it be adopting to achieve these goals?
Expanding capacity, new lines, and new plants are on the horizon of our growth. We will double pretty much every plant that we have right now, and we will also create new products. We are expanding our product lines in the building envelope to seal the whole building from the foundation, below grade, building envelope, and to the roof. That is the real challenge we are going through. All that we see on the horizon is our future.
Also, in Polyglass' future, we're working on expanding our territory, starting from the Canadian market to the Caribbean. Most importantly, we are working together with the Mapei Group's subsidiaries to complete the product offer in the building envelope field and being part of the Mapei Group will benefit our future growth.

In the United States, a huge infrastructure investment plan worth 1,200 billion dollars was launched. What opportunities open up for Polyglass USA?
In August 2021 the CEO of the National Roofing Contractors Association (NRCA) stated that the "NRCA commends the Senate for approving" this infrastructure investment act; the passing of this act was similarly applauded throughout the various roofing, waterproofing and construction communities and we applaud this investment commitment as well. Although the impact to Polyglass' roofing and waterproofing business will not be momentous in the short term, we do expect that we will see

MANUFACTURING PLANT
Fernley, Nevada
1992

MANUFACTURING PLANT
Waco, Texas
2017

MANUFACTURING PLANT
Hazleton, Pennsylvania
1997



MANUFACTURING PLANT
Phoenix, Arizona
2014

MANUFACTURING PLANT
Winter Haven, Florida
2007

HEADQUARTERS
Deerfield Beach, Florida
2010

At the cutting-edge in waterproofing agents for roofs

Brothers Luigi, Romano, and Antonio Zanchetta created their first modified bitumen compound formulation for roofing membranes in Italy in the 1960, paving the way for significant product innovations in the roofing and waterproofing industries over the coming years.
From opening their first plant in the USA in 1992, Polyglass USA has continued to carve out its name as an industry leader and expert manufacturer of innovative and quality roofing and waterproofing products.
Polyglass' future is bright, with several new initiatives in the pipeline including expansions at some of its state-of-the-art manufacturing facilities in North America.
With the support of the Mapei Group, Polyglass USA also looks to expand its products and solutions to serve new markets in 2022, beginning with the Building Envelope industry.

Polyschool: all-in training

Polyglass USA has always invested in training its clients, staff and business partners as part of its commitment to helping develop the roofing products industry. That is why it has created Polyschool, a teaching forum for building contractors, installers, sales, distributors, consultants, architects and designers focused on the benefits and distinctive traits/features of its products and systems. The training sessions highlight best practices for the selection, application and sale of Polyglass products. People can attend the trainings at the Polyschool facility in Winter Haven, which has its own lecture hall, and both an indoor and an outdoor space for hosting demonstrations. In addition to the in-person events, Polyschool holds online webinars for virtual trainings. In 2021, Polyglass USA held 36 in-person training sessions in 12 US states attended by 422 people, and 37 online webinars followed by 654 professionals.

a steady and significant increase in demand for our products in the longer term (2-5 years). Projected US infrastructure and construction spending is forecasted to grow 5% in 2022; 5.5% in 2023 (2% higher than without the bill). Shortly thereafter we expect to see a ripple effect of those investments as improvements boost both residential and commercial construction/renovation demand; changes in traffic patterns and broad band access will make less populated (and remote work) areas more attractive inviting growth, and we expect the labor market to improve as this bill will likely spark new employment interest ... all off of which will be of great benefit to Polyglass and our industry.

Polyglass is committed to giving back to the community and is proud to partner with and support local organizations, such as Dolphins Challenge Cancer,

We aim to double the number of our plants and launch innovative products. Our operations will be extended to encompass Canada and the Caribbean

Sol Relief for the donations of roofing materials to the Bahamas, Ronald McDonald House of Ft. Worth, Abandoned Pet Rescue in Fort Lauderdale, etc. What is the meaning for Polyglass in participating with these initiatives?
Giving back to our community and industry has always been a core pillar of our strategy and part of the culture of our identity as a company. I learned that part of our culture and identity from my family in Italy; the Mapei Group also embraces giving back to the community, which we will continue to do and support.

Since 2015, Polyglass USA has supported this project as a Fighting Sponsor of the Dolphins Challenge Cancer, a fundraiser for cancer research. The event includes a bike race and a run/walk in Miami with around 60 Polyglass employees taking part every year. All proceeds from entries are donated to the Sylvester Comprehensive Cancer Center in Miami.

POLYGLASS USA

1
HEADQUARTERS
IN DEERFIELD BEACH (FLORIDA)

5
MANUFACTURING PLANTS
IN PHOENIX, HAZLETON, WINTER HAVEN, WACO, FERNLEY

450
EMPLOYEES

585.3
KM² SELF-ADHERED MEMBRANES
PRODUCED TO DATE

20.5
MILLION LITERS ELASTOMERIC COATINGS
PRODUCED TO DATE

The various stages in Polyglass operations on the USA market

1992
Polyglass opened its first U.S. manufacturing facility and headquarters in Fernley (Nevada).

1997
Polyglass opened its second U.S. manufacturing plant in Hazleton, (Pennsylvania).

2003
Polyglass revolutionized the roofing industry by manufacturing its self-adhered membranes with its patented ADESO® technology.

2007
Polyglass opened the doors of its third U.S. plant in Winter Haven (Florida).

2008
The Mapei Group acquired Polyglass.

2010
Polyglass moved its U.S. headquarters to Deerfield Beach (Florida), in 2010, near the headquarters of Mapei Corp., US subsidiary of the Mapei Group.

2014
Polyglass USA, Inc. acquired KM Coatings to increase its footprint in manufacturing roof coatings. The acquisition resulted in a fourth U.S. manufacturing facility in Phoenix (Arizona).

2017
Polyglass USA, Inc. opened its fifth manufacturing plant in Waco (Texas).

2022
Polyglass celebrates its 30th years of business in the USA and it is expanding to new waterproofing markets.

ABOVE. ICU Medical's warehouse and distribution center in Santa Fe Springs lately underwent a reroofing intervention involving over 7,400 m².
TOP OF THE PAGE, RIGHT. By using POLYBRITE® 98 and POLYBRITE® 90.1, the contractor managed to overcome the challenges posed by a climate-controlled environment and an uneven roof surface.

Santa Fe Springs, California

ICU (Intensive Care Unit) Medical distribution center

ELASTOMERIC ROOF COATINGS BY POLYGLASS ENSURED A SAFE REROOFING INTERVENTION

ICU Medical is a medical care center based in Santa Fe Springs (Florida, USA) entirely focused on bringing intuitive, patient centric IV (intravenous therapy) products and services that provide meaningful clinical differentiation, consistent innovation, and superior value. For more than three decades, they have been dedicated to improving the safety and efficiency of IV therapy.

Safe restoration of the roofs

Polyglass took part in a 7,400 m² (80,000-square-foot) roof restoration project for one of ICU's warehousing and distribution centers in Santa Fe Springs. The medical supply firm contracted C.I. Services, a Polyglass Registered Contractor, for the job.
The roof system was in notably bad shape when C.I. Services made their first evaluation. "The warehouse is climate controlled, and many of the supplies they carry are sensitive to temperature and moisture," said C.I. Services General Manager Marcus Clinco, "They had been dealing with leak issues with the roof for a couple of years and were looking for a cost-effective long-term solution for dealing with the roof."
Another challenge for this specific project was that the total roof surface was not uniform but consisted of two different types of roofing, both showing significant signs of wear. "The existing roofing was a combination of older single-ply membrane on about three-fourths of the roof and a cap sheet built-up roof on about one-fourth of the roof," said Clinco.
When inspecting the roof and noting its makeup, C.I. Services project managers quickly ascertained that Polyglass roofing products were the best solution for the project.

Silicone elastomeric roof coatings

To deal with these specific challenges, the team at C.I. Services needed a silicone-based elastomeric roof coating that could easily cover and seal both roof types. "Based on the roof conditions, we immediately thought of a 20-year silicone application to restore the roof to serviceable condition," Clinco said, "Since the roof was only one layer, and the single-ply membrane was still in good enough shape to provide the base for a coating application, we made the recommendation for the Polyglass POLYBRITE® silicone system."
The team chose a two-part application for the roof at ICU Medical. They began with an application of POLYBRITE® 98, a water-based primer and bleed blocker designed to enhance consistent silicone adhesion on a variety of different substrate types. For the top layer, they applied POLYBRITE® 90.1 silicone coating, a premium liquid applied coating that cures to a highly durable and flexible membrane. POLYBRITE® 90.1 is also rated for its UV resistance and "cool roof" properties, an important feature for helping the warehouse maintain optimum interior temperatures.
Noted contractors like C.I. Services choose Polyglass roofing products, not only for quality and reliability, but also because of the company's technical support and one of the strongest warranties in the industry.

Find out more POLYBRITE® 90.1

TECHNICAL DATA
ICU (Intensive Care Unit) Medical distribution center,
Santa Fe Springs (California, USA)
Period of renovation: 2020
Roofing contractor: C.I. Services
Intervention by Polyglass: supplying products for renovating roofs

POLYGLASS PRODUCTS*
Polybrite® 98,
Polybrite® 90.1

*These products are manufactured and distributed on the North American market by Polyglass USA.
polyglass.com

Cape Coral, Florida

Cape Coral Condominiums

RELIABLE AND EASY-TO-INSTALL SOLUTIONS FOR A RESIDENTIAL COMPLEX ON THE GULF OF MEXICO

Situated in Lee County, Florida, on the Gulf of Mexico, Cape Coral was founded in 1957 and developed as a planned community. It is the largest city between Tampa and Miami in both population and area, with an area of 310 km² (120 square miles).
Cape Coral Condominiums is a multi-building residential complex located in this area that was completed in 2020. The owner called Modern Development USA for a 18,580 m² (200,000-square-foot) re-roofing project over several buildings, a firm that already had built up a 15-year reputation for excellence in the commercial roofing industry. Polyglass was their brand of choice for the Cape Coral Condominiums project.
Nathan Franses of Modern Development pointed out that Polyglass proved to be a selling point that helped them win the bid for Cape Coral Condominiums. "Quite simply...it is the best," says Nathan. "The clients knew who Polyglass was and the tile underlayment system, so it was easy to sell. The fact that it got the client a 30-year underlayment warranty made it a slam dunk."

Project needs and challenges

Cape Coral Condominiums is a residential complex located in one of Florida's most popular tourist and vacation destinations, but also an area prone to tropical heat and hurricanes. To solve the re-roofing challenges, Modern Development needed to choose a roofing underlayment system that was especially conducive to steep-sloped roofs and could accommodate tile roofing. They also required an underlayment rated for high temperatures and high wind resistance.
To meet these challenges, Modern Development chose a two-ply system specifically designed by Polyglass for tile assemblies. The process began by applying an initial layer of POLYSTICK® MTS PLUS, a dual-compound self-adhered underlayment rated for its thermal stability and ratings for temperatures up to 130°C (265 degrees Fahrenheit).
After applying all flashings, metals, and penetration accessories, the team then used a second Polyglass underlayment of POLYSTICK® TU MAX, a homogeneous rubberized asphalt waterproofing membrane designed to meet ASTM (American Society for Testing and Materials) and TAS (Testing Application Standard) testing requirements for steep slope roofing systems, before applying the final layer of roof tiles.
According to Nathan Franses, "Polyglass installation techniques are very easy to learn and to teach new hires, ensuring that all 400-plus of our roofers install and design the system the exact same way ensuring quality. The ease of installation is great, and the process is seamless."

ABOVE. Cape Coral Condominiums is a residential complex located in one of Florida's most popular tourist and vacation destinations.
LEFT. To ensure protection from tropical heat and hurricanes, the roofing contractor choose a roofing underlayment system that used POLYSTICK® membranes.

Find out more POLYSTICK® TU MAX

TECHNICAL DATA
Cape Coral Condominiums, Cape Coral (Florida, USA)
Period of the Polyglass intervention: 2020
Owner: Cape Coral Condominiums
Roofing contractor: Modern Development USA

POLYGLASS PRODUCTS*
Polystick® MTS Plus,
Polystick® TU MAX

*These products are manufactured and distributed on the USA market by Polyglass USA
polyglass.com

Solutions for every type of roof

POLYGLASS PRODUCTS ARE USED ON NEW AND RENOVATED ROOFS OF RESIDENTIAL COMPLEXES, WAREHOUSES, AND HEADQUARTERS

Triton's Trumpet residential complex
Ocean City, Maryland

This luxury residential complex, built in the 1980's, is just a short stroll from the sea in an area of the country characterized by particularly harsh winters and hurricanes. The roof of the building was showing signs of severe deterioration, which was also due to the damage caused by hurricane Isaias in August, 2020. In 2021 the roof was completely renovated by removing the existing roof and applying elastomeric membranes from the ELASTOFLEX line, characterized by their high level of resistance to atmospheric agents, in compliance with local authority standards regarding protection from hurricanes. The first step was to apply ELASTOFLEX SA V POLAR BASE® self-adhesive membrane, followed by a layer of ELASTOFLEX SA P POLAR CAP®, which is suitable for use in the most rigid of temperatures.

Warehouse storage facility
Martha's Vineyard - Massachusetts

The island of Martha's Vineyard is located off the coast of Massachusetts. With just 15,000 residents in the winter, it becomes more densely populated, which is why an air-conditioned warehouse was built where part-time residents could store their objects, furniture and other personal items during the months they are absent. The roof was recently renovated by installing a three-layered system, which was very quick to apply and ensures the roof remains completely waterproof and highly durable over time. A challenge which was overcome thanks to the use of ELASTOFLEX SA BASE, ELASTOFLEX SA V and ELASTOFLEX SA P elastomeric membranes.

Lereta headquarters
Pomona, California

Lereta is a company specialized in property tax tracking. Their corporate HQ in Pomona, California had a worn down PVC-P roof and needed a roof restoration. The company commissioned to carry out the waterproofing work chose to use a system of silicone coatings which guaranteed a 15-year warranty. The system that was installed used of a coat of POLYBRITE® primer to help the next layer bond more firmly, followed by a layer of POLYBRITE® 90.1, a highly durable, silicone coating product that provides protection against mold, UV rays and the effect of heat-island phenomenon.

Private house
Fort Worth, Texas

The new construction roof was in the "2020 Street of Dreams" project promoted by *Texas Magazine*. The roof contractor won the 2020 Golden Hammer Award from the North Texas Roofing Constructors Association for the best metal roof on a residential building. One of the greatest challenges with this project was that a new roof had to be built to cover a total surface area of 900 m², made up of different sections with several pitches. They chose to use the POLYSTICK® MTS PLUS self-adhered waterproofing membrane, particularly suitable for installing under metal roofs, which can reach high temperatures (up to 130° C) and is characterized by its non-slip properties.

Waianae District Park Gym
Honolulu - Hawaii

The Waianae District Park Gym is one of the most used public areas in the county of Honolulu. The roof protecting the gym became damaged, had leaks and electrical issues. This resulted in the closure of the gym's second floor. The solution consisted in removing the old roof and replacing it with Polyglass USA's SBS (Styrene - Butadiene - Styrene) multiply modified bitumen roof system ELASTOFLEX V, ELASTOFLEX SA and ELASTOFLEX S6 G FR.
POLYBRITE® 70 elastomeric coating was utilized to seal the details. The roof was completed just before the 2018 hurricane season and the building was used as one of the several evacuation centers on the island.

Hyatt House Miami Airport
Miami - Florida

Not far from the Port of Miami and steps from Miami International Airport, there is the Hyatt House Hotel. The project was requiring over 30,000 square feet (2800 m²) of new roof underlayment with maximum fire-resistance properties. The contractor selected POLYSTICK® XFR a dual-purpose, fire-resistant, and self-adhered waterproofing underlayment. The advanced Burn-Shield Technology™ delivered the fire-resistance properties needed in one single layer, installed as part of the metal roof assembly. Moreover, in the United States, POLYSTICK® XFR qualifies for up to a 30-year warranty backed by the Polyglass USA protection guarantee.

IRE (International Roofing Expo)

1ST-3RD FEBRUARY 2022, NEW ORLEANS

IN THE SPOTLIGHT THE EXTENSIVE PORTFOLIO OF POLYGLASS SOLUTIONS FOR ROOFS

The International Roofing Expo (IRE), the most important event dedicated to the North American roofing industry, was held live in New Orleans inside the Ernest N. Morial Convention Center from 1st to 3rd February. Professionals from the sector had the chance to meet in person, share ideas and projects and find out more about the latest products and technologies the market has to offer. This year's expo was attended by 397 exhibitors and the event attracted 10,000 professionals from the sector.

ABOVE. The Polyglass USA booth at IRE 2022. **BELOW.** Various live product demos were held during the expo showing how to install Polyglass products and their benefits.

New products, technologies, and demonstrations

Polyglass USA also took part at IRE 2022 displaying an extensive portfolio of products for waterproofing roofs. Some products showcased at the event included POLYSTICK® XFR and POLYFLASH® 1C, which are distributed in the United States market by Polyglass USA.
Apart from being able to consult with Polyglass experts on the booth, visitors were also treated to live product demos featuring self-adhered, double-layered waterproofing systems with ELASTOFLEX SA V PLUS & POLYFRESKO® G SA with SEALLap® ULTRA and POLYFLASH® 1C.
Also, during the expo Marco Sieber, National Product Manager, and Betiana Acha, Research & Development Director from Polyglass USA, presented a seminar entitled "Maximizing Efficiency with Polyglass Self-Adhered Roofing Membranes". They spoke about how the cost and scarcity of qualified labor has marked the trend towards more efficient roofing systems which allow for quicker installation, like self-adhered roofing.

Here's to the next 30 years

At IRE Polyglass USA announced the 30th anniversary of the company's foundation in the United States. In fact, the logo designed specifically for the occasion was on clear view throughout the expo on the Polyglass booth. Also, online announcements were made about the launch through social media campaigns, newsletters, banners on industry websites and press releases in the most important trade magazines aimed at the construction sector. Through these initiatives, the aim of Polyglass USA was to present the company as a reliable, highly experienced partner ready to take on the challenges of the future.

XIX INTERNATIONAL REFERENCE GRAND PRIX

TOURISM AND WELLNESS
Steigenberger Hotel Munich - Germany
Mapei systems helped install around 8,000 m² of wooden floors and 5,000 m² of textile floors in the rooms of this new 4 star-plus hotel.

COMMERCIAL FACILITIES
Dream Island - Moscow - Russian Federation
The construction of the largest indoor entertainment facility in Europe involved the use of over 300 tons of Mapei adhesives and grouts for ceramic tiles, as well as numerous waterproofing and anchoring materials.

2021 Reference Grand Prix

57 MAPEI SUBSIDIARIES ENTERED OVER 300 PROJECTS IN THE 19TH EDITION OF THE GROUP'S IN-HOUSE COMPETITION THAT AWARDED PRIZES TO THE MOST PRESTIGIOUS BUILDING SITES MAPEI HAS BEEN INVOLVED IN LAST YEAR WORLDWIDE.

Finansparken building - Stavanger - Norway

KTM Motohall - Mattighofen - Austria

Baia Populara wellness centre - Sibiu - Romania

Palace Elisabeth Heritage Hotel - Hvar - Croatia

Robinson Blue Ierapetra - Crete - Greece

XIX INTERNATIONAL REFERENCE GRAND PRIX

The prize-giving ceremony for the winning projects was held online on 15th December. The event was hosted by Gaia Maggi (left) and Davide Acampora (right).

PUBLIC BUILDING AND PLACES
Faculty of Psychology, University of Malaga
Malaga - Spain
Mapei systems were used to bond the ceramic coverings of the façade and lay resin floors in interiors.

PUBLIC BUILDING AND PLACES
LaGuardia Airport Mosaic Mural
New York - USA
One of the largest indoor murals in the world, this 2,400 m² artwork was completed with products for ceramic tiles supplied by Mapei Corp. (ULTRALITE MORTAR, TYPE 1, KERACOLOR S, MAPESIL T).

PRODUCTION FACILITIES
Costa Humphrey pecan plant - Torreón - Mexico
MAPEFLOOR CPU/MF and MAPEFLOOR CPU/TC resin-based systems were applied on the floors of this pecan nut plant for a total surface of 7.500 m², ensuring compliance with legal requirements for food plants.

RESIDENTIAL BUILDINGS
Tetris Hall - Kiev - Ukraine
This unique residential complex is made up of two high-rise towers connected by a pedestrian bridge. Mapei supplied waterproofers, adhesives for ceramic and resilient floors used in interiors and exteriors.

Swiss Paraplegic Centre - Nottwill - Switzerland

Želivka water treatment plant - Hulice - Czech Rep.

The Woldring location - Groningen - Netherlands

Casas Vis housing project - La Mojana - Colombia

Jewel residential complex - Gold Coast - Australia

INFRASTRUCTURES
Route 6
Kowloon - Hong Kong
A strategic section of Hong Kong's routes network, Route 6 will be completed in 2025. Over 300.000 m² were waterproofed with Mapei and Polyglass solutions (PURTOP, MAPEPLAN TU S) in several sections and tunnels along the route.

INFRASTRUCTURES
San Giorgio Bridge
Genoa - Italy
Mapei admixtures ensured the maintenance of the mechanical properties when pouring the concrete for the piles and helped facilitate surface-finishing operations on the deck.

SPORTS FACILITIES
Ferenc Puskás Stadium
Budapest - Hungary
One of the largest ever investment in Hungary for a sports complex, the renovation of the stadium involved the use of Mapei waterproofers of different lines to solve specific problems.

SPORTS FACILITIES
2020 China Tennis Tour Guangdong, Hong Kong, Macao Greater Bay Area Open P.R.C., Macao, Hong Kong
A score-winning tennis competition organized by China Tennis Association with Mapei involved as sponsor and supplier of sport flooring solutions for the tennis courts in both 2020 and 2021 editions.

© Horizon

Grand Paris Express - Line 15 - Paris - France

Langur Way canopy walk - Penang - Malaysia

Scalo San Lorenzo basketball court - Rome - Italy

Club Sport Marítimo - Funchal - Portugal

© Massimo Sestini for #ItalyExpo2020

Expo 2020 Dubai - UAE

© Alice Clancy, Pritzker Architecture Prize

Yvonne Farrell and Shelley McNamara.

A cosmopolitan vision in a place's "spirit"

THE IRISH ARCHITECTS SHELLEY MCNAMARA AND YVONNE FARRELL, WINNERS OF THE 2020 PRIZE

The 2020 Pritzker Architecture Prize has been awarded for the first time to a pair of Irish architects, Yvonne Farrell and Shelley McNamara. The prize's panel of judges underlined their path towards innovation over time, while always respecting the distinctive traits and features of each specific setting.
They motivated the choice as follows: "For the integrity of their approach as well as the way they conduct their professional practice, for their confidence in working in partnership, for their generosity towards their colleagues, for their unwavering commitment to excellence in architecture, for their responsible attitude towards the environment, for their ability to be cosmopolitan while embracing the uniqueness of each individual place they work in".
Their architecture is characterised by striking structures, not so much due to their size as to their meticulous handling of proportions and use of materials. This is the case, for example, with the main structure of Bocconi University in Milan, which is a fortress-like construction that opens up to the outside world.

Sobriety and visual power

Yvonne Farrell and Shelley McNamara both graduated from the School of Architecture in Dublin in 1974 and four years later decided to set up Grafton Architects. In 1991 they joined forces with other small firms under the name "91 Group" to enter an international competition for the redevelopment of Temple Bar in Dublin's inner city, which they won with a masterplan entitled "Temple Bar Lives!". The project had a major impact on the cultural renaissance of the Irish capital. Grafton Architects designed the square and a housing/services building. For many years they preferred to work mainly in Ireland and Dublin in particular, with the aim of putting their city and country back on the map.
A series of projects from this period all share a sense of dialogue and integration between public and private spaces and close interaction between buildings and the surrounding landscape: Urban Institute of Ireland, University College Dublin, Solstice Arts Centre in Navan, Loreto Community School in Milford, the Offices for the Department of Finance in Dublin and the School of Medicine at the University of Limerick. The structures they designed stand out for variations between different floors and the sobriety and visual power of their lines. Their spaces are characterised by a combination of natural light and shadows so that the buildings blend into their surroundings while meeting the client's requirements.

An overview of places of learning

Since the beginning of their partnership, they have focused on designing places of learning for all age groups, from infancy to university education. The school buildings they design aim to incorporate the landscape, whether it be natural or urban, with spaces that encourage socialising and with "gazes across the landscape, eyes that leap over walls, gardens that transform enclosures into a blend of experiences".
They received their first international commission in 2001 after winning a competition for the new Luigi Bocconi University campus in Milan. The project won the World Building of the Year Award at the World Architecture Festival in Barcelona in 2008. The panel of judges admired "the mature treatment of space, light and local materials by architects who, although not from Milan, have managed to transfer the very essence of this city into confident, contemporary forms.
The project emphasises the public and social traits of academic life and its ability to cultivate relationships with the city and surrounding environment".
Other major international projects followed the Milan project, including UTEC University Campus in Lima (Peru), winner of the 'Silver Lion' at the 2012 Biennial of Architecture in Venice, and projects completed in 2019 for the Institut Mines Télécom Business School in Paris and the Toulouse School of Economics in Toulouse (France). Currently under construction are the London School of Economics and the Parnell Square Cultural Quarter city library in Dublin.
In 2018 Farrell and McNamara also curated the 16th edition of the Venice Biennial of Architecture that was devoted to the manifesto-theme 'Freespace'. Grafton Architects first took part in the Biennial of Architecture in 2002 and then again in the 2016 edition with a project entitled 'The Physics of Culture'.
As early as 1976 Farrell and McNamara combined design with teaching, giving courses at University College Dublin where they graduated, and then as visiting professors at Lausanne (Switzerland), Harvard and Yale (USA), and now at the Accademia di Architettura in Mendrisio (Switzerland).

We want to employ values like humanism, technical expertise and cultural connections with the settings in which we work

© Federico Brunetti, Pritzker Architecture Prize

The Bocconi University Campus in Milan features internal stone floors installed with Mapei products.

© Grafton Architects, Pritzker Architecture Prize

Institut Mines Télécom Business School in Paris

#CYCLING

Ernesto Colnago celebrates his 90th birthday with a lecture at Bocconi University

The famous bike manufacturer Ernesto Colnago celebrated his 90th birthday on February 9th at Bocconi University in Milan. From January 1994, the Mapei Professional Cycling team always used the racing bikes supplied by Colnago. Lots of technological innovations by this bike manufacturer are linked to Mapei's great achievements, such as the two 'hour records' set by Toni Rominger 1994, when Rominger used the steel-framed bikes by Colnago, and the use of carbon and straight forks for the frames that helped Mapei win 5 Paris-Roubaix races. "On the eve of Paris-Roubaix 1995," so Colnago said on February 9th, "Giorgio Squinzi (the former CEO of the Mapei Group) called me because he was worried: he had been told that the carbon frames and forks would break on the cobblestones of Arenberg forest. I told him not to worry because I had had the products tested by various engineers. Ballerini won by a mile, Museeuw also came third and Giorgio paid me all kinds of compliments: the carbon frames with straight forks had done very well". In the photo, Giorgio Squinzi (left) and Ernesto Colnago (right).

#CYCLING

Mapei is one of the Official Partners of the 2023 UCI Cycling World Championships

The 2023 UCI Cycling World Championships will take place in Glasgow and across Scotland (Great Britain) from 3 to 13 August 2023. Bringing together 13 UCI World Championships for cycling's different disciplines, it is expected to welcome more than 8,000 amateur and elite cyclists from at least 120 countries. Mapei's long-standing partnership with the UCI (Union Cycliste Internationale) began in 2008 and will continue in 2024. Mapei's CEO Veronica Squinzi said: *«After such a long partnership with the UCI, we wanted to confirm our support for this historic edition of the World Championships, which, for the first time, will celebrate every aspect of cycling. This sport continues to epitomise values like commitment, determination, perseverance and teamwork that also lie at the very foundations of our company".*
In the photo: Veronica Squinzi and David Lappartient, President of UCI.

#FOOTBALL

Argentina, sponsoring Club Atlético Lanús again this year

Once again in 2022 Mapei Argentina is sponsoring Club Atlético Lanús, the football club from the Lanús district of Buenos Aires that plays in the top division of the Argentine championship. Founded in 1915, the club is involved in 30 sports and has a stadium holding over 47,000 spectators. In 2020 Mapei Argentina began a sponsorship deal with the club involving both its women's and men's football teams. The deal has been renewed again this year, because, as the General Manager, Gabriel Ros, says: "it is a partnership with a famous club helping young people develop in sport and sharing values like passion, commitment, and determination, which are part of our corporate DNA. Sponsoring the women's team is also in line with our commitment to gender equality in miscellaneous realms".

ANDREA FABRIS (THE CLUB'S ORGANISATIONAL MANAGER) EXPLAINS THE ANTI-COVID MEASURES AND PROCEDURES

Sassuolo: how we have handled the Covid-19 crisis

Problems linked with Covid-19 have caused real economic damage to Sassuolo and all football clubs. "The top clubs - so Andrea Fabris noted, Organisational Director of Sassuolo - have lost tens of millions of euros and the economic damage to Sassuolo has been significant, too. No proper season ticket campaign and, in recent times, reduced ticket sales have resulted in clubs suffering heavy losses". There have also been indirect consequences, namely the costs of all the swab tests and serological tests in general, and all the medical checks that have to be carried out on the players. "In addition to normal examinations players have always taken on a regular basis even in pre-pandemic times - Fabris went on to say - over the last two years they have also had to take Covid-19 prevention tests as well. And prevention is not the only issue, of course: when a person finally tested negative after having Covid, we and the other clubs had to comply with a further protocol of checks and examinations before they could play football again".
On the subject of restrictions, playing in front of no fans or, in recent months, only partially filled stadiums has also had a negative impact on Sassuolo and top-flight football in general. The Sassuolo team trains at Mapei Football Center that opened in June 2019. It is a modern facility with several pitches, clinics, gyms, offices, and also the official headquarters of Sassuolo Calcio. "Given the current situation," Fabris continued, "for the last two years only the first team had been able to train at Mapei Football Center. It was necessary for us and other clubs to keep Serie A players separate from the men's youth teams and all the women's teams. This meant the women's and youth teams had to find other training facilities."

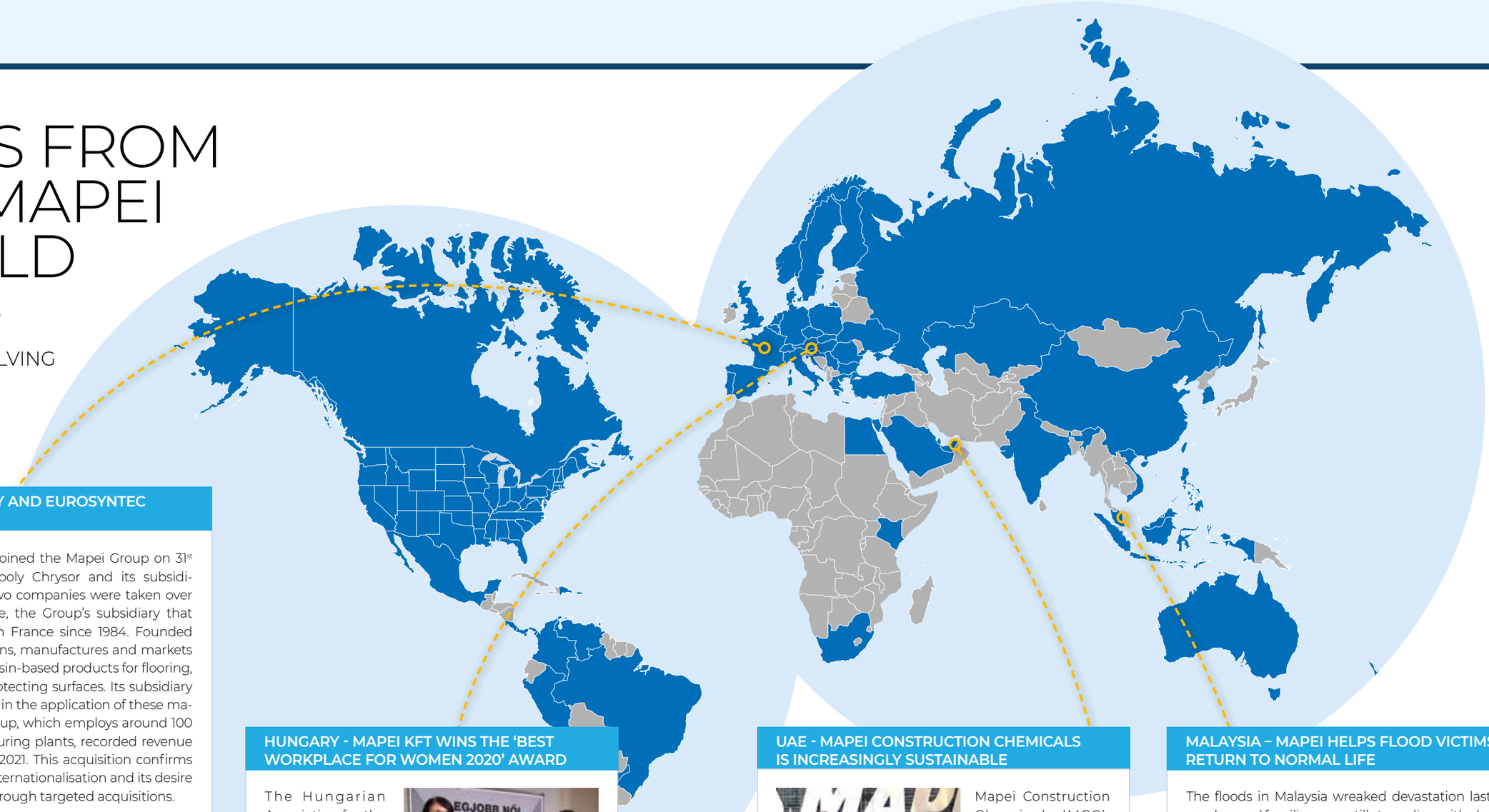
Covid-19 issues have changed people's habits all over the world. Does that even apply to the most passionate football fans? How have Sassuolo fans reacted?
"After two years of people hardly being able to go to stadiums, restaurants, theatres and night clubs but being able watch Serie A matches on television or on tablets, many fans have actually got out of the habit going to the stadium, although that really only applies to matches against mid-table teams. People still love watching games at the ground as is shown by the fact tickets are always in demand for big matches with stadiums filled to capacity in accordance with the anti-Covid regulations in force. In February maximum capacity was 50%.

What are the sanitation and prevention rules? What about the Covid-related procedures?
"As far as away matches are concerned, all the hotels we choose have measures in place to guarantee maximum safety for the team. Players can have lunch, dinner or breakfast in separate, reserved areas. Match and training gear and footwear are meticulously sanitised on a daily basis. Certain protocols are endorsed by the Italian Football Federation that we and other clubs have agreed to. As for the youth teams, only vaccinated players and those who have already had Covid can train.

Alessio Dionisi (left), Team Manager of Sassuolo, and Andrea Fabris (right), Organisational Director of Sassuolo.

NEWS FROM THE MAPEI WORLD

SPONSORSHIPS, EVENTS AND PROJECTS INVOLVING THE GROUP'S SUBSIDIARIES



FRANCE - RESIPOLY AND EUROSYNTEC JOIN THE GROUP

Two new companies joined the Mapei Group on 31st December 2021: Resipoly Chrysor and its subsidiary Eurosyntec. The two companies were taken over through Mapei France, the Group's subsidiary that has been operating in France since 1984. Founded in 1958, Resipoly designs, manufactures and markets innovative synthetic resin-based products for flooring, waterproofing and protecting surfaces. Its subsidiary Eurosyntec specialises in the application of these materials. The French Group, which employs around 100 people at 3 manufacturing plants, recorded revenue of 22 million euros in 2021. This acquisition confirms Mapei's vocation for internationalisation and its desire to continue to grow through targeted acquisitions.

HUNGARY - MAPEI KFT WINS THE 'BEST WORKPLACE FOR WOMEN 2020' AWARD

The Hungarian Association for the Professional Development of Women (MNKSZ) awarded Mapei Kft., the Group's Hungarian subsidiary, its third prize for the "Best Workplace for Women 2020" at a ceremony (in the photo above) held on 2nd December in Budapest. The project aims to promote women's career opportunities beyond just equal pay. The jury acknowledged Mapei Kft's commitment to guaranteeing every employee, regardless of their gender, an inclusive working environment, offering training courses that facilitate professional growth and interpersonal relationships based on ethics and an understanding of individual needs.

UAE - MAPEI CONSTRUCTION CHEMICALS IS INCREASINGLY SUSTAINABLE

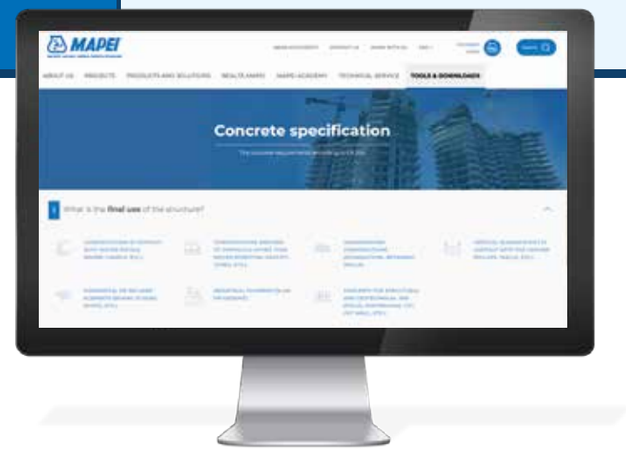
Mapei Construction Chemicals (MCC), the Group's subsidiary based in Dubai, recently reached an agree-ment with energy provider Yellow Door Energy to install 2,200 solar panels on the roof of its manufacturing plant. The plant, currently under construction, will generate 1.9 million Kw/h during its first year in operation, eventually reaching an output of 1.2 megawatts over the following years. The panels will cover 8,900 m^2 of the plant's roof and allow MCC to cover 85% of its energy needs, reducing its environmental impact by 800 tons of CO_2. In the photo: Stefano Iannacone, Mapei Group's Regional Director for Middle East and East Africa, e Rory McCarthy, Chief Commercial Officer of Yellow Door Energy.

MALAYSIA – MAPEI HELPS FLOOD VICTIMS RETURN TO NORMAL LIFE

The floods in Malaysia wreaked devastation last December and families were still struggling with clearing the mud and debris from their homes weeks after the disaster. Mapei Malaysia volunteered its assistance to Kiwanis association and was directed to a mother and her two young children in Shah Alam, Selangor. It took 13 staff volunteers (in the photo below) most of a day to clear damage items, clean muddy walls, windows and floors, wash salvageable items, and repair major wall cracks with MAPEGROUT PATCH 218.

WORK TOOLS

AVAILABLE IN ENGLISH ON MAPEI.IT



Concrete Specification

ON-LINE TOOL TO AID IN THE DESIGN OF CONCRETE ACCORDING TO EUROPEAN STANDARDS

The European standard EN 206 applies to concrete for structures cast on-site, precast structures and structural pre-cast products for building and civil engineering structures. The standard specifies the requirements for all constituents of concrete, the properties of fresh and hardened concrete, the limitation for concrete composition, the specification of concrete, the delivery of fresh concrete, the production control procedure and the conformity criteria and evaluation of conformity.

It also states that the concrete composition and the constituents for designed concrete should be selected to satisfy the requirements specified for fresh and hardened concrete, including consistence, density, strength and durability.

To help designers during this process, Mapei has a handy tool available in English on mapei.it which enables designers to obtain technical specifications for the concrete required for their specific project.

HOW TO USE THE TOOL

After accessing the dedicated page, the following need to be specified:

1. *type of element or structure under design and its intended final application;*
2. *compressive strength class;*
3. *exposure class;*
4. *in what type of environment will the concrete element be used (is it damp or not?);*
5. *consistency class;*
6. *the maximum aggregate size permitted for use in the mix;*
7. *the maximum chloride content specified for the concrete.*

Once all these data have been entered, the system generates a detailed technical specification that can be saved. New specifications can also be obtained by modifying these parameters.

The tool is available at www.mapei.com/it/en/tools-and-downloads/tools/concrete-specification

QUESTIONS & ANSWERS

STRONG POINTS AND AREAS OF USE OF THE SEVERAL PRODUCT RANGES

by **Marco Albelice**

Elastic sealants: a solution for every problem

Why should you use an elastic sealant?
Elastic sealants are specific products that help safeguard the integrity of breaks and gaps in structures even in the event of movements and deformations: joints, fissures, or cracks. In a structure exposed to atmospheric agents, water, dust, heat and noise are free to enter or escape through these breaks and gaps, thereby reducing living comfort and the durability of the structure.
An elastic seal, correctly executed, contributes to the durability and energy efficiency of the entire structure.

Are all elastic sealants made from silicone?
No. The elastic sealants category available on the market is now made up of various polymers: acrylic, bituminous, butyl, hybrid, polyurethane, and silicone polymers, each with its own specific physical-mechanical characteristics and specific areas of use.
Silicone sealants are just one of many different products in the elastic sealants category. The popularity of silicone sealants on the market, however, has led an (incorrect) use of the name of this group of products (silicone) and the name of the commodity category (elastic sealants): in fact, not all sealants are made of silicone.

Which are the best elastic sealants?
No elastic sealant is necessarily better than another one: each product group has specific physical-mechanical characteristics that make it particularly suitable for a particular type of application and less so for another type. For illustrative purposes, here are the key strong points of the most common product groups in the elastic sealants category:

➢ acrylic sealants
- easy to smooth
- paintable with elastic paint
- low-cost

➢ acetic silicone sealants
- easy to extrude and smooth off
- resistant to ageing
- resistant to high service temperatures and chemicals
- transparent version available (opalescent effect)

➢ neutral silicone sealants
- easy to extrude and smooth off
- adhere to a wide range of materials
- resistant to ageing
- resistant to high service temperatures and chemicals
- transparent version available (translucent effect)

➢ polyurethane sealants
- adhere to a wide range of materials
- high mechanical and tear resistance
- highly adhesive
- paintable with elastic paint

➢ hybrid sealants
- easy to extrude and smooth off
- adhere to a wide range of materials, including damp surfaces
- resistant to ageing
- limited surface dust retention
- transparent version available (crystal clear effect)

➢ epoxy-polyurethane sealants
- easy to extrude and smooth off
- strong and resistant to chemicals
- paintable or pigmentable on site.

Which product can I use to seal and bond different materials?
Mapeflex MS45 is a one-component, multi-purpose, flexible sealant for sealing vertical and horizontal joints between different absorbent and non-absorbent materials, including damp substrates: also, once set, it is compatible with elastomeric paints from the Mapei range. The same product may also be used as an adhesive to bond building components and features thanks to its initial grab power, rapid-hardening properties and adhesive performances.

Which sealant can I use for natural stone floor and wall coverings?
MAPESIL LM is an anti-stain sealant ideal for all types of absorbent and acid-sensitive stone; its chemical composition impedes the migration of liquids between the sealant and substrate, thereby preventing unsightly stains forming along the edges of joints caused by using unsuitable sealant. The wide range of colours available, coordinated with Mapei coloured grouts, allows them to be matched with the different colours of the most commonly used types of stone on floors and façades.

Which sealant can I use for ceramic floor and wall coverings?
MAPESIL AC is a coloured sealant specific for forming elastic seals in ceramic floor and wall coverings, bathroom fixtures, shower cabins and windows frames. The quality of the MAPESIL AC pure acetic silicone formula with Mapei BioBlock technology guarantees the maximum level of durability and performance. The extensive colour range available (40 different shades matching the Mapei coloured grouts) enables any aesthetic requirement to be met.

Which anti-mould sealant can I use in bathrooms and kitchens?
If an elastic sealant is frequently exposed to damp environments, mould and algae will probably form on its surface. Since mould and algae are a natural chemical reaction between damp, high temperatures and organic material, no sealant is able to prevent their formation. Certain elastic sealants, however, are able to delay them from taking root in surfaces thanks to the presence of special biocides that oppose the formation of efflorescence. Many products from the MAPESIL range are formulated with biocides, but only MAPESIL AC and MAPESIL LM benefit from BioBlock technology which extends biological protection for a long time, especially when correct, periodic maintenance is carried out on the sealant.

Which sealant can I use for industrial floors?
if a sealant is used on horizontal surfaces subjected to severe mechanical and chemical stresses and loads, it must have the capacity to elastically absorb movements in the joints and be able to resist contact with chemical substances and exposure to mechanical stresses caused by passing heavy goods vehicles. In this case, it is important that the sealant chosen for this specific use guarantees a balanced compromise of elasticity, resistance to chemicals and mechanical properties: MAPEFLEX E-PU 21 SL two-component epoxy-polyurethane sealant or MAPEFLEX PU35 CR one-component polyurethane sealant could be the right solution. Because of the number of factors in play, which depends on the specific area of use of the flooring, a personalised Mapei consultation could identify the most appropriate product for each specific case.

Which anti-fire sealant can I use?
In many civil and industrial settings, limiting the risk of fire is a determining factor when choosing the sealant. Some sealing products are formulated to reduce this risk, thanks to their particularly effective resistance to fire and their reaction in the event of fire. If a fire does break out, MAPEFLEX AC-FR 2 acrylic sealant and MAPESIL FR silicone sealant specifically guarantee high resistance to fire (the ability to delay the passage of flames, smoke and heat through joints) and low reaction to fire (the property to emit only a controlled amount and density of smoke and to limit the formation of incandescent droplets).

Technical Services, Mapei SpA (Italy)

PRODUCTS IN THE SPOTLIGHT

SEALING JOINTS IN CLEANROOMS, PROTECTING WALLPAPER, INSTALLING ALL TYPES OF WOODEN FLOORS

1

Mapeflex PU35 CR

HIGH CHEMICAL RESISTANCE, SUITABLE FOR CLEANROOMS

Highly deformable, high modulus of elasticity, thixotropic, one-component sealant for sealing expansion and contraction joints on vertical and horizontal surfaces in contact with aggressive chemical liquids. It complies with EN 14187-4, EN 14187-6 standards and ISO 2812-1 and meets the high standards required for application in sterile chambers (certified as CSM - Cleanroom Suitable Material - by IPA Fraunhofer). It is also certified as a product with low emission of VOC by GEV and complies with the requirements of the HACCP plan (Hazard Analysis and Critical Control Points) for use in food processing environments.

2

Mapecoat Decor Easy

PROTECTING FIBER-GLASS AND WALLPAPER

One-component polyurethane, aliphatic (non yellowing) and mat finish in water dispersion for protecting decorative fiber-glass and wallpaper in dry areas. It guarantees good resistance to abrasion and ultra-violet rays. MAPECOAT DECOR EASY is particularly suitable for making the cleaning of the printed wallpaper easier and to protect it from UV rays, when it is installed in dry areas. It is available in 1 liter canisters, is very easy to use and can be applied in one single crossed coat using a short-haired roller. MAPECOAT DECOR EASY is harmless for floor installers and end users.

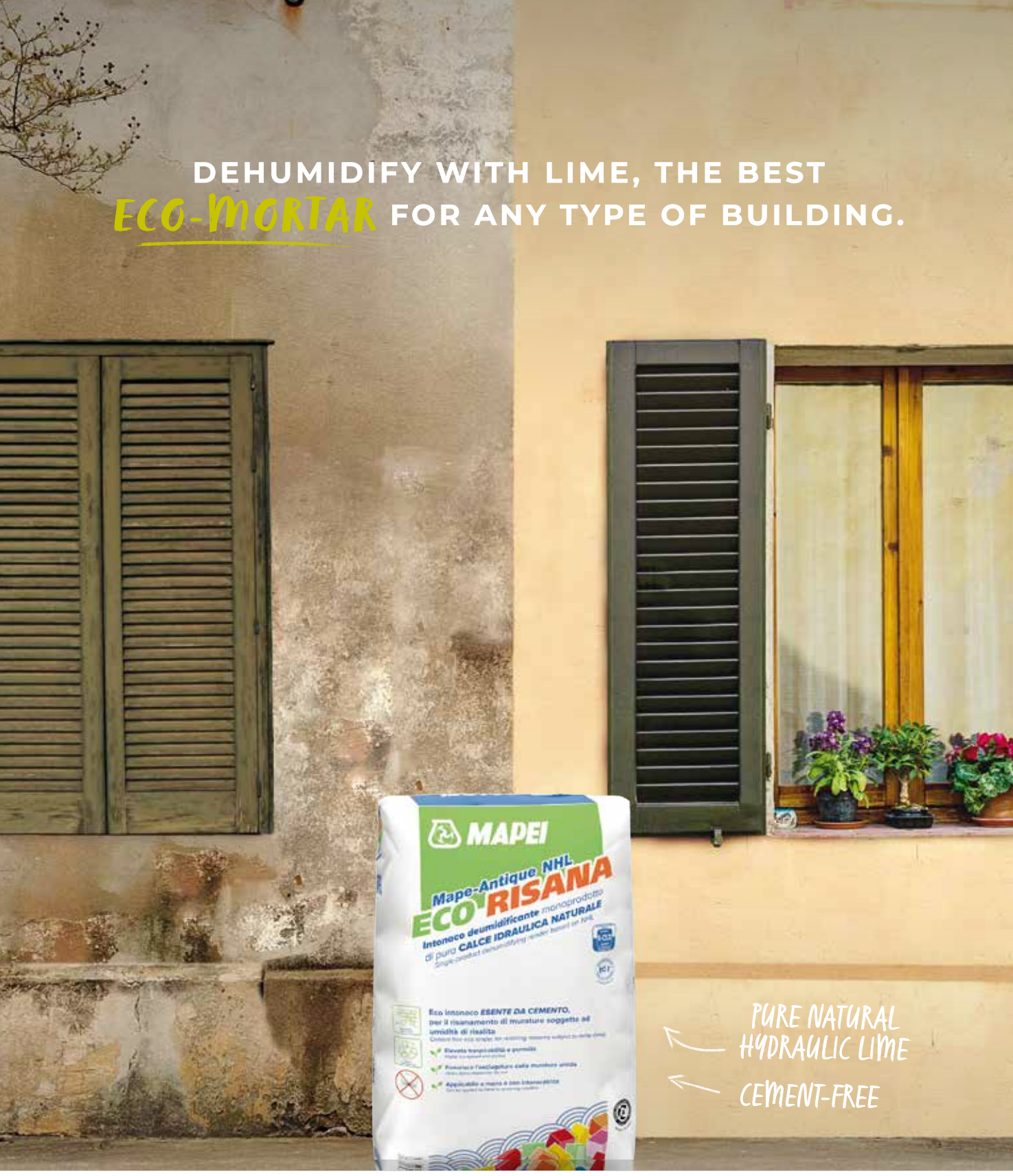
3

Ultrabond Eco S958 1K

HARD-ELASTIC ADHESIVE FOR ALL TYPES OF WOOD

One-component, hard-elastic silylated polymer-based adhesive with zero solvent content (according to TRGS 610).
It is especially suitable for installing all types and formats of pre-finished and solid wood flooring on any type of substrate, easy to remove from hands and pre-finished wood; and compatible with all ULTRACOAT OIL products and waterbased undercoats and varnishes from the ULTRACOAT range.
It is certified by GEV as a product with very low emission of volatile organic compounds (EMICODE EC)[Plus] and has obtained the Blauer Engel label.

DEHUMIDIFY WITH LIME, THE BEST ECO-MORTAR FOR ANY TYPE OF BUILDING.



Mape-Antique NHL ECO RISANA is the **single-product de-humidifying render made from pure natural hydraulic lime** and recycled materials, particularly recommended for **ECO**-compatible restoration work of existing masonry on any type of building, including listed builldings, with rising damp.

EVERYTHING'S **OK** WITH **MAPEI**

Learn more on **mapei.com**

MAPEI 85 years 1937-2022