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92

by **Guido Palmieri**
Realtà Mapei International's
Editor-in-Chief

The latest frontiers of infrastructures

Providing the country with modern and efficient infrastructures is not just a factor in growth, it also contributes to the concept of a nation-system that is decisive for building a competitive economy capable of attracting investment. In such a complex and uncertain period like the present day, infrastructure projects drawing on resources provided by the European Union can bring about a turnaround both in countries lacking in this respect (as is the case with Italy) and in economies that need to consolidate, such as those in Eastern Europe.

Substantial portions of the NRRP (National Recovery and Resilience Plan) of Hungary and Romania, for example, are earmarked for building or modernising road and rail networks. Not to mention the United States, where an infrastructure plan worth over 1 thousand billion US dollars has been launched.

Building new constructions and upgrading existing infrastructure are a priority in order to promote increasingly widespread and sustainable mobility.

Projects to renovate major existing works have, indeed, now become such an important and topical issue. "Concrete repair" is a key factor in this process and we have devoted a special issue of *Realtà Mapei International* to it. It is a field that requires specific knowhow and expertise based on a careful study of the causes of degradation and deterioration. Mapei is at the forefront of this kind of process devoting plenty of research to improving the durability of buildings following refurbishment and repair work. In this special issue we have selected some significant cases both in Italy and abroad.

REPAIRING CONCRETE TO ENSURE DURABILITY

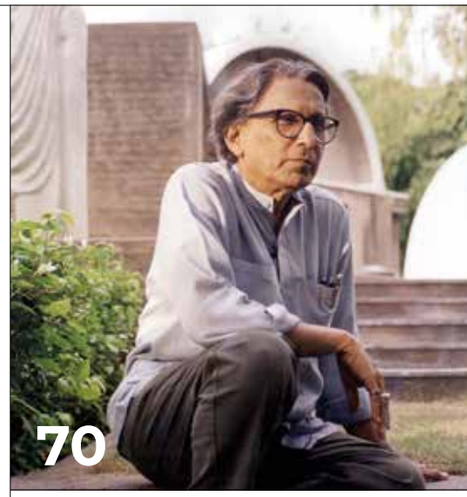
From research to internationalisation, another pillar of the Mapei philosophy. An important stage in this process has happened in France, where Mapei France, the subsidiary at the focus of the "Teamwork" section has been operating for over thirty years. Over this period in business, it has been involved in prestigious building projects (for example, the construction of Grand Paris Express, which, once completed, will be the largest urban mobility network in Europe) and has recently been further reinforced by the acquisition of Resipoly, a company specialising in synthetic resins.

The news does not end there. On the manufacturing side, Mapei has launched innovative products for protecting ceramic and natural stone surfaces. This new range will allow the Group to break into a new market niche and complete its range of products.

Finally, a couple of weeks ago Mapei opened new offices in Rome.

Enjoy your reading

SUMMARY



ERRATUM

The photo published at page 16 of issue no. 91 of *Realtà Mapei International* does not show the Church of Santa Maria Annunciata but rather the Church of San Francesco d'Assisi al Fopponino in Milan.
We apologize with our readers for the mistake.

Cover story
The focus of this issue of *Realtà Mapei International* is on Mapei solutions for concrete repair. It spotlights the innovative range of products the company developed for this field and a series of works carried out with these products all over the world.

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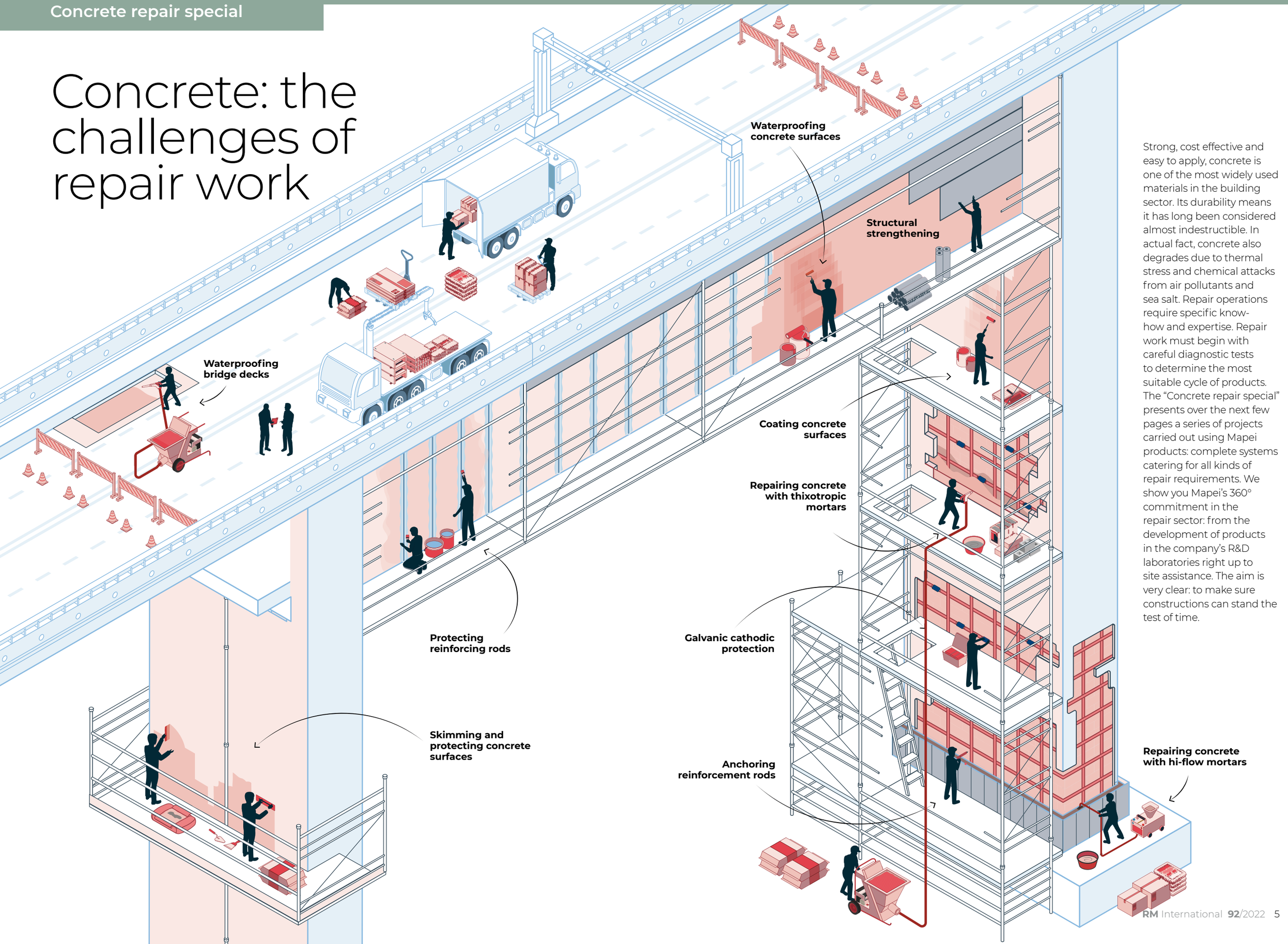
Concrete: the challenges of repair work



Strong, cost effective and easy to apply, concrete is one of the most widely used materials in the building sector. Its durability means it has long been considered almost indestructible. In actual fact, concrete also degrades due to thermal stress and chemical attacks from air pollutants and sea salt. Repair operations require specific know-how and expertise. Repair work must begin with careful diagnostic tests to determine the most suitable cycle of products. The “Concrete repair special” presents over the next few pages a series of projects carried out using Mapei products: complete systems catering for all kinds of repair requirements. We show you Mapei’s 360° commitment in the repair sector: from the development of products in the company’s R&D laboratories right up to site assistance. The aim is very clear: to make sure constructions can stand the test of time.

Overview of Mapei's range of products

FROM PROTECTING REINFORCEMENT RODS TO COATING CONCRETE SURFACES: A SOLUTION FOR EVERY NEED

PROTECTING STEEL REINFORCEMENT RODS

• MAPEFER and MAPEFER 1K, anti-corrosion cementitious mortars for protecting steel reinforcement rods. They actively protect against aggressive atmospheric agents.

THIXOTROPIC MORTARS FOR CONCRETE REPAIR

• MAPEGROUT EASY FLOW and MAPEGROUT EASY FLOW GF: one-component, fibre-reinforced, thixotropic mortars especially suitable for repairing concrete structures by using a spray rendering machine. They are ideal when easy pumping is required over long distances and under constant high heads. The latter is also used to increase concrete sections.

• MAPEGROUT T60, MAPEGROUT BM, MAPEGROUT BMT3 and MAPEGROUT LM2K: thixotropic mortars for concrete repair.

HI-FLOW MORTARS AND MICRO-CONCRETES FOR CONCRETE REPAIR

• MAPEGROUT HI-FLOW and MAPEGROUT HI-FLOW GF: shrinkage-compensated, fibre-reinforced mortars. They are especially suitable where particular thicknesses and conditions of deterioration require the use of hi-flow concretes.

• MAPEGROUT GF BETONCINO B1 and MAPEGROUT HI-FLOW B2: hi-flow, shrinkage-compensated, fibre-reinforced micro-concretes. They are used where certain thicknesses and special conformations require the use of hi-flow pre-dosed concrete.

• MAPEGROUT HI-FLOW TI 20 and MAPEGROUT SV FIBER: hi-flow, shrinkage-compensated, high-ductility cementitious mortar, reinforced with stiff steel fibres, used to repair joints in motorways.

PROTECTING AND FINISHING CONCRETE SURFACES

• MAPELASTIC GUARD: two-component, flexible cementitious mortar for protecting large concrete structures subjected to high stress. It is ideal for protecting concrete piles and decks on road and railway viaducts from carbon dioxide penetration; protecting structures with insufficient concrete cover around reinforcing steel; protecting concrete surfaces that come into contact with seawater and de-icing salts such as sodium chloride and calcium and sulphate salts.

• MAPEFINISH: two-component cementitious mortar for finishing concrete surfaces. It is especially suitable for smoothing and finishing concrete repaired with MAPEGROUT line mortars and protecting the concrete against mildly-aggressive agents from the surrounding environment.

COATING CONCRETE SURFACES

• Elastomeric cycle comprising MALECH, acrylic water-based primer, or ELASTOCOLOR PRIMER penetrative primer and ELASTOCOLOR PAINT colored elastomeric paint.

• Epoxy-polyurethane cycle comprising MAPECOAT E 23 two-component epoxy primer, and MAPECOAT PU 33, flexible coating based on two-component polyurethane resins.

WATERPROOFING BRIDGE DECKS

• PLANITOP BD: one-component rapid-drying highly elastic cementitious waterproofing mortar for concrete road decks.

ANCHORING PRODUCTS

• MAPEFILL and MAPEFILL R: high-flow non-shrink cementitious anchoring grouts for filling rigid joints between concrete elements and precast concrete.

• MAPEFIX PE SF: two-component, styrene-free product made from a mixture of polyester resins. It used for anchors on concrete and masonry.

• MAPEFIX VE SF: chemical styrene-free vinylester anchor for structural loads.

• MAPEFIX EP 100: epoxy resin-based chemical anchor for structural anchors, with service life of at least 100 years, including in seismic areas.

STRUCTURAL STRENGTHENING

• MAPEWRAP C SYSTEM: Structural strengthening system consisting of high-strength, high-modulus, carbon fibre fabric and epoxy resins to impregnate and bond the fabric.

• CARBOPLATE SYSTEM: Structural strengthening system consisting of pultruded plates in high-strength carbon fibre and epoxy resins to bond the plates.

• PLANITOP HPC range: two-component, shrinkage-compensated, free-flowing, high ductility cementitious mortars with FRC (Fibre-reinforced concrete) technology and stiff steel fibres.

GALVANIC CATHODIC PROTECTION FOR REINFORCEMENT RODS

• MAPESHIELD I: pure zinc anodes coated with a special conductive paste.

• MAPESHIELD E25: 25-cm self-adhesive zinc plate applied directly on the surface of structures.

The Sfalassà viaduct in Southern Italy was repaired between 2010 and 2012. using Mapei products.

RESEARCH AT THE SERVICE OF MAJOR INFRASTRUCTURES

by **Marta Bovassi**

HOW A CONCRETE REPAIR PRODUCT IS CREATED IN THE LABORATORY

Repairs to the concrete of large-scale infrastructures has become an issue of primary importance as shown, unfortunately, on reports and bulletins issued by news outlets in recent years. Each structure in reinforced concrete starts interacting with the surrounding environment as soon as it has been constructed.
Factors such as carbon dioxide, water, aggressive substances such as chlorides and sulphates, thermal stresses (freeze/thaw cycles), etc., along with possible design and construction errors, all lead to various forms of deterioration: efflorescence and liquids percolations, corrosion of reinforcement rods, cracks, detachment, etc. Repair work on concrete, therefore, is an operation that requires specific knowledge and skills, starting from an analysis of the causes of the deterioration, to defining the correct techniques for the intervention and choosing which types of products should be used.
Repair work on concrete is covered by European standard EN 1504, which is sub-divided into different sections that define the main chemical/physical and performance properties of products used for repair work.
In order to guarantee the structure fulfils its expected service life after it has been repaired, apart from complying with the properties specified by current standards, the material used for the repair work must also satisfy the principle of durability.

The challenge facing Mapei is to find the right balance between the cost-effectiveness of materials and performance standards

by **Giulio Morandini**

From preliminary survey to site assistance

GIULIO MORANDINI DISCUSSES THE MAPEI PRODUCT PORTFOLIO FOR THE BUILDING SECTOR

Concrete repair is one of the most important challenges facing contemporary architecture. What cutting-edge proposals are currently available from Mapei?
Mapei has always focused a great deal of attention to the technological value of its products and has also been committed to supplying technological proposals that are durable over time and, therefore, sustainable. For us as a Group, durability and sustainability are important objectives. We have numerous proposals for restoring reinforced concrete and each one takes into consideration a particular problem, for which we have at least one specific solution. The repair of reinforced concrete is highly dependent on the surroundings where the structure to be repaired is located. Renovating the front edge of a balcony on a residential building, for example, is completely different to carrying out restoration work on a reinforced concrete structure facing the sea, and hence exposed to far more aggressive surroundings. It depends very much on the age of the structure, its exposure to atmospheric agents, how deep the deterioration has penetrated, other work carried

Measurement of bond strength by pull-off according to EN 1542.

Mapei has always been very sensitive to this problem and, through our Research & Development laboratories, we are constantly striving to improve the durability of concrete with our products.

How is a Mapei product for concrete repair developed?
Formulating a repair product is a process that requires time and study both in the definition of the composition and in the determination of the characteristics, as well as in the subsequent evaluation. The initial phase focus on reproducing various formulates in order to choose the appropriate ingredients in terms of quality and environmental sustainability, and then combining them to obtain a mix that is functional from every perspective. The formulate must also meet all the requirements in terms of chemical, physical and mechanical properties specified by current standards as well as specific requirements necessary for its use. Formulates are then evaluated according to various test methods to find out the most suitable one.

Focus on durability
As mentioned previously, it is fundamental that products for repair work are durable over time. In fact, particular attention is dedicated to studying the main characteristics in terms of durability: a good level of adhesion to guarantee the monolithic nature of the existing structure, dimensional stability to contain shrinkage that causes cracking, protection against ingress of aggressive agents, etc.
To verify and guarantee how effective they really are, products are studied by simulating the problems that can occur outdoors under real service conditions, reproducing the various

out over the years and its area of use over the years.
For every problem we have a solution. Two examples of “representative” Mapei products I would like to mention are, for restoration work in the civil building sector, PLANITOP SMOOTH & REPAIR, a product used to reintegrate a section to its original size and shape and, at the same time, create a surface suitable to receive the final finish. With just one single product you can repair a deteriorated section and skim the surfaces. Site operations are therefore simpler and quicker and, at the same time, overall costs can be contained.
As far as infrastructures are concerned, a few years ago we developed a type of mortar that can be applied by spray to considerable heights and pumped over very long distances. I am talking about MAPEGROUT EASY FLOW, a fibre-reinforced mortar that, thanks to its versatility, is particularly appreciated on large-scale sites. Its application thickness can be varied to suit the area being restored. A solution adopted on a lot of motorway viaducts we work on.

What structural and materials analyses do you normally use as a starting point before proposing an intervention using Mapei systems?
When we are commissioned to work on a site, the first thing we do is to carry out a thorough diagnostic analysis to get a clear picture of what triggered deterioration in a structure. We usually carry out chemical analyses to check the presence and depth of aggressive substances, then we assess whether there are potential structural deficiencies. Then, if necessary, we suggest carrying out load tests that enable us to understand the structure’s level of residual strength, along with many other specific analyses according to the type and extent of deterioration on the structure in question.
This phase is of fundamental importance because, only once we have all the relative diagnostic data, are we able to understand and propose the most appropriate repair cycle. Mapei’s Research & Development laboratory also acts as a test lab.
So, if a client wishes to take advantage of our consultancy service, we are also able to support them during the diagnostic phase.

What criteria should be taken into consideration to choose the most suitable products before undertaking repair work?
The level of aggression of the surroundings in which the structure is located is certainly one of the criteria, followed by the depth and extent of the deterioration and the thickness that needs to be reintegrated, and then the structure’s area of use. So, only once we have completed the diagnostic analysis and got a clear picture of where the structure is located, and checked the thickness to be reintegrated and the structure’s area of use, are we in a position to meet with the client to propose what we consider to be the most appropriate Mapei systems and products to solve the problem or problems presented by the site.

What type of site assistance is Mapei able to provide?
We can provide complete technical assistance at 360 degrees! Mapei is renowned in the sector for the level of assistance it provides, right from the site survey, diagnostics and analysis phases. We also interface with construction companies both when proposing work cycles and procedures and during the actual application of our products. Our offer as far as technical assistance on site is concerned, and not only on site, is second to none. This level of support and the approach to assistance provided by Mapei is valid for all sites: from a simple front edge of a balcony to large-scale infrastructures, from small to major projects. And it also contemplates constant presence on site, particularly if requested directly by the client. Work teams made up mainly of engineers have been created in Mapei to provide further support for requests. Each team is assigned to a specific type of problem: repairs and renovation, structural strengthening, restoration and protection, and so on. These teams are highly specialised and are made up of people with specific technical expertise and the ability to tackle all the problems and needs of construction companies, designers and clients. Every intervention has its own dedicated team and, if the need arises, they can also work and interface with all the other teams.

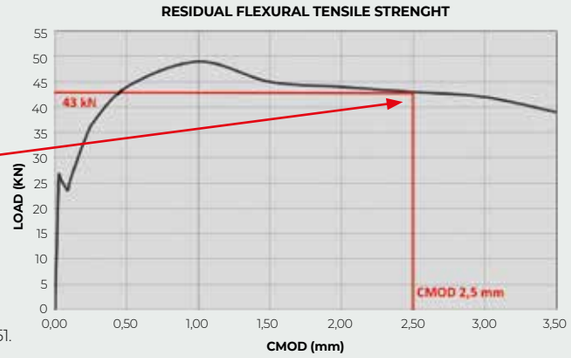
Corporate Product Line Director - Building, Mapei Group

types of stress they have to withstand. To evaluate the quality of Mapei formulates accurately, we are also very careful about the choice of test methods to be used, favouring those methods that guarantee good repeatability of results, but which are also able to simulate as closely as possible real exposure conditions. For many years Mapei has been highly dedicated and committed to the development of standards by participating in work groups with Italian and international organisations and associations. Sometimes standards are incomplete and/or propose test methods impractical and not particularly selective. Thanks to our extensive experience we can help improve these standards and even bring them in line with the latest market demands.
Durability cannot be assessed through laboratory tests alone on small quantities of a product which is why, with the help of Mapei Technical Services team, in the test areas of our laboratories we simulate the real types of product mixes and the real application phases like in job sites. Then we study the durability of these artifacts over time by means of adhesion tests, by monitoring the dimensional stability and by evaluating carbonation and/or the penetration of aggressive agents. Thanks to this approach we are able to finally arrive at product formulations with guaranteed properties even in the most critical service conditions.
Another aspect that needs to be taken into consideration is the economic viability of a product.
A competitive product from an economic perspective, however, is not always a guarantee of quality: the challenge for Mapei is to find the right balance between the economic viability of a material and its performance qualities, which have always been a trademark of our products. Once the development process of a product has been completed, we also work with accredited testing institutes to certify and guarantee its performance properties to further confirm what has already been studied and tested.

Special attention is focused on studying the main features of durability

Complete product systems
Up until this point, we have described how a product used for repair work is formulated in the Mapei R&D Laboratories.
From our point of view, however, to talk about a product alone is not exhaustive: sometimes a single product is not sufficient.
For really effective, durable repair work we believe it is fundamental to recommend a product system that provides protection for the reinforcement rods, repairs and restores concrete using structural and non-structural products and, above all, protects the concrete, a fundamental aspect in order to guarantee the durability of structures. This aspect, therefore, must also be considered in the case of new constructions to ensure they fulfil their designed service life.
So, our activity is not limited to formulating and studying a single product; it involves the study, research and evaluation of the benefits of repair work carried out using complete product systems.
The final aspect, and one which should never be overlooked, is how the products mentioned above are actually applied. To get the best results from repair work the way they are applied on site is fundamental: a high-quality product applied incorrectly could have a more negative influence on the final result of repair work than a poor quality product applied in the correct way.
This is why the work carried out in our laboratories includes also the drafting of technical documentation (technical data sheets, application manuals, operating instructions, etc.) in order to provide all the information and details required for the correct use of a product.

Research & Development Laboratories, Building Line, Mapei SpA (Italy)



Measurement of residual flexural tensile strength according to EN 14651.

This is how we “invented” what are still winning products

PASQUALE ZAFFARONI TELLS US ALL ABOUT A LINE CREATED AT THE END OF THE 1980’S WHEN MAPEI DEBUTED IN THIS SECTOR

Giorgio Squinzi and Pasquale Zaffaroni during a business trip in China.

Mapei’s Building Products Line was officially created in 1988 when I joined the company. Initially, Mapei produced adhesives for ceramic tiles. The Building Products Line was created thanks to a brilliant idea of Giorgio Squinzi who, apart from being CEO of the Mapei Group, was also Head of Research & Development and wanted to enter a new market: the building sector, a growing market represented by well-known names such as Sika and MAC, now called Master Builders Solutions Italia.
Giorgio Squinzi wanted to undertake the same journey as these two companies and become just like them, providing the sector with a complete, 360° service.
So, I joined Mapei with an ambitious objective: to compete with Sika and MAC at 360° in the construction sector.
Giorgio Squinzi’s project was simple: Mapei was the leading company in Italy when it comes to retailers of adhesives for ceramic tiles, marble and wood and resilient floorings, which means that with their support we could start making our products for building appreciated and well-known too. Thanks to the manufacturing plant in Robbiano di Mediglia, near Milan, Mapei has always had a good record as a manufacturer of powders and adhesives, which is why we assumed that starting with mortars for repairing concrete would allow us to make the most of our production capacity.

We started out with mortars for concrete repair to introduce high-quality products ensuring durability

How a product line is created
The sand used to make adhesives is very fine with a diameter of 0.2-0.3 mm, whereas for building products we needed different raw materials, such as coarser sand at least 2.5-3 mm in diameter. I visited retailers in person, and went to plants and quarries to buy the raw materials (sands, superplasticizers, fibres, silica fume, etc.) which I needed to formulate the mortars.
After a short time, we took part in a trade fair, SAIE 2, with the first products we had made and which are still in production today: MAPEGROUT THIXOTROPIC (still a very popular product), MAPEGROUT BM, MAPEFER for protecting reinforcement rods and MAPEFINISH skimming mortar. As a final protective finish, we presented MAPECOLOR paint, which was later superseded by ELASTOCOLOR. The products for the building industry we presented are still part of our product portfolio after all these years, thanks to the initial set-up we gave to the line which was to focus on quality above all else. We wanted to make the best possible entry into a very difficult and complex market, where retailers play a key role but it is also important to meet the requirements of small and large companies and, above all, designers. What is more, from the very start we focused on durability: any work carried out today must be guaranteed to last a long time.

The construction of the Storebælt bridge in Denmark involved the use of MAPEFILL fluid expansive mortar for anchoring and MAPELASTIC mortar for waterproofing operations.

To sell a product start with the packaging
Another important factor that set us apart from the others from the beginning – and here the contribution from Adriana Spazzoli, Mapei Group’s former Operational Marketing and Communication Director, was fundamental – was product packaging. The quality of Mapei packaging has always been very high but we wanted something special for the Building Products Line. Therore, we included a photograph showing the application of the products on both the labels of drums and canisters and the bags of powder products. A certain problem was simulated with the help of professional applicators and photos were taken by a professional photographer using different lights and angles to be able to choose the best photo to print on the packaging. In so doing, the packages on display in a retailer’s store were immediately identifiable: upon entering the store a client would see the package with a photo of deteriorated concrete and its exposed reinforcement, and a hand holding a trowel applying the mortar. The aim was not only to set us apart from our competitors, but also, and above all, to make life on site easier for our clients. Particular attention has also been paid to trade fairs and exhibitions: on our display stands we had four product demonstrations in just one day with their packaging clearly on view. Mapei was truly innovative under this aspect and the only manufacturer of building products to have a stand with such a powerful visual impact at the time.

Over the years we developed new mortars and added them to our portfolio to enhance a product line in constant evolution

The building products line grows and evolves
We gradually added more new products: form releasing agents and waterproofing mortars such as PLANISEAL88 (former IDROSILEX PRONTO), followed by MAPELASTIC, still one of our most outstanding products. We also developed admixtures for concrete.
The collaborative relationships we established in the first few years with renowned university professors, such as Mario Collepardi, proved to be very important. We began holding seminars all around Italy in the presence of up to 400 people. During these events Professor Collepardi talked about durability and deterioration, while we from Mapei talked about repair work and admixtures. The Mapei brand gradually started to make headway in the building sector, as well as amongst engineers. We then created a team of young engineers to promote our products among designers, contractors and owners and, later on, a section of the Mapei Technical Services dedicated to the building sector.
Over the years other product lines were created, such as the waterproofing line, the masonry restoration line, the structural strengthening line and the coatings line. We dedicated a lot of work to the prevention of deterioration which, in my opinion, will be the issue of the future. We added new mortars with different characteristics to the product portfolio such as MAPEGROUT EASY FLOW for repairing viaducts, which can be easily pumped up to 100 m of height. Then it was the turn of MAPESHIELD anodes to combat corrosion and fibre-reinforced mortars. All in all, this line will always be going through enormous evolution.

And then there are the projects
Amongst the projects most dear to me there is the restoration of the Solomon R. Guggenheim Museum in New York, a project which included specific testing protocols on the materials, lengthy periods of analysis and site surveys.
I also have fond memories of the Storebælt bridge in Denmark, one of the longest cable-stayed bridges in the world which connects the mainland to the islands. After a series of tests carried out at the Mapei plant, we supplied MAPEFILL mortar for the bearing elements and MAPELASTIC to protect them.
As far as Italy is concerned, I would like to mention the viaduct in Roccaprebalza where, to repair the pillars, we developed a new formula directly on site for what would become MAPEGROUT EASY FLOW repair mortar.
To finish off, I would like to mention the Sfalassà viaduct, again in Italy, where not only did we use MAPELASTIC GUARD waterproofing mortar for the first time, which was specifically developed for this site; it was here where we also recommended the application of MAPESHIELD zinc anodes for the first time.

Pasquale Zaffaroni. Ex Corporate Product Line Director - Building, Mapei Group

by **Giovanni Plizzari**

The cost to the environment is lower with new technologies

WITH FIBRE-REINFORCED CONCRETE CO_2 EMISSIONS ARE ALSO REDUCED

You have been involved in repair work on concrete structures for many years. What impact have special materials for structural applications had on work times and methods over the years?
Every new product or technology also brings something new to the way we conceive and construct new structures and to how we approach repair work on existing structures. With regards to fibre-reinforced concrete (FRC), the presence of fibrous strengthening that gives material a certain level of tensile strength leads to a reduction and, in some cases, the complete replacement of traditional reinforcement. This means the total amount of reinforcement can be reduced, but also the time required to make sure the reinforcement has been positioned correctly, which is normally carried out by the Director of Works. Having no reinforcement means it is no longer necessary to respect the minimum amount of concrete cover required and, at times, this means thicknesses within a structure can be reduced.
A typical example is when strengthening existing slabs by applying a layer of structural concrete to the extrados. With normal concrete reinforced with metallic mesh this layer has to be at least 50 mm thick (to include the amount of concrete cover over the mesh and the total thickness of the mesh in the areas where it has to overlap). By using FRC, the thickness can be reduced to 25-30 mm, that is, half that using traditional reinforcement. This is particularly useful in reducing the extra weight acting on a deck, but also the cost the environment has to pay due to lower production of CO_2.

How important is it to know and understand the materials used previously on an architectural structure before designing a truly effective repair proposal?
An architectural project tends to look at a construction in its entirety and has to interpret the opportunities offered by new materials and new technologies to optimise the performance of the construction. A typical example is being able to reduce the thicknesses within a structure which allows for more freedom and a sense of lightness in its geometry.

The repair of concrete structures is a much discussed topic at the moment and, in the coming years, will take on an increasingly significant role. What solutions do you think will come to the fore in the future?
Restoring and refurbishing existing buildings is obviously a topic of great interest and of enormous importance in countries like Italy, where there is a very high proportion of buildings constructed after the Second World War when the requirements were very different and certain problems, such as safety in the event of earthquakes, were not particularly considered or felt. As we said previously, the new materials are very useful, I would go as far to say winners, when it comes to repairing existing structures and infrastructures. Reducing minimum thicknesses in structures, as mentioned previously, may also be particularly useful when repairing bridge decks, where the weight of the structure is a particularly significant portion of its total weight.

> **“ Reducing minimum thicknesses in structures is decisive in the repair of structures**

What future do recycled materials have as a replacement for aggregates in structural concrete?
The circular economy and sustainability will be the key themes for the construction market in the upcoming years, also because caring for the environment has become non-negotiable. We must be very careful with our natural resources, such as aggregates, and prevent other products ending their life cycle as landfill. We already know we can use certain “waste” materials, such as products from demolition work and slag from steelworks, as a partial replacement for natural aggregates in concrete. Apart from these, other materials could be used for the same aim. This is why we need to let designers and contractors know about this important opportunity and make more use of them, and underline that using these types of concrete guarantees the same performance properties of concrete with natural aggregates. In the medium term, structural design will work increasingly alongside environmental design because these two design approaches can no longer be considered as separate, for the good of our planet.

Mapei products for concrete repair were used on this viaduct that stretches along the East Ring Road of Milan (Italy).

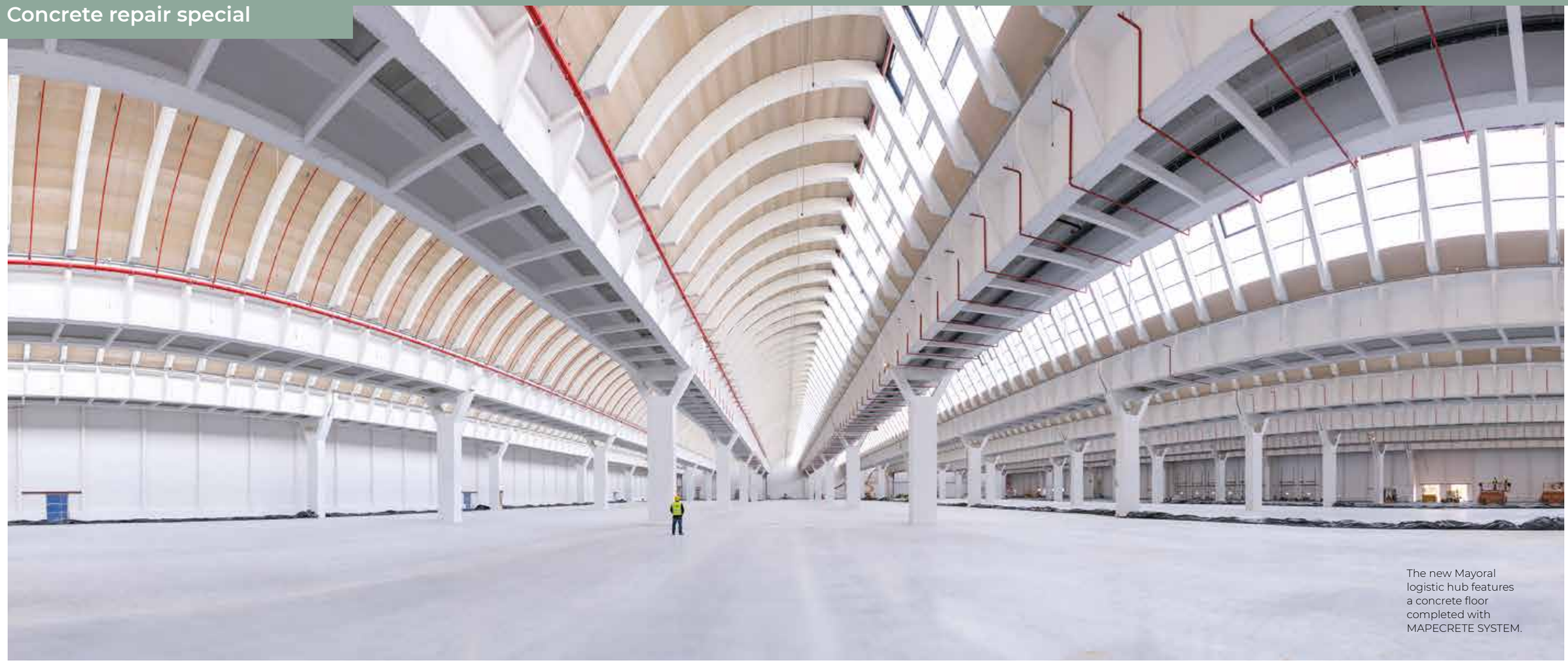
The durability of concrete: what are the most effective techniques to build structures that are able to resist the rigours of time?
The cost of a construction’s life cycle includes the cost of maintenance work required to ensure it maintains its expected level of performance throughout its entire life cycle. And this is why durability is a fundamental aspect that has to be taken into consideration when designing a structure. Guaranteeing durability means choosing materials and construction features and criteria suitable for the environment in which the structure is located. With regards to reinforced concrete structures, durability requires concrete mixes with low porosity and crack-control properties to prevent aggressive substances present in the surrounding environment reaching the reinforcement. Non-metallic reinforcement is also available nowadays on the market that does not suffer the effects of corrosion.

What is the best way of preventing cracking in concrete and corrosion of its reinforcement?
To prevent cracking in concrete and the possibility of corrosion in its reinforcement, first and foremost the design stage needs to consider reducing or eliminate the risk of cracking through pre-stressing. An alternative method to reduce the width of cracks is based on the use of fibre-reinforced concrete, which is particularly effective in achieving this. Also, to guarantee good structural durability, its performance properties need to be proportionate to the aggressiveness of the surrounding environment.

> **“ Guaranteeing durability means choosing materials suitable for the environment in which the structure is located**

GIOVANNI PLIZZARI
Professor of Building Technology in the Department of Civil Engineering, Architecture, Land and Environment of the University of Brescia, he is the author of over 200 scientific publications. His research has mainly focused on studying the behaviour of reinforced concrete structures and special materials for structural applications. Over the years, he has carried out research into fibre-reinforced concrete (FRC) for structural applications, focusing on industrial flooring and precast structures; more recently, he has analysed the possibility of using fibres for the inside surfaces of tunnels.

Full Professor, Building Technology, University of Brescia (Italy)



The new Mayoral logistic hub features a concrete floor completed with MAPECRETE SYSTEM.

Málaga (Spain)

Mayoral logistics hub

A FORMER INDUSTRIAL COMPLEX RECONVERTED WHILE MAINTAINING THE IMPOSING 200 M STRUCTURE INTACT

One of the nominees in one of the most recent editions of the Mies van der Rohe European Architecture Award was the renovation work on the Intelhorce factory designed by Manuel María Valdés and Ramón Vázquez Molezún between 1958 and 1963. The construction of an industrial complex in this area was completed thanks to a decision taken by the Spanish government to alleviate the difficult economic situation the Province of Málaga was going through at the time, through the creation of a state-owned company, Industrias Textiles del Guadalhorce (Intelhorce). Manuel María Valdés and Ramón Vázquez Molezún (the latter one of Spain's most prominent architects in the post-war era) designed the construction of a large-scale industrial complex which, apart from the production buildings, also featured office space and areas for the workers' activities and tools.

The building used for finishing operations, also known as "the industrial cathedral of Málaga" or "the ship", is now the last remaining example of Málaga's manufacturing traditions of the 20th century and is listed in the Spanish DOCOMOMO's (Committee for Documentation and Conservation of Buildings, Sites and Neighbourhoods of the Modern Movement) Register for the conservation of urban buildings from the Modernist era. It is also in the Andalucía Register of Listed Buildings and is under the protection of the Special Intelhorce Plan approved by Málaga City Council in 2011.

Left to its own devices since ceasing manufacturing activities in 2004, the building was purchased by Mayoral in 2013 with the intent of transforming it into the company's new logistics hub. The new owners decided to leave the imposing, 200 m-long quadrangular structure intact by renovating the reinforced concrete elements with more than half a century of service.

The space is divided into 9 longitudinal and 8 transversal axes with spans of 15 m and 30 m, respectively, with monumental "Y" pillars supporting the double beams for the semi-circular roof in pre-cast concrete.

Restoration and strengthening work on the structure

Restoration and renovation work on the building started with the repair and protection of its structural elements. The designers and technicians involved in the project carried out a survey of the entire structure and identified 12 different types of repair work that needed to be carried out. Basing their considerations on the results of the survey and the mechanical properties of the existing concrete, the Technical Services team from Mapei Spain, the Spanish subsidiary of Mapei Group, was able to establish the most suitable systems and products to renovate the structure and to protect it from carbonation and exposure to chlorides.

The first step was to prepare the surfaces according to their specific area of use: the areas where only the surface needed to be refurbished were hydro-blasted and the surface was removed mechanically, while in the areas with more serious signs of deterioration larger portions of concrete were removed leaving the reinforcement rods exposed, which were then protected with MAPEFER 1K one-component, corrosion-inhibiting cementitious mortar, specific for protecting reinforcement rods.

The most consistent part of the work was the reintegration of the concrete that had been removed and the renovation of the main pillars of the façades, which were suffering from various degrees of deterioration. The vertical surfaces were repaired with MAPEGROUT EASY FLOW, an easy-flow, one-component, fibre-reinforced, shrinkage-compensated, sulphate-resistant thixotropic mortar, particularly recommended for repairing concrete structures, in this case admixed with MAPECURE SRA to reduce the final hygrometric shrinkage of the mortar and make it less prone to cracking problems.

The contact surfaces between the beams and "Y" shaped supports of the pillars also needed to be levelled off and, for this operation, it was decided to use MAPEGROUT SV T, a shrinkage-compensated mortar, that guarantees

1. MAPEFER 1K, one-component, corrosion-inhibiting cementitious mortar, was used to protect reinforcement rods. **2.** MAPEGROUT SV T and MAPEGROUT EASY FLOW were used to repair several areas of the concrete pillars. **3.** After concrete was repaired, the surfaces were protected against carbonation by applying a coat of ELASTOCOLOR PAINT crack-resistant, elastomeric coating. **4**. A new high performance concrete floor was completed with MAPECRETE SYSTEM.

high mechanical properties and sets and hardens very quickly. In the "ribs" supporting the roof, as well as in areas of the pillars without excessive damage, the surfaces were skimmed over with PLANITOP SMOOTH & REPAIR, a fibre-reinforced, rapid-setting, shrinkage-compensated, class R2 thixotropic cementitious mortar, which may be applied in layers 3 to 40 mm thick.

Once all the renovation work had been completed, the surfaces were protected against carbonation by applying a coat of ELASTOCOLOR PAINT, a protective, crack-resistant, elastomeric paint which, when dry, forms a flexible coating impermeable to water and aggressive agents present in the atmosphere (CO_2–SO_2) but permeable to the passage of vapour. This product also guarantees excellent resistance to ageing, freezing weather conditions and de-icing salts, and the photo-chemical film which forms on the surface makes it very difficult for dirt to remain attached.

Shrinkage-compensated concrete floors

Once all the renovation and repair work had been completed, a new concrete floor was installed inside the structure using the MAPECRETE SYSTEM. The use of the expansive agent EXPANCRETE for shrinkage-compensated concrete, the admixture MAPECURE SRA (specifically formulated to reduce the formation of cracks due to hygrometric shrinkage in concrete by up to 50%) and the plasticizers DYNAMON FLOOR 3 (which is manufactured and distributed by Mapei Spain) and MAPEFLUID AC40 enabled a high quality, shrinkage-compensated concrete floor with high dimensional stability and fewer joints to be created.

Find out more
MAPEGROUT SV T

TECHNICAL DATA
Mayoral logistic hub, Málaga (Spain)
Period of construction: 1958-1963
Original design: Manuel María Valdés and Ramón Vázquez Molezún
Period of the intervention: 2017-2018
Design and works direction: Santiago Perez Vidal (Cemosa), System Arquitectura
Owner: Mayoral S.A.
Concrete repair contractor: Cimentia Construcción y Gestión
Concrete floor contractor: Prosistemas
Mapei coordinators: Jose Antonio Sánchez, Pedro Madera, Mar Penín, Antonio Faura, Manuel Millán and José Antonio Rodríguez, Mapei Spain

MAPEI PRODUCTS:
Protecting reinforcement: Mapefer 1K
Concrete repair: Mapegrout Easy Flow, Mapegrout SV T , Planitop Smooth & Repair
Protective coatings: Elastocolor Paint
Concrete floor: Expancrete, Mapecure SRA, Dynamon Floor 3*, Mapecure SRA, Mapefluid AC40

*This product is manufactured and distributed on the Spanish market by Mapei Spain

For further info: mapei.com

ABOVE. The Crestawald bridge is an arched structure built in 1959 that was lately refurbished.
RIGHT. Several areas of deteriorated concrete were repaired with MAPEGROUT THIXOTROPIC, after protecting the reinforcing rods with MAPEFER 1K.

Sufers (Canton of Graubünden, Switzerland)

Crestawald bridge

MAPEI SOLUTIONS TO REPAIR AN IMPORTANT STRUCTURE IN THE HISTORY OF THE SWISS CONSTRUCTION INDUSTRY

Crestawald Bridge is an arched structure built in 1959 that passes over the River Rhine in Sufers, in the Canton of Graubünden (Switzerland), and carries two lanes of the A13 motorway. 124 m long with a span of 71.5 m, it was designed by Christian Menn, a renowned Swiss engineer who, after completing this work, decided to specialise in the construction of bridges: another reason why Crestawald Bridge represents a milestone in the history of Swiss infrastructures.
Because of the intense levels of traffic in the last few years, the stretch of motorway running south from the Sufers interchange to the entrance of the Traversa tunnel had been damaged and refurbishment work needed to be carried out. Also, the tunnel had undergone temporary strengthening work in recent years: it had reached the point where it needed to be completely requalified so that it could be properly repaired, strengthened and extended. This work was carried out in 2020-2021 while maintaining the brige's identity and aesthetic appeal.

Repair work
The badly deteriorated sections of concrete were removed up to the level of the arch and then repaired. To avoid having to interrupt the flow of traffic while work was being carried out, a temporary two-lane bridge running parallel to the Crestawald Bridge was erected.
Using special instruments, the sections of deteriorated concrete damaged by sulphates were identified and repaired down to a depth of 1 cm (1st layer), while the areas with corroded reinforcing rods had to be repaired as far down as below the second layer. To prevent compromising the static properties of the bridge, work was carried out in several stages.
The reinforcing rods was cleaned by hydro-blasting without damaging it and then protected with a layer of MAPEFER 1K cementitious mortar, a product especially developed to prevent corrosion in reinforcing rods.
To remove the concrete from the surface of the arches, on the other hand, a special hydro-demolition machine was used, which was deployed for the first time in Switzerland on this site, consisting of special devices with wheels and mechanical “arms” and “legs”.
One of the most difficult challenges with this project was the repair works on the areas of deteriorated concrete on the intrados of the bridge. The challenge, won thanks to MAPEGROUT THIXOTROPIC, was to restore the appearance and texture of the concrete originally created using special formworks. Its thixotropic consistency made it easier to apply the product on the underside of the arch.
The intense teamwork between all the stakeholders has enabled this structure, a milestone in the history of the Swiss construction history, to be restored to its original splendour.

Find out more
MAPEFER 1K

TECHNICAL DATA
Crestawald bridge, Sufers (Graubünden, Switzerland)
Year of construction: 1959
Design: Christian Menn
Period of repair works: 2020–2021
Owner: Swiss authority for roads (ASTRA/OFROU)
Design: Casutt Wyrsch Zwicky AG
Main contractor: Erni Bau AG
Hydrodemolition: Hydrojet AG
Mapei coordinator: Roger Mohler, Mapei Suisse

MAPEI PRODUCTS
Protecting reinforcement rods: Mapefer 1K
Concrete repair: Mapegrout Thixotropic

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

Oô (Upper Garonne, France)

Lake d'Oô dam

SPECIALISED ACROBATIC BUILDING TEAMS ALSO DEPLOYED TO REPAIR CONCRETE

Located at 1500 m above sea level, within two “Natura 2000” zones under the protection of the European Union, Lake d'Oô is one of the most beautiful areas in the Pyrenees mountains in the South of France. The dam on the lake, which feeds Oô de Luchon power station, celebrated its 100th anniversary in 1921. The dam is of the gravity type: the dam wall was constructed mainly in masonry and the water is held back by its sheer weight. Since its construction until today, it has played an important role in the production of hydro-generated electricity and as a back-up to feed the River Garonne in periods when its level is low.

After analysing the water levels of the River Neste d’Oô that crosses the dam and then carrying out a site survey, EDF, the largest producer and provider of energy in France, launched a project to carry out major restoration and requalification work on the dam. The aim of the work was to increase the size of the spillway to maintain the dam at its highest level more efficiently, and the replacement of the sluice gate for the drain at the foot of the dam which, if necessary, allows the dam to be emptied.

RIGHT. The dam on Lake d’Oô is situated at an altitude of 1500 m in the Pyrenees mountain range. It was recently repaired with a complete Mapei system.
BELOW. The expansion joints were sealed again with MAPEFOAM and MAPEFLEX E-PU 30 NS.

Mapei solutions to repair the downstream face of the dam wall

The company commissioned to carry out the work, Aevia France SUD, contacted Mapei with a request for a proposal for a complete system to repair the downstream face of the dam wall. The work was carried out by specialised teams working suspended from ropes and cables without the use of scaffolding and with the support of the Mapei France Technical Services Division who provided the right training on how to apply the products. The reinforcement rods in the deteriorated areas were protected with MAPEFER 1K, anti-corrosion mortar. Before using the repair mortar, a coat of bonding slurry made with PLANICRETE LATEX was applied on the surfaces.

MAPEGROUT T60 F, a fibre-reinforced thixotropic mortar that is manufactured and distributed on the French market by Mapei France, was then used to repair the deteriorated areas. The cast iron covers for the drains at the foot of the dam were sealed with MAPEFILL MC compensated-shrinkage concrete, which is also manufactured and distributed in France by Mapei France.

The distribution joints on the dam wall, which by now were completely worn, were sealed by applying MAPEFOAM closed cell polyethylene foam cord along the bottom of the joints and then sealing the joints with MAPEFLEX E-PU 30 NS two-component, high-strength, epoxy-polyurethane sealant. This system allowed both the vertical joints and the horizontal joints to be repaired. When replacing the sluice gate for the drain at the foot of the dam, IDROSTOP hydrophilic expandable rubber profile was chosen to make sure the joints were perfectly waterproof, which was bonded in place with IDROSTOP MASTIC thixotropic adhesive.

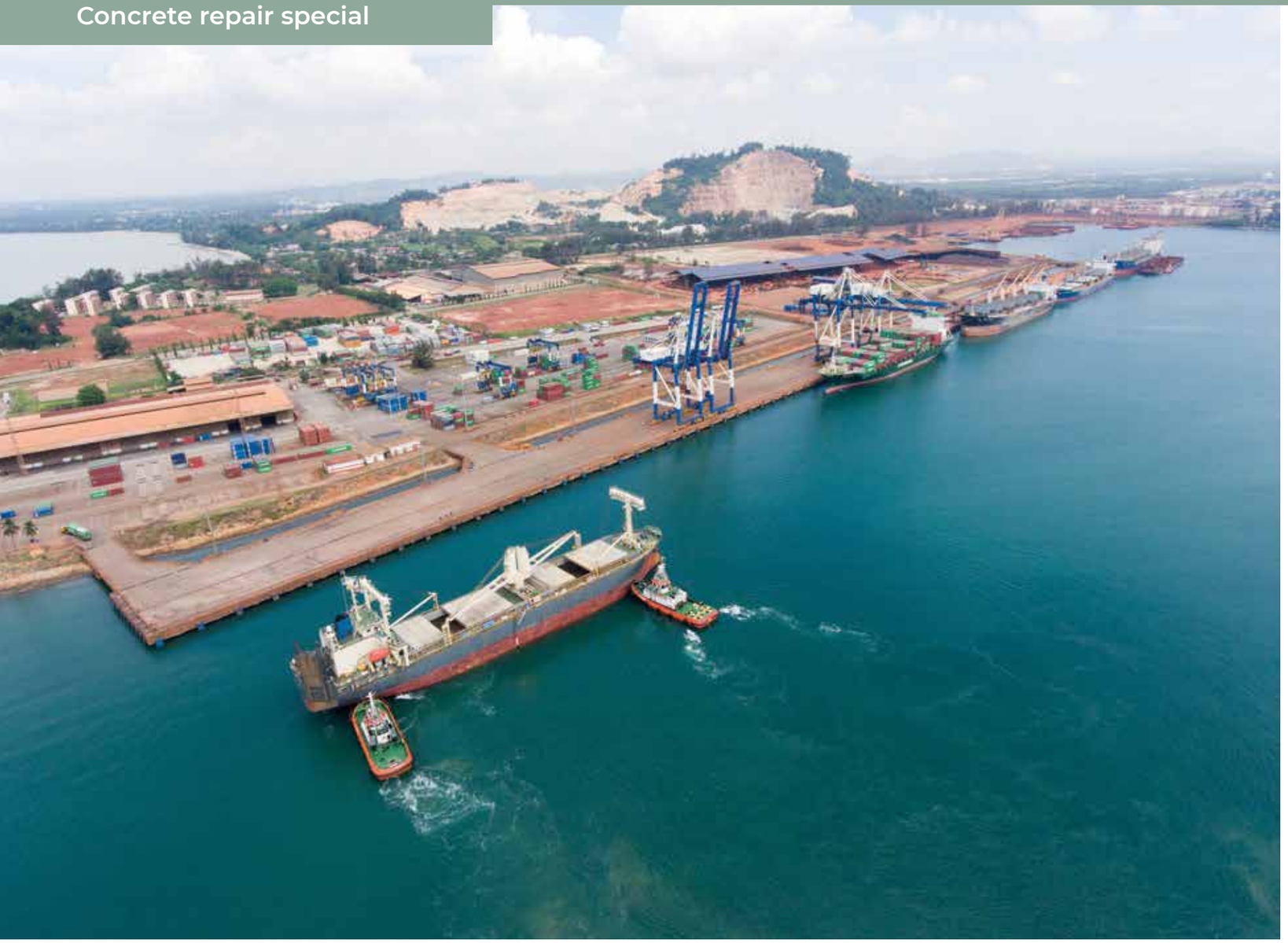
Find out more
MAPEFLEX E-PU 30 NS

TECHNICAL DATA
Lake d’Oô dam, Bagnères-de-Luchon, Haute-Garonne (France)
Year of construction: 1921
Intervention by Mapei: supplying products for concrete repair and sealing joints
Period of renovation works: 2020-2021
Owner: EDF Hydro Sud-Ouest
Contractor : AEVIA France SUD (Groupe Eiffage)
Mapei coordinators: Jérémy Cachard and Gaëtan Dujardin, Mapei France
Photos: Gaëtan Dujardin, © AG Pyrénées 31

MAPEI PRODUCTS
Protecting the reinforcement rods: Mapefer 1K
Repair work on the concrete: Planicrete Latex, Mapegrout T60 F*, Mapefill MC*
Sealing distribution joints: Mapefoam, Mapeflex E-PU 30 NS
Waterproofing joints: Idrostop, Idrostop Mastic

*These products are manufactured and distributed in France by Mapei France

For further info on products visit mapei.com mapei.fr



ABOVE. Kuantan Port is a multipurpose port in the East Coast region of Peninsular Malaysia.
LEFT. Damaged concrete areas were removed and reinforcement rods were protected with MAPECOAT ZR MY, fast-drying, zinc-rich coating. Underwater concrete elements were repaired with MAPEFILL MC 06.

Kuantan (Pahang, Malaysia)

Kuantan Port

CONCRETE REPAIR WORKS TO DOUBLE THE HANDLING CAPACITY OF THIS INFRASTRUCTURE

Facing South China Sea, Kuantan Port is a multipurpose port in the East Coast Region of Peninsular Malaysia and is managed by Kuantan Port Consortium Sdn. Bhd. (KPC).
It encloses 11 multipurpose berths (with a maximum draught of 11.2 m) that can accommodate 45,000 vessels, 7 warehouses, 3 container berths, 4 container cranes, a container freight station of 9,600 m^2, and a container yard with 1,500 ground slots. Kuantan Port container yard offers one of the longest free storage periods in Malaysia.
With the development of the Malaysia-China Kuantan Industrial Park and the East Coast Rail Link (ECRL), this port is becoming a world class infrastructure which is currently being extended. Beside building a new Deep Water Terminal, some refurbishment projects are being carried out on the wharfs to double the port's capacity to 52 million freight weight tons and enable larger ships to berth.

Protecting reinforcement rods and repairing concrete
Concrete elements had been deteriorated and reinforcement rods were suffering from corrosion caused by chloride aggression due to the presence of sea water.
Repair works were carried out from December 2017 to December 2018 with several products that are manufactured and distributed in the Malaysian market by Mapei Malaysia.
The cracks in the walls were repaired by using EPOJET LV, two-component epoxy resin, and ADESILEX PG2 TG, a two-component thixotropic epoxy adhesive. To properly protect the reinforcement rods, all the damaged concrete was removed till sound concrete was reached. All exposed reinforcement rods were then treated with MAPECOAT ZR MY, a fast-drying, zinc-rich coating used for the galvanic corrosion protection of steel substrates. As for the underwater sections of the wharf, concrete elements were repaired with MAPEFILL MC 06 shrinkage compensated, super flow micro-concrete, after protecting the reinforcement rods with MAPECOAT ZR MY. PLANITOP G40 SP repair mortar was used to level the repaired concrete surfaces.
The concrete surfaces were finally protected with ANTIPLUVIOL S-MY, water-repellent impregnating finish, and COLORITE PERFORMANCE S-MY, high-performance, solvent-based, methacrylate coating for the protection and decoration of concrete and masonry structures.

Find out more
COLORITE PERFORMANCE

TECHNICAL DATA
Kuantan Port, Kuantan (Pahang, Malaysia)
Period of construction: 1976-1979
Period of refurbishment: 2017-2018
Owner: Kuantan Port Consortium Sdn Bhd
Concrete repair contractor: 3R Systems Sdn Bhd
Mapei coordinators: Cheah Peck Kuan, Khairi/ Hanson Foong, Mapei Malaysia

MAPEI PRODUCTS
Repairing cracks: Epojet LV, Adesilex PG2 TG*
Protecting reinforcement rods: Mapecoat ZR MY*
Concrete repair: Planitop G40 SP*, Mapefill MC 06*
Coating concrete surfaces: Antipluviol S-MY*, Colorite Performance S-MY*

*These products are manufactured and distributed on the Malaysian market by Mapei Malaysia.

mapei.com, mapei.my

Joliette (Quebec, Canada)

CRH Canada Joliette Cement

MAPEI INC. HELPS REPAIRING THE CONCRETE SILOS OF ONE OF CANADA'S LEADING SPECIALTY CEMENT SUPPLIERS

The CRH Canada Joliette Cement Plant is one of Canada's leading specialty cement suppliers. Part of the CRH Canada Group Inc., the plant has operated for more than 50 years and has the ability to design, produce and deliver cement mixes that meet project- and region-specific requirements. Its four kilns operate 24 hours a day, giving the plant the unique flexibility to offer more than 10 types of cement to building materials manufacturers and construction companies from Alberta to Newfoundland. Its customer base even extends into the northeastern United States. The plant uses 20 silos to store the vast amounts of cement that it produces each day. To maintain safety standards and protect residents that live near the plant, the silos are regularly inspected for concrete degradation and, in case, immediately repaired.

In 2017, Mapei Inc., the Canadian subsidiary of the Group, was awarded the contract to repair the plant's silos using PLANITOP 12 SR repair mortar. The company was awarded the contract for its renowned high-quality products and innovative approach to the complicated logistical challenge of working on these storage silos.

Mapei products on the jobsite

While the plant's silos are about 30.5 m high, they are not particularly wide and, as such, conventional scaffolding could not be easily used to complete the repairs.

"To set up the scaffolding in such a restrained area would have cost at least $400,000 (over 380,000 Euros) in custom scaffolding," said Michel Lafortune, the Mapei representative leading the project. Instead of such a large sum being spent, Lafortune and PSM Technologies – the general contractor on the project – came up with a unique way to complete the repairs. They proposed the idea of having subcontracted installers from Vertika climb the sides of the silos like mountain climbers and then rappel down the sides like spelunkers. "Vertika specializes in working at height," Lafortune said. "They are also licensed to finish concrete. Their crew worked perfectly with the team from PSM Technologies and with the Mapei product." Tackling one silo at a time, three Vertika crew members would rappel down the silo while two PSM team members stayed on the roof to monitor the safety gear and the equipment. On the ground, two more PSM crew members stayed in constant contact with the facility management and made sure that all supplies reached the top as needed. Lafortune alternated between assisting at the top and on the ground. Once in place and suspended from harnesses, the three-man Vertika team used bush hammers suspended on ropes to rout out the deteriorated areas. Next, the three-man climbing team used a pressurized pump and hose – lowered on ropes – to apply PLANITOP 12 SR one-component, cementitious repair mortar which is manufactured and distributed in North America by Mapei Inc. (Canada) and Mapei Corp. (USA). Resistant to sulphates attack and well suited for vertical surfaces, this mortar was the perfect choice for this high-flying project. Lafortune added: "In Europe this is a common repair technique, but this is the first time that I'm aware of this method of working at height being used for concrete in Canada. It was a huge savings in time and money."

The project proved to be a great success. Now protected with a Mapei repair mortar, the plant will continue to supply cement mixes for the foreseeable future.

RIGHT. Rather than using scaffolding to apply concrete repair products, the contractor subcontracted installers to climb the sides of the silos. **BELOW.** PLANITOP 12 SR, a sulphate-resistant, one-component shrinkage-compensated cementitious mortar, was used to repair the concrete surfaces of the silos.

LEFT. CRH Canada Joliette Cement Plant is one of Canada's leading specialty cement suppliers and had its silos refurbished with Mapei products for concrete repair.

TECHNICAL DATA
CRH Canada Joliette Cement Plant, Joliette (Quebec, Canada)
Years of construction: 2017-2018
Years of Mapei's intervention: 2017-2018
Design: GESCO-NOREX
Concrete repair contractors: Vertika and PSM Technologies
Project manager: Olivier Muller
Mapei's intervention: supplying products for concrete repair of silos
Mapei coordinator: Michel Lafortune, Mapei Inc. (Canada)
Mapei distributor: Geroquip Inc.
Photos: Olivier Gariepy

MAPEI PRODUCT
Concrete repair: Planitop 12 SR*

*This product is manufactured and distributed in North America by Mapei Inc. (Canada) and Mapei Corp (USA)

mapei.com, mapei.ca
mapei.us

Olten (Switzerland)

Olten high school

USING MAPEI SOLUTIONS TO REPAIR THE CONCRETE FAÇADES AND STAIRS OF THIS HIGH SCHOOL, AN IMPORTANT EXAMPLE OF THE BRUTALIST STYLE

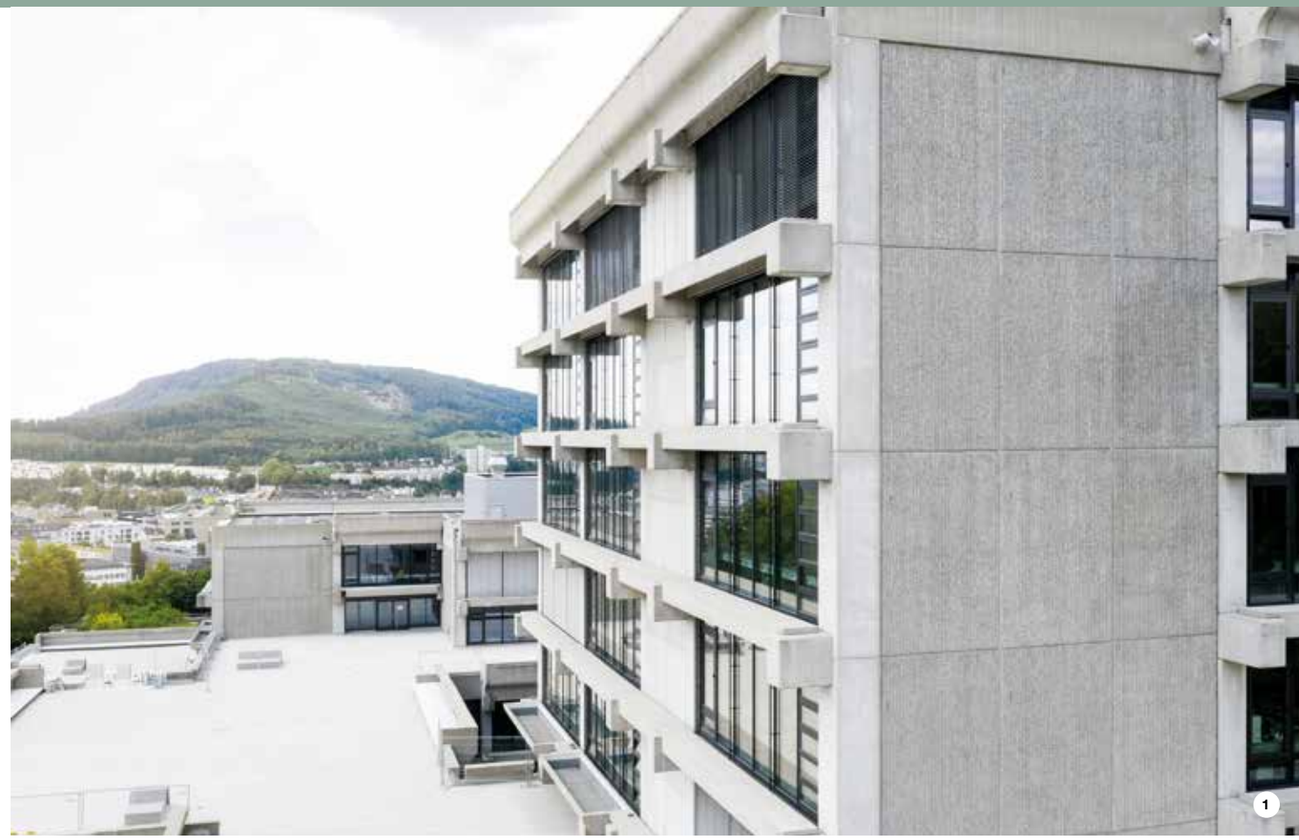
The Cantonal School of Olten, in Northwest Switzerland, was built between 1969 and 1973 and is an important example in the Canton of Solothurn of the post-war "Brutalist" style of architecture featuring the use of exposed concrete (or béton brut in French). Even though it had been refurbished several times in the past, the time had come to completely renovate the building because of the very poor condition of some of its elements and structures. Also, the school needed to be brought in line with current anti-seismic, fire and energy rating standards and to make it more accessible to people with disabilities. Work started in 2016 and was carried out in different stages in order to disturb the school's normal activities as little as possible.
Work included refurbishing the swimming pool, renovating the concrete façades, various interventions inside the building and an overhaul of the external spaces.

Mapei solutions to repair concrete and strengthen structures
Mapei Suisse, the Group's local subsidiary, supplied technical support and a number of solutions to restore the concrete and to carry out static strengthening work on the structure, as well as for other works in various areas.
The indoor swimming pool, the equipment for the pool, the changing rooms and the entrance to the pool were completely refurbished to make them more functional and welcoming and more accessible to people with disabilities. The ceiling of the pool was repaired with MAPEGROUT THIXOTROPIC shrinkage-compensated fibre-reinforced mortar after protecting the reinforcing rods with MAPEFER 1K one-component corrosion-inhibiting cementitious mortar.
To renovate the pre-cast concrete elements used in the construction of the school (pillars, ceilings and façades), some of them had to be removed by crane, such as those for the façade. The areas of concrete that had become badly deteriorated were repaired with MAPEGROUT THIXOTROPIC before levelling them off and protecting them with MAPEFINISH HD two-component, highly sulphate resistant cementitious mortar. The surfaces of the concrete elements were then protected with a layer of MALECH acrylic primer before painting them with elastomeric, protective ELASTOCOLOR PAINT. Once the repair and protection cycle on these elements had been completed, a crane was used to put them back into position on the façade.

Renovation of the stairs
The deteriorated areas of the external stairs were removed to create a solid layer of concrete and the cracks in the steps were filled with EPORIP epoxy adhesive. MAPEGROUT 430 fibre-reinforced mortar mixed with PLANICRETE synthetic-rubber latex was then applied over the EPORIP layer using the "fresh-on-fresh" technique, after which the steps were shaped to restore them to their original profile.

Structural strengthening
CARBOPLATE E170 pultruded plates made from high strength, low modulus carbon fibres were used to improve the strength and flexibility of the ceiling panels of the parking area for bikes and in the school's underground carpark. Also, because they are so light, it was much easier to bond them in place with ADESILEX PG2 adhesive. Steel bands, which were employed during the anti-seismic upgrade work in the area where the central lifts are located, were also bonded with ADESILEX PG2.

Find out more
MAPEGROUT THIXOTROPIC



1. The Solothurn high school is an important example of the post-war "Brutalist" style of architecture and was lately renovated with Mapei solutions. **2.** The pre-cast concrete elements used for the façade were repaired with MAPEGROUT THIXOTROPIC before protecting them with MAPEFINISH HD. **3.** The damaged areas of the external stairs were repaired with MAPEGROUT 430 mixed with PLANICRETE after filling the cracks with EPORIP.

TECHNICAL DATA
Solothurn high school, Olten (Solothurn, Switzerland)
Period of construction: 1969-1971
Design: Marc Funk, Hans Ulrich Fuhrimann
Period of renovation: 2016–2022
Owner: Solothurn Canton, Department for building and justice services
Design: Batimo AG Architekten SIA
Main contractor: STRABAG AG
Mapei coordinator: Roger Schär, Mapei Suisse

MAPEI PRODUCTS
Concrete repair:
Mapegrout Thixotropic, Mapefer 1K, Mapegrout 430, Mapefinish HD, Eporip, Mapefill, Planicrete, Planitop Smooth & Repair R4
Coating concrete surfaces:
Malech, Elastocolor Paint, Colorite Beton
Structural strengthening:
Adesilex PG2, Carboplate E170

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

IN THE FACING PAGE. The tram depot in Koželužská St in Olomouc (Czech Republic) had been in operation for more than a hundred years before undergoing refurbishment works. **RIGHT.** Mapei products were used for repairing concrete and anchoring works on the structures bearing the tracks.

Olomouc (Czech Republic)

Tram depot

THE CONCRETE ELEMENTS BEARING THE TRACKS WERE REPAIRED WITH MAPEI SOLUTIONS

The tram depot in Koželužská St in Olomouc (Czech Republic) has been in operation for more than a hundred years. The city obtained the concession to build and operate the tram line in 1898 but the plans to build a street line actually dated back to 1892. Technical and operational tests were conducted at the beginning of 1899 and tram operation officially began on April 1st.
Over the years, the depot has undergone many structural repairs in order to expand the premises to accommodate the ever-increasing number of public transport vehicles. However, despite all the changes that have been made, it was not possible to enlarge the depot to the necessary dimensions untill very recently.

The latest renovation operations
After decades of operation and many extensions, the depot clearly deserved a renovation, which was finally carried out in December 2018. The maintenance of the assembly pits of the 3rd and 4th tracks of the depot was the most important part of the project. The bearing structures showed structural failures and were at the limit of safety, which was caused not only by years of operation, but also by the constantly increasing weight of the tram cars since 1899.
Therefore, the rails were temporarily dismantled, and the existing concrete and reinforced concrete structures were demolished down to the depth of the foundations. The demolition exposed the damaged concrete elements and steel reinforcement, but especially highlighted the completely inadequate sizes of the existing structures for today's purposes. The refurbishment operations began with the pouring of the concrete for the foundation. This was followed by the reinforcement, the pouring of the concrete base and pillars. And finally, the tracks were reassembled. The length of the tracks was preserved, and the depot can now handle maintenance work on four cars at a time even after the refurbishment works.

Concrete repair and coating
The concrete surfaces needed to be chemically treated as a part of the renovation project, and the Mapei's proposal was chosen as the most suitable solution. MAPEGROUT T60, a fibre-reinforced shrinkage compensated thixotropic mortar, was used to repair and reconstruct the reinforced concrete structures. This mortar is suitable for the repair of all concrete and reinforced concrete surfaces exposed to sulphate attack, or for hydraulic works damaged by corrosion.
All concrete surfaces were then skimmed with PLANITOP 540, a fine skimming mortar based on based on cementitious binders, selected graded aggregates, admixtures and synthetic powder polymers. The product is suitable for smoothing cement-lime based or prepacked cured traditional renders, uneven concrete elements and "hardened" render units in interiors and exteriors, as well as for levelling ready-mix concrete units such as panels, columns and beams. After curing, the layer is characterized by high adhesion to the substrate.
MAPEFILL high-flow non-shrink cementitious grout was used to anchor the tracks. This mixture is mainly used for anchoring machinery, bolts, steel structures, turbines, milling machinery, etc., to concrete. Even after a short curing time, the mix has a very high flexural and compressive strength, excellent adhesion to steel and concrete and resists dynamic/mechanical stresses very well.
Once the repair operations were completed, MAPECOAT I24 two-component epoxy paint coating was applied on the surfaces to provide resistance to mechanical stresses and chemicals, oils and hydrocarbons. After mixing it with ADDITIX PE, a thickening and thixotropic additive for epoxy and polyurethane compounds, the product was used for the final treatment of the floors and walls of the depot. Mixing these products increases the thixotropic properties to such an extent that the mixture can also be used on vertical surfaces and plinths.

Find out more MAPEGROUT T60

TECHNICAL DATA
Tram depot, Olomouc (Czech Republic)
Owner: Dopravní podnik města Olomouce, a.s.
Main contractor: Dopravní podnik města Olomouce, a.s.
Concrete repair contractor: IDS Olomouc a.s.
Mapei coordinator: Jan Bébar, Mapei spol. sro (Czech Republic)
Photos: Aleš Berka

MAPEI PRODUCTS
Concrete repair: Mapegrout T60, Planitop 540
Anchoring: Mapefill
Coating concrete surfaces: Mapecoat I24, Additix PE

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

The bridge underwent a refurbishment and concrete repair intervention that made use of MAPEGROUT EASY FLOW GF, MAPEGROUT HI-FLOW B2, and MAPEGROUT LM2K.

A13 Bologna-Padua motorway (Italy)

Bridge over the River Po along the A13 Motorway

THIS BRIDGE BUILT AROUND 50 YEARS AGO WAS THE FOCUS OF IMPORTANT STRENGTHENING AND REPAIR WORK

Built in the 1960s and 1970s, the A13 Bologna-Padua motorway connects North-East of Italy to the important transit hub around Bologna in Central Italy. The A13 motorway is located along the Baltic-Adriatic Corridor and runs through the regions of Emilia Romagna and Veneto. Maintenance work started two years ago on the bridge crossing the River Po between Occhiobello and Ferrara Nord. The renovation and maintenance works were scheduled to start at the beginning of spring 2020 but, because of the pandemic, it was put back to April of the same year with a programme of works lasting around one year.

Areas of intervention: piles and deck

The Po Bridge is 1,800 m long and is located at point km 47+528 along the A13 Bologna-Padua motorway. It is made up of two separate carriageways, one heading north and the other heading south. Each carriageway is made up of 42 constrained spans sitting on piles and abutments. The spans are in various lengths of 32 m, 54 m and 67.20 m. Before carrying out the consolidation and strengthening work, the spans and piles were carefully surveyed to check their actual condition. The data collected from the bridge were put together and handed over to the client, a team of designers and the main contractor commissioned to carry out the work so they could put together a programme of works and decide on how to repair the areas in poor condition.

The data and site surveys, as well as the structural analyses, indicated that piles 21, 22, 23, 24, 25 and 26 were in need of repair works. The works were carried out by the company Divisione Cantieri Stradali under the guidance of Mario Iorio.

The first step was to prepare the substrate by mechanically removing all the areas in poor condition and then hydro-blasting the entire surface to remove all the crumbling and detached areas. The reinforcing rods were then cleaned and treated with MAPEFER 1K one-component, anti-corrosion cementitious mortar. MAPEGROUT EASY FLOW GF fibre-reinforced, thixotropic cementitious mortar was applied with a rendering machine to repair concrete in the areas where a higher level of ductility was required. For the areas where particular thicknesses or forms needed to be reintegrated and that required the use of pre-dosed, free-flowing concrete, on the other hand, MAPEGROUT HI-FLOW B2 shrinkage-compensated, fibre-reinforced micro concrete was applied, as well as MAPEGROUT LM2K thixotropic cementitious mortar in layers from 3 to 20 mm thick. Chemical anchors were cre-

After strengthening the deck, the concrete surfaces were finished with MAPECOAT E23 epoxy primer and MAPECOAT PU 33 polyurethane resin-based, flexible coating.

ated using MAPEFIX EP 385 pure epoxy resin-based product for structural loads. Once all the work had been completed, MAPELASTIC GUARD elastic cementitious mortar was applied to provide concrete surfaces with long-lasting protection from aggressive atmospheric agents.

Repairs on the bridge deck

For the repairs on the bridge deck in correspondence with piles 22, 24, 25 and 26 along the south-bound carriageway and pile 24 along the north-bound carriageway, after mechanically removing all the deteriorated areas and hydro-blasting the surface to remove the crumbling and detached areas, the concrete on the bridge deck was repaired with MAPEGROUT LM2K and MAPEGROUT EASY FLOW GF. A complete product cycle was applied to protect the deck, involving MAPECOAT E23 epoxy primer followed by a coat of MAPECOAT PU33 polyurethane resin-based, flexible coating.

In 2020, for a previous tender, Mapei also supplied FRP strengthening materials which were applied on deck 23 south of the bridge. This also enabled samples of FRP materials to be taken from the site, which then underwent testing in the laboratory in order to accept the material, as per the requirements of MIMS (Ministry for Infrastructures and Sustainable Mobility) guidelines. Particular attention was also paid when verifying the safety data sheets for each single application of the materials used on site, in line with both the prescriptions of Italian Legislative Decree 81/08 and the requirements of the client, Autostrade per l'Italia SpA.

Find out more
MAPEGROUT EASY FLOW GF

TECHNICAL DATA
Bridge on the River Po along A13 Bologna/ Padua motorway, Italy
Period of construction: 1970s
Period of the intervention: 2021-2022
Intervention by Mapei: supplying products for structural strengthening, and concrete repair
Design: Massimo Acanfora
Owner: Autostrade per l'Italia SpA
Project manager: Giuseppe Turco (ASPI Bologna)
Static tester: Prof. Andrea Prota
Works director: Ernesto Maione
Operational direction: Pasquale Staropoli, Ciro Valerio
Executional safety coordinator: Gaetano Mascetta
Technical-administrative testing: Alessandro Zamboni, Piero Indelli
Site direction: Gennaro Sorrentino, Andrea Carraretto
Main contractor: Divisione Cantieri Stradali, Mario Iorio
Contractor: Divisione Cantieri Stradali
Mapei coordinators: Giulio Morandini, Gianpiero Peluso, Davide Demicheli, Corrado Castiglioni, Mapei SpA (Italy)

MAPEI PRODUCTS
Concrete repair and strengthening:
Mapefer 1K, Mapefix EP385, Mapegrout Hi-Flow B2, Mapegrout Easy Flow GF, Mapegrout LM2K
Waterproofing and coating surfaces: Mapelastic Guard, Mapecoat E23, Mapecoat PU33

For further info on products: mapei.com

by **Giuseppe Turco**

Hydrometric variations and damp: the challenges of the project

A "LIGHTWEIGHT" SITE IN COMPLETE SAFETY THANKS TO FIBRE-REINFORCED MORTARS BY MAPEI

What type of investigations and checks did you carry out on the spans and piles of the bridge?
When we decided to intervene on the bridge, we contacted several external companies to verify the condition of the structure. Every three months, we carry out regular inspections to check the condition of all the infrastructures we are responsible for, as required according to current norms and standards. Then we contacted the engineering company, Strutture e Servizi Srl, which came up with a programme of inspections and tests to assess the work that needed to be carried out in more detail. We then drafted a project that was tendered out to a construction company which, in turn, chose Mapei as supplier of the products required to repair the concrete on the bridge.

What problems did the bridge have?
The bridge was built in the 1960's and was opened to vehicle traffic in the 1970's. During its 50 years of service various works were carried out to guarantee it remained in good health. This is a strategic structure, not only for Northeast Italy, but also for the rest of the country because it connects the region of Emilia Romagna to Veneto and then to Northern Europe. The programme of works was based on the critical areas identified in the concrete, mainly due to the level and flow rates of the river. Localised repair work was required along with repairs to the cortex of the concrete of both the piles and the spans on the riverbank side of the bridge.
The bridge had problems due to its age, but even more so because of the aggressive action of the river itself. In fact, the level and flow of the river can vary dramatically, which means the areas that are wet and then dry are particularly impacted: in just a few days the level of the Po River can rise quickly and then drop again just as quickly. What is more, the bridge is in a particularly damp area.

Safety and durability: the objectives of the intervention. How much did it help to be able to rely on cutting-edge, consolidated products such as those proposed by Mapei?
Using Mapei products helped us achieve the objectives of this intervention: to repair the concrete exactly where needed and to protect it. The result was highly appreciated by the owner, Autostrade per l'Italia. Before starting work, we studied the product data sheets and standards very carefully and we are convinced that the Mapei solutions have been fundamental for the structure.

How was life on site affected by being able to choose and introduce new materials, such as fibre-reinforced materials?
This was a very important choice for the intervention, considering the heights involved and the conditions we had to work in. Because of the wide variations in the level and flow of the river we couldn't erect scaffolding. To be able to count on products such as Mapei fibre-reinforced mortars was an enormous help to us.
We managed to carry out the work quickly while working in complete safety and without having to worry about having to demobilise the site because the level of the river was rising. We used portable platforms positioned under the bridge and choosing Mapei products combined to perfection with our idea of having a "lightweight" site, to work safely and to keep to the schedule.

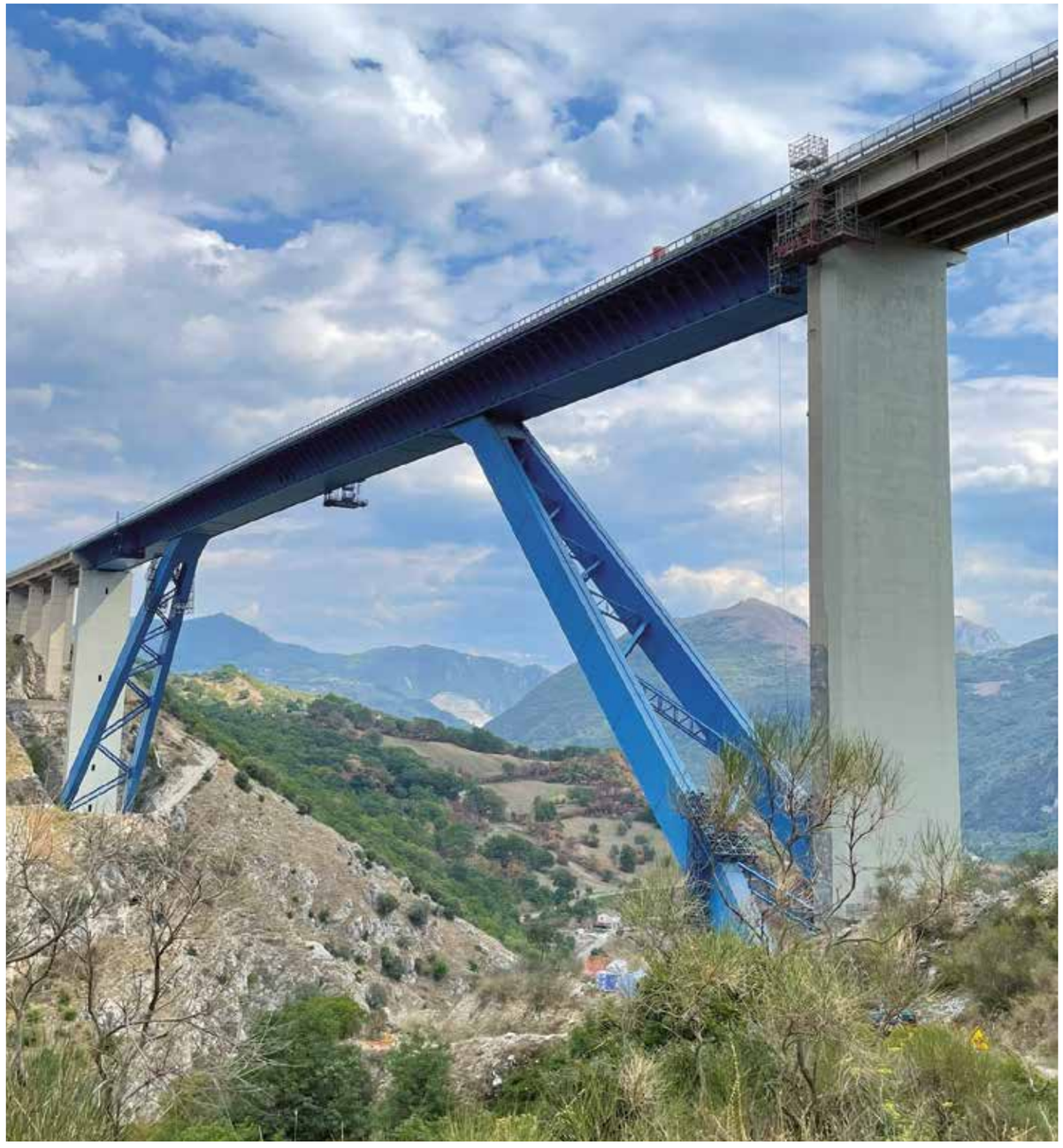
The infrastructure is located in a strategic zone connecting the regions of Emilia-Romagna and Veneto. How did you overcome the problem of closing the road to traffic to carry out the work?
The viaduct has two traffic lanes running in each direction, so timing was very important. By carrying out the work from under the bridge we managed to interfere with the flow of traffic as little as possible.
The work was carried out without closing the road to traffic, particularly when working on the piles using semi-pontoons, or barges, with mobile lifting arms.
When working on the spans, on the other hand, we used suspended scaffolding with access from both the left bank and the right bank of the river.

Site Project Manager, Autostrade per l'Italia SpA

Vietri di Potenza (Province of Potenza, Italy)

Platano viaduct

REPAIRS TO THE CONCRETE OF THE SECOND-TALLEST (220 M) RIGID-FRAME BRIDGE IN THE WORLD



After treating the exposed reinforcing rods with MAPEFER 1K, the concrete was reintegrated with MAPEGROUT EASY FLOW mortar admixed with MAPECURA SRA.

Platano Bridge is located along the Sicignano Scalo – Potenza Motorway Link Road and connects the Campania and Basilicata regions in Southern Italy. Constructed in 1969, it is 630 m long and 220 m tall: the third-tallest bridge in Italy and the second-tallest rigid-frame bridge in the world, after the Sfalassà Viaduct on the Salerno–Reggio Calabria Motorway.
Major maintenance work had already been carried out in 2017 to renovate the structure of the viaduct, with the bridge undergoing repair and strengthening work to the steel structures of the deck of the wide-span arched framework. After just a few years the Italian highways organisation, Anas, specified and scheduled further maintenance work, this time on the viaduct's two main piles. The tender was awarded to R.T.I. Ilpa Srl – Padana Interventi Srl and work got underway in June 2020, which included the use of several Mapei product systems for repairing and protecting concrete.

Repairing and protecting concrete

After hydro-scarifying the areas of deteriorated concrete and power-brushing the exposed reinforcing rods, MAPEFER 1K one-component anti-corrosion mortar was applied on the rods.
MAPEGROUT EASY FLOW, a special one-component sulphate-resistant, fibre-reinforced, shrinkage-compensated, thixotropic mortar, was applied with a rendering machine to reintegrate the deteriorated concrete.
In order for the expansive properties to develop in open air, MAPEGROUT EASY FLOW was admixed with 0.25% MAPECURE SRA, a special admixture that can reduce both plastic and hydraulic shrinkage.
The piles were then protected with MAPELASTIC GUARD two-component, elastic cementitious mortar, a product developed to provide protection for large-scale concrete structures subjected to high levels of stress.
The final stage of the work was to apply special elastic coating with a fluorinating effect on the repaired concrete surfaces. These surfaces were initially treated with MAPECOAT E23, two-component epoxy primer, followed by a coating of MAPECOAT PU33, a two-component, polyurethane resin-based flexible product with high resistance to aggressive atmospheric agents, which remains impermeable to water but permeable to water vapour.
Once this work had been completed, the surfaces were finished off with MAPECOAT AF, a transparent, fluorinated acrylic polymer-based protective coating.
Certain areas of the concrete on the viaduct were repaired with MAPEGROUT HI-FLOW B2 fibre-reinforced, shrinkage-compensated free-flowing micro-concrete admixed with MAPECURE SRA curing admixture.
The last phase of the work was to protect the surfaces with a protective elastomeric system involving MALECH, a water-based acrylic primer, and a coat of protective, elastomeric ELASTOCOLOR PAINT for crack-bridging protection with permanent elasticity and high resistance to aggressive chemical agents.

Find out more
MAPELASTIC GUARD

TECHNICAL DATA
Platano viaduct, Vietri di Potenza (Province of Potenza, Italy)
Year of construction: 1969
Original design: Silvano Zorzi and Sabatino Procaccia
Period of the intervention: 2020 - 2021
Intervention by Mapei: supplying products for repairing concrete and protecting reinforcement rods and concrete surfaces
Owner: ANAS SpA
Design for renovation works: Michele Scioia (ANAS)
Project manager: Antonio Lippolis (RAGR – ANAS)
Works direction: Giovanni Picariello (ANAS)
Operational direction: Stefano Taurisano (ANAS)
Contractors: ILPA Srl (CE), Antonio Cirillo
Mapei coordinators: Michele Mirco Malvasi, Gianpiero Peluso, Alessandro Mongiello, Achille Carcagnì, Mapei SpA (Italy)

MAPEI PRODUCTS
Concrete repair:
Mapefer 1K, Mapegrout Easy Flow, Mapegrout Hi-Flow B2, Mapecure SRA, Mapelastic Guard, Malech
Protecting and coating surfaces: Elastocolor Paint, Mapecoat E23, Mapecoat PU33, Mapecoat AF

For further info on products visit mapei.com

Marghera (Province of Venice, Italy)

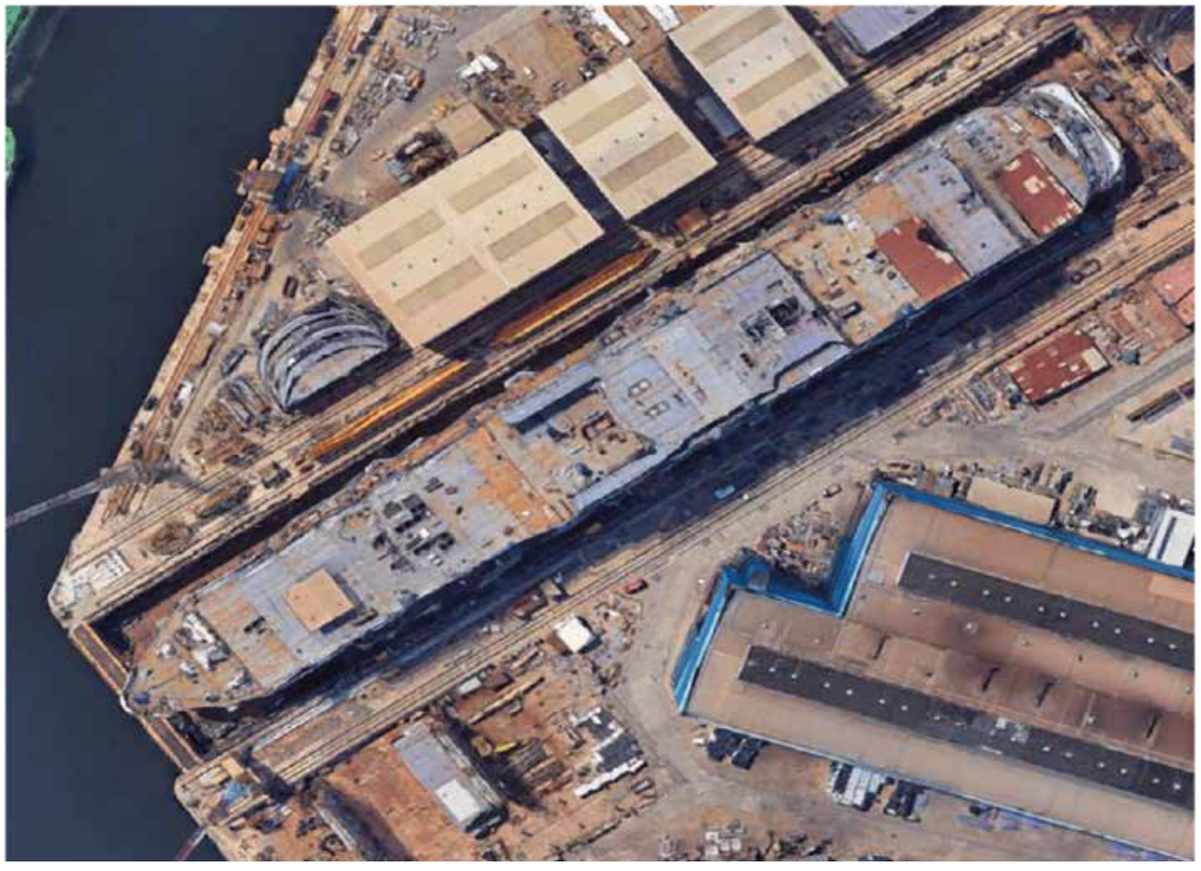
Dry docks

CONCRETE REPAIR AND WATERPROOFING IN THE FINCANTIERI SHIPYARD

The Ernesto Breda shipyard in Marghera (Province of Venice, Italy) was constructed after the First World War when Venice became an important industrial port. After changing ownership several times, it underwent radical restoration work between 1973 and 1978, which included the construction of a new dry dock to accommodate ships with a tonnage of up to 150,000 tonnes.
The yard at Porto Marghera was transformed into a particularly advanced complex and in 1984 was bought by Fincantieri SpA, one of the world's largest shipbuilding groups which, in recent years, became specialised in the construction of cruise liners.

Deterioration of the concrete in the dry docks
The dry dock is 334 m long, from the horseshoe-shaped rear end to the gate, and 54 m wide.
The walls have a constant thickness of 1.4 m for 7.45 m of their height, with a 1 m high bottom section of wall which is 30 cm thicker. To form the trench where the dock was inserted a reinforced and anchored diaphragm was created, with the walls of the dock sitting against the exposed concrete.
Between 2020 and 2021 the dock was completely refurbished due to deterioration of the concrete caused by the penetration of chloride salts, which had reached down as far as the reinforcement rods, and in some parts, had even gone past the reinforcement rods. The renovation work had three objectives:

- eliminate leaks and water seepage from the facing wall, as well as the formation of stains caused by damp, for a period of at least 10 years from the completion of work;
- protect the reinforced concrete facing walls and reinforcement rods to guarantee at least 4 cm of concrete cover over the external frame and 3 cm in the areas not filled with water;
- prevent water infiltrating through the vertical joints and foundation slab.



IN THE FACING PAGE. A view of the Fincantieri shipyard in Marghera, near Venice. **ABOVE.** Reinforcing rods were protected with MAPEFER anti-corrosion mortar (left), while several Mapei solutions were used to waterproof and repair the dock walls (right).

Restoring the strength and waterproofing capacity of the concrete
Numerous Mapei products were used to repair the concrete of the dock walls. This was a particularly special project because of the sheer size of the structure, the amount of materials supplied and the complexity of the work carried out over such a large area of operations.
Once the surfaces had been scarified and the deteriorated concrete had been removed, the walls were waterproofed as follows:

- water seepage was temporarily blocked with ADESILEX PG1 and LAMPOSILEX;
- packers were placed in the sections most damaged by water seepage and RESFOAM 1K-M one-component, ultra-fluid polyurethane resin was injected through them to ensure waterproofing at a deep level;
- FOAMJET J two-component polyurethane resin was injected where required, which is used to consolidate and waterproof structures with water leaks. Thanks to its high fluidity, FOAMJET F manages to penetrate and seal cracks that are even just several hundreds of microns wide.

The reinforcing rods were treated with MAPEFER anti-corrosion cementitious mortar.
MAPEGROUT EASY FLOW one-component, fibre-reinforced, thixotropic mortar was used to repair the concrete. Once hardened, this mortar is highly watertight and resistant to the aggressive action of sulphate salts and adheres perfectly to concrete surfaces.
Concrete surfaces were then treated with MAPELASTIC FOUNDATION two-component, flexible cementitious mortar, which was chosen to provide additional waterproofing capacity to the concrete surfaces. Once cured, this mortar is resistant to soluble salts such as chlorides and sulphates present in seawater or in the ground.

Find out more
MAPELASTIC FOUNDATION

TECHNICAL DATA
Dry docks, Fincantieri shipyard, Marghera (Province of Venice, Italy)
Year of construction: 1974
Period of the Mapei intervention: 2020/2021
Intervention by Mapei: supplying products and technical support for concrete repair and waterproofing concrete surfaces
Owner: Fincantieri SpA
Design: Studio IGT, Giovanni Tripoli
Works direction: Giovanni Tripoli
Contractor: Edil Merello
Mapei coordinators: Claudio Azzena and Gianpiero Peluso, Mapei SpA (Italy)

MAPEI PRODUCTS
Waterproofing works:
Adesilex PG1, Lamposilex, Mapelastic Foundation, Resfoam 1K-M, Foamjet F
Protecting reinforcing rods: Mapefer
Concrete repair:
Mapegrout Easy Flow

For further info on products visit mapei.com

New life for infrastructures

A SERIES OF PROJECTS CARRIED OUT WORLDWIDE THAT INVOLVED THE USE OF MAPEI PRODUCTS FOR REPAIRING AND PROTECTING CONCRETE

Ravbarkomanda viaduct - Postojna, Slovenia

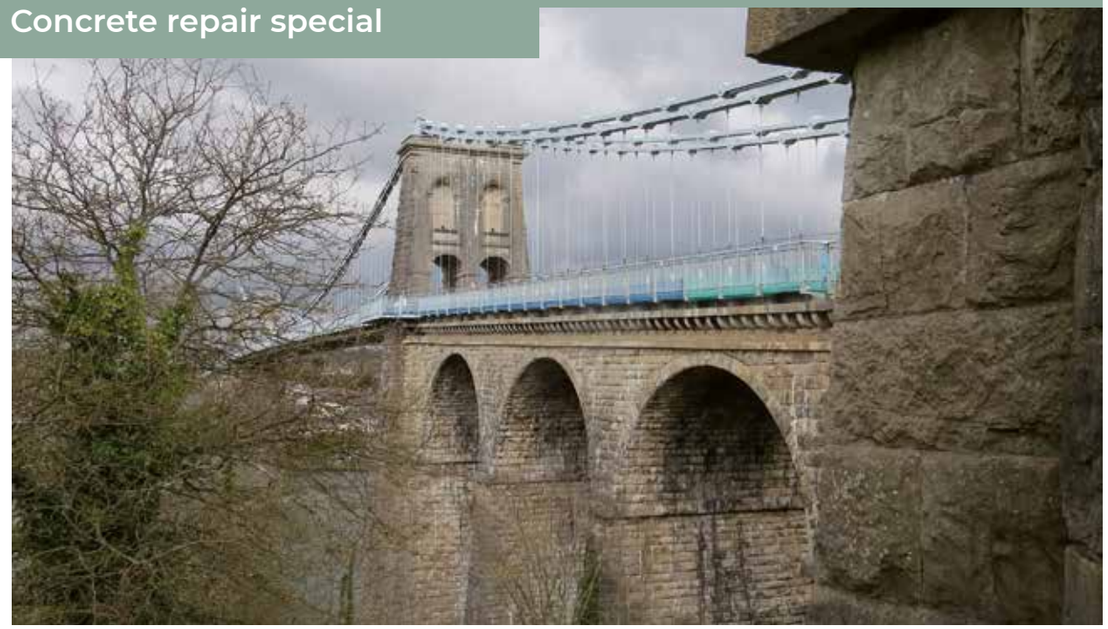
The Ravbarkomanda viaduct is situated along the Ljubljana-Koper motorway. It is around 590 m long and was constructed in 1972. The viaduct was recently overhauled, which included concrete repair work. Because the viaduct was widened and there was a greater load acting on it, new reinforcement was added using MAPEROD C 12 carbon composite rebar (that represents a compelling alternative to steel reinforcements with several advantages) bonded with ADESILEX PG1 epoxy adhesive. The repair work was carried out with MAPEGROUT EASY FLOW fibre-reinforced mortar, which was admixed during the summer with MAPECURE SRA to reduce the risk of cracking. New reinforcement was also added where needed and fastened in place with MAPEFIX EP 385 chemical anchor. The last operation was to protect and finish off the repaired surfaces with ELASTOCOLOR coating system.

Lake Turano viaduct - Castel di Tora, Province of Rieti, Italy

Lake Turano is located in Central Italy and was built in the 1930's to generate electricity and control the flow of the River Turano to prevent the frequent flooding of the near-by valley.
A repair and maintenance intervention was carried out between May and October 2021. Reinforcement rods were protected with MAPEFER 1K anti-corrosion mortar and the damaged concrete was reintegrated with MAPEGROUT 430 and MAPEGROUT T60 fibre-reinforced cementitious mortars. The concrete was then protected with a layer of MAPELASTIC GUARD two-component, elastic cementitious mortar.

Viaduct along the A50 west by-pass
Rho, Milan - Italy

Between 2020 and 2021 work was carried out to repair the 330 m long viaduct along the A50 West by-pass, close to the Rho area near Milan. Mapei products were used to repair the deck, by protecting the reinforcement rods with MAPEFER 1K anti-corrosion cementitious mortar and repairing concrete sections with MAPEGROUT EASY FLOW, MAPEGROUT 430 and PLANITOP SMOOTH & REPAIR R4.
As for the piles and foundations, galvanic-cathodic protection for the rods was ensured with MAPESHIELD I pure zinc anodes. New concrete was formulated, when needed, with STABILCEM, DYNAMON SP1, MAPECURE SRA, siliceous aggregates by VAGA (dried mix 0,1/15,0 mm) and MAPEGROUT HI-FLOW B2 fibre-reinforced micro-concrete. New reinforcement rods were fixed with MAPEFIX EP385 chemical anchor. The reinforcement rods on the deck intrados were ensured galvanic cathodic protection with zinc plates from the MAPESHIELD line. The surfaces were finally waterproofed with MAPELASTIC GUARD and protected with ELASTOCOLOR PAINT.



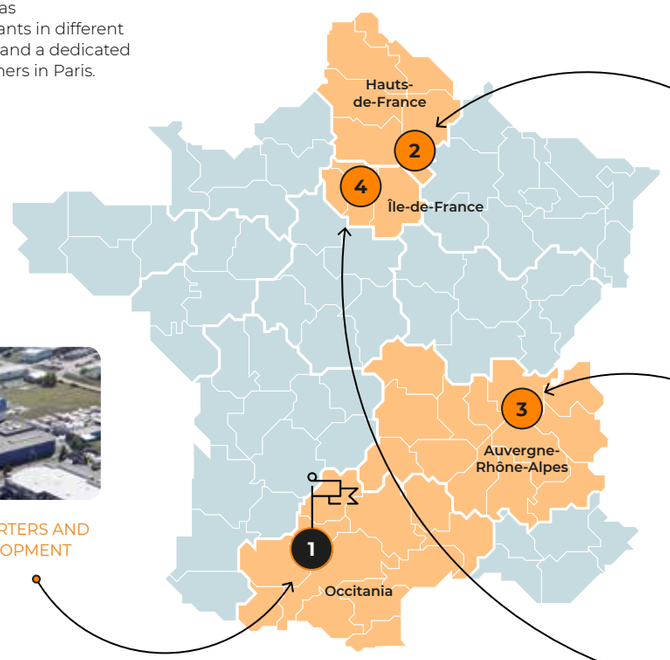
Menai suspension bridge - Island of Anglesey, UK

This bridge opened in 1826 and is a Grade I listed structure that carries road traffic between the Island of Anglesey and Mainland Wales. The redundant pipe was installed in 1955 and was supported by two corbels, which following the removal of the pipe, needed to be repaired. For the protection of the steel reinforcement against corrosion, Mapei UK recommended the installation of MAPESHIELD I pure zinc anodes for galvanic cathodic protection. To reinstate the voids, the product chosen was MAPEGROUT T60, a sulphate-resistant, R4 class fibre-reinforced mortar mixed with water and the curing admixture MAPECURE SRA to reduce hydraulic shrinkage and the formation of micro-cracks.

Cherno More hotel & casino
Varna, Bulgaria

"Black Sea" Hotel is one of the most emblematic modernist buildings in Varna, a famous seaside resort on the Bulgarian Black Sea. It was built in the 1960s-1970s period. It recently underwent a complex renovation intervention that involved concrete repair. The works started with hydroblasting to remove deteriorated and loose concrete until the substrate was solid and rough enough. MAPEFER 1K was used to protect steel reinforcement rods. Concrete repair was then ensured by shotcrete application of MAPEGROUT THIXOTROPIC, shrinkage-compensated fibre-reinforced mortar ensuring very high flexural and compressive strength, high modulus of elasticity, permeability to water vapour, resistance to abrasion and good adhesion to old concrete.

Mapei France has
3 production plants in different areas of France and a dedicated space for designers in Paris.



1. PLANT, HEADQUARTERS AND RESEARCH & DEVELOPMENT LABORATORY
Saint-Alban
1989

2. PLANT
Montgru Saint-Hilaire
1994

3. PLANT
Saint-Vulbas
2012

4. MapeiWorld PARIS
Paris
2019

Mapei France

Customised services for building professionals

INTERVIEW WITH CHRISTOPHE JEAUNEAU, GENERAL MANAGER OF MAPEI FRANCE

After two years of Covid-19, what are the prospects for the building trade in France?
Market trends are structurally good. However, difficulties in the supply of raw materials and inerrant rising costs have put a severe damper on the construction market with many uncertainties.

Which are the market segments that Mapei France considers most interesting and promising for its growth?
We are strengthening and diversifying our offer to provide a technical response and expert service in all market segments of the building industry. We are mainly focusing on cementitious and resin floors, chemical products for building, and concrete admixtures. Besides, we plan to introduce into the French market the Mapei systems for thermal insulation. Thus, after the integration in 2019 of Tecnopol France, a company specialized in waterproofing solutions for the building industry, the Mapei Group is continuing its growth in France with the recent acquisition of Resipoly Chrysor and its subsidiary Eurosyntec, which are specialized in the production and application of resins.
We are also developing new solutions and facilitating services for the concrete industry, such as MAPEI LE LAB', a mobile concrete laboratory service for ready-mix concrete and precast concrete plants. In terms of product innovation, we are launching a new range of C2 and C2S (improved cementitious) adhesives, and soon, a new concrete repair mortars line and a complete range for roadways.

What are Mapei France's sales channels and targets?
We sell our technical solutions through the professional distribution and DIY (Do-It-Yourself) point of sales, directly to the concrete industry and the specialized applicators for resilient floors and decorative and industrial cementitious and resin floorings, as well as waterproofing and civil engineering companies. A team from Mapei France is also dedicated to designers, who can draw on all the company's know-how, experience and technical products from the very earliest stages of their projects right through their execution until they are completed.

Mapei France is focused on customer loyalty. What strategies does it draw on?
We focus on prescribing our solutions and following up on business. For example, our MAESTRO loyalty program, launched a few years ago, is an additional means of strengthening our relations with application and installation companies. This is a

> **“ We are focusing on cementitious and resin floorings and concrete admixtures. We also want to launch Mapei's line of thermal insulation products in France**

A history stretching back over thirty years

As the third subsidiary of the Mapei Group outside Italy, Mapei France was founded in 1984 with a first commercial office and, in 1989, a manufacturing plant in Saint-Alban, near Toulouse, where the company headquarters, a Research and Development laboratory and training facilities are still located. After the Saint-Alban plant, specialized in the manufacture of powder products and adhesives, the Montgru Saint-Hilaire production plant opened in 1994 in northern France to produce powder products and, later on, concrete admixtures. In 2012, the Saint-Vulbas production unit was opened in the Lyon region to cover eastern France.
Next came Paris: in March 2019 MapeiWorld Paris was opened in the nation's capital close to one more nerve centre of the French economy and the big projects of the Olympic Games 2024. As a place of inspiration, exchange and trainings, MapeiWorld Paris is a "sister" facility of Mapei's Specification Centres in London and Milan and embodies the Group's determination to work closely with designers.

Mapei France's headquarters, Research & Development laboratories, and one of its manufacturing plants are located in Saint-Alban.

Our MAESTRO loyalty program is aimed at strengthening our relations with application and installation companies

project designed for installers and applicators that rewards them for purchasing Mapei products: they are offered a personalized agreement that develops and includes, according to the client's performance, extra free bespoke services such as dedicated technical assistance, training sessions, personal invitations, special offers, online sales of Mapei goodies and miscellaneous gifts, personalized travels, etc..

MapeiWorld Paris

An impactful showcase for the Mapei brand in the heart of Paris, MapeiWorld Paris is a source of inspiration for designers and has been a great success among building industry professionals since it first opened in March 2019. It includes the "Gallery" that brings together numerous Mapei systems and samples, the "Box" that allows visitors to immerse themselves digitally in the Mapei city, and a "Prescription" area where they can work on architectural projects with the help of Mapei experts. The spotlight has recently been focused on cementitious and resin flooring systems and solutions for sport surfaces from the MAPECOAT TNS range, the latter featuring a creation by the designer Gummy Gue.
MapeiWorld Paris also hosts training sessions and events: working lunches, after-work meetings, exhibitions on various topics (including sports) that turn into opportunities to provide technical advice in an informal setting. Among the various initiatives, are the "Mapei Club" podcasts or the "Talent Box" video vignettes recorded from here, which call on external referents and experts on various business, sports or cultural topics.

What are the sales opportunities offered by digital media and how do you use them most effectively?
Digital technologies allow us to provide services to facilitate the work of applicators, distributors and specifiers. For example, "MON CHANTIER avec MAPEI" is a customised technical solution that takes into account the distinctive features of individual building sites, providing direct access to technical documentation and stipulating the right quantities of product required. This saves time for the craftsman in his work site preparation and for the distributor who needs to quickly inform a customer.
Digital is also a strong vector of communication to highlight and share the know-how of craftsmen and companies. It is a tool that is able to transform our sector. In the medium term, we believe that specialized marketplaces will play a significant role in the distribution of our products to applicators.

What opportunities are opening up for Mapei France in the infrastructure and large-scale works sectors?
Thanks to our technical teams, prescription and underground works teams, Mapei France is participating in one of the largest urban projects in Europe: Grand Paris Express (GPE). With 200 km of automatic lines and 68 new stations, it will be easier to get from one point to another in the Île-de-France region without passing through Paris, and to reach the heart of the capital more quickly from its outskirts. As a new alternative to the car, the Grand Paris Express will reduce pollution and traffic jams and help create a more environmentally friendly metropolis. With our Underground Technology Team (UTT), we supplied three chemical products used to prepare a grout that made tunneling works with TBM (Tunnel Boring Machine) much easier. And we are proud to be, with our partners LEA Ceramiche, CS France and Pedrazzini, one of the two consortia that supply a complete and sustainable flooring system for half of the 68 new stations of Grand Paris Express. The project will will continue until 2030, with an important deadline in 2024 for the Paris Olympic and Paralympic Games. Mapei Frances also participates in important infrastructure projects like the Lyon-Turin high speed railway line or the new metro line in Toulouse.

Over recent years Paris has continued to be the focus of iconic projects, such as the Luis Vuitton Foundation, and infrastructural projects. How has Mapei France contributed?
Paris is a capital of culture. We have participated in iconic cultural projects such as the Quai Branly Museum, the Louis Vuitton Foundation, the Louvre Museum and, most recently, the Seine Musicale by providing solutions for all decorative cementitious floors. Thank to our expertise in decorative solutions, our flooring and prescription teams were able to work hand in hand with clients and architects to provide an aesthetic and sustainable solution that fits into the overall architectural project.

What has been achieved from the opening of MapeiWorld Paris in 2019 to the present day?
Since the inauguration in April 2019, we have received more than 1,500 people, architects and contractors, but also building companies, manufacturers and distributors. MapeiWorld Paris is a place of inspiration, training and exchange that welcomes more and more specifiers. Located in the heart of Paris in a district that is particularly popular with architectural agencies, it has developed new facilities and tools to help architects and designers to orient and support their choice of solutions and provide them with constant information on the evolution of the sector. In addition to numerous physical events throughout the year, we highlight MapeiWorld Paris through new media such as videos or podcasts with external experts on various business, sports or regulatory topics.

The Mapei brand is also linked to sports in France. What sports are you focusing on?
Sport, and in particular cycling, is deeply rooted in Mapei's DNA. In France, we share this passion

MAPEI FRANCE

116
MILLION EUROS
TURNOVER IN 2021

310
EMPLOYEES

3
PRODUCTION PLANTS
IN TOULOUSE SAINT- ALBAN, MONTGRU SAINT-HILAIRE AND LYON SAINT-VULBAS

1
RESEARCH & DEVELOPMENT LABORATORY
IN SAINT ALBAN

1
MAPEIWORLD PARIS
IN PARIS

A “mobile service” for training

Mapei Academy in France offers the technical training sessions for installers, retailers and construction companies that are held in person at Mapei France's headquarters in Toulouse Saint-Alban, its facilities in Lyon Saint-Vulbas and in MapeiWorld Paris. Training events are also held in spaces made available by customers. Theory sessions are supported by practical demonstrations with the expert advices of Mapei’s training technicians. Mapei France's training also includes a "mobile service" carried out at customers' sales outlets or directly on building sites with the help of specially equipped vehicles: this service is called MAPEI ON THE ROAD. In 2021, Mapei France organised 30 training events and expects to hold 40 events and 12 webinars in 2022.
Besides, MAPEI LE LAB' is a new and exclusive mobile technical support system designed to assist concrete manufacturers. Fully equipped, it travels to precast concrete plants, ready-mix concrete plants and construction sites to conduct tests on concrete mixes.

Mapei France is maintaining its long-lasting support for cycling by sponsoring teams and events at various levels.

and emotion with our customers, partners and employees inviting them to participate in numerous sporting events. We also support various sport clubs or athletes who share the same values of team spirit, commitment and youth training. Thus, we are partners of the training center of the AG2R Citröen U23 Team, of the GSC Blagnac Vélo 31 cycling club (one of the biggest French clubs in the National 1 Division), and of the Villemur Cycling Club, of which we are the oldest sponsor. For several seasons, we support the Nordic ski club of La Féclaz and make our clients discover a new sport discipline, such as cross-country skiing and biathlon. And we are very proud to support Arnaud Chautemps, a young cross-country skier and member of the French cross-country ski team, in his career as a high-level athlete. We support him from the beginning, and we hope to take part with him at the next Olympic Games in Milan-Cortina. Engaged in equality, we will be the sponsor of the White jersey of the first international women's tour of the Pyrenees (CIC Tour Féminin International des Pyrénées) this August.

How is Mapei France committed to sustainability?

The environment is a pillar of our strategy. We strive to limit our impact on the environment throughout the whole product life cycle of our materials, with, for example, the use of bio-sourced or recycled materials. Beside we take part in the the Fret 21 programme, which this year enabled us to reduce our greenhouse gas emissions from transport by nearly 1,000 tons. The publication of our first "Sustainability Report" in French language is also a strong sign of transparency on the commitments and actions taken over the last three years in favor of sustainable solutions. Today, our work focuses on reducing the CO_2 impact of our consumption, our products and systems, also by selecting committed partners.

Sustainability, quality, certifications

Mapei France has always stood out for its commitment to sustainability and quality: it is a founding member of Green Building Council France, the French branch of the World Green Building Council; It holds ISO 9001 certification for Quality Management and all its manufacturing plants were awarded BS OHSAS 18001 certification for Occupational Health and Safety Management in 2011 (updated as ISO 45001:2018 since 2020). The Saint-Alban plant has been regularly achieving ISO 14001 certification for its Environmental Management System since 2005. In 2011 it was awarded a Certificate of Excellence by Certiquality for its voluntary commitment to all ISO Management Systems (Quality, Environmental and Health and Safety).

By joining France's Fret 21 program, Mapei France has committed to reducing greenhouse gases, associated with the transportation of its products, by 10% in three years, as well as increasing the quantity of recycled materials used as raw materials for its products and favouring the use of renewable energy in its manufacturing processes. Last year, Mapei France, following in the footsteps of Mapei SpA, published its first "Sustainability Report." According to Christophe Jeaneau, General Manager of Mapei France, "The Report is part of a carefully reasoned approach to reduce our environmental impact."

Overview of French works

FROM A NEWSPAPER OFFICE TO AN ANCIENT CASTLE: PLACES WERE MAPEI HAS LEFT ITS HALLMARK

Le Monde headquarters
Paris - Île-de-France

To centralize all the editorial offices and welcome the 1,600 employees of the Le Monde group on 23,000 m², the Norvegian architecture and design studio Snøhetta, in partnership with SRA Architects, reveals an unusual bridge building. The new building relies on transparency and openness, seen as architectural metaphors for a free press. For the interior floors in the lobby and restaurant, Mapei supplied a complete epoxy-based system to create polished terrazzo floor coatings, mostly made up of mineral materials. The system is able to ensure durability, mechanical resistance and high aesthetic impact to the floor surfaces.

Bonrepos-Riquet castle
Bonrepos-Riquet, Upper-Garonne

Mapei contributed to the restoration of the castle that was originally built in two stages back in 1651 by order of Pierre-Paul Riquet, the creator of the Canal du Midi. In 2019, the company provided technical support and supplied products and systems to reinforce the vault and masonry of the so-called 'Cold Cave', such as MAPEI STEEL DRY helical bars that were attached to the masonry by means of MAPEFIX VE SF, a chemical styrene-free vinylester anchor extruded into holes drilled in the vault. PLANISEAL 88 was used to waterproof the upper parts of the roof and the side walls made of reinforced concrete. In 2020, the oak windows were repaired using the epoxy primer MAPEWOOD PRIMER 100 to reinforce the wooden parts, and MAPEWOOD PASTE 140 adhesive to replace missing parts or bond new sections of wood to replace damaged ones.

Villa Koegui hotel, Bayonne
(Pyrénées Atlantiques)

Located in the historic town centre of Bayonne, this hotel, which opened for business in 2020, is a tribute to Basque culture and was designed by Jean-Philippe Nuel, one of the greatest architects for the hospitality industry. A "terrazzo-all veneziana"-type floor was installed in the entrance hall using ULTRATOP SYSTEM. After creating a screed using TOPCEM, marble mosaic tiles were bonded with the help of KERAFLEX adhesive. The substrate was treated with PRIMER SN and fully broadcast with QUARTZ 1.2 before applying ULTRATOP self-levelling cementitious mortar, mixed with aggregates and coloured using MAPECOLOR PIGMENT. Final protection was ensured by means of MAPEFLOOR FINISH 630 protective acrylic filming agent.

Void-Vacon bridge
Void-Vacon (Department of Meuse, Grand Est)

This bridge, which crosses the Marne-Rhine canal, was reopened to traffic in 2021 after ten months' renovation work. Work needed to be carried out to ensure the reinforcement of both the bridge deck and foundations. Various types of concrete (for a total of 482 m^3) were used for these operations (C20/25 XC2, C35/45 XC4 XF1, C35/45 XF4, C45/55 or self-compacting) and included the use of admixtures such as DYNAMON EASY 630 and DYNAMON XTEND W333 superplasticizers, both manufactured and distributed in the French market by Mapei France.

Port of Bormes-
-les-Mimosas dam
Bormes-les-Mimosas (Provence-Alpes-Côte d'Azur Region)

The port is made up of a main dam around 770 m long, made from large rocks which, over the last few years, had been damaged by seaweater. In the 2019-2020 period, the dam underwent a complete refurbishment that involved raising the breakwater with 215 protective covers in precast concrete. More than 600 m^3 of concrete was used to make the covers and formulated with DYNAMON XTEND W333 superplasticiser and the set retardant MAPETARD CBS1. MAPEFORM ECO 2000, a vegetable-based release agent, was applied on the smooth surface of the formwork and some small surface defects were repaired with NIVOLITE G smoothing mortar mixed with PLANICRETE LATEX.

Mapei supplied various solutions for the underground work to help make tunnelling operations using TBMs (Tunnel Boring Machines) flow more smoothly.

Paris

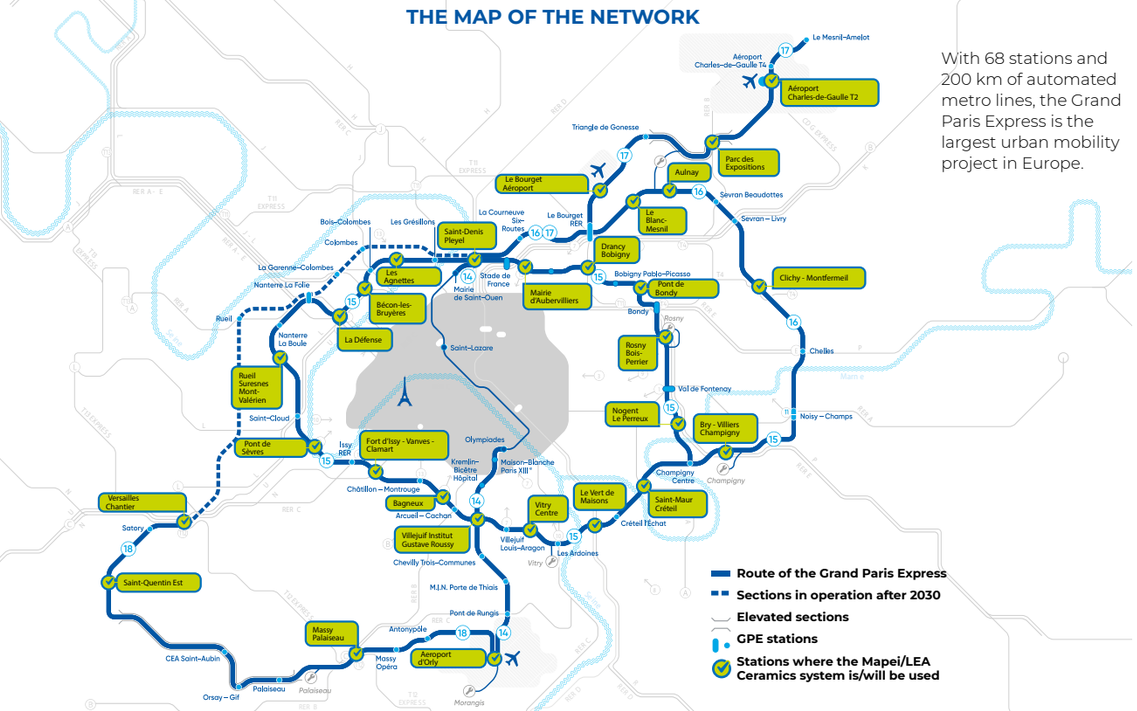
Grand Paris Express

MAPEI SUPPLIED SOLUTIONS FOR UNDERGROUND WORKS AND INSTALLING CERAMIC TILES IN THE STATIONS. THIS MAXI URBAN MOBILITY PROJECT IS SCHEDULED TO BE COMPLETED IN 2030

With 68 stations and 200 km of automated metro lines, the Grand Paris Express is the largest urban mobility project in Europe. The new metro system, scheduled to be completed in 2030, weaves its way through important hubs, such as airports, research centres, universities and urban and suburban areas which, today, are difficult to get to. The four new metro lines (15, 16, 17 and 18) and line 14, which is due to be extended in both north and south directions, will link up to Paris's existing transport system. Most of the new metro system will run underground, passing through the areas covered by the "Grand Paris" project (which aims at turning Paris and the surrounding area into one of the world's largest metropolises of the 21st century) and linking them all together.
Thanks to this new infrastructure it will be possible to go from one side of Île-de-France to the other without passing through Paris and make it that much easier to reach the centre of the capital from the suburbs. The first important "phase" of the Grand Paris Express will be completed in time for the Olympic and Paralympic Games in 2024.

Line 15: many challenges for underground works
Line 15 will be divided into 3 parts, East, West and South and will run around the outskirts of the city. With its 33 km of lines, it will run through 22 towns and districts and will make it much easier for one million inhabitants to move from one part to another. Construction of the line is divided into various lots. Going into detail, lot T2A, whose construction has been commissioned to the Horizon consortium, consists of 4 stations, the entrances to two tunnels, secondary works (emergency exits, access for emergency vehicles, etc.), a double tunnel and a single tunnel that connects the Infrastructure Maintenance Site (IMS) to the main line.
The excavation work for the tunnels started in February 2020 and was carried out using a variable density TBM (Tunnel Boring Machines) in a "slurry" mode.
For the backfilling injection of the annular gap, created during the TBM advance between the soil and concrete segments lining, the Horizon consortium decided to use a two-component grout consisting of component A (grout made by water, bentonite, cement and a retard-

THE MAP OF THE NETWORK



With 68 stations and 200 km of automated metro lines, the Grand Paris Express is the largest urban mobility project in Europe.

ing agent) and component B (accelerant). Two-component grout systems are the most widely used backfill systems in the world of TBM tunnelling, whereas in France this technology was not particularly popular and a mortar without accelerant used to be the preferred method.
Mapei, world leader in the supply of products for two-component backfill grouts, offered its experience and supplied three chemical products used to prepare a grout that would fit the requirements of this site.
The most widely used product was MAPEQUICK CBS SYSTEM 3. This is a liquid accelerant which, when added to component A of the mix just before being injected into the annular gap, very quickly transforms the grout into gel. In so doing, the mix sets and starts to develop its mechanical properties after a very short time, which is very important for the stability of the excavated tunnel and concrete lining.
Apart from the accelerant, Mapei also supplied the two additional products required to make component A, namely MAPEQUICK CBS SYSTEM 1, a retarding agent, which helps to maintain and extend the initial workability of the grout (up to 72 hours after being prepared), and MAPEBENT API 2 bentonite, which is needed to stabilise Component A, while also providing it with the rheological properties needed to make the pumping of the mix over long distances possible.
Beside chemical products, Mapei also provided technical support to carry out the laboratory tests, which then led to the development of two different types of two-component mixes: one with very high mechanical properties, which the Horizon consortium required for specific areas of the tunnel (such as the entrances and exits of the stations), and one with more common properties, used in other areas of the tunnel.
Lastly, MAPEBENT API2 bentonite was also used for the preparation of the slurry used by the variable density type TBMs. This bentonite slurry has a dual function: to maintain the stability of the tunnel face during TBM excavation (so that TBM can advance safely) and to transport the excavated soil while keeping it in suspension inside the pipes running along the tunnel. For this application, MAPEBENT API2 was chosen by the client after a long series of tests carried out in an external laboratory where its performance and properties were compared with those of numerous other types of bentonites available on the market.
In certain phases of the tunnelling works, MAPEDISP FLS was also added to the bentonite slurry. This product is a liquid dispersing agent which allows TBMs to excavate smoothly in particularly cohesive soil by improving its fluidity and reducing its adhesion to the metal components of the TBM.

A highly effective flooring system for half of the stations of the new lines

Thanks to a very fruitful collaboration with the tile manufacturer LEA Ceramiche, Mapei France developed a system to install the flooring in half of the 68 stations of the Grand Paris Express. The worksite begins in 2022 with the opening of the Orly airport station and is scheduled to end in 2030. The request from the client was, first and

Various Mapei solutions were and will be used to prepare substrates and to install ceramic flooring in the new stations of the Grand Paris Express.

THE FIGURES OF THE PROJECT

68
STATIONS

200
KM
OF FULLY-AUTOMATED RAILWAY LINES

4
NEW LINES

1
LINE (14)
EXTENDED IN TWO DIRECTIONS

2016
START OF WORKS

2030
SCHEDULED COMPLETION OF WORKS

MAPEI QUALITY AND RELIABILITY FOR THE FLOORS IN THE STATIONS

by **Didier Bourgeois**

The floors in the stations of the metro are amongst the architectural components most exposed to wear and attack from various agents, due to both the high level of pedestrian traffic and routine maintenance work. However, it was also necessary to have a uniform “identity” for all the stations of the Paris Grand Express network, from their entrance right up to the platforms. This identity is reflected in the creation of a continuous “identifying journey” for the floors in the stations of the Grand Paris Express. Research carried out by Société du Grand Paris (SGP) in 2015 showed that, as far as ceramic flooring is concerned, and considering the intense stresses the station floors need to withstand, meeting the requirements of class P4S of the UPEC reference system would not be sufficient. SGP, therefore, set itself the challenge of finding a solution suitable for the specific type of use and that would meet the requirements of the stations. It became immediately clear that the solution could not simply consist of different components selected independently from each other. Rather, a complete system had to be employed that would meet particularly severe technical criterion in order to achieve performance properties often higher than the standards required for UPEC certification.
As a result, in 2016 SGP started to consult with potential suppliers and, after more than four years of work, two complete solutions were selected that would meet SGP’s expectations in terms of performance properties, aesthetics and cost. Following a particularly intense and objective technical evaluation the solution proposed by Mapei, partnered by LEA Ceramiche, Pedrazzini and CS France, was found to be a particularly satisfying and high quality solution for the floors in the stations exposed to such intense passenger traffic.
Mapei demonstrated considerable commitment throughout this selection process and stood out for the consistency, professionalism and availability of its representatives. The proposal from Mapei is, quite literally, the “binder” of this solution for the floors and provides concreteness and consistency. Throughout the entire development process of the solution chosen, apart from being an unlimited source of ideas and proposals, the Mapei team instigated the constant dialogue with its partners regarding the technical aspects and showed understanding for the needs expressed by the other members of the group.
The organisation by Mapei of special, dedicated training sessions for future floor installers, and the use of the company’s own training facilities, is a very important element that we are taking into consideration for our next construction projects which are currently at the development stage.

Lead materials analyst for the Grand Paris Express Project

Ceramic floor and wall tiles were installed in the new stations along Line 14 using Mapei products such as GRANIRAPID, KERALASTIC T, ULTRALITE S2 QUICK and ULTRACOLOR PLUS.

foremost, for floorings that would be sufficiently resistant to very high levels of pedestrian traffic. The system consists of a screed, adhesive, grout for tile joints and sealant for expansion joints by Mapei France, ceramic tiles by LEA Ceramiche, expansion profiles by CS France and pododactile system by Pedrazzini.
The screeds will be made from new formulations, called MAPECEM X'PRESS or MAPECEM PRONTO X'PRESS, of existing ready-to-use, pre-blended Mapei mortars that have been widely used for a number of years. 37,5 x 75 cm light-coloured porcelain tiles will be installed on these surfaces using KERAFLUID HPR or KERAFLUID N adhesives, manufactured and distributed in France by Mapei France, before grouting the joints with KERACOLOR GG or ULTRACOLOR PLUS mortars to obtain a colour matching the colour of the flooring. The expansion joints will be sealed with MAPEFLEX E-PU21 SL, which is especially suitable for surfaces subjected to high levels of pedestrian traffic.
To make sure the installation work will be executed to perfection and get the most out of the finished surfaces, the installation companies will undergo a special training at MAPEI ACADEMY, the training centre located at Mapei France's facilities in Toulouse St-Alban.

4 new stations along line 14

Ever since it first opened in 1998, Line 14 has made a name for its level of innovation: in fact, it was the first line in the world to be fully automated. It has just been extended northwards by 5.8 km with 4 new stations to improve the transport conditions of its 610,000 daily users. The line's extension is part of the Grand Paris Express project which, by 2024, will include extending the line even further to the north, up to the station at Saint-Denis Pleyel, and to Orly Airport to the south and its connection to lines 15, 16, 17 and 18.
The four new stations (Pont-Cardinet, Porte de Clichy, Mairie de Saint-Ouen and Région Île-de-France) are characterised by an architectural style that is simple yet, at the same time, elegant, which also had an influence on the materials chosen to build the stations. These include white porcelain tiles for the floors and walls in the areas where the trains wait and transit. To install the tiles on 6500 m² of surfaces, Mapei supplied a complete system that also included preparation of the substrates with ULTRAPLAN MAXI FIBRÉ self-levelling skimming mortar and repairs to certain sections of deteriorated concrete substrates using PLANITOP 400 F rapid-setting class R3 mortar.

The Metro Factory

La Fabrique du métro (or Metro factory) was a specific wish of Société du Grand Paris which is behind the Grand Paris Express project, and is a display that allows visitors to "immerse" themselves in this grandiose infrastructure project. It features a reconstruction over an area of 100 m² of a metro station with its characteristic materials, equipment and furnishings. It is located in the Docks area of Paris in Saint-Ouen-sur-Seine.

Different areas of use, different types of substrates and different performance properties required for the finished surfaces called for the use of different types of adhesive. The ceramic floors in the corridors were installed with KERAFLUID N adhesive and the joints were grouted with ULTRACOLOR PLUS. The tiles for the walls were bonded with ULTRALITE MULTIFLEX, while the tiles for the vaulted ceilings were installed with ULTRALITE S2 QUICK. KERALASTIC T two-component polyurethane adhesive was used to bond tiles onto the steel doors. The adhesives chosen to install the ceramic flooring on the station platforms were KERAPOXY CQ and GRANIRAPID. The tile joints were grouted with KERAPOXY DESIGN. In this case, the products were chosen because they needed to provide guaranteed insulation from electric current, in compliance with the French standard NF C 15-100.
ULTRAPLAN MAXI FIBRÉ, PLANITOP 400 F, KERAFLUID N and ULTRALITE MULTIFLEX are manufactured and distributed in France by Mapei France.

Find out more
GRANIRAPID

TECHNICAL DATA

UNDERGROUND WORKS
Line 15, lot T2A, Paris
Period of construction: 2019-2021
Period of the Mapei intervention: 2019-2021
Owner : Société du Grand Paris
Project management: Systra
Main contractor: Horizon consortium including Bouygues Travaux Publics, Soletanche Bachy France, Soletanche Bachy Tunnels and Bessac et Sade
Intervention by Mapei: supplying products for TBM exaction works
Mapei coordinators: Edgar Doledec and Jérôme Darras, Mapei France
Photos: Edgar Doledec, Horizon

MAPEI PRODUCTS
Underground works:
Mapequick CBS System 1, Mapequick CBS System 3, Mapebent API2, Mapedisp FLS

INSTALLING CERAMIC FLOORS IN HALF OF THE 68 STATIONS
Period of construction: 2022-2030
Owner: Société du Grand Paris
Suppliers: Mapei France, LEA Ceramiche, CS France, Pedrazzini
Period of the Mapei intervention: 2022- 2030
Intervention by Mapei: supplying a complete system for installing ceramic floors in about half of the 68 new stations

MAPEI PRODUCTS
Building screeds:
Mapecem X'press*, Mapecem Pronto X'press*
Installing ceramic tiles:
Kerafluid HPR*, Kerafluid N*
Grouting tile joints:
Keracolor GG, Ultracolor Plus
Sealing expansion joints:
Mapeflex E-PU 21 SL

NEW CERAMIC COVERINGS IN 4 NEWS STATIONS ALONG LINE 14
Period of the works: 2019-2020
Owner: RATP
Design: AZC 15/17
I**nstallation companies:** Chantiers Modernes (Vinci Group), Brezillon (Bouygues Group)
Period of the Mapei intervention: 2019-2020
Intervention by Mapei: supplying products for preparing substrates and bonding and grouting ceramic tiles on walls and floors
Mapei distributors: Raboni and Carmat
Mapei coordinators: Yves Pradeau, Dominique Avet, Bryan Brissonnette, Mapei France
Photos: Yves Pradeau e RATP (Bruno Marguerite, Xavier Chibout)

MAPEI PRODUCTS
Preparing substrates:
Ultraplan Fibré*
Concrete repair: Planitop 400 F*
Installing ceramic floors:
Kerafluid N*, Granirapid, Keralastic T, Ultralite S2 Quick, Ultralite Multiflex*
Grouting joints: Ultracolor Plus, Kerapoxy CQ, Kerapoxy Design

*These products are manufactured and distributed on the French market by Mapei France

For further info: mapei.com
mapei.fr

Resipoly

Always at hand to help installers of resin-based products

GENERAL MANAGER, AXEL DE LAVERNHE, PROVIDES AN OVERVIEW OF RESIPOLY THAT WAS RECENTLY TAKEN OVER BY MAPEI

Resipoly was founded in 1958. Can you briefly tell us about the company's history?
Resipoly history started in 1958 when SCEG, a branch of Bouygues Group, decided to produce bituminous pavement joints at Villeneuve-le-Roi, near Paris, to be close to Orly where a new airport was under construction. Resin production started in the 1970s. In 2000, development of the company accelerated with the takeover of CHRYSO Résine (CHRYSOR), specialized in adhesive and flooring solutions, and Société des Résines Synthétiques (SRS), specialized in civil works solutions. After becoming a subsidiary of SMAC from 2006, Resipoly left the Bouygues Group in 2019 and joined the Mapei Group on 31st December 2021.

> **"The company specializes in the manufacture of resin-based products for floors, products for protecting concrete and sealants for joints**

Which sectors has Resipoly specialised in?
Resipoly is the French leader in providing synthetic resin solutions for the building industry. Resipoly designs, manufactures and distributes resin solutions in the field of flooring, sealing, concrete protection and adhesives. Resipoly addresses four main markets: building, industries, infrastructures and sports.

Traditionally, synthetic resins have mainly been used in industry. Nowadays, however, they are increasingly popular in the commercial and housing sectors. What are the prospects for Resipoly?
Even if the Resipoly's business is significantly more important in the industrial sector, resin flooring solutions such as "terrazzo-alla-veneziana" floors, acoustic floors or self-levelling polyurethane systems are getting more and more popular in different and new segments of the building sector.

Who is Resipoly targeted at and what kind of sales tools does it employ?
The strength of Resipoly, with its subsidiary Eurosyntec, is its proximity to the applicators. To increase our attractivity, we plan to reinforce our support to design offices, architects and major construction companies with a dedicated and focused team.

Axel de Lavernhe, General Manager of Resipoly.

Do you only operate in France or also on foreign markets?
Most of Resipoly sales are made in France and in French oversea territories. Nevertheless, a part of the company's production is also distributed in the rest of Europe and Africa on a regular basis and all over the world, mainly linked to specific civil works projects involving major French contractors.

Resipoly invests heavily in Research & Development: 12% of human resources are employed in its laboratories.

What kind of growth opportunities have been opened up for Resipoly by joining a major multinational group like Mapei?
The takeover of Resipoly by Mapei is certainly a great opportunity for Resipoly. A lot of synergies have been already identified in the field of operations and sales. The product ranges of Resipoly and Mapei are complementary and this offers Resipoly the chance to enrich its product portfolio. Resipoly's 3 plants, on the other hand, are sized to produce much more resin-based materials for Mapei France and other subsidiaries of the Group.

The company designs, develops and distributes quality resin-based products.

RESIPOLY & EUROSYNTEC

1958
THE YEAR RESIPOLY WAS FOUNDED

23
MILLION EUROS
TURNOVER IN 2021

110
EMPLOYEES

3
PRODUCTION PLANTS
IN VILLENEUVE-LE-ROI, VÉNISSIEUX, SAINT-MARS-LA-BRIÈRE

2,500
TONS OF RESIN
MANUFACTURED ANNUALLY

12%
STAFF
WORKING IN RESEARCH & DEVELOPMENT

Research and sustainability: the company's strong points

Resipoly has been designing, developing and marketing quality products based on synthetic resins since 1958, distributing them in France and abroad. Its range includes materials based on epoxy resins, polyurethane resins, acrylic resins and bituminous mastics used for coating floors, waterproofing buildings, protecting concrete and other special applications. These products are used in industrial, commercial, infrastructural and sports settings, both indoors and outdoors.
The company is based in Villeneuve-le-Roi, Île-de-France, where it has a manufacturing plant. Two other production units also belong to Resipoly: one is located in Vénissieux in the Auvergne-Rhône-Alpes region and the other in Saint-Mars-La-Brière, in the Pays de la Loire region.
In addition to a constant focus on developing eco-sustainable products, Resipoly invests heavily in Research & Development: 12% of its human resources are employed in its laboratories.
The company has always been committed to have a certified Quality Management System (in accordance with ISO 9001 standards) that has been regularly renewed since 2000. Resipoly has been certified for its processes in accordance with ISO 14001 standard since 2011: a recognition of its commitment to the environment and eco-sustainability.

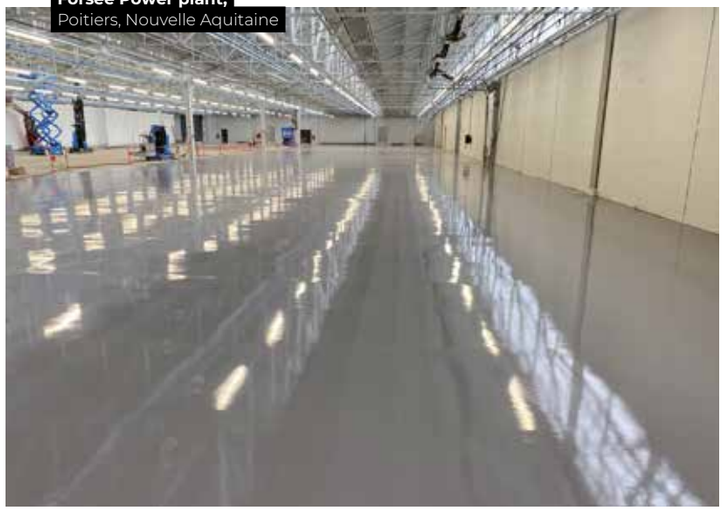
Resin-based solutions for works

A FEW EXAMPLES OF SOME IMPORTANT PROJECTS THAT WERE RECENTLY COMPLETED WITH RESIPOLY'S SOLUTIONS

Metro line 6
Paris, Île-de-France

Marie-José Pérec stadium,
Villiers-le-Bel, Île-de-France

Forsee Power plant,
Poitiers, Nouvelle Aquitaine



Products from the ULTRACARE range were recently used to complete the installation of stone materials within the building hosting the headquarters of Federchimica (the Italian Federation of the chemical industry) in Milan.

UltraCare Range

NEW PRODUCTS FOR PROTECTING CERAMIC AND STONE SURFACES COMPLETE MAPEI'S ULTRACARE RANGE

Always ready to help out installers of ceramic and stone coverings, Mapei can provide across-the-board support for installation work - from preparing substrates to protection and final maintenance of surfaces - offering complete products to simplify work so that it can be executed to perfection.
An example? The ULTRACARE range that was first presented at Cersaie 2021 (see *Realtà Mapei International* no. 88) and is currently being extended: an innovative, versatile and reliable system for cleaning, protecting and maintaining surfaces.

This is a new market niche for Mapei, which can now offer installers its trademark quality and reliability (gained from its experience working all over the world) even during the final stage in installation.
Since September 2021 the range has included nine cleaners, designed for end-of-installation cleaning and regular/special care of ceramic tiles, stone material and glass mosaic, to supplement such familiar products as KERANET and KERAPOXY CLEANER.
These products are now joined by seven products for protection and a complementary product to offer ideal solutions for miscellaneous needs:

- revitalising protection
- water- and oil-repellent protection
- protection for polished porcelain tiles and cementitious grouts
- pre-grouting protection.

The new products for protection are an ideal, easy-to-use solution for a wide variety of building work, from new installations in commercial/domestic settings to the protection and maintenance of existing surfaces.

Each product, available in different formats, is formulated to be safe to use and easy to apply, as well as performing to high standards.
ULTRACARE protective products are designed to be used for both professional and do-it-yourself purposes. They are ready-to-use and do not need to be diluted on dry (or slightly damp) or clean material. They are applied with a brush or other application tools, such as a cloth or waxing mop. These new innovative products complete Mapei's range of products for every stage in professional installation procedures.

New products from the **UltraCare** Line

ULTRACARE INTENSIFIER W

Water-based, high-penetration polymer microemulsion for invigorating and protecting surfaces.

ULTRACARE INTENSIFIER S

Solvent-based mixture of high-penetration polymers for invigorating and protecting surfaces.

ULTRACARE STAIN PROTECTOR W

Water-based polymer emulsion with protection and anti-stain properties with a natural-effect finish for unpolished surfaces.

ULTRACARE STAIN PROTECTOR S

Solvent-based polymer emulsion with protection and anti-stain properties with a natural-effect finish.

ULTRACARE STAIN PROTECTOR W PLUS

Water-based polymer emulsion with protection and anti-stain properties with a natural-effect finish.

ULTRACARE GROUT RELEASE

Water-dispersed product for protecting porous materials prior to grouting.

ULTRACARE GROUT PROTECTOR

Water-dispersed product for protecting cementitious grouts and porcelain tiles.

ULTRACARE FUGA FRESCA

Polymeric paint to refresh the colour of the cementitious grout joints between tiles.

New offices in Rome

MAPEI'S NEW OFFICES HAVE OPENED IN THE ITALIAN CAPITAL WITH SPACES ALLOCATED FOR TRAINING AND TECHNICAL/BUSINESS SUPPORT

An overview of the company's products for the building industry in spaces designed for work, training and technical/business support: Mapei's new offices in Rome, which were inaugurated on 27th May, are a multifunctional facility for accommodating staff, customers and business partners.
The offices, which are located in the Eur district of Rome and were designed by Onsitestudio, are the company's point of reference for the near-by area.
Inside, visitors can discover the world of Mapei products and how they are used for everything from residential buildings and large infrastructural works to restoration/renovation works and contemporary architectural design.
The journey begins with the history of the company and continues with an overview of its numerous product lines in a showroom divided into theme areas showcasing iconic references characterising the company's over eighty-five-year history such as the Solomon R. Guggenheim Museum in New York and the Isozaki Tower in Milan.
The focal point of the building is the training centre, which includes a seminar room with seating for over 50 people and a space used for hold courses on Mapei products. Free training sessions for designers, installers, retailers and companies are held here by experts from Mapei Technical Services.
A perfect combination of spaces offering a total experience: visitors can find out about the cutting-edge technologies developed in the Mapei Research & Development Laboratories directly from the experts and experience first-hand how to use them to make their work easier and more efficient so they can meet their customers' needs. This is how Mapei is boosting its operations in the Lazio Region, where it also has a production plant in Latina that employs 140 staff and is focused on manufacturing powder products and coloured coatings.

The new Mapei's offices in Rome showcase the company's solutions and their use. They also enclose a big conference hall. Above: a group photo showing the Mapei team and Veronica Squinzi, CEO of the Mapei Group.
Photos by piercarloquecchia@dsl_studio.

Corporate history and modern-day times

Onsitestudio - Giancarlo Floridi and Angelo Lunati

What were the design guidelines behind your project at the new Mapei offices in Rome?
The theme of the project was the reuse of a 1960s' house in the Eur district, which has been converted into offices. An attempt was made to restore the homely feel of the original sequence of rooms inside the house, creating a row of rooms accommodating the showroom and a series of spaces of varying sizes ranging from individual offices to areas serving training and demonstration purposes. The layout was rationalised and a clearly defined relationship was established between the premises and views of the garden, taking into account positioning in relation to light and the different functions of the various areas. Mapei products were used to make the building a sort of "catalogue" or exhibition of the company's products, highlighting how they adapt to the multifarious nature of the spaces: home, office, communal space.

The new offices are a workplace for staff and, above all, a meeting space for anybody interested in learning more about Mapei: what were your criteria for dividing up the spaces?
The new layout clearly distinguishes private flows towards the offices from incoming flows of visitors and customers, so they can walk through the building via the showroom to the other communal spaces. In the basement, the training room has been enhanced by using a large zenith skylight, while the auditorium, kitchen and hospitality area receive light from generously sized side windows. The materials and muted colours aim to bestow a discreet and elegant tone on the spaces, so as to showcase and spotlight information materials, products and activities held in these spaces. Certain specific features and details are rendered in more striking tones to emphasise their presence in special locations, such as the large bench and columns in the installations room or the Mapei blue ceilings, which, just like in historical buildings, are enhanced by introducing colour and glossy finishes to create a greater sense of height by reflecting the ambient light. The project aims to combine extreme pragmatism in keeping with the operational nature of the offices with plenty of ornamentation to showcase the representational function of these spaces.

Over 85 years of company history including so much business and sporting success: how have you brought this out?
The project is aimed at representing a possible and necessary relationship between a long history and modern-day times. References to such traditional features as the sequence of rooms, the ornamentation of the ceilings and corridors and the use of tried and tested forms is combined with the modernity of seamless surfaces and innovative materials, like resins and enamels or mosaic tiles in new formats.
The project is also intended to feature a kind of sustainability that is not only delegated to the performance ratings of the chosen materials but also to the need to create a lasting image for the built spaces and the materials used to construct them, as well as a general economising on means that hopefully coincides with a very definite idea of beauty.

A big box of memories

MAPEI COATINGS FOR THE INSTALLATION BY THE BRAZILIAN ARCHITECT ISAY WEINFELD AT THE FUORISALONE IN MILAN

'Design Re-Generation' is the title of an exhibition that the magazine Interni staged this year - from 6th-13th June - at the FuoriSalone design week in Milan. The setting for this exhibition was the University of Milan's courtyard, which regularly hosts installations designed by Italian and foreign designers with the backing of businesses and institutions to recreate that synergy between creativity, design and reflections on modern-day life that has been such a great success with visitors for over thirty years.
The main themes of this year's exhibition, curated by Gilda Bojardi, the Editor-in-Chief of *Interni*, with Matteo Vercelloni and Andrea Branzi, stem from thoughts on the relationship between design, nature and artifice. 'Design Re-Generation' showcases new design projects (both material and functional) in which the transversal theme of sustainability is considered to be of fundamental importance for a new quality of life.

Free creative links
The installations included Supercalifragilisticexpialidocious, a simple black wooden construction designed by the Brazilian architect Isay Weinfeld. Born in São Paulo, Brazil, in 1952, Weinfeld is a graduate from Mackenzie Presbyterian University. He runs a multidisciplinary firm operating in various sectors - civil, commercial, residential, hospitality – focused on architecture and interior design.
The interiors of his installation at FuoriSalone 2022 feature a world of ideas that evoke the visual arts, music, dance, theatre, and literature tracing the artist's own personal story. "I extrapolated a selection of pieces from my emotional, sensory and sculptural bundle of memories, which, over the years, have given me inspiration, food for thought, fun, nostalgia and joy", so the architect explained. "I now like to share them as an invitation and stimulus for visitors to freely design their own relationships".
The colour black was added to the box of memories by Mapei with its siloxane-based coating products SILANCOLOR TONACHINO and SILANCOLOR AC PAINT (also used on the interior surface of the ceiling). COLORITE PERFORMANCE protective acrylic paint was, instead, used to colour some of the 22 interior panels incorporating display niches to create, one by one, the pathway of dreams and memories.

From left on, Veronica Squinzi, CEO of Mapei, Isay Weinfeld, and Gilda Bojardi, Editor-in-Chief of *Interni*.

All kinds of ideas inside a simple black-coloured wooden construction

OVER 30 YEARS OF THE FUORISALONE

The first Salone del Mobile (Furniture Show) was held in the halls of the old Milan Trade Fair grounds in September 1961, promoted by the local wood-furniture manufacturing district. This successful event, which has grown year after year, has been accompanied since 1990 by the 'FuoriSalone', a series of side events involving the city and its various design venues, including art galleries, showrooms and furniture shops. The brainchild of Gilda Bojardi, Editor-in-chief of *Interni* magazine, the FuoriSalone set out to engage and entertain people through side shows and events in which design objects are a pretext for exploring new means of presentation to mix together different styles and set up interactive relations.
Over the years, Mapei has supported the event on several occasions, providing technical support and supplying products for installations by such big names in design as Mario Botta (in 2011) or Cino Zucchi (in 2021, see *Realtà Mapei International* no. 88).

Mario Botta's installation "Stanza" presented at the 2011 edition of FuoriSalone was created using Mapei adhesives and coatings.

Clerkenwell Design Week: Mapei among the key players

MapeiWorld London City is Mapei UK's Specification Centre, which opened in the Clerkenwell district of London in March 2015. It was lately fully refurbished with a new interior design, product installations and displays.

EVENTS FOR DESIGNERS IN THE RENOVATED SPACES OF MAPEIWORLD LONDON CITY

"MapeiWorld London City", Mapei UK's Specification Centre, has been operating in the Clerkenwell district of London since March 2015. This space is entirely devoted to the world of design, a booming sector in the United Kingdom. The Clerkenwell district boasts an extremely high concentration of design and architecture practices: at "MapeiWorld London City" architects and designers from all over the world have access to technical assistance, information about innovative products, practical solutions to building problems, help with design work and specifications, plus training and CPD (Continuing Professional Development) events.

During Clerkenwell Design Week 2022, Mapei UK showcased new products and colour shades with its "Festival of Colours" which involved workshops, exhibitions and special dessert tasting events.

A fully refurbished Specification Center

Mapei UK has lately re-opened the "MapeiWorld London City", following a full refurbishment. The new space features a new 'zoned' interior design, new product installations and displays by renowned design firms. The centre now flows through three zones: Welcome - a social and inspirational area; Learning - featuring finished product displays and CPD space - and Technical - which includes larger meeting spaces and technical support resources. The white design is punctuated with colourful gallery-style sample displays; key finished products feature throughout application and display areas, from ULTRATOP LOFT cementitious flooring to an eye-catching installations which features the latest shades of Mapei grouts. Wall coating and cementitious flooring samples are displayed in a wide colour spectrum and the technical area features a range of construction samples for systems 'beneath the surface'.

Clerkenwell Design Week 2022

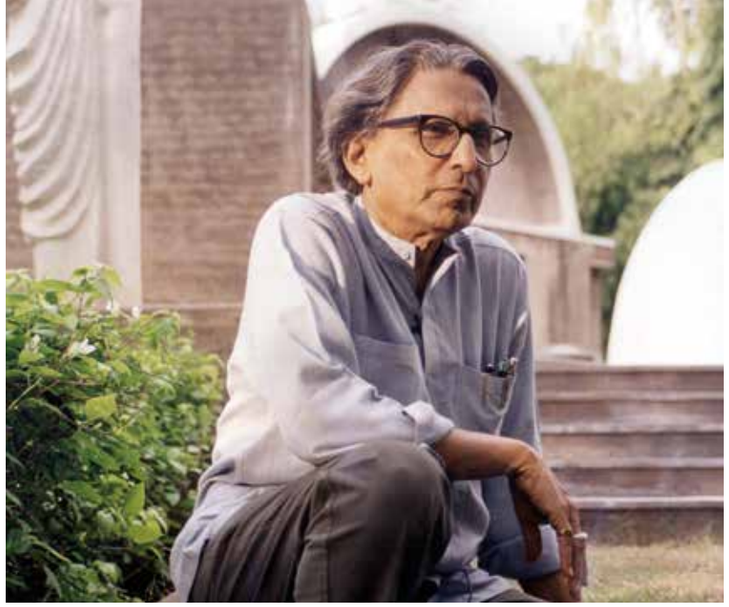
A large number of showrooms took part in Clerkenwell Design Week this year after a two-year absence: the design community descended on the area in their thousands to discover the new products and initiatives suppliers had to offer. At MapeiWorld London City Mapei UK took the opportunity to showcase new shades of products with its three-day "Festival of Colour" reflecting current trends and focusing on tone, texture and taste.

On Tuesday 24 May**,** Mapei's Grout & Sealant Showcase included the launch of new grout and sealant colours plus new products such as KERAPOXY EASY DESIGN and MAPECOLOR METALLIC with a brand-new installation. An exhibition of ceramic tiles and mosaics demonstrated creative displays using complimentary and contrasting grout tones.

Visitors were also able to experiment with different combinations throughout the event - from a palette of 86 shades - using a brand-new Grout App. Dragon's Breath Meringue, Spherification Bubbles and Ice Cream, provided by NITRO desserts were served in flavours and hues of the new grout colours. A grout icing workshop was given by BRIK Chocolate, who provided chocolate 'tiles' for visitors to grout in the new Mapei grout colours. The tiles were designed to show textures of Mapei products such as SILANCOLOR TONACHINO and ULTRATOP with its "Terrazzo-alla-veneziana" effect.

On Wednesday 25 May, visitors experienced an exhibition on the Mapei line of resin and cementitious floorings which included MAPECOAT I 24, MAPEFLOOR I 320 SL CONCEPT, ULTRATOP, ULTRATOP LOFT and MAPECOAT TNS sport floorings. Nitro desserts adjusted the colours and flavours to compliment the ULTRATOP LOFT colour range and the BRIK chocolate workshop involved creating chocolate terrazzo slabs using 'candy aggregate'.

On Thursday 26 May, the Specification Centre spotlighted the extensive colour range available in Mapei's protective and decorative wall coatings with an exhibition of SILANCOLOR PAINT, SILANCOLOR TONACHINO and COLORITE PERFORMANCE. Nitro desserts and a Gnome Painted workshop reflected the large number of hues achievable with Mapei's ColorMap automatic tinting system.



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Balkrishna Doshi.

Doshi, a pioneer of social housing

THE INDIAN ARCHITECT WAS AWARDED THE PRESTIGIOUS PRIZE IN 2018

When he was awarded the Pritzker Architecture Prize in 2018, the architect Balkrishna Doshi was already 90 years old and had already spent almost 70 years into his career in design.
A true 'monument' of Indian architecture, who had begun his long career working with two renowned masters of international architecture: Le Corbusier and Louis Kahn. In fact, the first statement Doshi made after being awarded the Priztker Prize paid tribute to Le Corbusier's impact on his work: "My works are an extension of my life, my philosophy and my dreams, which seek to create treasures of the architectural spirit (...). I owe this prestigious award to my guru, Le Corbusier".

His studies and first projects in India

Doshi was born in 1927 in Pune, in the state of Maharashtra, in a family that had been making furniture for two generations. By his own admission this meant he grew up surrounded by craftsmen, always struggling with measurements, proportions and materials. At the same time, life in the big family home, which - as is customary in India – gradually expanded over time to make room for the homes of uncles and cousins and their families, was a source of inspiration for the future architect. It gave him a bright and ever-changing perception of living space. In 1947, the year India gained independence, he joined the Sir J.J. College of Architecture in what was then the city of Bombay, one of India's oldest and most prestigious schools of architecture.
After graduating from university, he moved to London for a period and then worked in Le Corbusier's firm in Paris from 1951 to 1954.
The influence of the latter's architectural philosophy and stylistic canons were fundamental on Doshi's entire body of work, as he himself acknowledged: "His teachings led me to question my own identity, prompting me to discover a renewed contemporary expression of life, employed regionally but aimed at discovering a holistic sustainable habitat. It is an affirmation of my belief that life is celebrated when lifestyle and architecture come together."
In 1955, he returned to India to supervise the Swiss-French architect's projects for the cities of Ahmedabad (Gujarat) and Chandigarh. In Chandigarh, Doshi supervised building works in the capital of Punjab that the Indian Prime Minister Jawaharlal Nehru commissioned directly to Le Corbusier. In Ahmedabad, on the other hand, he worked on plans for the Mill Owner's Association Building and Shodan House. In 1956 he decided to open his own environmental design firm called Sanghat in the city of Ahmedabad.
A few years later, in 1962, he began a ten-year working partnership with the American architect Louis Kahn to build the Indian Institute of Management in Ahmedabad, later followed by other projects.

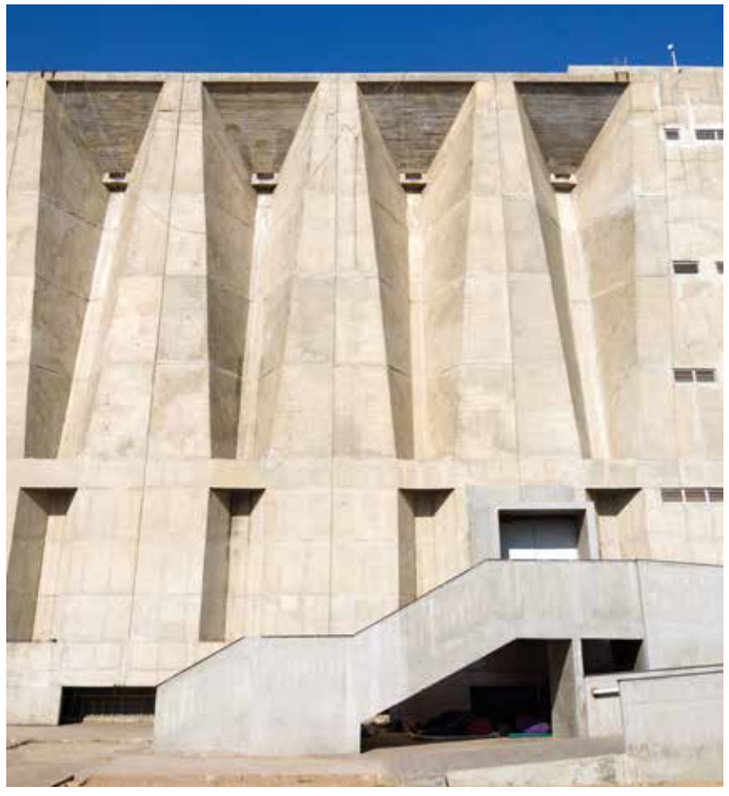
He worked alongside Le Corbusier and Louis Kahn with an eye for the social, economic and environmental situation in his country

© Pritzker Architecture Prize

The Aranya Community Housing in Indore, Madhya Pradesh, was also designed by Doshi.

Social housing for India

Thanks to his pioneering work focused on the construction of low-cost housing and his work on modern town-planning along the lines of Le Corbusier's teachings, Balkrishna Doshi began to make a name for himself outside India. As the jury of the Pritzker Prize said in its announcement statement: 'Over the years, Balkrishna Doshi has always created an architecture that is serious, never flashy or a follower of trends. With a deep sense of responsibility and a desire to contribute to his country and its people through high quality, authentic architecture, he has created projects for public administrations and utilities, educational and cultural institutions, and residences for private clients, among others." A vision of architecture focused on the wellbeing of the community and not just making money, as Doshi himself has emphasised several times.
Doshi's lengthy partnerships with Le Corbusier and Louis Khan certainly left their mark, particularly on his early works that were mainly eye-catching constructions with powerful lines made out of exposed concrete.
Over time, his architecture began to focus more on gaining a greater understanding and appreciation of traditional Indian architecture.
Doshi built several social housing projects as early as 1950. A few years later he acknowledged that designing housing specifically for India's poor classes had become a personal as well as a professional goal for him: a mission that saw him leave his signature on projects developed around the social, economic and even environmental settings in which they would be built. Examples include low-cost housing complexes as the Indian Farmers Fertilisers Cooperative in Kalol (Gujarat) and Aranya Community Housing in Indore (Madhya Pradesh).
He never stopped creating eco-sustainable buildings, such as Madhya Pradesh State Electricity Board in Jabalpur in 1979 and the Indian Institute of Management in Bangalore (Karnataka) in 1992.
Also worth mentioning is his Life Insurance Corporation Housing project in Ahmedabad: a housing complex that could be occupied by several generations of the same family, thanks to a sequence of terraces that could be converted into new housing units if needed.



Tagore Memorial Hall in Ahmedabad, Gujarat, India.

by **Luca Mondazzi**

Master athletes: a nutritionist's dietary tips

IT'S A MISTAKE TO THINK "I'M MATURE AND EXPERIENCED, I EAT WELL, I DON'T NEED ANY SPECIAL NUTRITIONAL TIPS".

Athletes over the age of 35 are officially classed as "masters" but most of the research is focused on those over the age of 50 and the information in this article is aimed at them. Up until a few years ago, it was rare to see master athletes capable of high-level sporting performances, the sort of thing 20 or 30-year-olds would do. Today, many masters athletes train really hard with passion and sacrifice, and they love to compete. But there are also masters athletes with no particular interest in competing, that are still capable of performing to a high standard. Unfortunately, some of these athletes think that, in their case, the reasons for managing their nutrition properly are less significant compared to young athletes. "I'm mature and experienced, I eat well, I don't need follow any special nutritional tips". Unfortunately, that is a mistake. Let's see why.

Anabolic resistance

The main reason we eat proteins is to activate and reinforce the building of our own proteins, especially in our muscles. However, master athletes have a problem. As the years go by, the ability to use proteins effectively (even those contained in "supplements") tends to gradually diminish. That means the effectiveness of the protein we eat decreases, which has a negative effect on muscle mass. This loss is called anabolic resistance and has several causes:

- decreased ability to digest proteins and/or absorb amino acids;
- increased sequestration of amino acids in the intestine and liver, which causes a reduction in the amount reaching the muscles;
- decrease in blood supply to the muscles, which causes a reduction in the "delivery" of amino acids;
- decreased capacity of the muscles to absorb amino acids from the blood;
- decreased capacity of amino acids, once they enter the muscles, to activate protein synthesis.

The problem can be solved. The proteins in our diet must be in the right quantity and quality and perfectly distributed between main meals and snacks, when required. It seems paradoxical, but master athletes have even more need for protein (and perfect management of it) than a twenty-year-old athlete. Leaving aside illnesses such as chronic kidney disease, any fear that this will cause health issues is scientifically unfounded. On the contrary, a "well-calculated" increase in protein intake in the diet of people who are no longer young is an important health aid, as well as boosting athletic performance. This is based on well-grounded scientific evidence, not personal opinion.

A well-calculated increase in protein intake in our diet is important for our health

Hydration and temperature control

Hydration is another critical issue. During exercise, blood is "diverted" to the muscles but also to the skin. Vasodilation of the skin is intended to bring heat from the inside the body to the surface in order to help dissipate it. During exercise, 49-60 year old master athletes have blood flow through the skin reduced to as much as half that of 22-28 year old athletes. This can be a problem in hot conditions. Moreover, as we age, sweating decreases and tends to start later during exercise. And sweating is an even more important means of heat dissipation. Finally, there is also a decrease in thirst. In other words, master athletes tend to drink less than their younger counterparts. All of this can have a negative effect on body temperature control during exercise. This means masters athletes must also be more competent and disciplined in managing hydration.

Vitamin B12, folic acid (vitamin B9) and vitamin D

Vitamin B12 and folic acid (also known as vitamin B9), among other things, play a fundamental part in the production of red blood cells. As the years go by, it becomes more likely that alterations in the stomach and its functions reduce the absorption of vitamin B12 and folic acid. As well as those vital functions in metabolising calcium and preserving bone tissue, vitamin D plays an important role in immune defences. The active form of vitamin D is generated in our skin by sunlight. As we age, the skin's ability to generate active vitamin D is reduced. So, the risk of vitamin D deficiency is greater for master athletes than for young people. Our immune defences matter, especially nowadays.

Head of the Nutrition for Sport and Dietology for Wellness at Mapei Sport Research Centre (Italy)

#"GENERAZIONE S" ENTERS SCHOOLS AND GOES INTERNATIONAL

Taking stock of the first year of Sassuolo's social/sports project

With a convention held at Mapei Stadium in Reggio Emilia (Central Italy), on May the 17th Sassuolo celebrated the first year of "Generazione S", a free and inclusive social responsibility project aimed at promoting the ethical/educational principles of sport among young people.
"It takes passion to be great" is the slogan for all the coordinators and key players in the Generazione S project. The slogan has its roots in the Squinzi family, owner of Sassuolo football club, and Mapei in general.
After just one year, Generazione S can already boast big numbers: 80 clubs are involved from all over Italy, 41 of which taking part in the Educational/Experience section and 39 in the Academy. Sassuolo has already organised three sessions of technical meetings at facilities belonging to affiliated clubs. Sassuolo experts have also carried out training sessions with young athletes.
"Goalkeeper Day" was also a great success: a day specially focused on goalkeepers from clubs involved in the project. The young goalkeepers went through their paces at Mapei Football Centre, under the watchful and supervision of the Sassuolo team managers. Andrea Consigli, Sassuolo's goalkeeper in the Serie A first team, was also there.
The initiative "Tutti al Mapei Stadium con Generazione S" (Everybody to Mapei Stadium with Generazione S) also attracted young kids' teams to come and watch Sassuolo's home matches in the Italian Serie A. The end-of-season Generazione S party was held after Sassuolo's match against Udinese: an event full of fun and games together with Sassuolo staff.

EDUCATION AND GUIDELINES

After a year in business, Sassuolo has reasserted the guidelines of the "Generazione S" project. Giovanni Carnevali, General Manager and CEO of Sassuolo, pointed out that "We accept any players who want to improve and progress so we can serve an important educational, ethical-social, recreational and sporting purpose.
The project is free of charge and its credo matches Sassuolo's values perfectly. There is no other project like this one in Italy and we hope to extend it into a network". Indeed, Generazione S has almost reached its internationalisation phase: "We have received an application from the United States," so Carnevali told us.
"We are working more closely with school authorities," so Andrea Fabris noted, Sassuolo's Organizational Director, "we have lots of ideas and want to bring Sassuolo's knowhow into schools".
"We are very proud of the results we have achieved so far," so Veronica Squinzi stated, Mapei's CEO and Vice-President of Sassuolo, "but we are also convinced that we have to keep on improving and we believe we have the potential and, most certainly, the passion to do so."
The event was also attended by the President of the Emilia Romagna Region, Stefano Bonaccini, Sassuolo's President and CEO Carlo Rossi, the club's executives and staff from Mapei Sport Research Centre.

Sassuolo women are turning pro

AS OF JULY, THE RULES FOR SERIE A PLAYERS WILL CHANGE: NEWS ABOUT THE FOOTBALLERS' PROFESSIONAL STATUS

Italian women's football is going through an epoch-making turning point: as of 1st July, the players of Sassuolo and those of other Serie A teams will be considered professionals. In April, FIGC (Italian Football Federation) leaders approved new rules and regulations. This step forward also has considerable social, not just sporting, significance. "A woman who plays football," so Alessandro Terzi, Sassuolo Women's Football Area Development Director, noted "will no longer be a student, employee or worker, who also plays football. She will be a professional footballer".
In the women's league, professional status is only for players in the Italian Serie A. Players of teams getting relegated from division A to division B will become amateurs again. In the men's game, players relegated from division C to division D are classed as amateurs but regain their professional status if they play in divisions A, B or C again.
"The professional status of female players," Terzi went on to say, "will make a big impact on the transfer market. The women's team will now be a club asset and existing contracts or expiring contracts will have to be considered very carefully when buying or selling women players. Just like in men's football, young players from the women's youth squad who are still amateurs will be able to make their debut in Serie A. In the women's league, this mix of professionalism-amateurism will be much more common". Until the age of 21, players of both sexes are amateurs unless a professional contract is signed.
In Sassuolo's case, professionalism will be part of the club's bylaws. "Sassuolo's female players" – Alessandro Terzi pointed out – "have always had equal status with men in many respects, not just as regards medical assistance, fitness preparation and training facilities".

Sassuolo's defender Maria Luisa Filangeri.

PIOVANI KEPT ON AS TEAM MANAGER AMIDST PLENTY OF EXCITEMENT

Juventus won the 2021-22 Women's Serie A League Championship with Sassuolo finishing fourth while, for long periods of the season, Sassuolo was right up near the top of the table. "For us it was the year of consolidating our team in the top-flight." so Alessandro Terzi noted, "Lots of players confirmed what great qualities they have and footballers from Sassuolo women's team getting picked to play for Italy and other national teams confirms the good work that has been done". Official fixtures for the 2022-23 season will begin at the end of August. The Mapei Group's women's team will play in Serie A for the sixth season in a row. Alessandro Terzi also officially announced that Gianpiero Piovani will be staying on as team manager. He joined Sassuolo in the summer of 2018. The team had already played in the top division for one season at the time. The women's sector of Mapei football club will continue to develop its youth squad to bring on more young players: "We would like to start from a wider base to develop talented youngsters" so Piovani added.

NEWS FROM THE MAPEI WORLD

EVENTS, SPONSORSHIPS AND INITIATIVES FROM THE GROUP'S SUBSIDIARIES

PUERTO RICO – MOSAICS AND CHILDREN AT HANDYMAN WORLD

Handyman World is the biggest exhibition in Puerto Rico focusing on Do-It-Yourself (DIY), landscaping and renovation. The 2022 edition, held on 30th April-1st May, also included workshops, tutorials and talks by industry experts. Mapei Caribe, the Group's Puerto Rican subsidiary, also attended with its technicians, who illustrated how to use the company's products to carry out work in the housing sector. It also took part in the "Kids at Work" project that included a special area where children of all ages got the chance to create a mosaic souvenir using Mapei products.

UGANDA - ONE YEAR IN ENTEBBE WITH EMERGENCY'S HOSPITAL

Last May, Emergency's paediatric hospital located in Entebbe on the shores of Lake Victoria in Uganda 'turned one year old'. A pet project of Emergency's founder Gino Strada and designed by Renzo Piano in partnership with Studio TAMassociati, the hospital has already welcomed over 1000 children and carried out 7000 examinations and 1000 surgeries setting the benchmark for the entire African continent. The hospital was also built with the help of Mapei, which supplied special binders to make the raw earth involved in the pisé technique used to construct the walls.

GERMANY - GOLD AWARD FOR BEST HOTEL SYSTEMS

Readers of the magazines *Tophotel* and *Hotel+Technik* have no doubts: Shower System Decor by Mapei is among the best systems for hotels in the category "Special Construction Hotel+Technik" and was, therefore, the winner of the "Tophotel Star Award in Gold". A professional panel of judges selected 18 products in 7 categories: the readers then chose the winners.
Shower System Decor is a complete and innovative solutions for installing decorative wall coverings in bathrooms, showers and wet environments in general. It includes MAPEGUM WPS, ULTRABOND ECO DECOR WET and MAPECOAT DECOR PROTECTION.

AUSTRALIA – PARTNERING THE JUNIOR RUGBY LEAGUE TEAM

For the third year running, Mapei Australia has re-asserted its commitment to St Marys Junior Rugby League team, one of the children's rugby League clubs with the most members in the world. It is part of the famous St Mary Saints club based in Sydney and founded in 1908. Mapei Australia's sponsorship is aimed not only at promoting the company's brand through such a popular sport, but also at supporting the development of talented young sportspeople in line with such company values as teamwork, commitment and determination.

QUESTIONS & ANSWERS

GALVANIC CATHODIC PROTECTION: AN EFFECTIVE APPROACH TO PRESERVE REINFORCEMENT OVER TIME

by **Federico Laino**

Reinforced concrete structures: how to protect them against corrosion

The durability of reinforced concrete structures has become a much-discussed topic and involves various sectors of the building industry, from large infrastructures to residential and industrial buildings. Even though concrete is a material with excellent mechanical properties, the reinforcement rods inside the concrete corrode over the years, resulting in an increase in their volume which generates internal stresses that can crack and deteriorate the concrete itself. The service life of these structures, therefore, is highly dependent on the amount of corrosion to their reinforcement. Let's take a closer look at this phenomenon and the possible solutions.

What causes the corrosion of reinforcement rods?
In new or uncontaminated concrete, the reinforcement is embedded in a solution with pH > 11.5 (alkaline). In these conditions, a thin film of oxide forms on the surface of the reinforcement rods and protects them against corrosion: this condition is known as passivity. Over the years concrete may lose its alkalinity and, therefore, its capacity to protect the reinforcement. This mainly occurs because of two phenomena:

- Carbonation: carbon dioxide present in the atmosphere penetrates into the concrete and lowers its pH to around 9. At such a pH level, the film of oxide on the reinforcement rods breaks up and loses its state of passivity.
- Contamination by chlorides: in this case, too, the chlorides penetrate into the concrete and break up the film of passivation on the reinforcement rods; also acting in a localised and destructive way, corrosion caused by chlorides is the most aggressive and dangerous type for the structural stability of a reinforced concrete element.

MAPESHIELD anodes are connected to the reinforcement rods so that the zinc they are made of oxides over time, protecting the reinforcement.

How can we protect reinforcement rods against corrosion?
Electro-chemical techniques are very useful and effective. They limit the effects of corrosion in order to prevent or contain the effects to within acceptable limits, taking the rods into the passive state or reducing the amount of activity on their surface. In order to achieve this condition, the rods need to be taken in a state of cathodic polarisation by connecting them to sacrificial zinc anodes which, thanks to their more negative potential, protect the reinforcement and keep them free from corrosion.
Every anode creates an active field that protects the reinforcing rod within its field. Calculating exactly where the anodes need to be positioned has to take a number of factors into consideration, such as the density of the reinforcement rods, the geometry of the structure and the structure's exposure to aggressive agents.

On what kind of structures is it possible to intervene?
The protection of structures with galvanic anodes is based on simple considerations. In the case of new structures, it is sufficient to apply a light cathodic polarisation at the reinforcement/concrete interface at the very beginning of the structure's service life. In these conditions it is possible to prevent corrosion in a simple, effective way because only low-density currents are required (just a few anodes inserted during the construction phase).
For structures that need to be repaired, on the other hand, because the reinforcement is particularly active, there is a higher initial demand for current, which then progressively reduces as soon as the reinforcement reaches a state of passivity (around 6 to 12 months after installation).
The main feature of these systems, therefore, is that they are self-regulating according to the effective variables, thereby limiting the amount of current to what is actually required and, as a result, reducing their rate of consumption.

What does Mapei propose for this type of intervention?
Mapei has developed MAPESHIELD anodes for galvanic cathodic protection. The zinc of these anodes oxidises over time, "sacrificing" itself in favour of the reinforcement inside the concrete. The corrosion process is therefore delayed or interrupted, considerably increasing the durability of the structure. Thanks to their composition, MAPESHIELD anodes protect against or prevent corrosion phenomena and have a clearly beneficial effect on the structure. They can be used on both new structures and on structures in need of repair and can be placed selectively and precisely, that is, in the areas of the structure with the highest risk of corrosion. What is more, they do not require any maintenance during their normal service life, and they may be monitored during operation by installing a simple control system.

Regional Product Line Manager, Building Line, Mapei SpA (Italy)

The Mapeshield range

MAPESHIELD I
Pure zinc anodes coated with a special conductive paste, for galvanic cathodic protection against corrosion of reinforcement rods in new structures and in structures requiring repair.

MAPESHIELD E25
Self-adhesive zinc plate applied directly on the surface of structures for galvanic cathodic protection against the corrosion of reinforcement rods in concrete.

MAPESHIELD CORROSION CONTROL
Self-adhesive 12 cm zinc plates applied directly on the surface of concrete to provide galvanic cathodic protection for reinforcement rods and prevent corrosion. It is particularly recommended for residential structures that do not require any repair work and to reduce or interrupt oxidation in listed buildings that need to be restored.

PRODUCTS IN THE SPOTLIGHT

WATERPROOFING WET ENVIRONMENTS,
CLEANING CERAMIC AND STONE SURFACES,
CONSOLIDATING SUBSTRATES

1

Mapelastic AquaDefense

ELASTIC AND QUICK DRYING MEMBRANE

Totally solvent-free, ready-to-use, ultra-quick drying, flexible membrane used for waterproofing bathrooms, showers and wet environments. It is a one-component light blue, synthetic resin based paste in water dispersion, easy to apply using a long-haired roller, brush or trowel on several kinds of horizontal, sloping and vertical surfaces. Its flexible nature helps it withstand normal movements caused by expansion and shrinkage of the substrate due to temperature variations and vibration. MAPELASTIC AQUADEFENSE dries very quickly to form a flexible, waterproof layer, ready for laying ceramic, stone materials and mosaic of all kinds. It complies with EN 14891 standard.

2

Ultracare HD Cleaner

EFFECTIVE CLEANING AND DEGREASING ACTION

Concentrated professional detergent to remove organic dirt and to undertake a deep clean of surfaces.
It is ideal to clean particularly dirty surfaces made up of porcelain tiles, ceramic, glass, unpolished natural stone, concrete, terracotta, terrazzo. Thanks to its effective cleaning and degreasing action, it is ideal for the preparation of existing ceramic and stone material before installing “tile on tile”, with a cementitious adhesive or before applying a cementitious levelling compound to ensure full adhesion and to avoid detachments.
It is ideal for the restoration of surfaces, including removal of previous water-based and metallic wax treatments.

3

Primer 3296

CONSOLIDATING AND ELIMINATING DUST

Acrylic polymer-based water-dispersion primer, made up of very fine particles, which gives it its high penetration characteristics, even on surfaces with low porosity. It consolidates surfaces and eliminates dust and powder on substrates, giving them good mechanical strength. It is also suitable for outdoor use for consolidating the surface of concrete slabs, screeds, renders, bricks, sandstone, tuff, cement and lime-based decorative mortar. Substrates consolidated with PRIMER 3296 are not damaged by climatic attack.
It is an odourless, non-irritating product in water dispersion, suitable for application in areas where there are people present or in the vicinity of habitations.

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