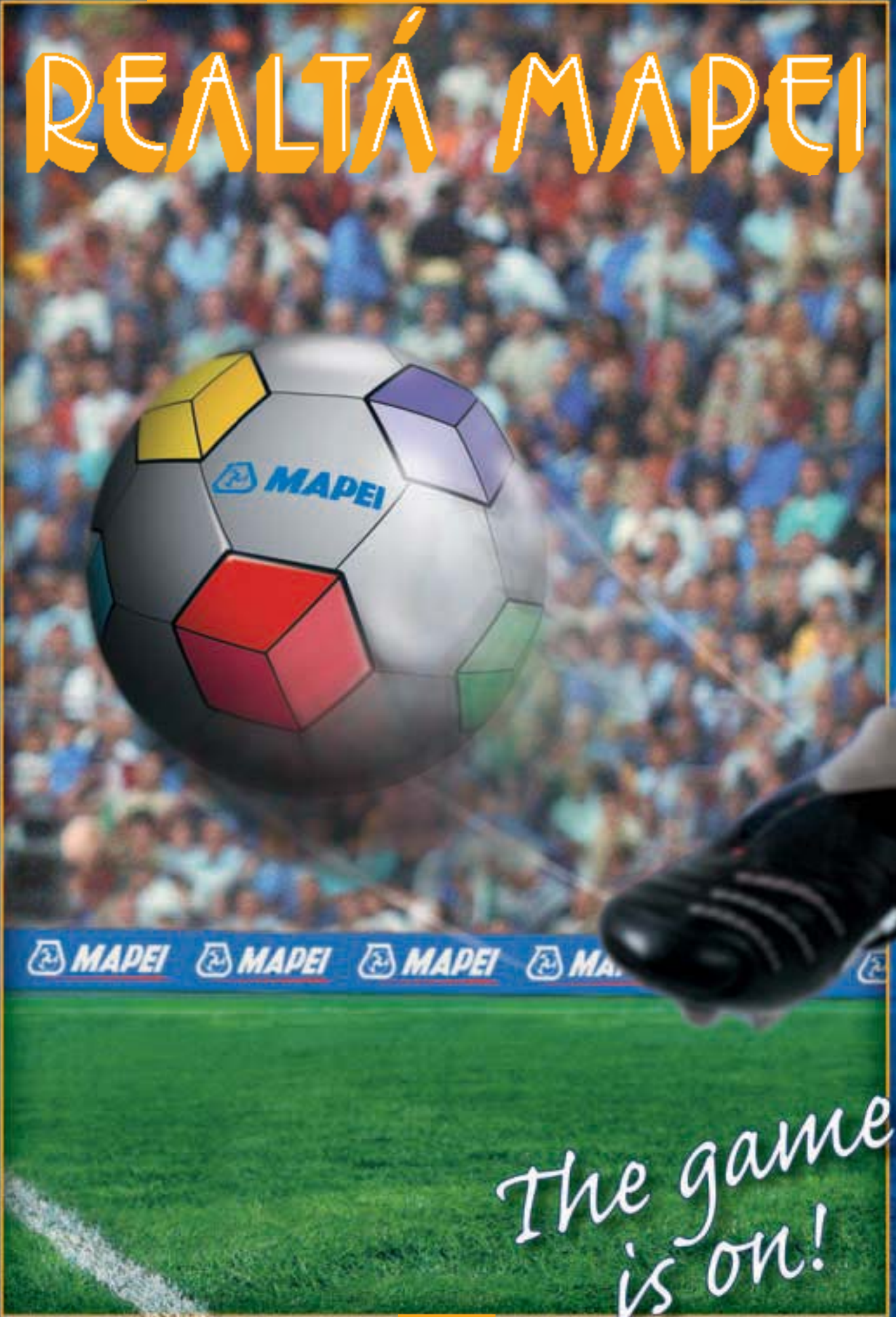


REALTÁ MAPEI



*The game
is on!*

MAPEI AND THE ITALIAN NATIONAL FOOTBALL TEAM

As we briefly reported in the previous issue of Realtà Mapei International, last November Mapei became an Official Sponsor of the Italian National Football Team.

The reasons for this decision includes both marketing strategies and true fondness for sports. In order to better understand them, we interviewed Mr. Giorgio Squinzi, CEO of Mapei Group.

Mr. Squinzi, what are you expecting from this sponsorship deal?

Mapei is an Italian firm, so we are mainly interested in promoting and publicising our trademark in Italy. To achieve this goal we have decided to sponsor the Italian National Football Team for two main reasons.

Firstly, because of how fond the Italian people are of their football team, we were only too willing to be associated with such an important emblem of our country.

Secondly, and due to what was said above, because this deal works on all kinds of levels, from a communication and marketing viewpoint we expect to have a great return in terms of popularity.

Was this sponsorship deal also supposed to promote the Mapei brand on international markets, too?

Most of the work that has gone into this project, including all the other related enterprises, is focused on activities in our home country. Nevertheless, it is true, according to recent surveys, that the Italian National Football Team is the second most popular team in the world after Brazil. I think this might be another good reason for Mapei attracting greater international attention abroad.

Do you like football?

Like most Italians, I am a football fan and I really enjoy watching this sport.

Do you think there is any particular player in our National Football Team who in some way embodies the Mapei spirit?

Rino Gattuso is certainly a player who, out on the pitch, conveys a lot of the qualities Mapei stands for. I really like the kind of effort, determination, hard but fair play and dedication to the cause he shows out on the pitch, and in my opinion they are that something extra which Mapei can rely on to strengthen its presence abroad.

How do you think Italy will do in the forthcoming World Cup? Give us your prediction.

Everybody thinks Brazil is the favourite, but our team has played really well recently and I hope we can get to the final.

Of course, this would also be great for Mapei's image. Yes, I would love to see an Italy-Brazil final.

You support A.C. Milan. So this would be Gattuso's fighting spirit against Kakà's class?

That would be great! And it is also nice to think that, if you like, you can see these two wonderful players in action in Milan on Sunday afternoons.



EDITOR: Adriana Spazzoli

ENGLISH EDITING AND TRANSLATION
Martyn Anderson, Nicholas John Bartram,
Trans-Edit Group

COORDINATION: Metella Iaconello

EDITORIAL ASSISTANT: Carla Fini

GRAPHIC DESIGN AND ART DIRECTION
Magazine - Milan (Italy)

COLOUR SEPARATION AND LAYOUT
Overscan - Milan

PRINTER: Arti Grafiche Beta - Milan

EDITORIAL ADDRESS:
Mapei S.p.A.
Via Cafiero, 22 - 20158 Milan (Italy)
tel. +39/02/376731 - fax +39/02/37673214
Web site: <http://www.mapei.com>
E-mail: mapei@mapei.it

PUBLISHER: Mapei S.p.A.

Realtà Mapei - Bimonthly magazine
Registered by the Tribunal of Milan
n. 363/20.5.1991
Realtà Mapei International is published
4 times per year



Main cover photo:
The Italian National Football Championship shield (i.e. the Italian Football Game Federation's new logo) meets with Mapei's coloured grouts. Indeed, until the end of 2006 Mapei is an Official Sponsor of the Italian Football Team (see the interview on the left).

Articles appearing in this magazine may be reproduced in whole or in part after obtaining the permission of the publisher. However, the source must be cited.

TRADE FAIRS

Saie 2005	page 2
Domotex Hannover	page 40

NEWS

Chemicals in Europe: Sustainability, Co-operation and... Bureaucracy	page 8
The "Decopaint" Directive is at the Starting Gate	page 10

THE EXPERT'S OPINION

Reinforcement, Reclamation and Protection of Buildings:	
How to Plan a Reliable Renovation	page 11
Concrete Industrial Floors	page 14
Earthquake-proof	page 19
Safety First	page 25
Sports Science Applied to Football	page 54
Artificial Grass Pitches and Football Injuries:	
Science Versus Prejudic	page 56

PROJECTS

Mid-European Wellness	page 28
Shopping in the Blue Giant	page 32
The New TFC Training Centre	page 36
"The Quartet" at Tropicana Casino	page 38
The Giant's Garden	page 48

PRODUCT SPOTLIGHT

Planitop 580	page 58
Mapetex System	page 59

www.mapei.com

The Mapei web site contains all the information about the Group's products, its organisation in Italy and overseas, its involvement in the sector's main trade fairs and lots more.



220,000 m² of exhibition space, 1,850 exhibiting firms, including 450 from abroad (meaning an 8% increase compared to last year): these are the promising figures recorded at Saie 2005, the 41st edition of the International Show of Building Technologies, which was held at the Bologna Trade Fair from 12th to 16th October.

If it is true that trade fairs are the real litmus test for any economic sector, highlighting its tendencies and trends, then the building industry certainly seems to be very healthy at the moment.

For the sixth year running the entire sector is showing signs of rather well-sustained growth (+3.1% in investments) and over the last six years investments in building have accounted for 22% of the increment in the Italian GNP.

The increasingly international nature of this event has been reinforced this year by all the trade delegations in attendance (from 12 of the most interesting nations for the international companies). It was particularly interesting to note the presence, amongst others, of delegations from China, Russia and India, the major geographical areas offering so many opportunities for both national and international firms, due to the great demand for new buildings.

A Privileged Watchdog

Saie has proved to be a watchdog for analysing the dynamism and drive towards innovation currently characterising the building industry. About 400 technological innovations and new products were presented for the first time at the event, so that all the technicians and other professionals attending could get familiar with and test out what the market has to offer. As we shall see, lots of these novelties were by Mapei.

Saie 2005 devoted a wide range of events to concrete in particular - one of the building materials currently most popular with the leading exponents of modern-day architecture - so that the issue could be analysed in-depth through conventions, exhibitions and dedicated meetings.

The First Report on Reinforced Concrete, Construction and the Italian Economy (promoted by the Italian Advisory Board for Concrete and BolognaFiere, carried out by the Cresme Research Centre) outlined the importance of the reinforced concrete industry, reconstructing its market dynamics in both the short and long term in relation to the national economy.

Among the curiosities on display at the exhibition on this theme, we had "Concrete Visions"; a LiTraCon panel, an incredible piece of "transparent concrete" invented by the Hungarian architect Aron Losonczi, which will most likely soon find interesting applications in modern-day architecture.

Conventions

Architecture of the highest level found just the right stage at Saie 2005 to tackle every aspect of the issue of transforming our cities.

Lots of topics were examined: ranging from current trends in architectural experimentation to the input coming from developments in society's approach to designing and developing our city centres and the materials used in present-day architecture.

These are just some of the major fields of research which were debated by leading exponents of modern-day architecture - Françoise-Helene Juorda, Boris Podrecca, Shigeru Ban, Georg Reiberg, Winy Mass - at all the conventions organised during the event. These well-attended meetings highlighted the new role the architect now plays, as he is expected not only to design homes, focusing attention solely on the building shell (its shapes and lines), but also to concentrate on its essence, on how the territory is evolving, without forgetting ever closer bonds with ecological thinking and the sociological analysis of society.

A key event at the Bologna show took place on 14th October in the Sala Europa of the Conference Hall: the Convention organised by Mapei on "Reinforcement, Reclamation and Protection of Buildings: How to Plan a Reliable Renovation". The article published on pages 11-13 gives a full report on the day's proceedings, including all the contributions made on the topic during this well-attended event.

Mapei's Guidelines

The issue of renovation provided a guiding thread for the various theme areas at the Mapei stand. Once again this year Mapei took advantage of the Saie show to present the latest and most innovative products and systems it has developed in the various realms of building: housing and major construction projects.

Mapei's increasingly prominent role on the international scene was underlined at Saie by the words "The World of Mapei" written in huge letters on the front of the stand and explained in greater detail inside by means of a giant planisphere showing where the firm operates around the world.

Just like at the Cersaie event, here again Mapei used the slogan "Not just adhesives...." to send out a clear message to all retailers of tiles and building materials. By choosing Mapei, these retailers have a better chance to expand, since, in addition to tiles, they can offer plenty of other ranges of products: rapid and special mortars, dehumidifying and waterproofing compounds, certified solutions for energy saving and flooring systems, admixtures for concretes and, above all, every imaginable kind of wall coating, notably including SILEXCOLOR MARMORINO, a product completing all kinds of design options.

The stand took visitors on a theme tour highlighting various operating realms.

As Pasquale Zaffaroni, Product Manager of the Building Speciality Line, has stated, "Mapei is successful because it does not just develop products but real systems, "operating cycles" aimed at providing definitive solutions to every imaginable need in the building industry".





New Mapei Products

The Mapei stand has been designed along just these lines.

A large area has been devoted to building renovation and repair, both for concrete and masonry buildings; both these sectors require custom-designed operations and special formulated products serving specific purposes: to this end the fair displayed the MAPEGROUT and MAPE-ANTIQUÉ lines.

The MAPE-ANTIQUÉ line, devised

over ten years ago, is being constantly improved and extended as more experience is gained in renovating and repairing historical buildings around the world.

The combined use of lime and Eco-Pozzolana (an inorganic synthetic pozzolanic material rich in amorphous silica with a high specific surface and high reactivity), developed in the Mapei Research & Development laboratories, has resulted in the formulation of a line with no rivals on the market.

As well as having very similar physical-mechanical properties to those of the products used for the original project, the products from this line also feature high physical and chemical resistance to attacks from aggressive agents, such as the sulphates, chlorides and nitrates found in masonry or introduced by rising damp.

There are three important new products for **structural reinforcement using composite materials**:

- MAPEGRID G 220 alkali-resistant fibreglass mesh for structural reinforcement of stone, brick and tuff substrates, to be applied using Planitop HDM;
- PLANITOP HDM two component high-ductility mortar for reinforcing masonry structures in conjunction with Mapegrid G 220 and for smoothing and levelling surfaces in concrete, stone and tuff;
- MAPEWRAP S30 mono-direction, high-strength steel-fibre fabric.

The new **curing agents** include MAPECURE CA white-coloured solvent-based film-forming curing compound, which may be painted over, for mortars and concrete.

The **structural bonding compounds** have been supplemented by ADESILEX PG4 two component thixotropic epoxy adhesive with modified-rheology for bonding Mapeband, Mapeband TPE, PVC braces, Hypalon and for structural bonding.

Careful attention has been focused on all the solutions ensuring greater **comfort** for users of the environments where they are installed, such as dehumidifying renders, protective coatings and thermal insulation systems such as the innovative MAPETHERM.

The wide range of **protective and decorative coatings** has been enhanced with:

- COLORITE BETON acrylic resin-based semi-transparent paint in water dispersion for protecting concrete, reinforced concrete or cementitious surfaces;
- COLORITE PERFORMANCE acrylic resin-based paint in water dispersion for protecting and decorating both external and internal surfaces;



- POROMAP FINITURA cement-free, light-coloured, fine mortar for finishing dehumidifying renders applied on stone, brick or tuff. CONSOLIDANTE 8020, a resoluble consolidating solvent for the conservative restoration of stone substrates, has been introduced into the field of consolidation.

There are a number of new products in the **sealing and waterproofing** sector:

- MAPEBAND TPE, a TPE tape for flexible sealing and waterproofing expansion joints and cracks subject to movements of up to 5 or to 10 mm, using Mapeband TPE 170 or Mapeband TPE 325 respectively;
- FOAMJET G one-component, polyurethane self-expanding foam applied using an extrusion gun for sealing, filling and insulating;
- FOAMJET M one-component, polyurethane, self-expanding foam, manually applied, for sealing, filling and insulating;
- MAPEFLEX PU50 SL one-component, fluid, polyurethane sealant with a low modulus of elasticity for sealing joints subject to movements of up to 25%;
- MAPEFLEX PU55 SL one component, fluid, polyurethane sealant with a high modulus of elasticity for sealing joints subject to movements of up to 7.5%;
- PRIMER AS one component primer in solvent solution to improve adhesion at the edges of the joints sealed with Mapeflex PU50 SL and Mapeflex PU55 SL;
- MAPECOAT BS 1 two component flexible, abrasion-resistant, epoxy-polyurethane coating for protecting and waterproofing concrete structures.

The area devoted to **cementitious and resin floorings** illustrated all the





more specific systems for using the kind of coatings now in great demand not only in work places - such as manufacturing plants or mechanical workshops - but also in the most fashionable showrooms and private homes.

The industrial flooring sector has been enhanced with:

- MAPEFLOOR FINISH 52 W two component, non-yellowing polyurethane finishing compound in water dispersion for dust-repellent and anti-oil treatments. It does not modify the appearance of the substrates;
- MAPEFLOOR I 350 SL two component, neutral-coloured, classified as A1_{fl} (reaction fire test), multi-purpose epoxy treatment for industrial floors at a thickness of up to 4 mm;
- MAPEFLOOR I 910 two-component epoxy primer for mortar applied by trowel or as a bonding promoter for resin coatings.

The **admixtures for concrete** section was also extremely interesting, featuring increasingly effective products for carrying out futuristic projects involving concrete. This range has three new products:

- DYNAMON SR21 a modified acrylic-based superplasticizer for ready-mix concrete with a low water/cement ratio and good maintenance of its workability;
- DYNAMON SR31 modified acrylic-based superplasticizer for ready-mix concrete with a low water/cement ratio and long maintenance of its workability;
- DYNAMON SR41 modified acrylic-based superplasticizer for ready-mix concrete with a low water/cement ratio and extremely long maintenance of its workability.

As usual, the Mapei stand also left room for its product range for **underground constructions**, requiring special technology and custom-made systems of products due to the complexity involved in the design phase and extremely tough working conditions.

A novelty this year was the space devoted to the **road maintenance sector**: operations increasingly in need of their own range of specific products providing the right technical solutions to ensure the work carried out lasts longer and to speed up operations so that roads are not closed to traffic any longer than necessary.

In addition to MAPEGROUT SV (fast-setting, easy-flow,





controlled-shrinkage mortar for repairing concrete and fastening drains, manhole covers and roadwork fittings in place), Mapei presented STABILSOIL 200 at the fair, a custom-designed system for stabilising all kinds of ground, used for carrying out durable repairs to "white" roads, cycle paths, car parks and contaminated waste material containers etc.

Mapei displayed a wide range of new products for every aspect of building: from housing to major works.

A full range of themes were on visual display inside the stand, a sort of "ideal city" concretely illustrating all the problems Mapei can handle through its increasingly innovative range of products.

A practical presentation which met with the approval of all the visitors who flocked to the Mapei stand at the 2005 Saie Show.

A Real Success

"This year's Saie show was a real success for Mapei", according to Ernesto Erali from Mapei's Business Management team. He also underlined how much more active and effective this year's event was compared to last year's edition. Mr. Erali, who was also keen to point out that the "old" yet incomparable MAPELASTIC was still the star attraction of the event, as it has been for years, also noted that, as well as arriving in greater numbers, "our customers showed their appreciation for the firm's continuing efforts to improve and extend all its ranges of products. This is shown by the high sales of certain products displayed and promoted during the fair". The optimism emerging from the trade fair - not gauged by the good sales results alone - also augers well for the future and proves that the entire building industry is trying to keep up and even improve on the fine results it has achieved so far.

The next edition of Saie, which will again be held in Bologna, will take place from 25th to 29th October 2006.





CHEMICALS IN EUROPE: SUSTAINABILITY, CO-OPERATION AND.... BUREAUCRACY

GIORGIO SQUINZI'S SPEECH AT THE 3rd CONGRESS OF THE EUROPEAN CHEMICAL REGIONS NETWORK.



The 3rd Congress of the European Chemical Regions Network was held at the Trade Fair Conference Centre in Milan on 6th October 2005. The day's proceedings were on the topic of "Chemical Regions as Actors for Sustainability and Cooperation in Europe".

The European Chemicals Regions Network, the ECRN, is designed to bring together most of the regions in Europe with a vocation for chemicals, so that they can work together on a new interregional co-operation project to develop a continental-wide chemicals policy.

The annual conference of the European Chemical Regions Network was held in Milan because it was promoted and organised by the Lombardy (the Italian region with Milan as its chief city) Regional Council, a member of the ECRN and Italy's national representative, in conjunction with international events in the chemicals sector, held at the Milan Trade Fair Foundation's Conference Centre (Rich-Mach, Milanoenergia, Acqua and Expobiotech).

The event provided the chance for important figures from the world of politics, economics, science and public administration on a European, national and regional level to get together to discuss the challenges currently facing chemicals manufacturing regions and their prospects for the future. The meeting was scheduled at a crucial moment in time, when key aspects of sustainable competitive development in the enlarged European Union are being tackled.

The latest regulations governing the Registration, Evaluation and Authorisation of Chemicals (REACH) have been ratified by the Parliament of the European Union and a number of players are now actively involved in the process of finding a balanced solution meeting the project's environmental and economic targets.

Another important challenge facing chemicals manufacturing regions is to boost cutting-edge research and expertise in innovation to make the industry more competitive.

The European Union has, in fact, set clear priorities for encouraging European research into sustainable chemicals.

However, it ought to be pointed out that the Italian chemicals industry might have to pay a surcharge of 1.2 billion Euros (bureaucracy costs) for the administrative procedures required to register chemical compounds according to the latest REACH regulations.

These regulations actually make it compulsory to register all chemical compounds and assess the risks they involve, including familiar compounds which have always been widely available.

These extra costs - spent on consumer safety and protecting the environment - are investments that Italian chemicals firms would be quite

*Photo below:
Diana Bracco, President
of Assolombardia
(Association of the
Italian Firms located in
the Lombardy Region),
emphasised the need
to innovate more and
more effectively, when
speaking at the
3rd ECRN Congress.*



willing to make, if it were not for the normative-bureaucratic excesses and the ensuing loss of competitiveness this entails.

This is why the full-page headline of an article on this meeting published in "Il Sole 24 Ore" on 7th October stated: "Chemical industry alarmed by EU costs"

So the congress also provided the opportunity to study an issue which will have notable future implications on a sector, like the chemicals industry, of such great socio-economic importance.

When opening the proceedings, Giorgio Squinzi, as the President of Federchimica and CEO of Mapei S.p.A., emphasised the importance of chemicals for Europe and, figures in hand, underlined the fact that 50 regions of Europe out of 116 each have over 10,000 chemical workers, and there are at least 100 chemical plants in 75 regions.

Squinzi stressed the importance of chemicals in Lombardy and their role in Italy. This region actually hosts about 41% of the Italian national chemicals industry. Lombardy also has the second highest number of chemical workers in Europe (over 90,000) and most companies (over 400, without counting the hundreds of small businesses).

To maintain such an important role in Europe, the entire sector must keep on investing in innovation, focusing on market niches projected into the future.

Giorgio Squinzi drew on the Lombardy region to exemplify what can and must happen in all regions with busy chemicals industries.

Lombardy has the most important instances of chemicals industries which have managed to grow and become leaders in their own niches of the global market. As we know, Mapei is one of these companies. Squinzi pointed out the importance of protecting these companies' interests and development, which means boosting the regional industry and offering good job prospects for the younger generations. According to Squinzi, this must move hand-in-hand with sustainable growth guaranteeing balanced industrial development focusing on safeguarding health and the environment.

"This challenge cannot be successfully negotiated alone - Squinzi said - the private and public sectors must work together.

There is a great danger that we must combat together: the risk of thinking that industry is no longer of central, strategic importance in Europe, particularly Italian industry, so it can be unnecessarily burdened with pointless rules and regulations.

The European Parliament - so Squinzi continued - has introduced about 700 new environmental regulations over the last 15 years.

Regulations which, quite inappropriately, all too often envisage greater restrictions and constraints than those foreseen in other areas of the world comparable to Italy.

The result is that the European chemicals industry completely loses its competitiveness, thereby threatening thousands of jobs."

The ECRN's commitment to work with public administrations can also be read favourably in this sense: the European Chemical Regions Network does indeed encourage the development of European-wide partnerships between leading players.

Moreover, the nature of future European regional policy will have a big impact on regions with a vocation for chemicals.

The chemicals industry has a powerful influence on the development of regional ecosystems and Structural European Funds have notably supported the process of restructuring and modernisation of chemicals sites.

The exchanging of ideas and proper practices between old and new Member States is, then, important for making effective use of European funds in this field.

RM



THE "DECOPAINT" DIRECTIVE IS AT THE STARTING GATE

From the 1st of January 2007, painting products will have to abide by limits laid down by EU Directive 2004/42/CE regarding their volatile organic compounds content. The subject was discussed during a symposium organised by Vinavil in collaboration with AITIVA.

by Roberto Leoni

Just how serious is the problem of air pollution?

Very serious, if the findings presented by the European Union's Commission are anything to go by. The results show that domestic air pollution is responsible for 2.7% of all serious illnesses in the world, that from 2 to 7% of tumours may be attributed to pollution in the air (both inside and outside buildings) and that 20% of Europeans suffer from asthma due to substances inhaled inside their own homes. The problem is caused by a number of sources, with the main ones being cigarettes, fumes from combustion (such as gas rings), furniture, carpets and building materials, including adhesives and painting products.

The European Union is analysing this problem with increasing preoccupation and attention and a number of the EU's agencies are drawing up new regulations to tackle the problem.

In the light of this analysis, on the 6th of October, 2005 Vinavil promoted a symposium to discuss one of the new regulations which aims to reduce the content of volatile organic compounds (solvents, plasticisers and similar substances) which are present in a number of painting products (Directive 2004/42/CE, the so-called "Decopaint Directive").

The symposium was organised together with AITIVA (Associazione Italiana dei Tecnici dell'Industria di Vernici ed Affini - Association of Italian Technicians for the Paint and Allied Industries) and was held in the Mapei Auditorium in Milan, with more than 100 participants representing the industry sector, standards organisations and the press taking part. After the opening welcome speech by Franco Lucherini, Chairman of AITIVA, and by Zaverio Rovea, Managing Director of Vinavil, and after the presentation of Vinavil by Ivan Fuso Nerini, the company's Commercial and Marketing Director, Franco Pellaschiar from AVISA (Associazione dei Produttori di Vernici, Inchiostri, Sigillanti e Adesivi - Association of Paint, Ink, Sealants and Adhesives Producers) took the podium, to clear up a few points regarding the contents of Directive 2004/42/CE and its current position. The next speakers were Fabio Abbà and Mikaela Decio from the Vinavil and Mapei R&D laboratories. The two researchers discussed the analytical instruments currently available for technicians, which may be used to assess the volatile organic compounds (VOC) present in painting products, highlighting the possible ways to approach the problem: the level of



"packaged" VOC, that is the level of VOC contained in paint before it is applied, and the level of VOC emitted once applied.

The results illustrated stirred up a lot of interest among the participants and showed how the measurement of emissions taken after application, through the use of "environmental chambers" under laboratory conditions, which simulate the development of VOC emissions inside a home, is the only method able to effectively demonstrate the pollution potential of painting products used in a domestic environment.

In fact, this method is the only one which is able to highlight the significant difference in the behaviour of the products, which the measurement of the "packaged" value, according to the methods prescribed by Directive 2004/42/CE, is unable to demonstrate.

The symposium ended with the presentation of a number of new innovative products which Vinavil has developed to reduce VOC in painting products. These products were presented by Antonietta Schirò, head of Vinavil's Technical Assistance for the Building Industry Department.

In the afternoon, after the symposium, the participants were invited to take part on a guided tour of Mapei's R&D laboratories. During the visit, the participants were able to fully appreciate the quality of the technical personnel and diagnostic and preparation instruments which the Mapei Group has available in order to fully satisfy all the requirements of their customers. [RM](#)



SAIE CONVENTION

Reinforcement, Reclamation and Protection of Buildings: how to Plan a Reliable Renovation



On Friday the 14th of October, 2005, during the Saie Trade Fair, Mapei organised their customary convention in the Europa Hall at the Conference Centre. On this occasion, the conference was dedicated to **Reinforcement, Reclamation and Protection of Buildings: how to Plan a Reliable Renovation**.

The convention was divided into two sessions: the first session was dedicated to consolidation and structural reinforcement, from the experimentation phase to the application phase, while the second session focused on the restoration of walls, including de-humidifying, waterproofing and protection.

There were numerous, important presentations. During the first session, Prof. Gaetano Manfredi from the Federico II University, Naples focused his presentation on **"Deterioration and Structural Consolidation: the Use of New Materials"**. Giulio Morandini B.Sc. from Mapei Technical Service Department further developed the theme by discussing **"Materials for Consolidation and Reinforcement"**. The morning session was rounded off by Prof. Alberto Balsamo from the Federico II University, who further developed the theme on **"Technology and Innovative Materials: from Research to Application"**.

The second session opened with the presentation by Prof. Luca Bertolini from Milan Polytechnic, dedicated to **"Humidity and Deterioration Mechanisms in Buildings"**; followed by a presentation by the architect Davide Bandera, from Mapei Building Department, who discussed **"De-humidifying and Waterproofing Works: Innovative Solutions"**. The closing presentation for the day was by Mr. Paolo Sala, Project Manager of the Mapei Coating Systems Range, with the title **"Integrated Systems for Coatings on Façades. Durability: Laboratory Testing and In-service Performance"**. This presentation will be discussed below in more detail.



The presentation by Paolo Sala, on which the article is based, also contained numerous pictures. The first ones, shown above and used by the speaker as an introduction to the discussion, refer to two different types of work carried out. They portray the coating of two façades of considerable artistic value, a work carried out using a number of highly-evaluated Mapei products and systems.

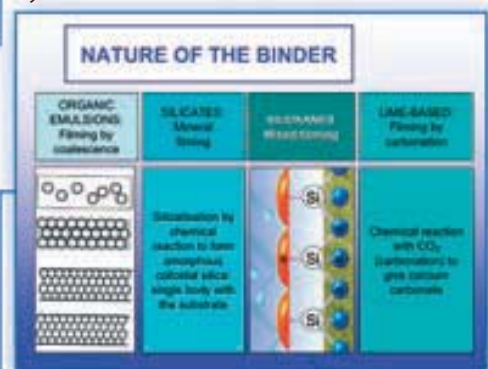
INTEGRATED SYSTEMS FOR COATINGS ON FAÇADES. DURABILITY: LABORATORY TESTING AND IN-SERVICE PERFORMANCE

At the Saie Convention, Mr. Sala opened his presentation by stating that the aesthetic appearance of coatings on façades is often identified as the main performance characteristic. In fact, reference lists often highlight the quality of the work but, above all, the fact that they have an attractive appearance, as if the interventions were carried out merely to decorate the surfaces. Only in the case of large project (bridges, viaducts, etc.) the concept of durability is a focal point of the work carried out.

In his presentation Mr. Sala described Mapei's innovative approach to maintenance and coloured coatings of facades. This approach, with the strong support of an analytic-performance study protocol, is based not only on an analysis of the products and the substrates, but also on an analysis of the substrate-coating interface and on the deterioration of performance with time, according to the diverse environmental conditions, which means that we can foresee the durability of an intervention with reasonable accuracy.

How do we Assess the Prevision of Durability?

Generally speaking, according to Mr. Sala, the starting point is the composition: the quantity and the quality of the raw materials used to blend the



recipe will continue to be a reference point to define the quality of a product and, therefore, the durability foreseen. The importance of the binder component with this approach is quite clear, both from a quality point of view and from a quantity point of view.

As far as the binder is concerned, the most significant qualitative distinction is the type of film which occurs, the process through which



this li-liquid component, which binds the powders together and allows them to bind to the substrate, passes from a liquid state to a solid state. Obviously, apart from the quality of the binder, the quantity of binder is also of fundamental importance and, in particular, the quantity of the so-called free binder. Therefore, PVC is particularly important, that is, the concentration level in volume of the pigment (or rather, the powders) in the product. PVC was widely used in the 1980's and 1990's for the formalistic approach of products and the classification of painting products, since it is undeniable that, as the level of PVC increases, the durability of the product is drastically reduced.

The limit to this "compositional-formulistic" approach when predicting the durability of a repair intervention is that the coating is not an independent unit but rather an integral part where the substrate-coating interaction plays the most important role.

The Choice of a Coating

The coating-substrate system must take into account certain fundamental parameters before defining which is the most suitable coating.

Therefore, we must consider the type of substrate and the chemical-physical characteristics of the substrate. For example, the devastating corrosive action of CO₂ on reinforcement rods, and its capacity of penetrating into reinforced concrete, are well known. We must certainly use a product which acts as a barrier against CO₂, one which has, therefore, a high level of S_D, that

is, no lower than the minimum level established by Klopfer (50 m). In this case, the most suitable solution is represented by the COLORITE Systems (BETON and PERFORMANCE) and the ELASTOCOLOR System (PAINT and RASANTE), which complete the MAPEGROUT, MAPEFINISH, MONOFINISH and PLANITOP 100 and 400 repair systems.

For traditional renders and smoothing and levelling repair compounds, the major function of the coating is to have good water repellence, in order to protect the substrate from the disintegrating action of rainwater and of the aggressive agents which it carries. There are various solutions available, since the Mapei Coating Systems have a high content of free binders and permit a wide choice while guaranteeing that water absorption is not high. Mr. Sala mentioned SILANCOLOR System, COLORITE PERFORMANCE System, QUARZOLITE System and ELASTOCOLOR System, which complement the façade smoothing and levelling compounds PLANITOP 200, 520 and 540. Again in this case, de-humidifying, which leads to the use of macro-porous renders, requires highly transpiring coatings. In Mr. Sala's opinion, the most suitable systems are the silicate-based SILEXCOLOR System and the siloxane-based SILANCOLOR System.

How to Treat Irregularities

In the substrate-coating system, there are also physical problems which must be considered. The most common are: cracks and unevenness in the surface pattern of the substrate, along with special requirements such as evening out the colour (with "natural-finish" cement, for example) and the coating of façades featuring thermal systems.

With repair work, when a number of partial interventions are carried out, unpleasant irregularities might be visible and the coatings applied to façades are not always able to even out or cover them. In these cases, the use of a polymer-modified cementitious smoothing compound with high-wetting properties (such as PLANITOP 200) with reinforcement mesh helps to even out the coating and improves its appearance and functionality. However, if the mesh is not used correctly surface irregularities may again occur. In this case, the coating of a medium-grained mortar may help to even



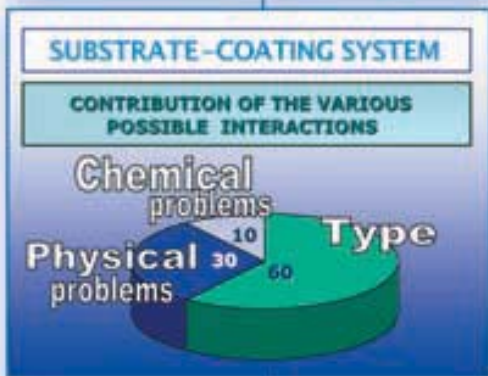
TRADITIONAL RENDER	WATER-REPELLENT PRODUCT
Kuenzle: $w_{24} \leq 0,5 \text{ kg}/(\text{m}^2 \cdot \text{h}^{1/2})$	
UNI EN ISO 1062-3 :	
CLASS	w (kg/(m ² h ^{1/2}))
I HIGH	> 0.50
II MEDIUM	0.1 - 0.5
III LOW	< 0.1

INTERACTION BY PHYSICAL CHARACTERISTICS:

SURFACE IRREGULARITIES

solutions

- Using a polymer-modified cementitious smoothing compound with high wetting properties, such as PLANITOP 200 with embedded mesh
- Using a medium to large-grained mortar



out the surface. A special type of unevenness in colour may occur in natural-finish cement. This may be due to different mixes being applied or the presence of stains caused by form-release compounds, which may be evened out with an acrylic resin-based paint, such as COLORITE BETON.

Finally, in thermal insulation systems, the very presence of the insulating panels may result in poor performance of the substrate's dissipation effect when there are sudden temperature changes, with the heat from the outer side causing thermal stresses in the smoothing-coating layer. In this case, the coating must have special characteristics regarding the type of binder and type of colour, which must be highly reflective. Light colours, therefore, are particularly recommended.

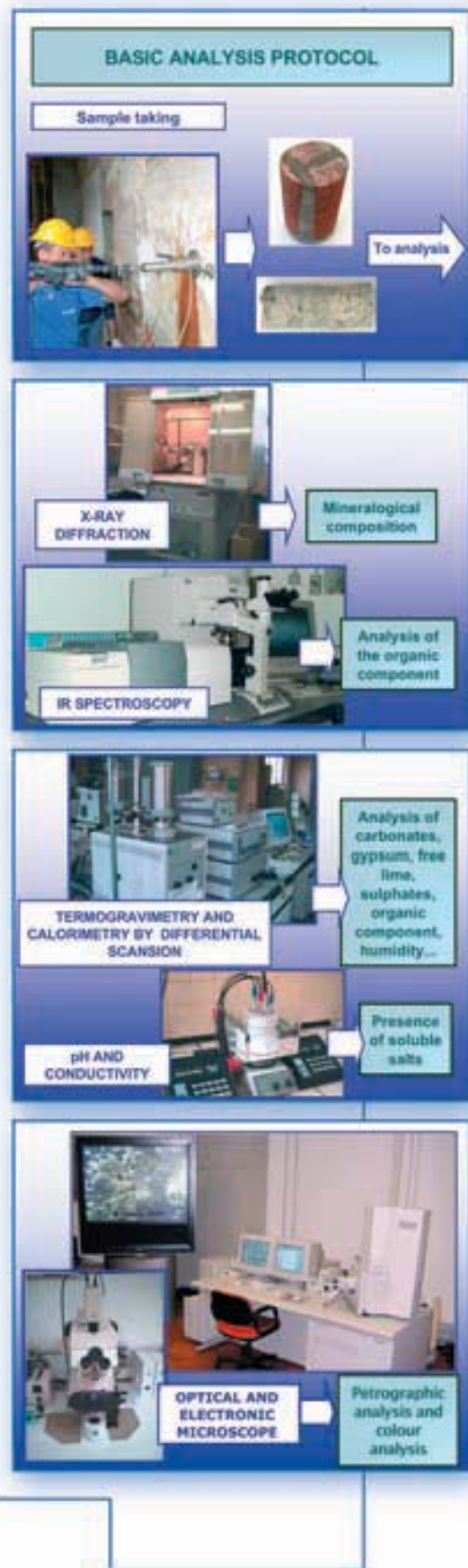
Mr. Sala also discussed the final durability of the coating, mentioning how problems regarding the type of substrate (that is, chemical problems and problems that can be defined as "physical") are particularly influential. All these problems should be put under the control of the supplier of an integrated façade-substrate-coating system (mortar, smoothing compound and coloured finishing coating).

Handling, Mixing and Application of the Product

There are also other parameters which may be kept under control by those who carry out the work, and which contribute significantly to the resulting durability of work carried out on facades. One parameter is the handling of the product and, in particular, its dilution. The most common, and damaging, mistake regards the amount of thinner used: adding too much thinner may lead to a layer of product which is incapable of providing adequate protection of the substrate, even though initially its appearance seems no worse from an aesthetic point of view. Once the product has been diluted (if dilution is specifically indicated) the way it is applied may heavily influence the final durability. If the yield of the product is higher than the recommended level due to the product being spread out too much, its thickness and, therefore, level of protection will be reduced. The way the product is applied also plays an important part on the service life of the work. A typical example is the application of a thermal insulation system: there is a considerable difference between spot bonding and fully covering the panel with a mortar. Another parameter to be taken into account is how the product is applied. A typical example is the application of a coloured mortar: if the mortar is worked over for too long with a wet sponge (which is sometimes used to correct application mistakes), the pigments may be drawn out to the surface. Later, the surface may become quickly discoloured, which is not due to the pigment's instability to ultraviolet rays, but by the washing action of rain which removes the pigments. Lastly, Mr. Sala argued that the final result may be heavily influenced by environmental conditions. Direct sunlight and winds may have a devastating effect on the aesthetic appearance of a surface, but it is low temperatures and rain which have a much more damaging effect on the durability of the protective layer.

The Mapei Protocol

Once the preliminary conditions have been verified, the Mapei analytic-performance enquiry protocol includes an analysis of the substrate and, where required, of the product. Thus, the real durability screening of the various systems is carried out with accelerated ageing tests using the latest models of weather-ometers, which allow an overall assessment of the deterioration of the substrate-coating system to be carried out, concerning both changes in colour and other performance characteristics. These figures are carefully cross-referenced, so that the in-service performance of a substrate-coating system may be assessed, since they correspond perfectly to what happens in a real-life on-site situation over time. They also determine the real durability performance characteristics that can be related to the products employed. Deciding on the colouring system for a façade, not only from the important aesthetic point of view, but also in terms of durability, means proposing integrated substrate-coating systems, and not simple painting cycles. It also means analytical testing and performance-forecast investigations, which guarantee a good result of the work and its entire aesthetic-protective function.



Records of the convention, organised by Mapei at Saie 2005, are contained in a CD. Copies are available upon request from the Mapei Marketing Office by e-mail: marketing@mapei.it or by fax: +39-02-37673214.



CONCRETE INDUSTRIAL FLOORS

by Gianluca Bianchin and Andrea Siboni, Mapei Admixtures for Concrete Division

Concrete industrial floors, which have always been considered to be structures of little importance and, therefore, laid without due regard for their requirements in terms of durability and mechanical strength, are often the cause of complaints in the ready-mix concrete sector.

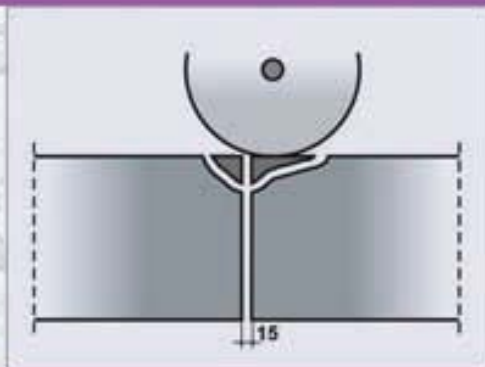
In recent years, however, the various figures involved in this sector have become increasingly aware of these floors' technical importance: designers, customers, site managers, building companies and installation companies.

The factors which influence the working life of the floor are now more carefully assessed. One of these factors is the correct preparation of the foundation slab or substrate which must support the floor. In practice, the characteristics of this layer must be taken into consideration in order to correctly calculate the mix-design of the concrete together with its relative reinforcement. Furthermore, even if their size has been correctly calculated, the shrinkage joints still represent the weak point in the working life of the floor, especially if subjected to the continuous and systematic traffic of vehicles, such as lorries and fork-lift trucks.

Fork-lift trucks are particularly damaging, in that

maintenance work and, therefore, long down-times to carry out the repair work, is represented by the possibility of laying floors with a large surface area (up to 1200 m²) without joints using the MAPECRETE SYSTEM.

Mapei Laboratories have developed a system which allows the natural shrinkage of concrete to be compensated for by using special admixtures, which allow all the chemical-physical processes which transform the mix from a fresh state to a solid state to be controlled. Therefore, it is possible to reduce the number of joints so that they correspond with the



Picture 1. Damage at the edges of the joint

they are often equipped with wheels in "vulcan" and the heavy loads which they carry are concentrated into areas of only a few centimetres, thus provoking heavy stresses on the surface of the floor which damage the edges of the said joints (see Picture 1).

In these cases, the best solution to avoid costly

construction joints which, in turn, may be carried out by inserting suitable reinforcement ("jointless floor"), thus eliminating all the weak points in the floor.

The example taken into consideration, and which is illustrated in the photographs in this article, regards the laying of a floor in a shopping centre in the Province of Novara, Italy, carried out between 2004 and 2005. In this case, the MAPECRETE SYSTEM was applied in building the service court area of the supermarket, an area which is used for receiving goods and, therefore, subjected to intense, continuous loads.

In fact, the customer required a surface on which the goods could be loaded and unloaded for 365 days a year. Any maintenance intervention in such an area, therefore, means interrupting sales activities, so the technology proposed proved to be the most appropriate solution (see Photo 1).

The work was approached by carrying out initial sampling of the materials supplied by the concrete manufacturer, on which a series of laboratory tests were carried out: grain-size analysis, a study of the best grain-size distribution and a study of the mix design according to the mechanical characteristics which were required to carry out the work.

The workability and maintenance of workability characteristics were tested using various modified acrylic-based superplasticers from the DYNAMON range, in order to choose the most suitable product accor-

ding to the climatic conditions at the moment of casting. The contrasted expansion values were measured, in compliance with Standard UNI 8148, and the standard mix normally used by the supplier of ready-mix concrete for industrial floors was compared with the one mixed using the MAPECRETE SYSTEM (see Table 1).

Finally, the values of the compressive strength of the concrete samples under testing were measured after a period of 1, 7 and 28 days curing time, thus characterising the performances of the mixes to be used.

As mentioned previously, the size of the floor slab was designed according to both the characteristics of the substrate on which it was to be formed and on the type of traffic which it would have to bear. Also, another considerably important factor was the reinforcement foreseen for the floor, and to verify if it would be sufficient to guarantee adequate compensation to the expansion induced by the MAPECRETE SYSTEM.

The installation was carried out with the support of technicians from the Mapei Admixtures for Concrete Division right from the phase of loading the concrete in the mixing plant

(see Photo 2). The quality control checks, carried out in the mixing plant, and again on site, allowed the team to confirm that the characteristics of the fresh concrete corresponded to the design characteristics (see Photo 3).

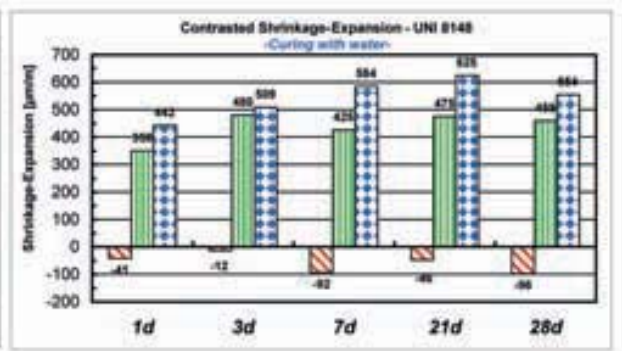
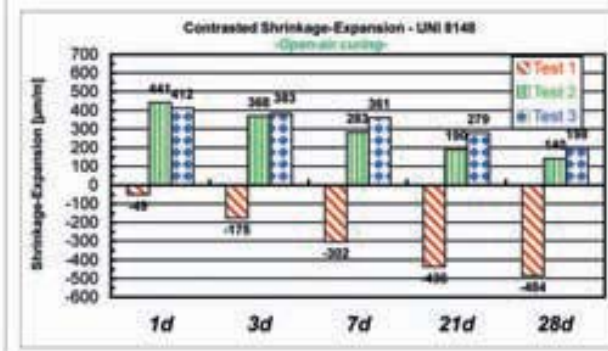
The concrete was poured using traditional methods by hand, with the concrete having an S5 consistency (slump > 230 mm). The result was a concrete which was particularly easy to use, both while discharging with a pump and during the levelling-off phase. By carefully studying the mix, a blend with good cohesion and rich in fine particles was obtained, along with bleeding phenomenon being all but eliminated (see Photo 4). After sprinkling the surface with quartz to reinforce the surface, the floor was wetted and covered with waterproof sheets to guarantee that curing was carried out under damp conditions for the first few days (see Photo 5). After almost a year of completing the work, the floor is still in perfect condition and in a monolithic state (see Photo 6). Taking into account the respect for the parameters regarding the water/cement and agglomerate/cement ratios for the concrete used, the density of the reinforcement and the relative environmental humidity, we can safely say that the



TABLE 1. CONTRASTED SHRINKAGE - EXPANSION - UNI 8148

Time (days)	Test 1		Test 2		Test 3	
	1-Air	1-H2O	2-Air	2-H2O	3-Air	3-H2O
1d	-49	-41	441	350	412	442
3d	-175	-12	368	480	383	509
7d	-302	-92	283	425	361	584
21d	-436	-46	190	475	279	625
28d	-484	-96	140	459	198	554

Test 1	Concrete with DYNAMON
Test 2	Concrete + EXPANCRETE
Test 3	Concrete + EXPANCRETE + SRA



MAPECRETE SYSTEM has clearly demonstrated that it is totally efficient in guaranteeing the performance characteristics required by the customer and the designer of the work. It is highly important to underline that MAPECRETE SYSTEM, the revolutionary system to create large concrete structures without shrinkage joints, may be used for any kind of work, from large floored areas to foundation slabs and long walls. Thanks to the proper blend of the components which make up the product, MAPECRETE SYSTEM may be modulated according to design requirements, the conditions under which the concrete is cured and its expansion characteristics, so that cracking due to hygrometric shrinkage of the concrete may be controlled and eliminated.

In fact, concrete made using the MAPECRETE SYSTEM is able to develop an expansion rate which is sufficient to compensate for shrinkage during the plastic phase, even if the curing conditions are not ideal.

As is well known, concrete made with expansive admixtures must be cured in environments which are saturated with humidity, in order to develop a level of expansion which is sufficient to compensate for hygrometric shrinkage of the cementitious conglomerate.

Concrete made using the MAPECRETE SYSTEM, on the other hand, is less affected by the conditions under which it is cured, so that its expansion level develops correctly even if it is cured in the open air, immediately after the formwork has been removed. By using MAPECRETE SYSTEM technology, therefore, performance levels which would otherwise be considered unthinkable for cementitious systems may be achieved, such as:

- designed expansion levels may be reached under all curing conditions, with a better yield of the expansive agent;
- extremely low final shrinkage of the conglomerates;
- control and elimination of cracking due to contraction;
- reduction or elimination of wet curing;

MAPECRETE SYSTEM is an extremely versatile system: in fact, it is possible to regulate the fluidity, workability and development of the strength of the concrete, without effecting its expansion and crack-control characteristics. RM

For further information on these products, see their technical data sheets available at the web site www.mapei.com.



COMPONENTS WHICH MAKE UP THE *Mapecrete System*

MAPECRETE SYSTEM is an exclusive Mapei technology, based on a careful combination of the following components:

◆ **DYNAMON SYSTEM**, an innovative range of nano-technology, super-plasticising admixtures (based on the latest generation of modified acrylic, divided into four families of specific products for all applications of ready-mix and pre-cast concrete), and concrete for site use;

◆ **EXPANCRETE**, expansive agent for preparing shrinkage-compensated mortar and concrete;

◆ **MAPECURE SRA**, an admixture which promotes expansion, even under non-humid curing conditions, in order to reduce hydraulic shrinkage and the resulting formation of cracks.

MAPECRETE SYSTEM, may also be used to repair concrete: by combining MAPECURE SRA with special binders, such as STABILCEM and STABILCEM SCC, the same shrinkage and crack-control advantages may be obtained.



EARTHQUAKE-PROOF

A study on structural reinforcement using the FRP System

by A. Balsamo, M. Di Ludovico, G. Manfredi and A. Prota
Department of Analysis and Structural Design, Federico II University, Naples.

During the Convention dedicated to "Reinforcement, Reclamation and Protection of Buildings: how to Plan a Reliable Renovation", which was organised by Mapei in Bologna in occasion of the Saie fair, Prof. Alberto Balsamo presented a paper regarding the technology and innovative materials used for consolidation and structural reinforcement. The study presented in this article, developed by Prof. Balsamo together with a team of researchers from the Federico II University, Naples, is the scientific introduction to the paper and the experimental basis on which the latest generation of Mapei FRP SYSTEMS has been successfully tested: a complete range of products based on carbon fibre, fibreglass and epoxy resins for structural reinforcement.

Introduction

One of the most important factors increasing the risk in case of seismic activity in Southern European countries is the high number of existing reinforced concrete (RC) structures underdesigned or designed following old codes and construction practices rather than the current seismic regulations. Such structural deficiencies are the main cause for the loss of human lives in case of seismic activity. The European research project SPEAR (Seismic Performance Assessment and Rehabilitation) involved a series of pseudo-dynamic bi-directional tests carried out on a three-storey reinforced concrete structure with an irregular layout at the ELSA laboratory

of the European Union's JRC (Joint Research Centre) in Ispra (on the Maggiore Lake, Italy). The structure under examination was designed and built with the aim of creating a structural prototype featuring all the main problems normally affecting existing structures: plan irregularity, geometric dimensions of the structural elements and reinforcement designed by considering only gravity loads, the use of smooth reinforcement bars, poor local detailing, insufficient confinement in the structural elements and weak beam-column joints.

Once constructed, the structure was subjected to two pseudo-dynamic tests, both in its original configuration and after the retrofit by Glass Fiber Reinforced Polymer (GFRP). The bi-directional pseudo-dynamic tests were based on the accelerogram provided by Herceg-Novi Montenegro record, scaled at various values of intensity of peak ground acceleration (PGA) and applied to the structure in various steps according to prefixed intensities. In particular, the structure in its original configuration was subjected to two experimental tests characterised by PGA values of 0.15 g and 0.20 g, respectively. The retrofitted structure, on the other hand, was subjected to a first seismic load with PGA equal to 0.2 g, followed by a further test under the action of an earthquake with PGA equal to 0.30.

The bi-directional pseudo-dynamic tests were carried out by simultaneously applying seismic loads to the structure both in a longitudinal and transversal direction by using four

actuators connected to the structure at each floor.

The SPEAR experimental program aimed at two main objectives:

- 1) to improve the understanding of the influence of plan irregularity on the seismic response;
- 2) to assess the effectiveness of the composite materials as a seismic retrofit technique in RC structures.

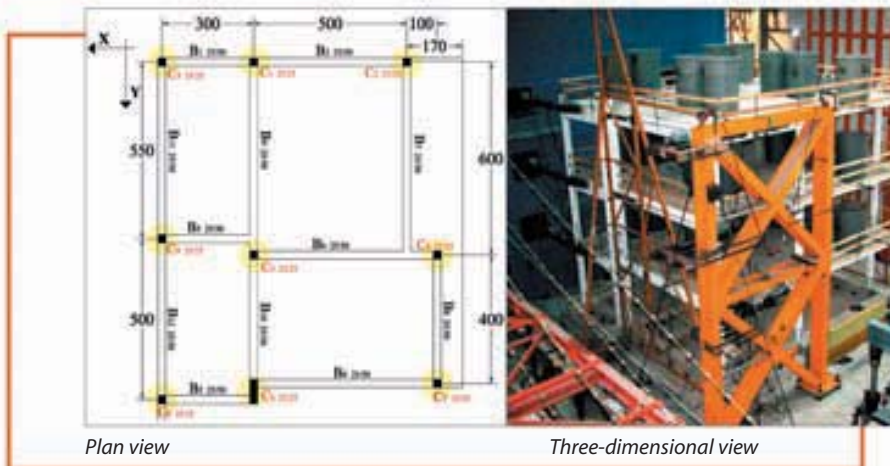
Analyses and assessment regarding the first theme (discussed in Negro *et al.*, 2004) are beyond the aims of this paper, which focuses on the philosophy criteria and calculation procedures adopted for the FRP retrofit of the structure.

Philosophy of the Intervention

The selection of a specific rehabilitation technique is generally made based on the deficiencies that the theoretical analysis or the observation of post-earthquake damage points out as well as on economic considerations. In the case of the SPEAR structure, seismic retrofit was carried out with a selective work using composite materials. The design of the intervention was carried out according to the provisions of the CNR-DT 200/2004 guideline. As shown in the CNR-DT 200/2004, the use of composite materials for the seismic retrofit of existing RC structures allows increasing the global deformation capacity of the structure in one of the following ways:

- 1) by increasing the ductility of the potential plastic hinges without changing their position;
- 2) by relocating the potential plastic hinges with respect to the hierarchy

Picture 1 - Sizes of the structure



of strengths criteria. Since the aim of the SPEAR project was to verify the possibility of improving seismic performance by carrying out a so-called "light" intervention (that is a localized low-cost intervention with an easy and fast installation procedure), the design project was based on the first of the two aforementioned strategies. In the case of structures designed for gravity loads only, the overall deformation capacity is usually governed by the limited rotation capacity in the plastic hinge at columns ends (inadequate cross-sectional dimensions and amount of longitudinal steel reinforcement). The retrofit was targeted at increasing the concrete confinement of the potential plastic hinge (located at the columns ends); such objective was pursued by GFRP columns confinement that allows enhancing the ultimate concrete compressive strain. This corresponds to an increase of curvature ductility that, assuming a plastic hinge length not significantly affected by the retrofit intervention, determines a proportional increase of the plastic hinge rotation capacity.

It is worth pointing out that confinement using composite materials at the ends of columns, for intervals which are typical of normal stress levels, induces a considerable increase in terms of ductility to the sections, but does not lead to a significant increase in strength. Therefore, this type of retrofit does not modify the hierarchy of strengths of the structure. Finally, it is worth noting that, in order to allow the structure to fully exploit the increased overall deformation capacity obtained by FRP confinement, it is necessary to foresee the formation of brittle mechanisms, the

activation of which could be detrimental to the global structural performance. For this reason, the retrofit of the SPEAR structure also foresaw shear strengthening of the un-confined corner beam-column joints and shear strengthening of the wall-type column.

Description of the Structure

The SPEAR structure represents a full-scale, three-storey building designed for gravity loads only, without any anti-seismic provisions.

The structure was built in compliance with Greek building codes enforced between 1954 and 1995 and in line with the constructive practices of the early 1970's. It may be considered typical of most existing buildings of the Southern European countries.

The structure is regular in elevation with a storey height of 3 m and a 2.5 m clear height of columns between the beams; it is non symmetric in both directions, with 2-bay frames spanning from 3 to 6 m. The plan layout and a three-dimensional view of the structure after the completion of the building work, is shown in Picture 1.

The structural elements have the same characteristics on each floor and, in particular, the transversal sections of the beams are 25 cm wide by 50 cm deep. Eight out of the nine columns have a square 25x25 cm cross-section while the ninth column (C6) has a rectangular cross-section of 25x75 cm, which makes it much stiffer and stronger than the others along the Y direction which is the strong direction for the whole structure. The square columns have longitudinal reinforcement made up of 4Ø12 bars (one at each corner), while the rectangular column reinforcement is provi-

ded by 10Ø2 placed along its perimeter. The overlap length is equal to 40 cm, with the same being applied for every floor in the structure.

The stirrups in the columns are Ø8 spaced at 25 cm and the beam-column joints do not have stirrups at all. The main elements are connected by 15 cm-thick floor slabs.

The construction was made of concrete with a nominal strength value of $f'_c = 25$ MPa and smooth steel rebars with a strength value of $f_y = 320$ MPa.

As far as the FRP intervention is concerned, the columns were confined with uni-axial GFRP laminates with density of 900 gr/m², an equivalent dry fabric thickness in each direction of 0.48 mm, modulus of elasticity of 65.7 GPa, tensile strength of 1314 MPa and ultimate strain equal to 0.02.

The shear strengthening of the corner joints and of the rectangular column C6 was carried out at each storey by using quadri-axial GFRP laminates with density of 1140 gr/m², an equivalent dry fabric thickness in each direction of 0.1096 mm, modulus of elasticity of 65.7 GPa, tensile strength equal to 986 MPa and ultimate strain equal to 0.015.

Experimental Performance of the "As-Built" Structure

The structure was initially subjected to seismic loads with a PGA level equal to 0.15 g.

After the test, however, the damages were far less serious than foreseen by the theoretical analysis prediction; thus, the structure was subjected to a second test characterised by a value of PGA equal to 0.20 g.

After such test phase, a much higher degree of damage was observed, with

Picture 2 - Damage to the columns



Head of column C3

Picture 3 - Phases of the reinforcement installation



Application of grout

Application by saturating



Application of the first layer

Application of the second layer

considerable damage in correspondence of the columns ends (see Picture 2), while slight cracking was found in some of the external joints and in the wall-type column C6.

The experiment showed that column C3, subjected to the highest level of axial load, was at each floor the one in which damage due to crushing of the concrete was more severe if compared with the other columns. It was also observed that the entity of the damage found at the base of the columns was less severe or, in some cases (such as the columns at the third floor), completely absent.

This is probably due to the fact that the reinforcement in those sections was doubled by the presence of the overlapping longitudinal reinforcement.

Once the test of the "as-built" structure was completed, prior to the laminates' installation, the unsound concrete was removed in all the zones of the elements where crushing was detected; then the original cross-sections were restored using a non-shrinking mortar. In addition, all cracks caused by the first round of test were epoxy-injected. Following the tests carried out on the original structure, and

before proceeding with the reinforcement using FRP, the damaged concrete parts were rebuilt and the cracks were repaired. After that, the structure was rehabilitated using GFRP laminates with uniaxial and quadriaxial (0° - $90^\circ \pm 45^\circ$) fiber texture.

Design of the Rehabilitation with Composites

The columns confinement was designed according to the expression provided by the CNR-DT 200/2004 guideline.

Assuming that the plastic hinge length remains basically constant after the application of FRP wrapping, an increase of ultimate concrete strain and consequently of the cross-section ductility implies a proportional increase of the rotation capacity of the plastic hinge.

As design hypothesis a concrete stress-strain diagram was assumed to be parabolic-rectangular and calculations procedures usually adopted for uni-axial bending were extended to the case of biaxial bending.

For calculation purposes, column C3 was chosen as the reference one because it carries the maximum axial force due to the gravity loads ($P = 403$

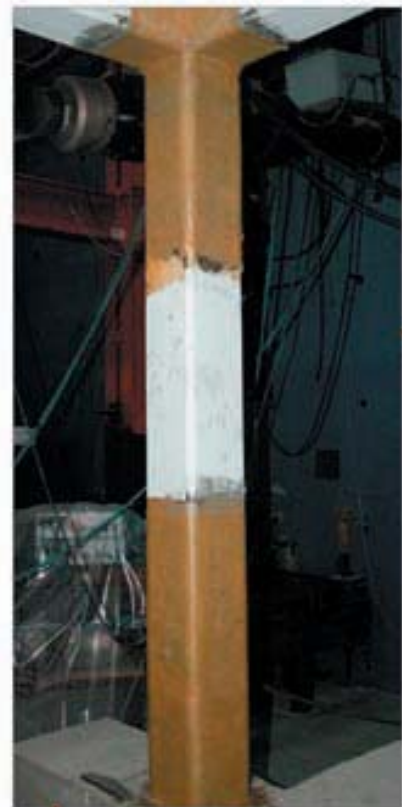
kN at first storey).

The calculation of the ultimate axial strain for FRP-confined concrete was carried out for both the hypothesis of uni-axial GFRP laminates with density of 900 gr/m^2 and uni-axial CFRP laminates with density of 300 gr/m^2 .

It was observed that both types of fibers produce a considerable, and at the same time very similar, increase of the cross-section ultimate curvature. Furthermore, considering that in the case of interior application in buildings, durability performance is not the driving design criterion, the choice of the fibers to be utilized was essentially governed by economic evaluations. Comparing the application costs per square meter, it was calculated that by using uni-axial glass fibers with density of 900 gr/m^2 , instead of uni-axial carbon fibers with density of 300 gr/m^2 , the costs were reduced by a factor of about 30%; this was the reason for selecting glass laminates.

Since the design goal was to achieve an ultimate strain of FRP confined concrete greater than 0.010 (about three times the conventional one, 0.0035), two plies of GFRP with den-

Picture 4 - Reinforcement of the column



Column with a 770 mm wrapping

sity of 900 gr/m² were chosen as external reinforcement. Thus, the eight square columns were all confined at the top and bottom using 2 plies of GFRP uni-axial laminates having each a density of 900 gr/m². At each storey, the GFRP confinement was extended for 800 mm from the beam-column interface; in some cases, such length was increased up to 1000 mm in order to account for the more extended concrete damage. The main phases of the installation procedure are shown in Picture 3.

In any case the GFRP confinement was extended for a length greater than the effective plastic hinge length, about 400 mm, computed following the expression given by the latest seismic guideline developed by the Italian Department of Civil Protection (see *Ordinanza 3431, 2005*).

Picture 4 shows an example of the confined element.

As far as the un-confined corner joints are concerned (in this case, all those around the perimeter of the building), firstly the original shear strength of the exterior joints was computed by using equations provided by the *Ordinanza 3431*. Since theoretical simulations of the first round of tests predicted shear stresses on the exterior joints very close to the limit value of $0.3\sqrt{f_c}$ as confirmed by shear cracks observed on joints after the tests, it was decided to preserve the corners joints by installing FRP laminates.

The shear improvement provided by FRP laminates was assessed according to the approach proposed by Antonopoulos and Triantafillou (see *Antonopoulos and Triantafillou, 2002*); the amount of GFRP required to double the shear strength of the joints was calculated. Based on such evaluations, beam-column joints corresponding to the corner square columns (C2, C5, C7 and C8) were strengthened using 2 plies of quadric-axial GFRP laminates having each a balanced density of 1140 gr/m². This joint reinforcement was extended on the beams by 200 mm on each side in order to U-wrap it and to ensure a proper bond, as shown in Picture 6.

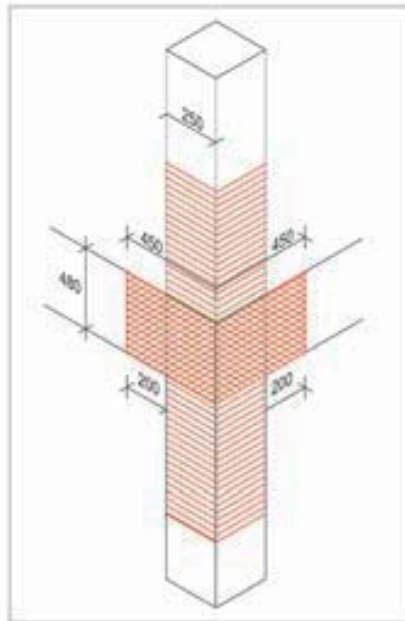
Furthermore, in order to obtain a plastic hinge length of rehabilitated columns comparable to that of those "as-built", the external reinforcement on the joints was not connected to the columns.

Picture 7 shows a view of the joint after completion of the reinforcement

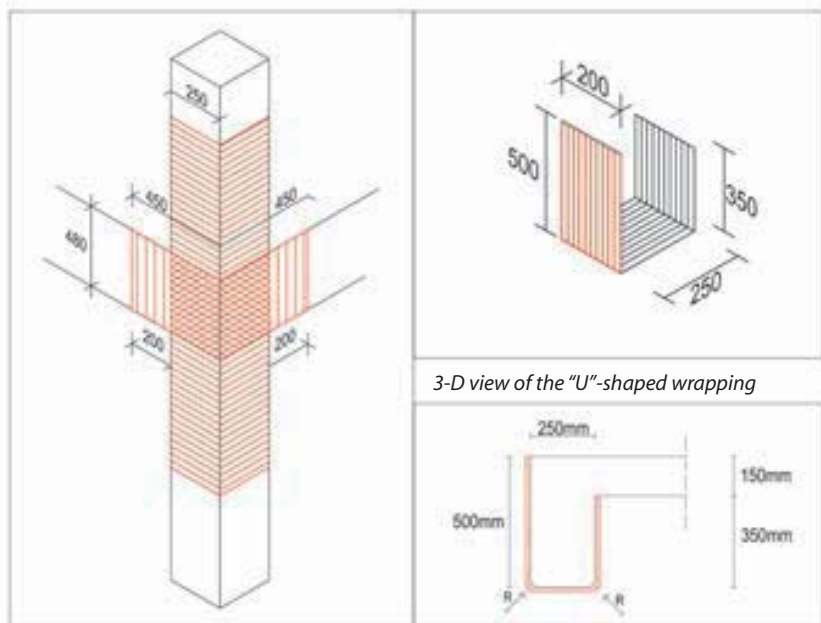
application.

Finally, since the rectangular column C6 has a sectional aspect ratio equal to 3, shear, rather than flexure, controlled its behavior. For this reason, shear FRP retrofit was considered necessary. It was computed (by using the CNR-DT 200/2004 provisions) that, by totally wrapping the rectangular column C6 for its entire length with

Picture 5 - Schematic layout of the reinforcement by means of joint panel (Phase I). Application of the panel



Picture 6 - Schematic layout of the reinforcement by means of joint panel (Phase II)



Application of the "U"-shaped wrapping

Detail of the "U"-shaped wrapping

two plies of the same quadri-axial GFRP laminates used for the above mentioned joints, it was possible to increase the shear strength by a factor of about 50% (with the shear strength ranging from 196 kN, when taking into account the concrete's and stirrups' shear contribution, up to a value of 286 kN, when considering the GFRP effect).

It should be pointed out that only those fibers placed perpendicular to the longitudinal axis of the column and those having a component on that direction were taken into account for calculations; thus, the same expressions provided for uni-axial laminates shear strengthening were used in calculations.

Picture 8 shows a schematic layout of the reinforcement and a view of the column upon completion of the work.

Experimental Performance of the Retrofitted Structure

Following the FRP retrofit, the structure was first tested under the same input ground motion of the "as-built" structure, with a PGA level of 0.20 g, in order to have a direct comparison with the previously executed experiment, then with a PGA level of 0.30 g. The experimental behavior of the rehabilitated structure was very close to that expected according to the rehabilitation design and it was

Picture 7 - Reinforcement of the joint panel




Internal view of the joint

External view of the joint

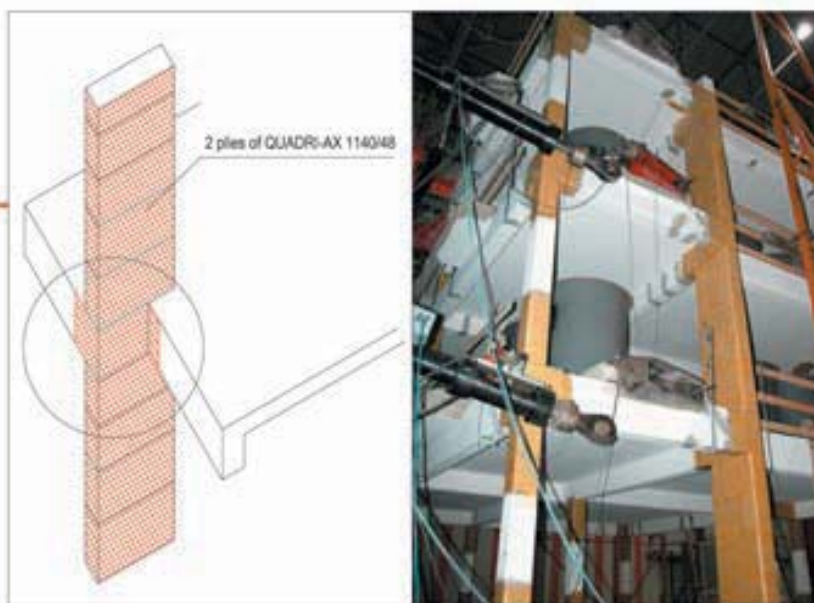
observed that: 1) the columns featured a very ductile behaviour; 2) no brittle mechanism (i.e. shear failure or significant damage of joints) occurred. The damage of the unstrengthened joints highlighted an incoming failure of beams due to crushing of concrete and the initiation of a shear crack pattern of the joints themselves, whereas no visible damage were detected on the strengthened joints.

Lastly, column C6 did not suffer any kind of damage and the laminates installed were found to be intact in all points.

The experiments confirmed that the

retrofit intervention gave the structure a significant increase in its overall deformation capacity compared with the original structure, allowing it to withstand bi-directional seismic actions 50% higher than those applied to the 'as-built' structure, without suffering significant damage. For instance, the maximum inter-storey drift recorded on the retrofitted structure was equal to 106 mm on the second floor, while in the "as-built" structure, at the same floor, the maximum inter-storey drift was equal to 57 mm. Therefore, an increase approximately equal to 86% was recorded. 

Picture 8 - Schematic diagram and view of the shear reinforcement of column C6



Detail of the reinforcement of column C6

View of the reinforced column

Acknowledgements

The design of the structure was carried out by Prof. Michael Fardis, of the University of Patrasso (Greece).

The authors would like to express their thanks to Paolo Negro B.Sc. and Elena Mola B.Sc. of the Joint Research Centre, Ispra, and all the technical staff of the Centre's Laboratory where the experiments were entirely carried out.

Bibliography

Antonopoulos C.P. and Triantafyllou T.C., "Analysis of FRP-Strengthened RC Beam-Column Joints", in *ASCE Journal of Composites for Construction*, Vol. 6, No. 1, pp.41-51, 2002.

CNR-DT 200/2004. *Instructions for the Design, Execution and Control of Static Strengthening using Fibre Reinforced Composites*.

Negro P., Mola E., Molina F.J. and Magonette G., "Full-Scale PsD Testing Of A Torsionally Unbalanced Three-Storey Non-Seismic RC Frame", in *Proc. of the 13th WCEE*, Paper N. 968, Vancouver, 2004.

Ordinance no. 3431, 3rd May 2005, Further Changes and Integrations to the Ordinance Issued by the Chairman of the Minister's Committee no. 3274 dating 20th March, 2003, titled "Basic Elements of the General Criteria for the Seismic Classification of the Italian National Territory and Technical Regulations for Construction Work in Seismic Zones".

A CD is available, which contains in-depth information on the correct use of the products from the FRP System Range. In particular, the CD includes a section regarding calculation programs for projecting structural reinforcement works, developed by the Department of Structural Analysis and Design of the Federico II University, Naples.

The CD also contains informations about the current regulations of the field, technical documentation about the products and references of applications. The CD is called "Mapei FRP System" and is available in Italian and English. It may be supplied upon request from the company's Marketing Office (fax: +39-02-37673214, - e-mail: marketing@mapei.it).



THE EXPERT'S OPINION

SAFETY FIRST

Stone material: the green light for correct laying

Traffic-lights made of stone material with the red light on: this is the go-ahead signal for a correct laying of stone material.

This image is to be seen on the front cover of a new 12-page brochure, titled "Safety First", which analyses different methods for laying stone materials and the best solutions proposed by Mapei for this kind of work.

Indeed, stone materials may suffer from a considerable amount of bowing and/or expansion if subjected to humidity or due to the effect of thermal gradients. Also, in the presence of water rising up from the substrate, screed or adhesive, they may be stained or present unsightly efflorescence.

Mapei has used their own Research & Development Laboratories to become the only company in the world to have designed and developed an analytical classification system for stone materials according to their degree of sensitivity to water, a system which has been recognized by the CEN and standardized by the EN 14617-12 code of standards.

In order to overcome the typical problems encountered when laying stone material, Mapei offers a complete range of products which includes screeds, levelling compounds, adhesives, grouts for joints and special sealants.

The examples presented in this brochure illustrate various tried-and-tested, long-lasting laying techniques for natural stone and agglomerates under various service conditions.



THE EXPERT'S OPINION

Laying on an anti-fracture membrane

This useful publication includes the following chapters:

- laying on an anti-fracture membrane
- laying on façades
- waterproofing and laying on balconies and terraces
- laying dimensionally-unstable stone material
- waterproofing and laying in bathrooms and shower cubicles
- laying on heated screeds
- evening-off levelling and laying on mortar beds.

The last section of the brochure is devoted to a detailed classification of natural and artificial stone materials according to dimensional stability testing (sensitivity to water).

Laying on façades

Waterproofing and laying on balconies and terraces

TRAVERTINE

Ultracolor Plus 114

Ultracolor Plus

Keracolor GG

Keracolor GG

Mapeitex

Keracolor GG

Keracolor GG

Old screed

Old flooring in ceramic material with micro cracks

VERONA ROSSO

Mapefil LM

Keracolor GG

S2 Mono

Nivoplan (+ Planicrete)

GRANITE

Ultracolor Plus 114

Ultracolor Plus

Mapeflex PU55 SL

Mapefoam

Elastorapid grey

Mapeband

Mapelastic

Fibreglass Mesh

Old flooring in ceramic material with micro cracks

The brochure "Safety First" may be ordered at Mapei Marketing Department:
 Fax number:
 +39-02-37673214
 E-mail: marketing@mapei.it

Laying dimensionally-unstable stone material



Keracolor FF

Waterproofing and laying in bathrooms and shower cubicles



Keracolor GG



Elastorapid bianco

Laying on heated screeds



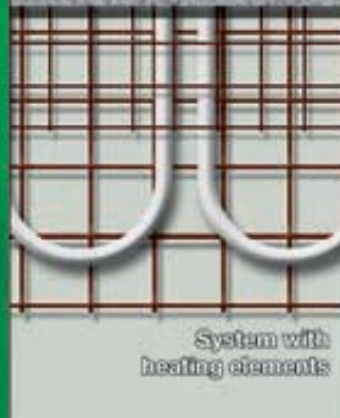
Keracolor FF



Granirapid White



Topcem Pronto



System with heating elements

Evening-off levelling and laying on mortar beds



Keracolor GG

Mapeflex PU50 SL



Mapestone 2



Mapestone 3 Primer

Cementitious screed with an uneven surface



Keralastic



Mapegum WPS



Mapecem Pronto



Nivoplan + Planicrete



MID-EUROPEAN WELLNESS

The wide range of Mapei products ensured a perfect installation of several kinds of materials in the Sárvár Spa and Wellness Centre.

Sárvár is a small town, located in the western part of Hungary, not far from the Austrian, Slovak and Slovenian borders. It features a picturesque old town centre, whose highlight is the Nádasdy-castle dating back to the Middle Ages but mostly sporting Renaissance constructions. The arboretum near the castle has several rarities including 350 species of trees and bushes.

The town is surrounded by a beautiful natural environment, which also encloses a rowing lake. However, its thermal water is without doubt what made Sárvár well-known even beyond the national borders, attracting tourists from several countries. In the Sárvár area two completely different types of thermal water are available and allow the healing of different kinds of illnesses and the performance of wellness treatments: the water which springs from a depth of 1,200 metres reaches a temperature of 43°, while the water which originates from a depth of 2,000 metres reaches the much higher temperature of 83 °C. The former contains alkaline hydrogen carbonates and is especially suitable for the treat-

ment of movement disorders, post-injury rehabilitation, neurological complaints and muscle relaxing baths. The latter, due to its very high salt content, can be used effectively in the treatment of movement disorders as well as for dermatological and gynaecological purposes.

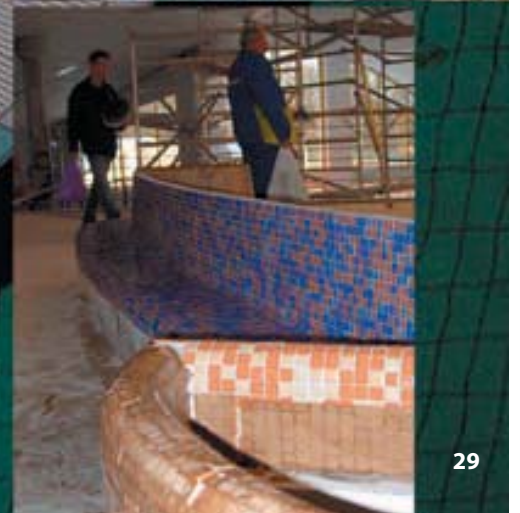
To make the most of the benefits offered by these precious natural sources, in 2002 the local government of Sárvár decided to build a new spa centre on the undeveloped plot next to the old medicinal bath. This paved the way to the opening of the "Sárvár Furdo" or Sárvár Spa and Wellness Centre. The centre, which is open all year round, encloses many pools, both indoor and outdoor, covered and partly covered, filled with water from 30 °C to 37 °C, an ailments cure centre, a fitness centre, a wellness centre, a sauna world, a beauty salon and various catering services. From spring until autumn guests can also enjoy a multi functional beach pool (1,800 m²) which is suitable for swimming and comes complete with a slide, a wave pool, a jumping board, a garden area, a children's adventure pool, a toddlers' pad-



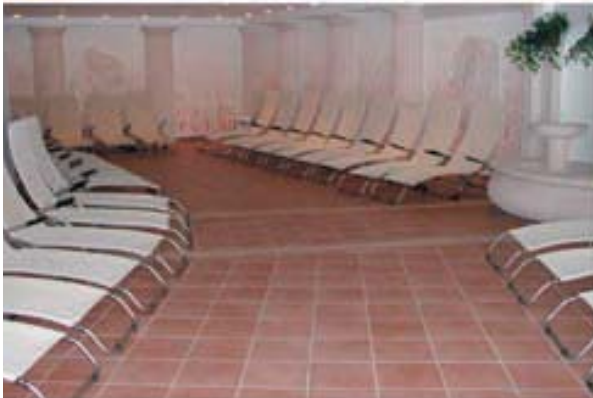
dling pool, a playground and a number of sports' pitches (for beach volleyball, 5-a-side soccer and bowls). The centre covers a total area of 55,000 m², with the net area of the buildings totalling over 10,000 m² and the water surface area exceeding 3,600 m². The main building has a 5,000 m² basic area and hosts medicinal and adventure pools with dressing rooms, a fitness block, therapeutics services, catering facilities and the hotel.

Having considered the investor's expectations and the quality requirements, the general contractor, Záv Rt., selected high-quality and reliable products supplied by companies well-known in this field, such as Marazzi and Floor Gres ceramic tiles and Mapei systems for installing floor and wall coverings. The public and service rooms were clad with Marazzi tiles and Togama mosaic tiles, while the pools and the area around the pools were covered with Floor Gres tiles. More than 70 types of floor tiles and 50 different kinds of wall tiles and glass mosaic were laid to ensure a varied and pleasant design.

Tempero Rt., which carried out the entire pool project, chose to use MAPELASTIC* grout and MAPEBAND* polyester rubber fabric for waterproofing the interior surfaces. Tiles were fixed with KERAFLEX* adhesive and grouted with SEWAMENT 2* ready-mix cementitious mortar, while expansion joints were sealed with MAPESIL AC* silicone sealant. When preparing the substrates of the anti-skid surfaces around the pools, TOPCEM PRONTO* pre-packed mortar was used due to its fast drying times. In the common areas, instead, after priming with PRIMER G*, PLANO 3* and NOVOPLAN 21* fast-hardening self-levelling smoothing compounds were applied on the substrates for screeding. The 30x30 cm tiles were laid on them with ADESILEX P9 cementitious adhesive, while KERAFLEX MAXI* was used to



PROJECTS



install the 40x40 cm and 30x60 cm tiles and the terracotta cladding. Granite tiles were fixed to the steps with GRANIRAPID* cementitious adhesive and grouted with ULTRACOLOR* high performance grout. Expansion joints were again sealed with MAPESIL AC*.

The side walls in the sanitary blocks were waterproofed with MAPEGUM WP* liquid membrane and the joints were sealed with MAPEBAND*. The wall tiles up to 30x30 cm in size were laid with ADESILEX P9 adhesive up to 30x30 cm size, while the KERABOND* + ISOLASTIC* system was chosen for larger ceramic and glass mosaic tiles. ULTRACOLOR* and SEWAMENT 2* were again used for grouting the joints, depending on the expectable wear and tear. SEWAMENT 2* is normally used for grouting joints of ceramic coverings in water purification plants and sewerage systems. In this case the product was chosen due to its high resistance to the chemical aggression produced by the high sulphate content of the local thermal water. Expansion joints were sealed with MAPESIL AC*.

The wide range of the products selected ensured a smooth completion of the works. The installation of floor and wall coverings was in the limelight because of the very short time available. The regular assistance of expert consultants definitely contributed to the final success of the works.

RM





***Mapei Products:** the products referred to in this article belong to the "Products for Ceramic Tiles and Stone Materials," "Building Speciality Line" and "Products for the Installation of Resilient, Textile and Wood Floor and Wall Coverings" ranges. The technical data sheets are available on the "Mapei Global Infonet" CD/DVD and from the web site: www.mapei.com.

Mapei adhesives and grouts conform to EN 12004 and EN 13888 standards.

Adesilex P9 (C2TE): high-performance cementitious adhesive with no vertical slip and extended open time for ceramic tiles.

Granirapid (C2F): high performance, deformable, fast-setting and hydration two-component cementitious adhesive for ceramic tiles and stone material.

Isolastic: flexible latex additive to be mixed with Kerabond, Keraflex and Adesilex P10.

Kerabond (C1, becomes C2 when mixed with Isolastic): cementitious adhesive for ceramic tiles.

Keraflex (C2TE): high performance cementitious adhesive, with no vertical slip and extended open time for ceramic tiles and stone material.

Keraflex Maxi (C2TE): high performance cementitious adhesive with no vertical slip, extended open time and deformable for ceramic tiles and stone material: particularly suitable for the installation of large sized porcelain tiles and stone material (thickness of adhesive from 3 to 15 mm).

Mapeband: polyester reinforced rubber tape for the flexible sealing and waterproofing of internal and external expansion joints.

Mapegum WP: liquid elastic membrane for interior waterproofing. **N.B.** The product has been replaced by Mapegum WPS.

Mapelastic: two-component flexible cementitious mortar for waterproofing concrete, balconies, terraces, bathrooms and swimming pools.

Mapesil AC: solvent-free, acetic-cross-linking mildew-resistant silicone sealant, available in 26 colours and transparent.

Novoplan 21: fast hardening self-levelling smoothing compound for thicknesses from 1 to 5 mm.

Plano 3: fast hardening self-levelling smoothing compound.

Primer G: synthetic resin based primer in water dispersion with very low emission of volatile organic compounds (VOC).

Sewament 2: high performance, ready-mix, cementitious mortar for grouting ceramic floor and wall tiles in sewerage systems (width of joints up to 15 mm).

Topcem Pronto: ready-to-use, pre-packed, normal-setting mortar with controlled shrinkage for fast-drying screeds (4 days).

Ultracolor (CG2): fast setting and drying, anti-efflorescence grout for joints from 2 to 20 mm, available in 26 colours. **N.B.** The product has been replaced by Ultracolor Plus.

TECHNICAL DATA

Spa and Wellness Centre, Sárvár (Hungary)

Work: preparation and treatment of wall and floor substrates, installation of ceramic and mosaic floor and wall coverings, laying of the pools' surfaces

Materials: ceramic tiles, stone slabs and mosaics (by Marazzi, Floor Gres and Togata)

Year: 2002

Contractor: local government of Sárvár

Project: Mérmű 2000 architectural office, Zalaegerszeg (Hungary)

Interior Design: Zalaki Bt.

Project Manager: Mr. Imre Vörös, Sárvár Spa

General Contractor: Záv Rt., Zalaegerszeg

Installation Companies: Tempero Rt., Stukkó Kft., Olépkér Kft., Euro-ép Bau Kft., Kreatív Bau Kft., Sk-Certus Kft., P-Quality Bt., Tilerama Bt.

Mapei Distributor: Építőanyag Szaktelep Kft.

Mapei Co-ordinator: Béla Pálmai, Mapei Kft (Hungary)

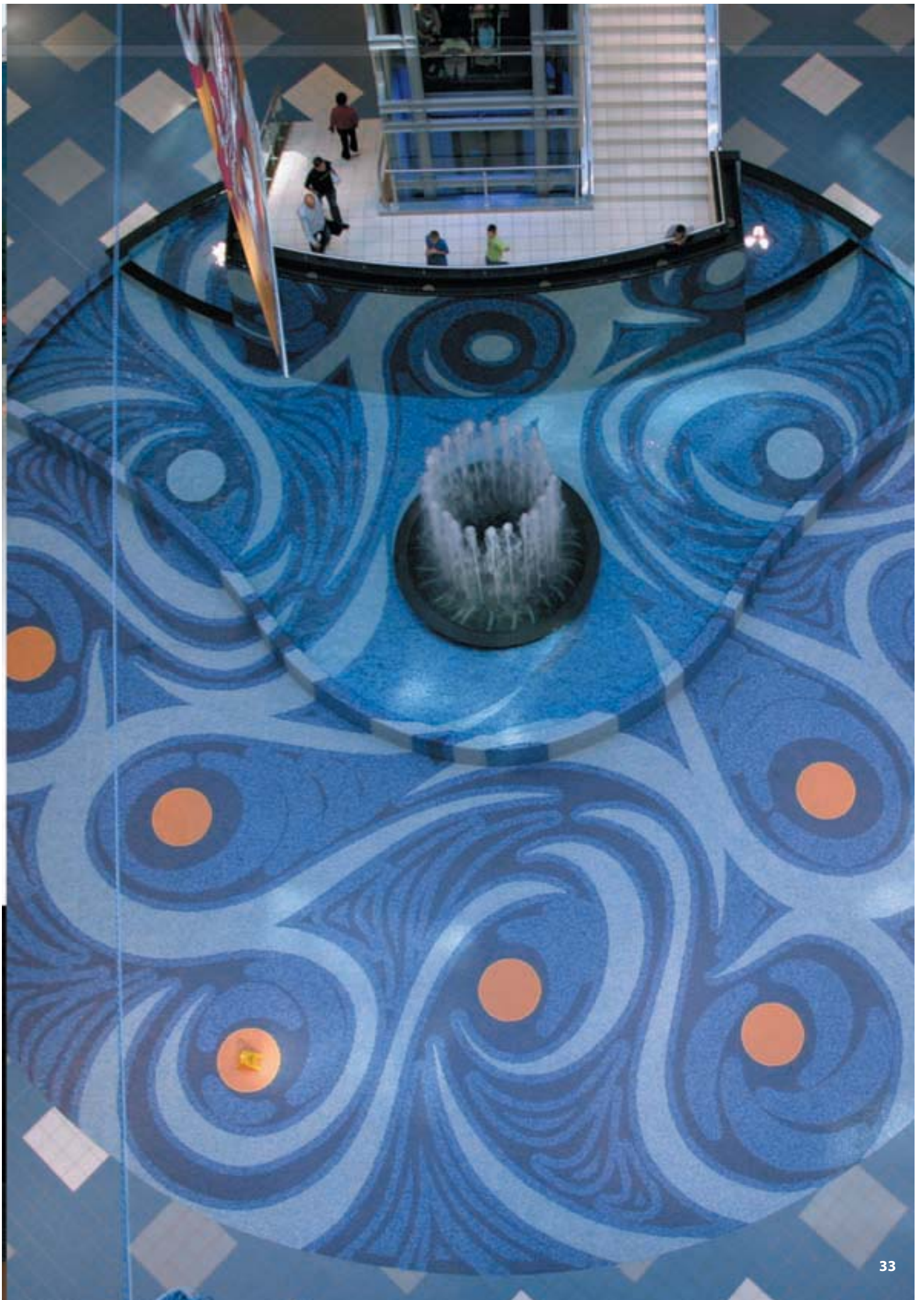


Since March 2004 the architecture of Warsaw boasts a new record: on this date the Blue City, the largest shopping and entertainment centre in Poland and in Europe itself, was officially opened. The building is named after its main colour, blue in all its shades which ensure a strong aesthetic impact both inside and outside. This effect is enhanced by the light reaching the interior through the glass roofs and dome.

Beside its strong aesthetic appeal, the Blue City also performs a number of practical functions: it hosts a shopping centre (including around 200 retail outlets), entertainment facilities, a three-star hotel, a business centre, a medical centre, several restaurants, cafés and bars, a multiplex cinema, a night club for top-level concerts and performances, offices and family and children entertainment areas. These facilities are accommodated on five levels on a total surface area of 186,000 m². Moreover, the visitors to Blue City have free access to an underground heated car park for nearly 3,000 cars.

The Blue City has a very interesting and stormy history. The project was initially launched on a grand scale by a Turkish investor. Due to financial problems, the site was later sold to two Dutch companies (belonging to American investors) who preserved the outer shell of the site but completely modified its interior. The gigantic effort of finishing each level, which started in May 2002, involved six contractors. The initial selection of building products did not include Mapei systems but rather solutions belonging to the ranges from other firms (such as Sopro, PCI, Henkel, Schönox and Mira). That is just what pushed Mapei to take up the challenge: with detailed presentations and practical demonstrations on the building site their experts managed to convince the contractors of the reliability and competitive advantages of Mapei products. For instance, they repeatedly pointed out that Mapei's working methods and solutions would maximise the speed and the efficiency of the commissioned works.








For installing ceramic tiles on the floors, the investor initially opted for self-filling tile adhesives with semi-liquid consistency.

Mapei experts instead suggested the use of NOVOPLAN 21* fast hardening self-levelling smoothing compound and ADESILEX P4* high performance, rapid setting, full contact, cementitious adhesive. This combined solution proved to be especially suitable to environments, like those of a shopping centre, daily subjected daily to heavy loads, and was chosen for floor surfaces which required prior levelling. As for the remaining floors, it was initially suggested to perform two-sided applications where the adhesive was spread on the substrate and the tile. This method significantly prolonged working time and increased adhesive consumption. In order to solve this problem, Mapei recommended the use of ADESILEX P9* high performance cementitious adhesive with no vertical slip and extended open time, which was directly spread with a gauging trowel on the tile. Once the superiority of Mapei products was shown on the building site, the contractors decided to use them to finish the 80% of all works to be carried out, namely the installation of around 20.000 m² of coverings.

Mapei was able to meet the contractors' requirements even as for the completion of the Blue City's architectural climax: a fountain, featuring a 26 metre-high jet stream (the tallest

fountain stream in Poland), whose base and walls were fully clad with Bisazza blue glass mosaic tiles. The Bisazza glass mosaic was cut manually at the site and every small piece was carefully selected to match the design. The requirements for the finishing and sealing of the fountain were clearly set: impeccable waterproofing with white flexible adhesive with an extended open time. Mapei supplied an ideal solution: the combination of KERABOND* adhesive with ISOLASTIC* flexible latex additive, a mix which proved to be especially suitable for setting tiles on rounded areas. The joints of the surfaces of the fountain were grouted with KERAPOXY* two-component epoxy grout.

The area surrounding the fountain was also laid with mosaic tiles in different shades of blue. MAPELASTIC* two-component, flexible, cementitious mortar was applied for waterproofing the whole of the fountain area. The use of the above-mentioned products ensured perfect waterproofing and high mechanical strength of the final surface, in addition to a smooth appearance without noticeable shrinkage. Mapei solutions contributed in speeding-up the building works which finished in March 2004. The opening ceremony of this huge shopping centre took place at the end of the same month and paralysed the traffic in the Polish capital. Since then on, thousands of Varsoviens enjoy the numerous attractions offered by the Blue City. 





In the previous page, photos above: installing ceramic tiles on an internal floor (left) and bonding Bisazza glass mosaic tiles on the surfaces of the fountain (right).

Remaining photos: some areas in the Blue City after completion of the works.

***Mapei Products:** the products referred to in this article belong to the "Products for Ceramic Tiles and Stone Materials" range. The technical data sheets are available on the "Mapei Global Infonet" CD/DVD and from the web site: www.mapei.com.

Mapei adhesives and grouts conform to EN 12004 and EN 13888 standards.

Adesilex P4 (C2F): high-performance, rapid setting, full contact, cementitious adhesive for ceramic tiles and stone material.

Adesilex P9 (C2TE): high-performance cementitious adhesive with no vertical slip and extended open time for ceramic tiles.

Isolastic: flexible latex additive to be mixed with Kerabond, Kerafloor and Adesilex P10.

Kerabond (C1, mixed with Isolastic it satisfies class C2): cementitious adhesive for ceramic tiles.

Kerapoxy (R2T): two-component acid-resistant epoxy grout (available in 26 colours) for joints of at least 3 mm.

Mapelastix: two-component flexible cementitious mortar for waterproofing concrete, balconies, terraces, bathrooms and swimming pools.

Novoplan 21: fast hardening self-levelling smoothing compound for thicknesses from 1 to 5 mm.

TECNICAL DATA

Blue City Shopping and Entertainment Centre,
Warsaw (Poland)

Work: installation of ceramic tiles on the floors and of glass mosaic coverings on the surfaces of the fountain

Years: May 2002 - March 2004

Customers: Singspiel Investeringen B.V. (Netherlands) and Anandrous B.V. (Netherlands)

Project: APA Wojciechowski Sp. z o.o.

Work Management: Yoran Reshef

Main Contractor: Warbud S.A.

Installation Companies: Iniect-System S.C. and Roger Preston Polka Sp. z o.o.

Materials: ceramic tiles and glass mosaics (Bisazza)

Mapei Co-ordinators:

Roman Owczarek, Anna Leitgeber, Mirosław Sabok (Mapei Polska Sp. z o.o.) and Andrea Aliverti (Mapei S.p.A.)



The new TFC Training Centre

Toulouse Football Club has a glorious history in French football. The club has recently built a sports complex for “studying” the players of the future.

Rugby not football is the most popular sport in France. This is particularly the case in Toulouse, whose rugby team, Stade Toulousain, won the French Championship in 2005. The same city is also home to Toulouse Football Club, a very old team originally founded in 1937, whose fans enjoy one of the best grounds in the whole of France: the Stadium. A few years ago the team's management staff realised it needed to broaden its ranks by bringing some young players into the team, so that the club might once again become the top team in the Midi Pyrénées region.

This is why the management team of Toulouse Football Club (TFC) decided a few years ago to construct a building where talented young players from all over the region could come and get special coaching. The project the Centre offers young players is spread over six years' training and teaches them the technical, physical and psychological skills required to become a top-class footballer. The courses are held inside the sports complex and consist in daily training and physical-technical coaching. The new Training Centre soon produced results: this year the junior team won the famous Gambardella Cup.

Mapei's Work

The Training Centre is located along the banks of the River Garonne, not far from the city stadium, which was given a makeover for the FIFA World Cup held in France in 1998.

Construction work on the building, which covers an area of 3,500 m², began in 2003. As well as several gyms fitted out with all the latest cutting-edge sports equipment, the Centre also contains a small indoor pool, a football pitch for training and coaching lessons, classrooms for lectures as well as rest-relaxation rooms and facilities to accommodate the 55 apprentices accepted on the courses each year.

The Mapei France Technical Service Department was contacted to supply ideal products for installing the tiles (approximately 2300 m²) in the various premises of the Centre.

Mapei experts decided to use PLANOBOND* for laying the large sized (30x30 cm) porcelain tiles on the floors.

This cementitious adhesive is ideal for large tiles, which can be safely laid without the need of double backbutte-

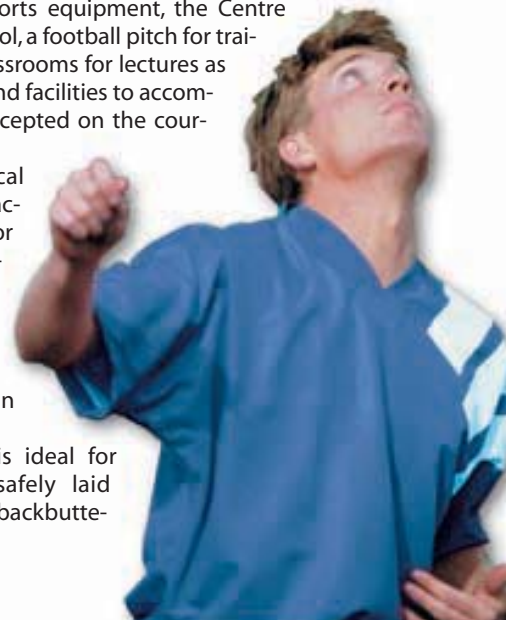




Photo 1.
The TFC Training Centre looks directly onto the football pitch.

Photo 2.
The main entrance to the Centre is instantly recognisable from Toulouse Football Club's emblem and colours.

Photo 3.
The corridors leading through to the changing rooms.

Planobond adhesive was used to lay the porcelain tiles on the floor.

Photos 4 and 5.
After being waterproofed with Mapelastico, the small indoor swimming pool has been covered with ceramic tiles using Granirapid adhesive.

ring.

The walls and floors of the showers first had the surfaces being tiled over waterproofed using AQUAFLEX* liquid membrane.

AQUAFLEX* is a ready-to-use paste with a base of synthetic resins in water dispersion.

Once dried, it becomes a continuous flexible and waterproof membrane.

The ceramic tiles (15x15 cm) were then installed using the KERABOND* + ISOLASTIC* system. Mixing KERABOND* cementitious adhesive with ISOLASTIC* flexible latex additive instead of water improves the properties to meet C2 class standard (improved cementitious adhesive), in accordance with EN 12004, and S2 class standard (highly deformable adhesive in accordance with EN 12002).

MAPELASTIC* has been applied to the walls of the small indoor Jacuzzi pool. This two-component cementitious mortar is ideal for surfaces in constant contact with water and often used for creating highly flexible waterproofing coatings over concrete surfaces.

The entire pool was then tiled over using GRANIRAPID* fast-setting and hydration two-component cementitious adhesive.

The joints were grouted using ULTRACOLOR* anti-efflorescent grout, which features a good resistance to acids.

A resistant covering was laid on the floors of the apprentices' sleeping rooms. Before carrying out the installation, the substrate was levelled and smoothed using MAPESOL 3*, a self-levelling smoothing compound (only distributed in France).

RM

Our thanks go to "Mapei e Vous", no.14, published by Mapei France, from which this article was taken.

***Mapei Products:** the products referred to in this article belong to the "Building Speciality Line" and "Products for Ceramic Tiles and Stone Materials" ranges. The technical data sheets are available on the "Mapei Global Infonet" CD/DVD and from the website: www.mapei.com.

Mapei adhesive and grouts conform to EN 12004 and EN 13888 standards.

Aquaflex System: flexible, waterproofing and anti-fracture liquid membrane.

Granirapid (C2F): high-performance, deformable, fast setting and hydration two-component cementitious adhesive for ceramic tiles and stone material.

Isolastic: flexible latex additive to be mixed with Kerabond, Kerafloor and Adesilex P10.

Kerabond (C1, becomes C2 when mixed with Isolastic): cementitious adhesive for ceramic tiles.

Mapelastico: two-component flexible cementitious mortar for waterproofing concrete, balconies, terraces, bathrooms and swimming pools.

Mapesol 3: self-levelling smoothing compound (P3, according to French UPEC classification). This product, which used to be Planosol 3, is only distributed in France.

Planobond (C2E): high performance full contact cementitious adhesive with extended open time for ceramic tiles and stone material.

Ultracolor (CG2): fast-setting and drying, anti-efflorescence grout for joints from 2 to 20 mm, available in 26 colours. **N.B.** The product has been replaced by Ultracolor Plus.



TECHNICAL DATA

Toulouse Football Club Training Centre, Toulouse (France)

Work: installation of porcelain tiles on the floors, waterproofing and installation of ceramic tiles in the swimming pool, waterproofing and installation of ceramic tiles in the showers, smoothing and levelling of the floors in the sleeping rooms

Years: 2003-2004

Customer: Association Toulouse Football Club

Project: Atelier d'Architecture

Works Management: Mr. Dominique Alet, architect

Installation Company: Mosailux

Company in Charge of Smoothing Operations: Spidéco

Mapei Co-ordinator: Yves Caussanel, Mapei France

"THE QUARTET" AT TROPICANA CASINO

Acid-stained Ultratop is being used more and more to give artistic touches to famous attractions.

by Diane J. Choate, Mapei Corp.



Atlantic City has been a tourist mecca along the New Jersey shore in the USA since the end of the 19th century. When casinos became part of the attraction at American resorts, the tourists went west to Las Vegas. Aware that there was a need to entertain the whole family, the Las Vegas casino owners quickly developed family-style attractions. Now, Atlantic City is wooing tourists and their families back to the East Coast with entertainment complexes large enough to be small cities by themselves. One example of this trend can be found at the Tropicana Casino and Resort, and its new addition dubbed "The Quarter" – a Latin-themed shopping, dining and entertainment megaplex reminiscent of Havana in its heyday.

Visitors will enter The Quarter from a courtyard off the Palm Walk in the Tropicana. Taking a page from the incredible success Las Vegas casinos have experienced with decorative concrete, the Tropicana architects turned to the versatility and flexibility of Mapei's ULTRATOP* self-leveling concrete topping. The general contractor selected Arcon of Las Vegas and Bomanite of New Jersey Inc. because they have worked previously with the Tropicana. Ira Goldberg of Bomanite managed the project.

First, PLANIBOND EBA* epoxy bonding agent and primer was used to prepare the surface for the ULTRATOP* pour. PLANIBOND EBA* minimized any potential for hairline cracks that can occur in seamless concrete toppings. ULTRATOP WHITE* formed the canvas upon which Bomanite executed the architects' designs. Goldberg said, "Using acid stains, we can create any colors and shapes imaginable on a durable surface. The designs in the courtyard form a large checkered floor in bright white and rusty bronze that adds elegance and charm to the fountain in the center. A windowpane design in soft tans and rusts provides a subtle balance to the vibrantly realistic, three-story-tall mural of old Havana that highlights The Quarter."

"This kind of work could only be achieved through teamwork with the other contractors operating in the area at the same time," said

Photo 1.
The prepared surface of the courtyard is ready for its new look.

Photo 2 and 3.
After the project's completion, the result is durability and beauty.

Photo 4.
Close-up of the decorative design.

Photo 5.
Close-up of the decorative staining.

Goldberg. "The general contractor, Keating Construction Inc., was incredibly well-organized and helped make sure we had the room and the time to get our work done. And, most important, they made sure no one left footprints in or on the finished product!" Bomanite enjoyed working with Mapei products because of their proven track record. Goldberg commented, "This kind of work never allows anyone to cut corners, so we depended on Mapei for their high quality. The Mapei customer service was also very reliable, making sure we had all our supplies on time." Bomanite's artistry in developing magnificent colors created a wonderful atmosphere at the Tropicana. Now, the work continues in The Quarter. Goldberg summed up his thoughts on the project: "We feel like we will be leaving a piece of history behind when we complete the project. The durability and beauty of our art will last a lifetime." Mapei is proud to be a part of that history. RM



TECHNICAL DATA

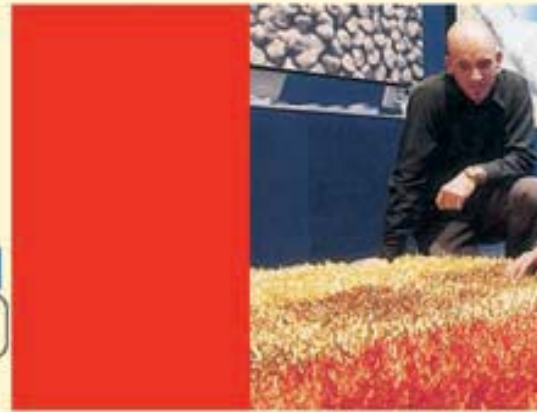
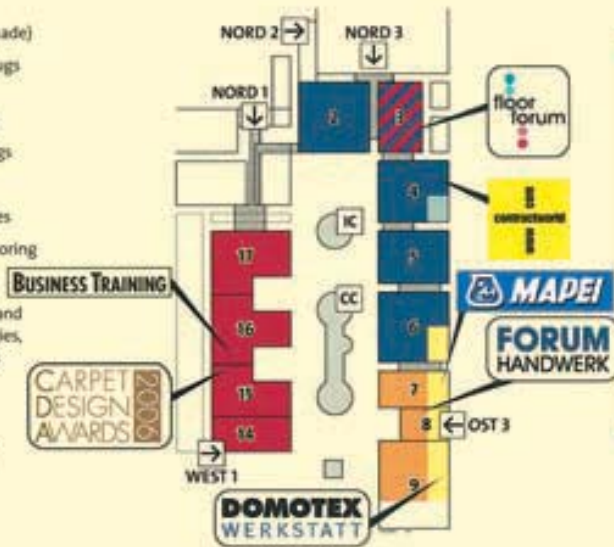
"The Quartet", an entertainment complex of the Tropicana Casino, Atlantic City, New Jersey (USA)
Work: setting of decorative concrete floor
Project: Wimberly, Allison and Tong & Goo, Las Vegas (USA)
Contractor: Keating Construction Inc.
Installation Firms: Arcon, Las Vegas and Bomanite, New Jersey
Mapei Distributor: Gamka Sales, ICF Systems
Mapei Co-ordinator: Ed Parma, Mapei Corp.

***Mapei Products:** Ultratop White, Planibond EBA. The products referred to in this article are manufactured and distributed in America by Mapei Corp. (USA) and Mapei Inc. (CDN). For further information see the web site www.mapei.com.



TRADE FAIRS

- Carpets/rugs (hand-made)
- Woven carpets/area rugs (machine-made)
- Textile floor coverings
- Resilient floor coverings
- Contract business
- Fibres, yarns and textiles
- Wood and parquet flooring
- Laminated coverings
- Laying skills, cleaning and application technologies, presentation of goods
- Natural stone and ceramic tiles
- Specialist publishers, associations, design, services



DOMOTEX

H A N N O V E R

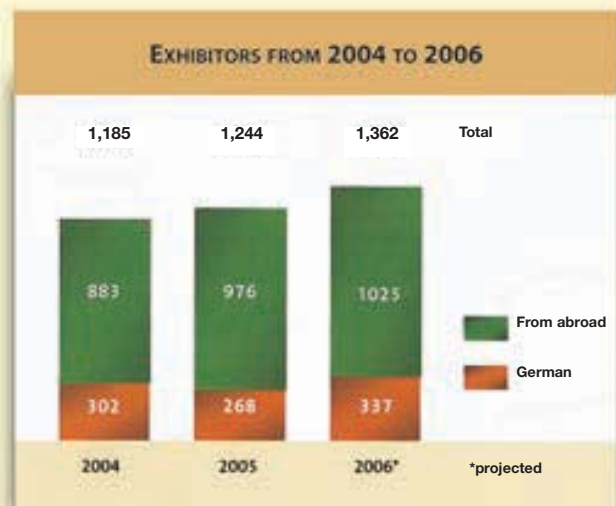
4 RESILIENT MATERIALS

The 2006 edition of Domotex Hannover had more visitors than any other before it. Over 48,500 people working in the sector attended the world's biggest carpet and resilient floors show from 14th-17th January to find out all about the latest products and current trends: over 10.6% more than at the 2005 event, which recorded 43,855 visitors.

"Over recent years we have invested a lot in improving the quality of the show. Exhibitors and visitors have told us we are on the right track", so Stephan Ph. Kühne, Member of the Board of Deutsche Messe AG, told journalists gathering in Hannover for the conference held on the closing day of the show. Kühne pointed out that the exhibition area had been increased from 90,142 m² at the 2005 edition to 93,000 m² and that the highest ever number of firms had taken part: 1,362 compared to 1,244 in 2005. This means the fair now has a high profile. Over 75% of the exhibitors were foreign. The 27,400 visitors included 56.5% from abroad. Indeed, 1,025 (compared to 976 in 2005) of the overall number of exhibiting firms were from abroad. Belgium was the most prominent foreign exhibitor, with over 13,000 m² of space taken up by 103 firms, followed by Turkey, the Netherlands, India, Italy and Iran. The flooring industry was very pleased with this year's Domotex, which had the highest ever number of high-profile visitors: one in two were executives, meaning that there were 24,300 decision-makers at the fair: 37% more than last year. At the end of the event various exponents from the

sector said that the more positive general atmosphere, the powerful drive towards innovation and an enhanced awareness of the quality standards achieved had resulted in much brisker trading well above expectations.

Domotex Hannover's claim to be the world's most important trade fair in the carpet and resilient flooring sector is justified by the fact that 44.5% of the specialists in attendance do not take part in any other similar specialist trade fair.





Mapei: A Boat-Load of Sport

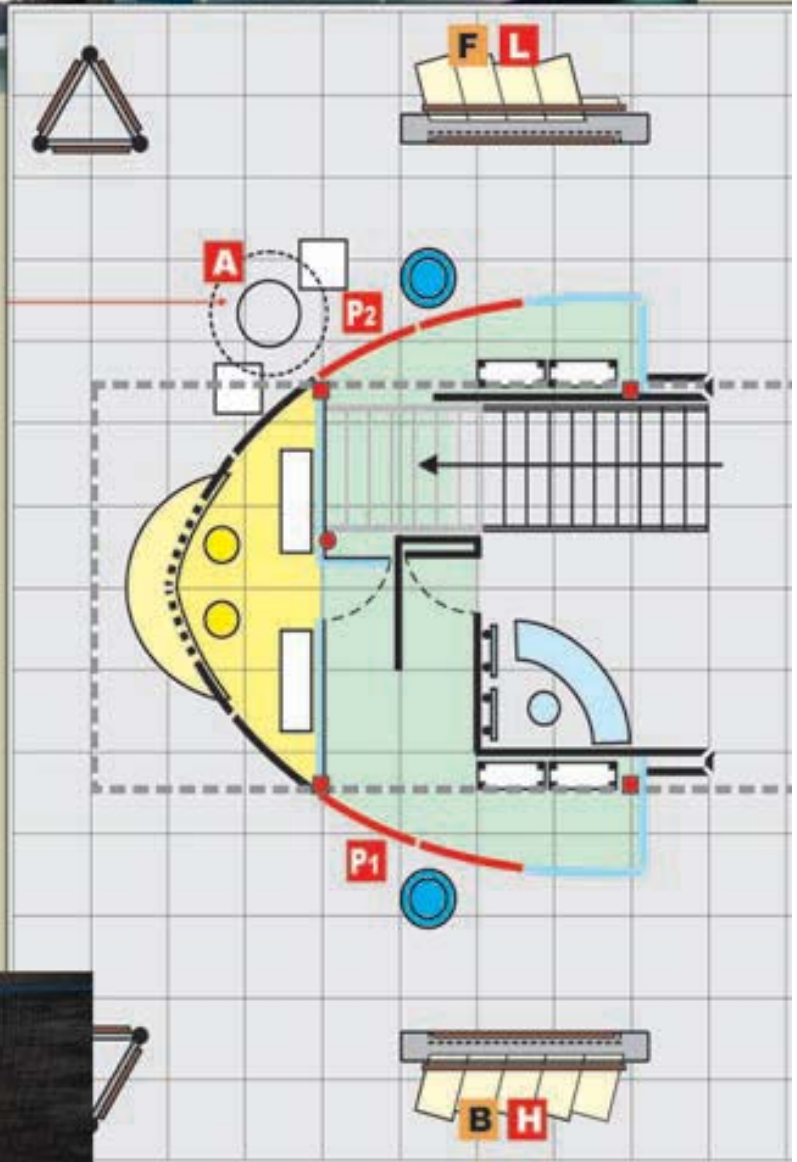
Mapei has always treated this German event as the most important international trade fair on resilient materials. In fact, it might be said that Domotex has the same international reputation for textiles and resilient flooring (carpets, parquet, laminates, linoleum and PVC) as Cersaie for ceramic products. This is why this year Mapei's presence was once again impressive, due to both its own custom-designed stand and its products and innovations. The stand was designed like a huge boat inside which, as well as an overall view of Mapei's entire collection of products, there was a full display of the firm's wide range of products for installing resilient materials. The "top-deck bridge" of this imaginary cruise boat riding the calm waters of Domotex provided a comfortable place for welcoming guests visiting the stand and interested in getting a closer look at what the firm has to offer. Against a backdrop of corporate images, this space also helped set up new trade relations and strengthen those already in place. On the ground floor, on the big and extremely busy "lower

deck" of the Mapei boat, a small football pitch made of synthetic grass had been set in place to remind visitors of two main things. Firstly, that this year Mapei is an Official Sponsor of the Italian National Football Team and also that part of its business involves designing and creating increasingly innovative products for laying synthetic grass for sports grounds, including football and five-a-side pitches. As regards sports facilities, plenty of attention was focused on the fact that Mapei has a wide range of cutting-edge products used for laying wooden and linoleum floorings in gyms and sports centres all over the world, as well as specific products for installing modern athletics tracks. The forthcoming Football World Cup matches, which will be held in Germany this summer, was one of the main themes underpinning the entire event. And as newly appointed Official Sponsor of the Italian National Team, Mapei certainly was not caught unawares. "Winning Together" and "Mapei: The Champion of the Great Projects" were written in large letters on the stand decorated in the company's official colours. Mapei used the metaphor of sport throughout the entire show and it helped

TRADE FAIRS



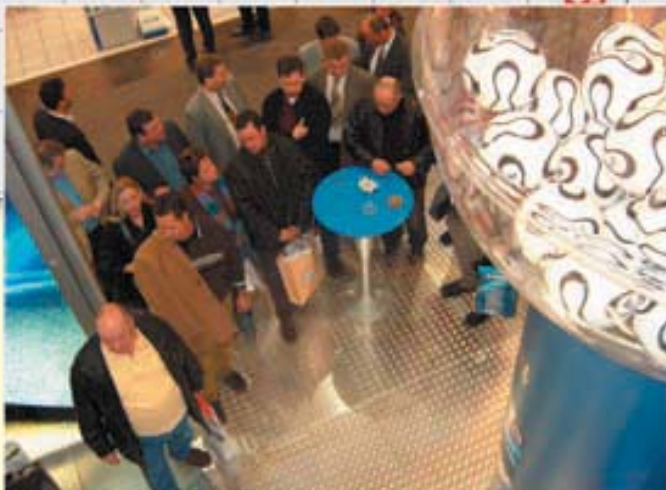
outline Mapei's spirit and intentions to great effect. In the background of the sport field set up in the stand, a large screen showing film clips of the company's history also allowed visitors to play FIFA's virtual football game on a Microsoft console. The prize lottery which, like every other year, livened up the Mapei stand was also based around football. All visitors with official invitations to the fair were able to take part. The prizes were a trip to watch the German football team play in Italy, exclusive Puma sports bags and Adidas footballs. To conclude this important section about



sport, it is worth mentioning that the famous German sports manager Marcel Reif took part in a number of debates on football and the forthcoming FIFA World Cup at the Mapei stand on the Sunday. Meetings in which plenty of Mapei customers were also involved.

New Products and New Technical Documentation

Mapei presented its entire range of products for preparing substrates and for laying resilient, textile and wooden floors throughout its approximately 260-m² two-storey exhibition space in Hannover.

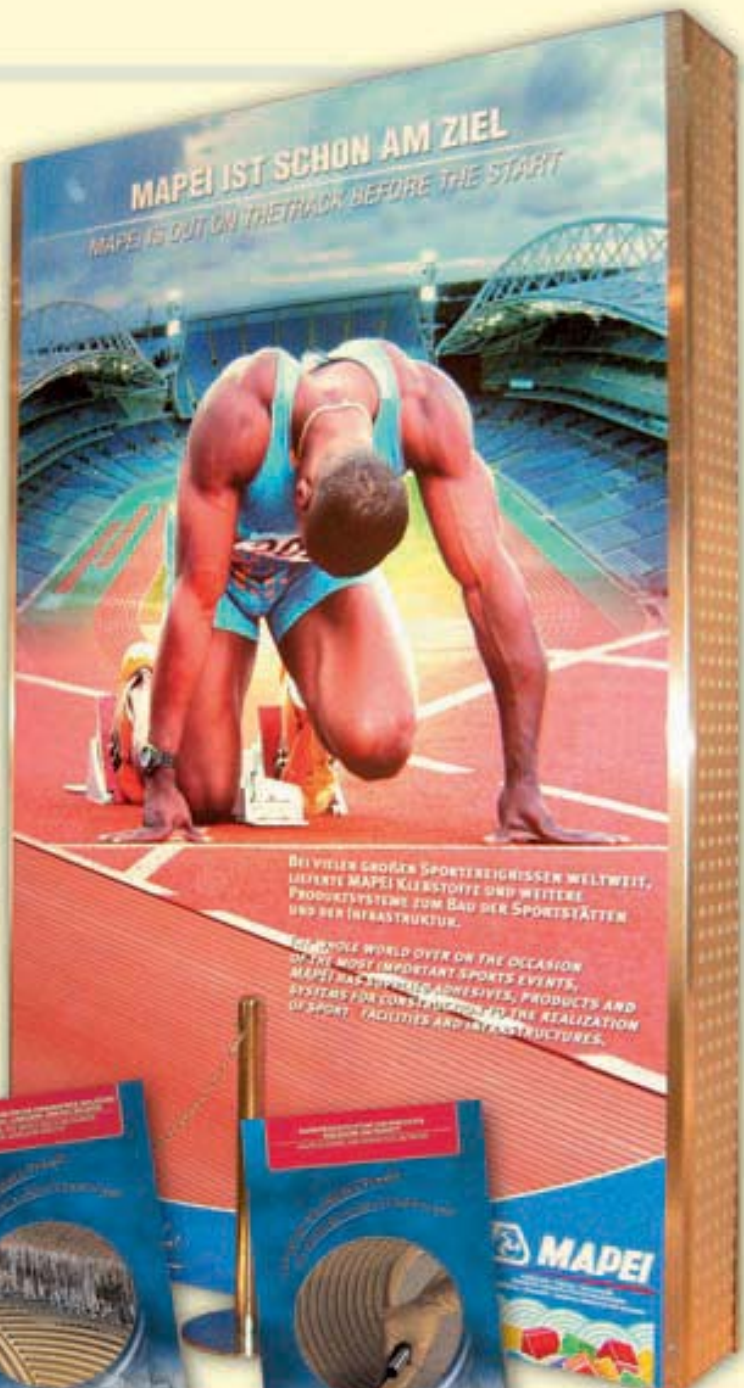


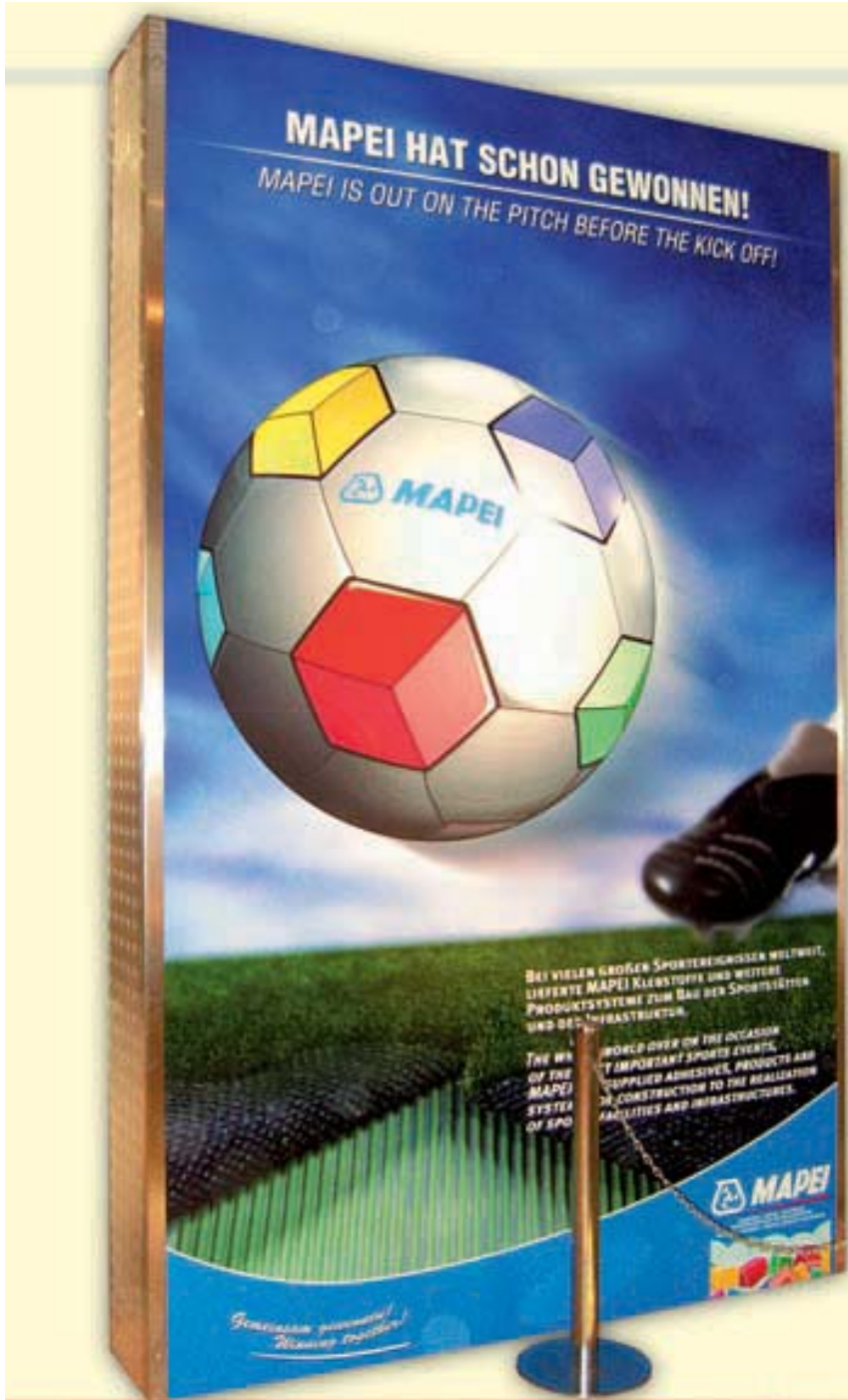
TRADE FAIRS

The trade fair also provided the chance to present the new technical documentation on the products and ranges of products for installing resilient materials. In addition to the new main catalogue (dating January 2006) devoted to the installation of resilient materials, four new brochures provide a clear and comprehensive picture of the four specific business sectors in which Mapei's systems are so effective in installing these materials. A new brochure has been devoted to systems for installing wood, one to systems for installing floorings in sports facilities, another to the installation of linoleum and PVC and, finally, yet another to systems for installing textile materials.

To underline the importance of this new approach and provide a better idea of the specific features of each installation system, four large islands in the lower section of the stand outlined Mapei's new way of handling this special and highly important sector.

The theme of renovation and a range of inno-

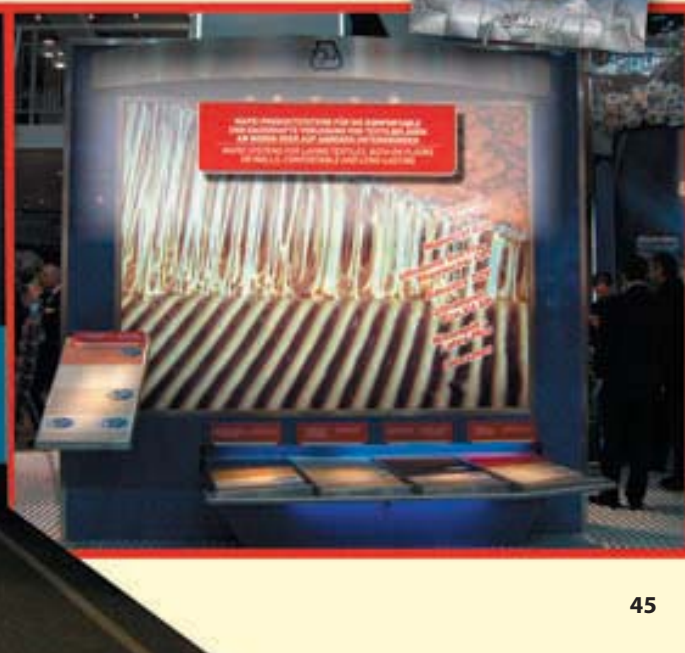




vative products designed to meet practical needs characterised Mapei's involvement in Domotex 2006.

The new products, specially developed for the German market, ranged from Planopur, a polyurethane smoothing compound for difficult, highly deformable substrates, to a new contact adhesive in water dispersion called Ultrabond Aqua-Contact Cork, ideal for natural cork coverings and Ultrabond P902 2K, a two component polyurethane adhesive for wooden floors.

Preparing the substrates is an important prerequisite for ensuring the flooring is properly in place when installing resilient floors in places subject to heavy loads. At the Domotex fair Mapei presented its two-component, solvent free, polyurethane smoothing compound, **Planopour**, especially suitable for deformable substrates subject to heavy traffic. This smoothing compound is extremely smooth-flowing when being applied and then has excellent



TRADE FAIRS



deformability and safety properties after it has hardened. It can be used on both indoor and outdoor surfaces of any thickness. After hardening, the surface is smoothed using fine grades (80er). It is then ready to take any kind of coating. This makes Planopur an important part of any installation system comprising Mapei floor adhesives.



Ultrabond Aqua Contact Cork, a contact adhesive in water dispersion, is another totally new product belonging to the wide range of Mapei professional products. This is a ready-to-use contact adhesive in paste form and water dispersion, particularly easy to apply with a roller. It is suitable for all kinds of surfaces made of wood strips, whose back side

is made of natural cork or includes cork elements in natural state.

For instance, it is ideal for laying natural cork floors and painted/waxed surfaces, with no back coating, on absorbent or non-absorbent substrates or even permanent inte-

ducts with EC1 E GEV certification.

The Domotex trade fair also provided the chance to better assess and understand a market which is once again growing on a worldwide scale. The current trend is to focus on the use of new materials, as well as re-considering PVC, making wider use of pre-finished wooden floors and confirming the popularity of laminated wooden floors. Mapei is certainly in line with a market, which, as it seeks new outlets, is increasingly relying on qualified companies supplying just the right product.

A Full Programme of Side Events

Domotex has once again confirmed its position as the world's leading fair, thanks also to its full calendar of side events. **Floorforum** was a real hit: the multi prize-winning designer Ulf Moritz (Designer of the Year 2003) from Amsterdam created a classy total work of art in pavilion 3, using modern carpets, floors, fabrics, furniture and accessories. **Contractworld**, an international forum on architecture and interior design, was another highly successful event. This is the most important meeting place for the world of international architecture. It need only be noted that about 2,400 people (20% more than in 2005) attended the event. Architects, decorators, designers and interior designers from all over the world met in pavilion 4 of Contractworld to exchange thoughts and ideas.

One of the event's key moments was the awarding of the **Contractworld Award**. This is a very innovative internatio-

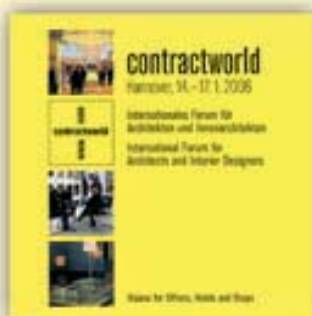


rior surfaces. The adhesive can easily be applied using either a roller or brush on both the substrate and the back of the covering. Cork coverings to which the adhesive has been applied with a brush may be installed the following day (i.e. after 14-16 hours) on substrates to which the adhesive has just been applied using a brush and which have been well-aired. Despite the long time, the installed coating is soon ready to take traffic.

In Germany, unquestionably the home of ecological thinking, Mapei has already gained a reputation for the constant attention it shows to developing eco-friendly products that are not harmful to either people or the environment. Prepared in accordance with the strictest regulations on these issues and opening up the way for other firms in the sector, Mapei is publicising and promoting pro-

nal prize for interior designs, whose prize money of 50,000 Euros is the highest of its kind in the world of architecture. Entrants from South Korea, Spain, Austria and Germany were all high on the lists for the various sections.

The **Contractworld Congress** - where know-how about the international architecture scene is exchanged - really caught the eye and was extremely well-attended. For plenty of visitors this provided a unique chance to meet famous creative people like Riken Yamamoto (from Yokohama), Klaus Kada (from Graz) and Anurée Putman (from Paris). A total of 24 high-profile speakers described all the latest developments in the architectural design of offices, hotels and retail outlets to a very large audience. This year the **Carpet Design Award** was successfully awarded for the first time. Lots of visitors to the fair did not miss the chan-





The Italian ceramic tiles industry was also in attendance at Contractworld in Hannover. To boost the image of Italian firms in Germany, "Ceramic Tiles of Italy", the trademark which has been promoting high-quality Italian ceramic tiles around the world for over forty years, took part in this important international exhibition for the first time with its own exhibition stand.

Graziano Sezzi from Assopiastrelle explained why: "The main aim was to capture the attention of international designers and interior designers amongst all those present at Domotex, in order to give them a better idea of ceramic products. Products which, in addition to being extremely practical, can serve a vast array of decorative purposes, thanks to the creativity of Italian firms".

The market figures also explain why Assopiastrelle wanted to attend Contactworld. The German market has always been one of the leading European trade outlets for the Italian ceramics tiles industry. Despite the tricky period the Italian ceramic tile industry is going through, Italian firms' exports to Germany over the first nine months of 2005 have reached 36.9 million m², accounting for 12.81% of total exports of ceramic tiles.

The Ceramic Tiles of Italy stand, designed by the architect Dante Donegani, was situated in a central part of the exhibition pavilion. It acted as an information point about Italian ceramic products, which were displayed both physically and in catalogues and magazines published by the



Above:
The Assopiastrelle stand at Domotex.

Left:
A picture of the area where the European Team Floorlaying Competition was held and a picture of the three winning teams (Italy, Switzerland and UK) posing together.

association. Let's not forget that Mapei, an associate member of Assopiastrelle, was also part of this joint stand through its grouting systems.

Those not yet familiar with them were very impressed by Mapei's **Coloured Grouts**, which showed (in this very popular display stand with people working in the sector) just how well creativity can be combined with technology. This is the message Mapei was trying to convey in this elegant exhibition space entirely devoted to a key sector of "Made in Italy" like the ceramic tile industry.

In occasion of this fair, Ceramic Tiles of Italy also organised a seminar in conjunction with the ICE (Italian Institute for Foreign Trade) office from Berlin entitled "Concept Follows Material".

The speaker at this meeting was the American architect Bernard Tschumi, who provided the over 200 people present with an outline of projects carried out in the USA drawing on the invaluable help of ceramic tiles manufactured by Italian industry.

ce to attend the prize-giving ceremony for this award for creativity and innovative design in the hand-made carpets sector on Sunday, the 16th of January, in pavilion 15.

Domotex's special events also included the **Business Training**, the **Domotex Workshop** (Domotex Werkstatt), the **Craft Forum** (Forum Handwerk), the **Roundtable of the German Association of Interior Decorators** and the **European Team Floorlaying Competition**, held for third time this year. The competition was organized by Britain's National Institute of Carpet & Floorlayers (NICF) and involved 6 teams of three from Switzerland, Austria, Germany, Italy, Netherlands and the UK with six judges, one from each country, judging their performance. The teams had to take part in four different tests: laying/setting in place of carpet, craftsman-like installation of a laminate, laying/grouting of linoleum and bonding of PVC inlays. After 2 years of winning the competition, the UK team was pushed into 3rd place with Italy taking 1st place and



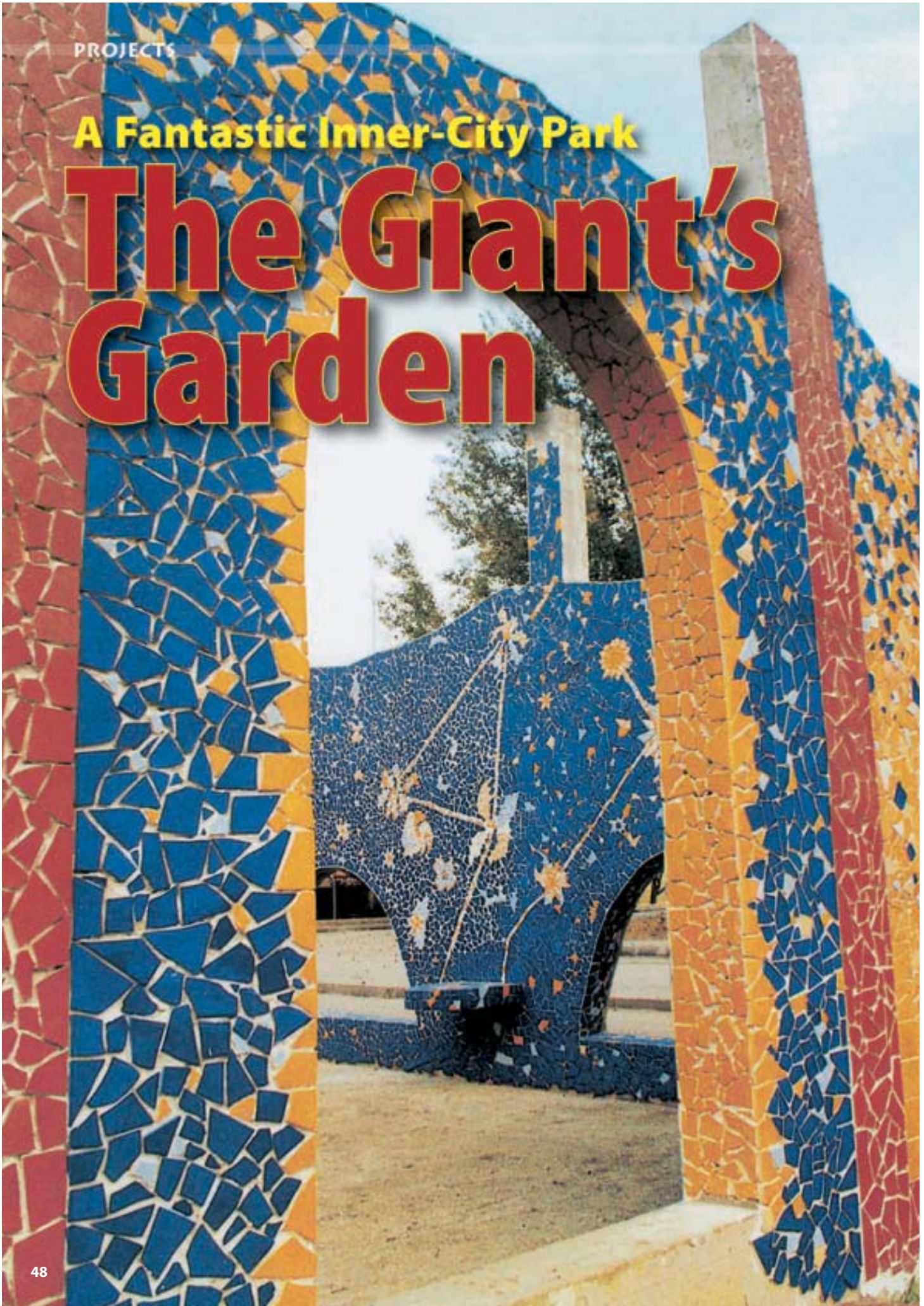
Switzerland 2nd with all six teams being commended for the quality of workmanship. Mapei have been involved from the beginning with sponsorship which this year included the Swiss Team by Mapei Switzerland, materials for building the installation areas and products (such as Mapecem Pronto, Acquacol T, Ultrabond V4SP, Adesilex LP, Primer G, Eporip Turbo and Ultraplan Eco) used during the installation by Mapei Germany and Mapei UK for financial support. The next edition of Domotex will be held in Hannover from Saturday, 13th January, to Tuesday, 16th January 2007.



PROJECTS

A Fantastic Inner-City Park

The Giant's Garden



A DREAM COMES TRUE

A little girl's dream has come true thanks to an artist's creativity and the joint efforts of art students, private enterprises and a number of sponsors.

The "Giant's Garden" (Giardino del Gigante) in Cento, a city located in the province of Ferrara (Italy), was designed around a large area of public greenery set between a big new residential-commercial complex and the city's main school facility.

This public space, serving recreation-service purposes for a wide range of locals (families with children, students and the elderly, as well as visitors from out of town), has been converted into an authentic work of environmental art, thanks to Mapei's sponsorship and products. Designed and created by the artist Marco Pellizzola, the park is a magically evocative place, whose landscaping and sculptural refurbishing (designed as individual features, unique of their kind) combine to create a place for thought and recreation, thanks to a synergy of art and nature. All this in osmosis with the naturalistic traits of the Po Valley region, like some fabulous haven set inside the existing cityscape.

The theme is an imaginary rendition of certain distinctive features of the Po Valley landscape, like, for instance, a leaf, a lizard, blackbirds, a snake and heavenly constellations. The huge size of all these elements, made to look fabulous by this over-sizing, means they can be inhabited and walked through. Sculptures which are also games, rest areas and congregation areas inside a landscaped garden specially set out to accommodate them properly, so as to ensure a harmonious view of art and nature.

Even the lights and approximately 1-kilometre cycle path through the garden are designed in relation to the works: the support posts for the lamps vary in colour and height in accordance with the structures placed alongside them. The lampposts, tall stanchions with illuminated cages, are sculpture/objects providing night-time lighting to make the park look truly spectacular.

The main technique for creating the sculptural features is a "Gaudi-style" ceramic mosaic, an incredibly striking decorative colour scheme, not very common in this area but ideal for applying to lots of products manufactured by leading local ceramics companies.







The Garden also provided a wonderful chance to lay on an educational-training course on installing ceramic mosaics. In 2003 Paola Morselli, the Cento City Councillor for Culture, organised a workshop on working with ceramic mosaics for pupils at the city's primary and middle schools. For a whole month, pupils were directly involved in the work and helped design and install the glazed ceramic tiles, under the artist Mr. Pellizzola's supervision.

But that was not all. This chance to learn about and spread a very special work method resulted in a training course being set up: "Specialist technique in laying traditional and designer ceramic mosaic," financed by the European Social Fund.

Started in 2001, the building of the Giant's Garden will be entirely over by October 2006: this was a work in progress which opened to the public as the various sections were completed.

Mapei made a notable contribution and the ceramics products used proved just how durable and effective they are as the works progressed.

We thought Mapei's input to the construction of Garden could best be summed up by the person, who, more than anybody else, was responsible for its creation: Marco Pellizzola.



THE USE OF MAPEI PRODUCTS WHEN BUILDING THE “GIANT’S GARDEN” ART PARK

by Marco Pellizzola

Every single storage place for building materials is probably a container of potential sculptures or, rather, objects which, if suitably adapted, could serve a different purpose than that for which they were originally designed. That is why, whenever I happened to be in one of these places, I have always ended up imagining that a large concrete pipe could easily be turned into an armchair or a piece of tree trunk could be sat on. Working on these assumptions, I designed my first real objects covered with ceramic mosaics, which are now part of the Giant's Garden, a large theme park I designed and that was built in Cento.

It is also cheaper to use existing objects than make brand-new ones from scratch. A concrete pipe measuring 100 cm in diameter, cut both vertically and horizontally, already has the basic structure of a chair. Then, with iron rods, a drill, metal mesh and a welder, it can easily be knocked into the desired shape. After injecting the iron into the reinforced concrete and anchoring it in place with chemical resin, it can be bent and welded; the metal mesh can be shaped into the right form and then the empty spaces between the iron rod and mesh can be filled with polyurethane foam to make the frame lighter and watch the figure rapidly take shape.

As soon as the polyurethane dries, it can be covered with a layer of cement, then the cement can be touched up with several coats of grey KERAFLEX* adhesive, which has high thixotropic properties, binding together the original and new cement.

KERAFLEX*, mixed with just a little water, can be shaped in several layers to achieve very special finishes. The surface is smoothed over with a damp sponge before the adhesive dries, in order to obtain the right kind of surface for installing the mosaic. Some of the structures used for the park, which were touched up on the outside using just grey KERAFLEX* adhesive and left outside for a whole year, subject to temperatures ranging from +35 to -15° C, showed no signs of surface changes, despite not yet being covered with mosaic.

After undergoing these procedures, the structure is ready for the installation of ceramic mosaic tiles.

We used white KERAFLEX* adhesive for installation purposes, due to its fine bonding and non-slip properties. Its clear colour means you get a good idea of exactly how to set out the joints. Here again some of the structures were left uncovered without grouting for an entire year and still they adhered perfectly, none of the mosaic tiles broke off even under pressure; this was a pleasant surprise because a number of builders were sceptical about bonding without grouting. The grouting is the final part of the entire job; it is what creates the final image. The choice of the colour of the grout is important for chromatic-highlighting reasons. Mapei's ULTRACOLOR* allowed me to create the desired contrast, gradually applying the product to bring out the colours of the mosaic tiles.





At the start I had some problems in finding just the right consistency for the grout, since in the past I had always used grouts with bigger grains (and hence easier to apply) but then, once I had got the right mix, the work was over very quickly.

Mixing the colours of ULTRACOLOR* grouts meant I could achieve new shades and, during final painting using acid, the blend of superimposed colours created some unique colour effects, initially by chance but then carefully reproduced. The latest Mapei product, ULTRACOLOR PLUS*, is very similar to ULTRACOLOR*, but different in terms of its sculptural properties. I used it to grout the small lake: slightly glossier than its predecessor, it is ideal for surfaces simulating a watery effect, as in this case, where the surface is decorated with nymphs and goldfish against a light-blue background. Building work aside, further experimentation was carried out with Mapei products during a series of educational workshops with children from primary and middle schools in Cento. In this case, the ceramic mosaic tiles were bonded onto a smooth substrate.

They were actually single-fired tiles laid using white KERAFLEX* adhesive after experimenting with various drying times and ensuing bonding ratings. The tests carried out showed that after just twelve hours it was already hard to remove the mosaic tiles and after twenty-four hours it was a lot more difficult. After a few days they could only be removed with a hammer. Overall, the characteristics of Mapei products turned out to be ideal for the purpose at hand, both in terms of resistance to outside agents and performance. The aesthetic quality of the grouts was of key importance and vital in carrying out a work whose visual impact calls for great attention to chromatic appearance. The wide range of ULTRACOLOR* colours ensured this goal was achieved.



***Mapei Products:** the products referred to in this article belong to the "Products for Ceramic Tiles and Stone Materials" range. The technical data sheets are available on the "Mapei Global Infonet" CD/DVD and from the website: www.mapei.com. Mapei adhesives and grouts conform to EN 12004 and EN 13888 standards.

Keraflex (C2TE): high performance cementitious adhesive, with no vertical slip and extended open time, for ceramic tiles and stone material.

Ultracolor (CG2): fast-setting and drying, anti-efflorescence grout for joints from 2 to 20 mm, available in 26 colours. **N.B.** The product has been replaced by Ultracolor Plus.

Ultracolor Plus (CG2): fast setting and drying, high performance, polymer modified, anti-efflorescence, water-repellent grout for joints from 2 to 20 mm. With Dropeffect® and anti-mold with BioBlock® technology.

TECHNICAL DATA

The Giant's Garden, Cento - Ferrara (Italy)

Work: installation of mosaic coverings

Years: 2001-2006

Customer: Cento City Council

Project: Professor Marco Pellizzola

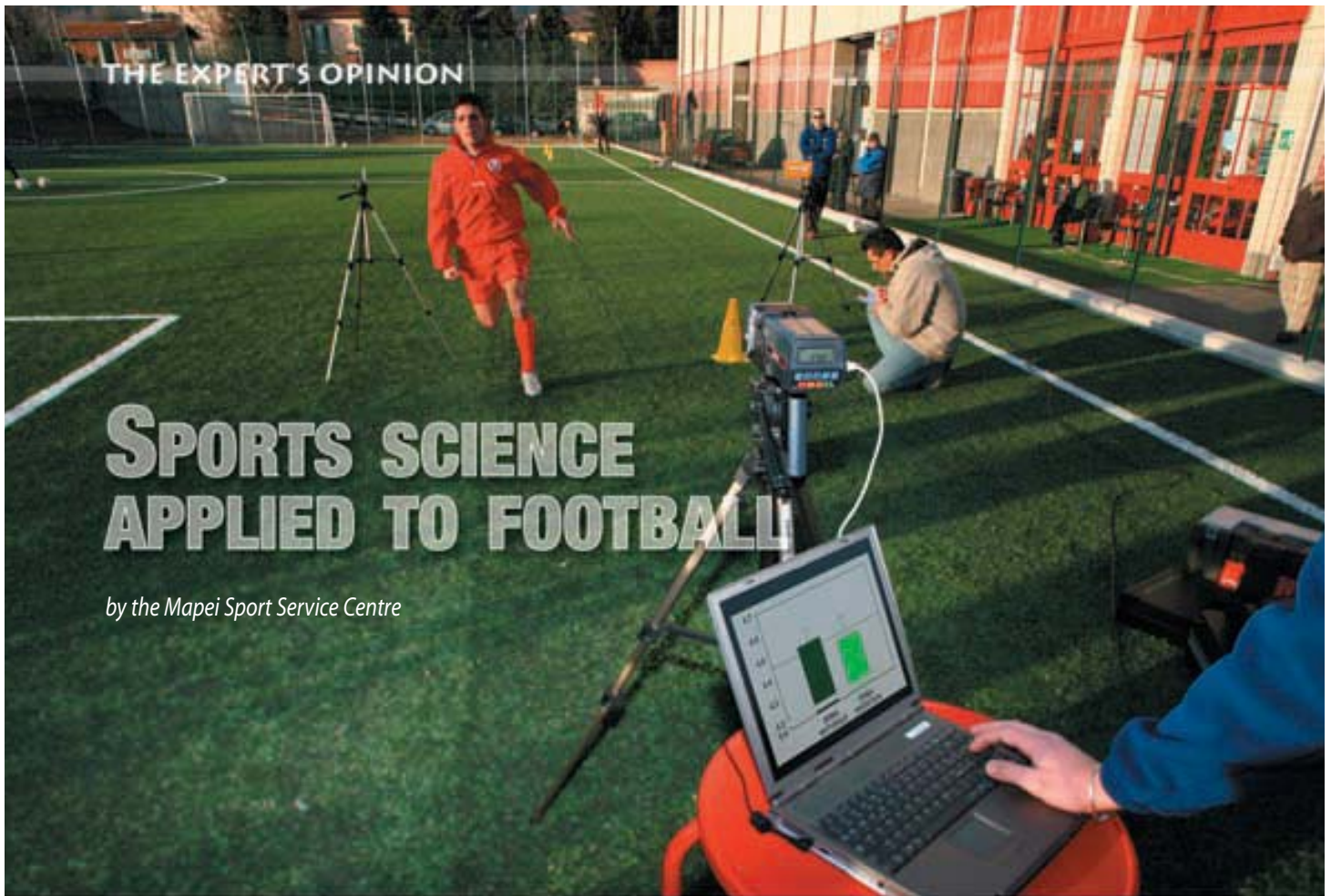
Works Management: Professor Marco Pellizzola

Contractor: Martinelli Costruzioni S.p.A.

Installation Workers: Pupils of Professor Marco Pellizzola

Mapei Distributor: S.I.L.L.A., Cento

Mapei Co-ordinator: Gian Paolo Grillenzoni, Mapei S.p.A.



THE EXPERT'S OPINION

SPORTS SCIENCE APPLIED TO FOOTBALL

by the Mapei Sport Service Centre

Mapei also means research into sport.

2006 marks the tenth anniversary of the setting-up of the Mapei Sport Service Centre. The facility, which Mr. Giorgio Squinzi decided to create to provide the Mapei Professional Cycling Team with scientific and ethical support, was first established in Autumn '96. When the decision was taken in late 2002 to abandon the Professional Cycling Team, the Centre's research work - carried out in Castellanza, mid-way between Milan and Milan-Malpensa Airport - was extended to encompass other sports: running, skiing (focusing on the Italian national teams), tennis, volleyball, fencing... and, last but not least, football. But at the same time greater attention also began to be focused on people who take part in sports just to keep fit and healthy; this has resulted in the development of a special fitness project devoted to "wellness and worksite" (an American expression referring to physical activities carried out at the work place): the first to benefit from all this was the gymnasium at the Mapei headquarters in Viale Jenner, Milan, while one more gymnasium will soon be opened at the company's main manufacturing

plant in Mediglia (near Milan). In 2002 sports research was given an added fillip, so that our Castellanza facility can now boast the highest number of scientific studies in the world on mountain biking, published in leading international journals. A study confirming an innovative cycling assessment test developed entirely at the Castellanza centre was recently published on a highly rated science journal. This test was used by the Mapei Professional Cycling Team over recent years and is still being taken by professionals working with our Centre.

Ever since 2002, an important part of the Centre's research work has been devoted to some topics related to football, which other research teams had not yet fully explored. With three articles already published in international journals and five more due to appear in the course 2006, the Castellanza Sports Research Centre will be one of the world's top 5 research teams in the realms of football. In the early 2006 our Centre's research work in the specific field of Sports Science is currently ahead of most Italian university faculties and

degree courses in motor sciences.

Research into Football

The Castellanza Centre's scientific work has always been distinctive for the way it focuses on cutting-edge issues with potentially immediate advantages for sports people (trainers, coaches, etc.). Most of the studies derive, as a matter of fact, from attempts to come up with scientifically valid solutions for trainers working for professional or even non-professional football teams, who turn to the Mapei Sport Service Centre for advice.

An initial study published in one of the most prestigious international science journals on Sports Science (the "Medicine and Science in Sports and Exercise", which is also the American College of Sports Medicine's official journal) concerns the development of a method for monitoring a footballer's training loads. Over the past decade there has been plenty of talk in the football world about whether it is possible to train certain athletic traits of footballers using exercises with a ball: in other words, lots of trainers thought

that using a ball meant that footballers could not really be pushed to their limits, so they were forced to carry out a number of exercises without the ball (never very popular and often grumbled at by the players themselves). But our research has shown that, on the contrary, with the right adjustments this kind of training can actually be carried out with the ball, also making the training more football-specific. Other studies have also been carried out at Castellanza to develop and check certain tests out on the playing field. These tests are currently used by most trainers, even if their suitability to football training was not yet fully analysed.

Research in this sport has been given an extra boost thanks to working with firms like SICS, which provide video-analysis services on key matches for both top professional teams and TV networks. These firms have cameras in position at football grounds and, using sophisticated software to process and pinpoint images, can provide all the relevant physical performance data (total distance, metres covered running, sprinting or walking, jumps, etc.) just 24 hours after the game. They can also provide technical information (successful passes, failed passes, shots on goal, tackles, direction of play etc.). The studies currently being carried out at the Mapei Sport Service Centre are some of the first scientific researches to be based on this modern technology for analysing matches (both league and UEFA Cup games).

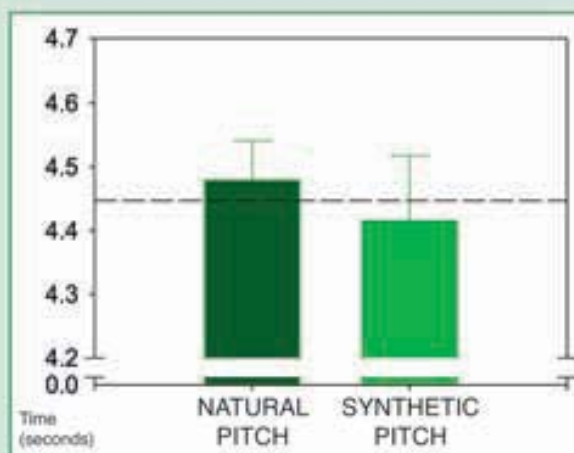
Finally, given greater interest and hence a growing demand for more detailed statistics about the effect of synthetic pitches on physical performance and the player's physiological responses, the Castellanza Centre has recently started working closely with Limonta Sport Italia, one of the leading manufacturers of synthetic football pitches, in order to further scientific knowledge in this field. After just a few weeks working together, the first pilot study was completed, aimed at assessing the effect on physical performance (sprinting and changes of direction) of synthetic pitches compared to natural pitches under severe weather conditions like winter.

LOW TEMPERATURES: COMPARISON BETWEEN SYNTHETIC AND NATURAL PITCHES

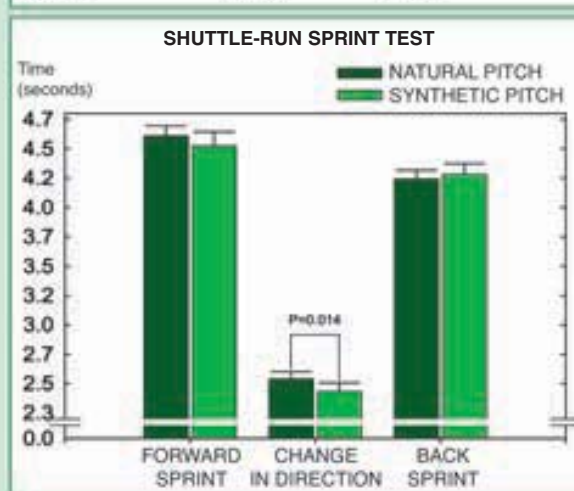
The pilot study carried out with Limonta Sport Italia

One of the alleged benefits of synthetic pitches is that they can stand up better to harsh weather conditions like those generally found in winter. At ambient temperatures close to or less than 0 °C, natural grass pitches tend to become very hard, while the performance of synthetic pitches does not really change at all, as can clearly be seen from the special tests carried out. On the other hand, there are no figures available for comparing variations in the performance of football players due to differences in the characteristics of natural and synthetic pitches at low temperatures. The aim of our first pilot study carried out in conjunction with Limonta Sport Italia was to compare these variations in performance during sprints and changes in direction at temperatures of around 0 °C. Tests were performed on 12 players from the Berretti team in the Varese Calcio league (8 of whom completed all the tests). The players did 3 sprints over 30 m and 3 sprints with a change of direction over 35 m, on both synthetic and natural grass pitches. Despite the harsh ambient temperature, the synthetic playing surface continued to deform upon impact (tested out using the so-called "Berlin athlete") within the ranges required by sports teams, while the natural surface deformed as much as 5 times less upon impact! The average (using photo-cell systems) and instantaneous (using a radar recording device) speeds recorded during sprints and changes of direction show that players tended to be faster and capable of much quicker changes in direction (presumably due to better underfoot grip on artificial surfaces) on artificial pitch.

In conclusion, this pilot study suggests that artificial grass pitches allow good physical performances (especially as far as sprinting and changes of direction are concerned) in ambient temperatures close to 0° C.



Graph 1. The graph shows how the sprint time over 30 m tends to be faster on an artificial pitch than on a natural pitch ($P=0.08$; effect size=0.74; statistical power=0.45).



Graph 2. The graph shows how a change in direction can statistically be handled better on an artificial pitch than on a natural pitch (effect size=1.14; statistical power=0.50).

ARTIFICIAL GRASS PITCHES AND FOOTBALL INJURIES: SCIENCE VERSUS PREJUDICE

by the Mapei Sport Service Centre



Whenever artificial grass pitches are mentioned, the most frequently heard objection is that they cause more injuries to footballers than natural grass. This worry is often taken as the gospel truth even by people working in sports (doctors, trainers and the players themselves), without it actually being backed up by any concrete evidence. It is worth pointing something out straight away: this worry is quite simply a cliché. We have researched into - and interpreted - the most authoritative studies carried out on this matter: it turns out that there is no scientific proof to justify this fear, even though it is so widely held throughout sports.

The Use Of Synthetic Playing Fields In American Football

Synthetic grass pitches first started being used for official matches back in 1966, when an American Football game was played on a synthetic surface. A synthetic playing field was installed at the Astrodome Stadium in Houston (Texas, USA), where the grass pitch could not be kept in good condition due to the unfavourable micro-climate caused by the stadium roof. It was not a happy start and the players were not very impressed. Over subsequent years a number of studies were published in scientific journals which did not show any clear correlation between the playing surface and injuries, but at the same time a number of research projects

were also carried out which allegedly showed an increase in injuries to the joints, sprains and abrasions due to these artificial surfaces; nevertheless, more artificial playing fields for football and baseball were built in the USA. As the years went by, the technological development of more new materials resulted in radical changes to the characteristics of the synthetic pitches. In 2004 an article appeared in the prestigious "American Journal of Sports Medicine" giving the results of a 5-year study (covering a total of 240 American football matches), which assessed how frequent injuries were on these latest generation pitches. As these American researchers expected, it turned out that injuries were equally frequent on both synthetic and natural playing fields. It is worth emphasising that although American football is a quite different sport to our football - and although at the beginning there actually seemed to be a greater risk of injury on synthetic pitches - the latest building technology has reduced (to virtually nothing) any disadvantages associated with the earliest generations of artificial grass.

What the Studies Say

Football is now considered to be one of the world's most popular sports. Various epidemiological studies have looked at injuries in this sport. The most recent and important studies were carried out by Jan Ekstrand, Vice President of the UEFA Medical Commission and a world famous research



cher. Unfortunately, there are only two studies dealing with the effects of artificial grass football pitches on injuries. The first dates back to 1977 and is based on data gathered over the previous two years; the second is from 1996, based on data from 1991. The 1977 study was carried out by the Swedish Professor Renstrom and his colleagues following the construction of an artificial football pitch in Gothenburg, Sweden, in 1975. The results of this study did not show any greater likelihood of injuries occurring on artificial pitches compared to natural grass pitches. The Iceland researcher Arnason and his colleagues came up with quite the opposite results in the study they carried out on 84 Icelandic players. It is fair to say that the only two studies comparing the frequency of injuries on artificial and natural grass pitches came up with conflicting results; but, most significantly, it needs to be pointed out that these studies were carried out on first generation playing fields, whose properties and performance have little to do with the surfaces developed over the last few years and classified as third generation.

A scientifically objective analysis of these studies, therefore, shows that there are no indisputable results proving there are more injuries on artificial grass pitches, and that the little evidence (one piece) backing up this theory dates back to 1991, when the playing fields had quite different characteristics to those used nowadays.

In 1999, the UEFA set a research project under way to work out and provide international guidelines to reduce the risk of injuries to footballers: traumatic injuries turned out to be statistically less frequent on artificial grass pitches than on natural grass pitches (5 compared to 7 for every 1000 hours' play).

Conclusions

Based on recent research and studies carried out in the past, it is clear that, overall speaking, there is no scientific evidence to back up the assumption that artificial grass pitches may cause more injuries compared to natural pitches. Many experts believe that the obstacles encountered when trying to get people to use artificial playing fields nowadays are mainly of a psychological nature or due to prejudices on the part of the players themselves. In 2004, FIFA and UEFA approved the use of artificial grass surfaces for official matches, complying with what international bodies in other sports, such as rugby and American football, had already done.

In the world of football, a lot of people believe that, particularly in Central-Northern Europe, the use of artificial pitches on an amateur, youth and semi-professional level is almost inevitable in light of improvements in the characteristics and properties of the latest generation of pitches. A step forward which, looking at the research, may be taken with nothing to fear.

RM

Planitop 580

White lime- and gypsum-based levelling compound for smoothing internal renders.

PLANITOP 580 is a white, one-component, pre-blended, normal-setting, smoothing compound made up of hydrated lime, gypsum, ultra-fine marble powder, rheologic additives and powdered synthetic polymers, according to a new formula developed in Mapei's own R&D laboratories.


PLANITOP 580 is used for smoothing traditional and pre-blended renders before decorating with paint and thin layers of mineral or synthetic dressing materials.

When PLANITOP 580 is mixed with water, its special composition and remarkable fineness result into a product with high bonding characteristics and which flows smoothly when spread on the surface with a smooth, metal trowel. PLANITOP 580 is a smooth-flowing product that is easy to apply even to large walls, smoothing off any unevenness in renders or rough large-grained surfaces to create a perfectly smooth finish.

PLANITOP 580, which may be applied at a thickness of up to 3 mm for each coat on well-cured renders, has a fine texture providing good support for paints or mineral pastes from the SILEXCOLOR and SILANCOLOR ranges.

PLANITOP 580 can be used for a wide variety of purposes, ranging from smoothing lime-, gypsum- and cementitious internal renders, provided they are sufficiently dry and cured, to smoothing renders where wallpaper or light-fabric dressings are to be applied.

PLANITOP 580 may also be used for touching up rendered walls with small, irregular areas after the removal of old paint, wallpaper or textile wall coverings. It is also particularly suitable for smoothing gypsum surfaces, light-weight concrete blocks and gypsum blocks.

PLANITOP 580, indispensable for smoothing traditional or pre-blended renders, may even be used as a smoothing coat applied on large-grained levelling compounds. 



For further information on this product, see its technical data sheet available at the web site www.mapei.com.

Mapetex System

Completely removable system for the installation of ceramic tiles and natural stone.

MAPETEX SYSTEM is a completely removable system for the installation of ceramic tiles and stone materials. It is composed of two products: MAPETEX and MAPETEX-STRIP. The former is a special non-woven fabric that can be used with MAPETEX-STRIP (rolls of adhesive paper) as a substrate for the installation of floor and wall coverings that can easily be removed.

When directly bonded to the substrate using the rapid-setting cementitious adhesive KERAQUICK improved with LATEX PLUS additive, it also acts as an anti-fracture layer. It may be used for a wide range of applications: for example, as a removable substrate for indoor installations of new wall and floor coverings on chipboard, wood, PVC, linoleum, ceramic tile and stone material substrates, on cementitious screeds and underfloor heating installations.

It can also be used as a substrate for bonding ceramic tiles and stone slabs on display panels for samples in showrooms.

The system is also suitable for providing an anti-fracture and removable layer for bonding floors on concrete slabs and uncured cementitious screeds, as well as for

the installation of ceramic tiles and stone material on screeds without the need of respecting the expansion joints of the covering, particularly when installing diagonally on cracked screeds. MAPETEX, produced according to a special technique, features high mechanical resistance, thanks to the special characteristics of its fibres, and a surface that ensures the best interaction with Mapei adhesives and with MAPETEX-STRIP, the adhesive tape that is necessary for fixing.

It may also be used as a reinforcement for MAPELASTIC (a two-component flexible cementitious mortar for waterproofing concrete, terraces, bathrooms, balconies and swimming pools) to obtain a particularly resistant waterproof membrane. MAPETEX is available in 1 and 2 m high rolls.

For large floorings, the use of 2 m high rolls is recommended.

For installing ceramic tiles, the use of ULTRAMASTIC III (class D2TE ready-to-use paste adhesive for ceramic tiles), KERAQUICK or GRANIRAPID (class C2F fast setting and hydration two-component adhesive for ceramic tiles and stone material) is advisable.

For grouting coverings use



ULTRACOLOR PLUS class CG2, high performance, anti-efflorescence grout or KERACOLOR FF and KERACOLOR GG class CG2, high performance, cementitious grouts improved with FUGOLASTIC additive.

For sealing expansion joints, the use of MAPESIL AC and MAPESIL LM solvent-free, cross-linking silicone sealants is recommended. RM

For further information on this system, see its technical data sheet available at the web site: www.mapei.com.



Fixing Mapetex on Mapetex-Strip



Installing ceramic tiles with Keraquick



Grouting with Ultracolor Plus



Floors and walls installed with Mapetex System