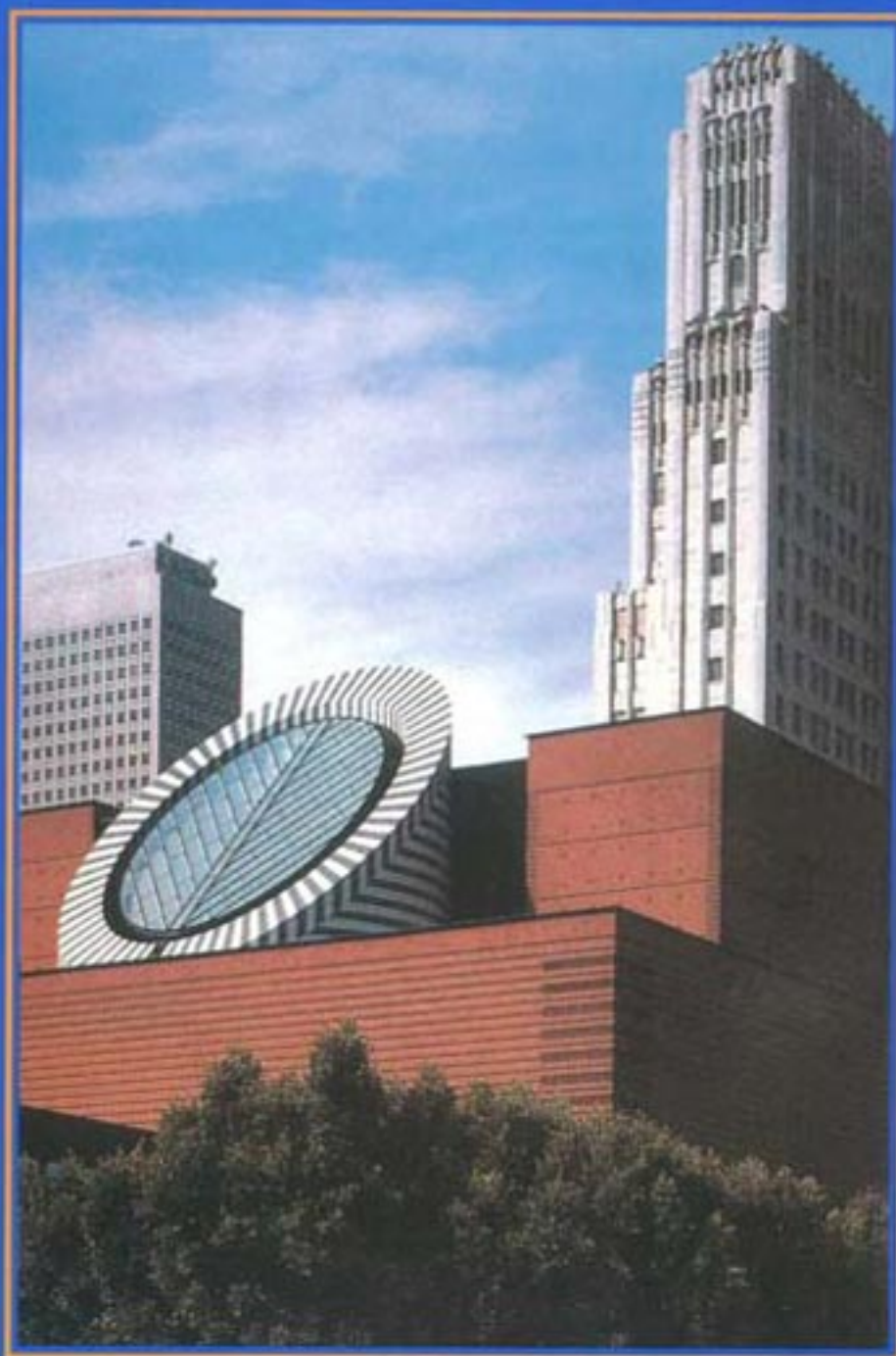


INTERNATIONAL

REALTÁ MAPEI



The Cora
Shopping Centers

The Ducal Palace
of Sassuolo

Warner Village
Cinemas

The San Francisco
Museum
of Modern Art

Mapei Benelux

Architectural Concrete



6



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MAPEI SPORTS DIVISION

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MAPEI BENELUX



The international panorama of Mapei subsidiaries would not have been complete without a presence in North Central Europe. The Mapei Benelux project was conceived in the summer of 1995. Mapei Benelux S.A./N.V. was formed soon afterward with headquarters in Liège, Belgium. On April 18, 1997 the new headquarters of Mapei Benelux was inaugurated in Grâce Hollogne (Liège) with regional, provincial and local authorities in attendance along with customers from Belgium, Holland and Luxembourg. It was as certainly a great day for all concerned but no one was more pleased than Aristide Mariotti (seen in the photo above) who saw his dream come true after representing Mapei in Belgium for twenty years.



Mr. Mariotti was named as the company's General Manager for the great professionalism and sense of duty he has always shown where Mapei is concerned. We asked Mr. Mariotti to explain how the idea of creating Mapei Benelux came about and to discuss that market and its future prospects.

Can you give us a brief history of Mapei Benelux?

Mapei Benelux is one of the youngest subsidiaries of the Mapei Group. It was

founded on 2 June 1995 and the inauguration of the headquarters in Grâce Hollogne took place only two years ago. The

decision to found Mapei Benelux was made because of the substantial sales we'd had over the last few years, especially in Belgium, where Mapei products were used in major construction projects, culminating in our biggest success with the new Brussels airport.

When did you begin working with Mapei?

In long ago November of 1977 I met up with Mapei for

the first time in the person of Dr. Squinzi. We connected immediately. When we started up the business it was difficult at first but later on it proved to be a winner. It's been a source of great satisfaction.

What have been the most important moments in your career with Mapei?

There have been many, but the most exciting one was 18 April 1997, when the new Grâce Hollogne headquarters was officially opened.

How did the idea of opening a subsidiary in the Benelux come about? And what were the reasons for it?

The idea was in the air for several years. It became a reality because of Belgium's central location in Europe and the growing importance of the Benelux

The name Benelux is derived from the initial syllables of the names of three European countries (Belgium, the Netherlands and Luxembourg) bordering on each other in the north-west corner of the continent. In

1944 they joined in a customs union which was subsequently modified in the 1958 Treaty of the Hague to achieve better coordination of economic, financial and social policies.



market. We felt we had to offer our customers the first rate service and assistance that are musts for a company like Mapei. We are now in a position to do just that and are proud of it, I must say. We are already beginning to harvest the benefits.

Tell us about the staff of Mapei Benelux?

At present the Mapei Benelux staff consists of 14 people besides myself, six of whom form a tight multi-lingual sales and technical team that offers total service to all customers in our market. We provide quick, efficient technical assistance both pre- and post-sale.

How does the Benelux market shape up?

In general the Benelux market is mature and knowledgeable. More and more, what the consumer is looking for is quality. That's why quality is the number one priority. In the Benelux countries we distribute mainly through two channels: first, ceramic tile and resilient flooring dealers, and second, D.I.Y. outlets.

Speaking of the D.I.Y. market, how important is it today? Is Mapei present? Mapei is active on the D.I.Y. market in both Belgium and Holland. And we recently launched a program selling a series of Mapei products in D.I.Y. packaging through traditional dealers.

From a technical standpoint is the

PHOTO 4



Benelux market different from the Italian market?

Building techniques differ from country to country, of course. But installing ceramic tile and natural stone is basically the same in the Benelux as in Italy, except in a few cases like tiling over gypsumboard walls, for example.

Has Mapei Benelux already seen positive results since the inauguration?

PHOTO 1



*Photo 1
13 September 1996
Laying the corner stone of the new Mapei Benelux headquarters in the presence of the President Minister, Robert Collignon and the Governor of the Province of Liège, Paul Bolland*

PHOTO 2



*Photos 2, 3 and 4
18 April 1997: the official opening of the new headquarters attended by the authorities, Mapei customers and honored guests, among whom were several champion riders from the Mapei cycling team*

PHOTO 3



PHOTO 5



Definitely, especially since now that we have our warehouse we can deliver most products 24 hours after an order is placed. And that's good news.

How are your relations with the other Mapei subsidiaries, especially with neighboring Mapei France?

We have close working relationships with the other Mapei Group companies and we exchange technical and sales-related information when needed. Because Mapei France is so close, they often act as our suppliers, as do Mapei Austria and Mapei Germany.

Is the Benelux market concentrated more in new construction or in remodeling?

Right now there is a high demand in both markets.

*Photo 5
Giorgio Squinzi flanked by Johan Museeuw, left, and Franco Ballerini in 1998*



PHOTO 6

Photo 6

The new Mapei Benelux headquarters was designed by the architect Walter Pezzetti in collaboration with the engineering firm of BCT Philippe Colson under the supervision of SECO S.A. It was built by the Entreprise Générale de Constructions Wust on a 19,000-sq m (205,000 sq ft) site that contains 1,800 sq m (19,400 sq ft) of warehouse space and 400 sq m (4,300 sq ft) of offices, representing a total investment of approx. 60 million Belgian francs

Photo 7

Mapei victories in the Benelux countries' 1999 Northern Classic races are detailed in the Mapei Sports section on Page 18. Below, Tom Steels, Belgian National Champion

What is the percentage of residential building as compared to infrastructure projects?

This is a period of great activity above all for commercial construction in the Benelux. Many new hotels, supermarkets (see the Cora article on page 6) and metro stations have been built. Residential building has slowed down somewhat. Numbers-wise let's say that 65% of the market is commercial and the remaining 35% residential.

And large scale construction projects (bridges, roads, dams, etc.)?

This is a market segment that Mapei Benelux is just starting to penetrate and one in which we can foresee significant development in the future.

Mapei always puts a lot of emphasis on training. How does Mapei Benelux handle training?

We maintain that training is fundamental to the relationships we have with our customers.

That is why we host at least four training courses each month at our headquarters. We also develop specially tailored courses that we hold at our dealers' on request.

How important has our cycling sponsorship been to Mapei Benelux?

Cycling has been without a doubt a valuable ally for Mapei Benelux. In fact, during the last three seasons, thanks to the past partnerships with GB and Bricobi, and our present partnership with Quick Step, the Mapei team has won races all over the world. Special credit must be given to the group of Belgian riders captained by the great champion Johan Museeuw who, in addition to countless other races, won two consecutive World Cups, a World Championship and a National Championship in three years, and to Tom Steels who was Belgian national champion two years in a row. That's an extraordinary record that will be tough to beat. These racing victories have given Mapei enormous recognition and popularity, not only with people in our business but also with the public at large who are the end-users of our products.

PHOTO 7



MAPEI BENELUX: CROWNED WITH SUCCESS

For his contribution to "furthering economic, industrial and personal relations" between Italy and Belgium, Giorgio Squinzi was honored with the title of Commander of the Order of the Crown by His Majesty King Albert II of Belgium. On April 17 of this year at the Chateau Val Duchesse in Brussels Dr. Squinzi was presented with a medal commemorating the honor by Elio Di Rupo, the Belgian Vice-Premier who is Economic and Telecommunications Minister and Chargé for Foreign Trade (seen at left in the photo with Dr. Squinzi on the bottom of the page). Also in attendance at the ceremony was Mr. Philippe Beke, presently Mr. Di Rupo's Vice-Cabinet Chief and the former Belgian Consul General in Milan, who was well acquainted with Dr. Squinzi. It was Mr. Beke, an expert on Italian industry and an avid professional cycling fan, who had originally brought Mapei and Mapei President Squinzi's activities in Belgium to the attention of Vice-Premier Di Rupo. Dr. Squinzi would like to share the honor with all the staff of Mapei Benelux for their outstanding efforts.

Photo courtesy of "La Dernière Heure"



BUSINESS IS BOOMING AT MAPEI BENELUX

Mapei's increasingly strong presence in the Benelux countries is evidenced by the large number of prestigious projects where Mapei products have been used. A few of these are shown in the photos below, on the pages that follow, and on the inside back cover. □



European Parliament, Brussels



Metro Station, Brussels



TGV Terminal, Gare du Midi, Brussels



Zaventem 2000 Airport, Brussels



Holland Casino, Rotterdam, Netherlands



With Mapei's "record breaking" products the Cora chain was able to remodel its shopping centers in record time without losing a sale.

by *Aristide Mariotti*

Retail space measuring 40,000 square metres (430,520 sq. ft.), a parking garage for 2,500 cars, 450 employees, and 27 shops soon to become 47: these are some of the impressive figures that describe the latest Cora shopping center that the company recently opened in Anderlecht, Belgium.

Cora is a supermarket chain that is a familiar name in Belgium. There are five Cora centers in Wallonie plus this newest addition in Anderlecht, near Brussels. In the last few years Cora has made a big investment: 3 billion lire (\$1.72 million USD) to transform these five existing supermarkets into shopping centers and an equal amount to build the new Anderlecht shopping center.

Record breaking products for remodeling in record time

The Cora supermarkets are frequented by 12,000 people every day, so they had to remain open for business during the remodeling without inconveniencing their customers. Because of the limited time available and the special working conditions, the architects specified Mapei's "record breaking" products that are guaranteed to get the job done quickly. They dry super fast and have the high compressive strength that floors in high traffic areas require.

Another factor which contributed to Mapei products' being selected was the complete installation package Mapei offered. This led to the architects' and the contractors' decision to have the work



Cora Shopping Center in Hornu

Belgium
Remodeled floor:
7,200 m² (77,494 sq. ft.)



Cora Shopping Center in La Louvière, Belgium

Remodeled floor:
4,500 m² (48,500 sq. ft.)



Cora Center, Mesancy, Belgium
 Remodeled floor: 8,000 m² (86,104 sq. ft.)



Cora Shopping Center in Rocourt
 Remodeled floor: 3,500 m² (37,600 sq. ft.)



Cora Shopping Center in Chatelaineau
 Remodeled floor: 3,500 m² (37,600 sq. ft.)

done at night so that during the day customers could shop uninterrupted.

The first Cora to be remodeled was the Hornu Center in the summer of 1994, where all the floors were to be replaced. After closing to the public at 8 p.m., the Cora was transformed into a job site. After thoroughly cleaning the cement based substrate, an anchor bond slurry of PLANICRETE was applied over it. PLANICRETE is a synthetic rubber latex for cement based mixes. While this was still fresh, a MAPECEM screed was formed over it. MAPECEM is a special hydraulic binder for screeds with controlled shrinkage that can be tiled over in record time. The very next day the customers would be walking on the hardened screed! Only three hours later 40x40x12 cm (16x16x5") stoneware tile flooring was set with

GRANIRAPID, a fast-setting, fast-hydrating adhesive system. The GRANIRAPID was applied using the back-buttering and float method which ensures better bonding and is essential when installing tiles larger than 30x30 cm (12x12").

The evening of the following day the tiles were grouted with KERACOLOR, a cement based grout for joints 5 to 15 mm wide that is easy to apply and easy to clean up. Because of the excellent results achieved on this job in terms of time and workmanship, the Cora management decided to continue using Mapei products to remodel the other four supermarkets.

The next was the Cora in La Louvière, again in 1994. The same system was used here, but ULTRACOLOR grout was substituted for the KERACOLOR because it sets even more rapidly, is more flexible and is watertight. 4,500 square metres (48,434 sq. ft.) of flooring were installed, including 1,300 m² (13,992 sq. ft.) installed directly over existing ceramic flooring in several retail spaces, using GRANIRAPID for setting and ULTRACOLOR for grouting.

In 1995 work was begun on remodeling the Cora Center in Rocourt: 3,500 square metres (37,670 sq. ft.) of flooring were installed using the same materials described above. When they saw the great results, the retail store



Cora Center, Mesancy, Belgium
Remodeled floor: 8,000 m² (86,104 sq. ft.)

owners in the Rocourt Center asked to have their area remodeled, too, using the same Mapei rapid system, after being assured that the substrate was compatible with the wood and resilient flooring they wanted to use (approx. 3000 m²/32,289 sq. ft.).

In 1996 the Cora supermarkets in Chatelineau and Mesancy were redone. The Mesancy job took place during a winter that was particularly harsh, with outside temperatures reaching -10°C. Despite some doubts as to using the Mapei rapid system under weather conditions very different from those experienced on the previous jobs, the work turned out beautifully. The remarkable flexibility of the system made it extremely versatile.

The new Cora in Anderlecht

In 1997 Cora decided to build a new shopping center in Anderlecht. Again their choice favored Mapei products.

This new Cora center was on a much larger scale: 27,000 m² (290,600 sq. ft.) of supermarket and other retail spaces plus another 13,000 m² (139,919 sq. ft.) of boutiques and service areas. This center is divided into several sections:

- The sales floor was treated in the same way as the previous remodeling projects, the only difference being that back-buttering was not used to apply the GRANIRAPID because the stoneware

tiles used measured only 20x20 cm. (8x8").

- The restaurant spaces and the fish market needed floors that were especially resistant to kitchen oils and grease. Here, too, after a thorough cleaning, an anchor bond slurry of PLANICRETE was applied over the old floor before preparing a MAPECEM screed.

To make the new floor more resistant, after letting the MAPECEM cure for five hours at +23°C, a layer approximately 2 mm thick of MAPELASTIC, a two-part cement based flexible mortar, was applied over the MAPECEM. This was reinforced with a fiberglass mesh. After letting the MAPELASTIC cure for five days the flooring was set with GRANIRAPID and grouted with KERAPOXY, a two-part acid resistant epoxy sealant. This product is formulated for ceramic tile floors in food processing plants and so was the right choice for the fish market. In the loading zone MAPELASTIC was applied over the existing concrete before a new concrete floor modified with PLANICRETE was poured.

In the Mall the same products were used as in the other areas, the only exception being that Mapei's new product, TOPCEM, was substituted for MAPECEM. TOPCEM is a special hydraulic binder that has normal setting yet dries in ultra-fast time. It's ready for traffic in only 12 hours and completely cured in 7 days. □



Aristide Mariotti congratulated by Valery Miot

Above: **Cora Shopping Center, Anderlecht, Belgium**
Flooring installed: 40,000 m² (430,520 sq. ft.)

TECHNICAL DATA, CORA SHOPPING CENTRES, BELGIUM



► Project: Cora Shopping Center – Hornu, Belgium

Year of execution: 1994

Architects: Coquelet, Boussu

Contractors, subfloors: Miot

Contractors, tile installation: Tradigres

Flooring: Casalgrande Padana stoneware tiles 40x40 cm (16x16")

Mapei products*
PLANICRETE
MAPECEM
GRANIRAPID
KERACOLOR

► Project: Cora Shopping Center – La Louvière, Belgium

Year of execution: 1994

Architects: Coquelet, Boussu

Contractors, subfloors: Miot

Contractors, tile installation: Tradigres

Surface: 4,500 m² (48,500 sq. ft.)

Floor tiles: Casalgrande Padana stoneware tiles 40x40 cm (16x16")

Mapei products*
PLANICRETE
MAPECEM
GRANIRAPID
ULTRACOLOR

► Project: Cora Shopping Center – Rocourt, Belgium

Year of execution: 1995

Architects: David, Liège

Surface: 3,500 m² (37,670 sq. ft.)

Floor tiles: Casalgrande Padana stoneware tiles 40x40 cm (16x16")

Mapei products*
PLANICRETE
MAPECEM
GRANIRAPID
ULTRACOLOR

► Cora Shopping Center, Chatelineau, Belgium

Year of execution: 1996

Architects: David, Liège

Contractors, subfloors: Miot

Contractors, tile installation: Tradigres

Surface: 3,500 m² (37,670 sq. ft.)

Floor tiles: Casalgrande Padana stoneware tiles 40x40 cm (16x16")

Mapei products*
PLANICRETE
MAPECEM
GRANIRAPID
ULTRACOLOR

► Cora Shopping Center, Mesancy, Belgium

Year of execution: 1996

Architects: Atelier Le Cavet, Arlon

Contractors, subfloors: Miot

Contractors, tile installation: Andreosso

Surface: 8,000 m² (86,104 sq. ft.)

Floor tiles: Casalgrande Padana stoneware tiles 40x40 cm (16x16")

Mapei products*
PLANICRETE
MAPECEM
GRANIRAPID
ULTRACOLOR

► Cora Shopping Center, Anderlecht, Belgium

Year of execution: 1997-8

Architects: Studio Geau, Brussels, Arch. Coquelet, Boussu, Studio Georgel Mowvioc, Paris

Contractors, subfloors: Miot

Contractors, tile installation: Tradigres

Surface: 27,000 m² (290,600 sq. ft.) + 13,000 m² (139,919 sq. ft.), boutiques and service areas.

Floor tiles: Casalgrande Padana stoneware 20x20 cm (8x8")

Mapei products*
PLANICRETE
MAPECEM
MAPELASTIC
TOPCEM
GRANIRAPID
KERAPOXY

*The materials mentioned are part of MAPEI's European product lines

In less than five years the Cora Group remodeled its five supermarkets in Belgium and opened a sixth: almost 70,000 m² (753,410 sq. ft.) of screeds and flooring were expertly installed in record time. You can see the results on these pages and ...under the feet of millions of shoppers.



Technical Data Sheets for the products cited are contained in Mapei Binder no.1, "Ceramic Tile Installation Products"



THE KEYS TO SUCCESS

Creativity, capacity for innovation, flexibility, and adaptability to the needs of the marketplace are a few of the key qualities that the A.T. Kearney report identified in 65 leading Italian companies, including Mapei.

Leadership in a special market niche, a strong customer-oriented philosophy, quality products and service, streamlined organization, and innovation-driven research: these are some of the success factors that 65 Italian companies have in common, according to a report published by A.T. Kearney, a major American consulting company.

The study, entitled "The Keys to Success: The Top Medium-sized Companies" was coordinated by Prof. Carlo Mario Guerci of the Università Statale of Milan. A.T. Kearney performed the study on a group of medium-sized companies with excellent track records that were chosen from various fields. The selection criteria required the companies to have operated three consecutive years in the black, with exports constituting more than 50% of their production. They also had to have a certain number of plants abroad and occupy a leadership position on the Italian, European or even the world market.

The companies profiled have a combined annual turnover of 16 trillion lire (\$914,000,000 USD). Half of them could double their sales by the year 2001. Their operations show an average rate of return of approx. 9%, with so little owed in outstanding loans that debt service amounts to less than 1.5% of turnover. These performance levels are found in widely differing areas: the study reveals that success depends not on the type of business but rather its capacity to offer products that are attractive and to some extent unique, along with contained costs and lean, flexible organizations. These leading companies deal in bicycle parts, housewares, furniture, ceramic tiles, chemical products for building, etc.

Let's examine what these winners are like. The study shows that most of them are family-owned businesses: in fact, 61% of them are 100% family-owned. "Actually," underlines Carlo Mario Guerci, "family-owned companies often

contain a nucleus of competent, very trusted managers whose methods embody the best managerial techniques. This is the case with Mapei, one of the 65 companies identified, whose President, Giorgio Squinzi, makes all important decisions with a group of 5 or 6 managers who have been with the company for some time." Another salient factor that emerged in all of the companies mentioned is the care they take in hiring, managing and developing their staff. Employees are required to be professional, adept at problem solving, motivated and able to work as part of a team. An essential characteristic of all of the Top 65 is that they are strongly customer-oriented. They try to comprehend their



Prof. Carlo Mario Guerci

customers' expectations and anticipate their needs. Being customer-oriented is inextricably linked to the conception these companies have of a product as consisting of a combination of attributes that go beyond the mere "physical" product. The "extended product" is achieved through a combination of factors including, most importantly, quality, innovation and service. Considering the emphasis that the Top 65 place on product excellence, quality must come first. They pursue it with

systematic organization and precision.

Another very important consideration among the Top 65 is Research and Development. They spend an average of 3.6% of their annual turnover in R&D (the A.T. Kearney report mentions the "astounding 6% that Mapei budgets for R&D in expensively equipped laboratories. These are essential for structural analysis of materials and for various strength and endurance tests performed under the widest range of environmental conditions"). 93% of these companies have R&D departments that employ 8% of their manpower on average.

As far as market presence is concerned, exports constitute an average of 65% of the turnover of the companies analyzed. 35% of them have production facilities abroad and 50% of them have made acquisitions or joint ventures. But what exactly are their keys to success?

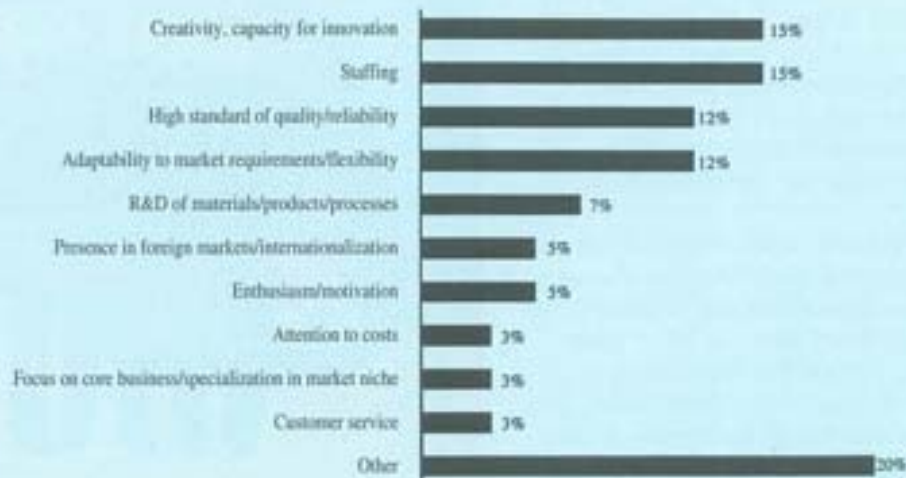
The Top 65 have answered that question themselves, identifying five essentials:

- The ability to be creative and innovative
- Staffing
- Adaptability to market needs, flexibility
- High quality standards for the extended product, i.e. product + service
- Internationalization

"The medium-size companies examined in the report have the quality and the potential to become big companies within a short time," observed Roberto Crapelli, President of A.T. Kearney Italy. "They're not asking for help to make this transition, but rather understanding and encouragement as they continue to develop in their own way."

The real heart of the matter, say the Top 65, is the way the country is run, i.e. taxes, labour costs, services, the bureaucracy. "We've been waiting for a permit to build another plant in Robbiano di Mediglia for eight years," said Giorgio Squinzi. The pharmaceutical manufacturer Sergio Dompè, president of Dompè Biotec, is even more outspoken. "If I had money to invest, I'd invest it elsewhere in Europe and would hold off on Italy." Not to mention labor costs which are 30% higher in Italy than in the USA and 25% more than in France. And Mario Carraro, President of Carraro, manufacturers of tractor axles and transmissions, mentioned lastly "the barrier of organized crime" that stymies investments in Southern Italy.

THE KEYS TO SUCCESS



Source: A.T. Kearney study

K N I G H T O F L A B O R

On June 2, 1998, the title of Cavaliere al Merito di Lavoro (Knight of Labor) was conferred on Giorgio Squinzi, the President of Mapei, by the President of the Italian Republic, Oscar Luigi Scalfaro. Dr. Squinzi was one of the twenty-



President Scalfaro, flanked by the Minister of Industry, Pierluigi Bersani, and the President of the Order of the Knights of Labor, Alfredo Diana.

five new Knights so honored for their distinguished careers. The official ceremony was held in Rome at the Quirinale, the Presidential Palace, on October 23rd of last year, when this photo was taken. Shaking hands with Dr. Squinzi (right) is

SUCCESS PROFILE

■ YEAR OF FOUNDING

Most of the companies were founded in two periods, 39% before 1950 and 37% between 1950 and 1970.

■ LOCATION

39% of the companies are located in industrial areas.

■ TURNOVER

- Average turnover: LIT 275 billion (USD 157 million)

- Combined turnover: LIT 16,000 billion (USD 914 million)

- Rate of increase in yield for 1995-6: 11%

- Predicted growth: average increase in turnover in 2001: 91% (the turnover of 45% of the companies studied is predicted at least to double)

■ EMPLOYEES

- 561 on average

- 10% with doctorates

- Number of employees increased 2.4% overall (1.8% in Italy, 7.5% abroad)

■ INTERNATIONALIZATION

- Average exports: 65%

- Companies with production facilities abroad: 35%

■ PROFITS

An average of 9% of turnover

■ MARKET LEADERSHIP

- 41% are leaders in Italy

- 18% in Europe

- 41% worldwide

■ OWNERSHIP

- 74% are totally or partially family-controlled.

- 21% are controlled by other companies or groups.

- 5% have an institutional investor as majority shareholder.

■ STOCK MARKET TRADING

19% are publicly traded

Source: A.T. Kearney Study

Graphics: RdC

MAPEI-QUICK STEP

THE INTERCONTINENTAL STRIKE FORCE

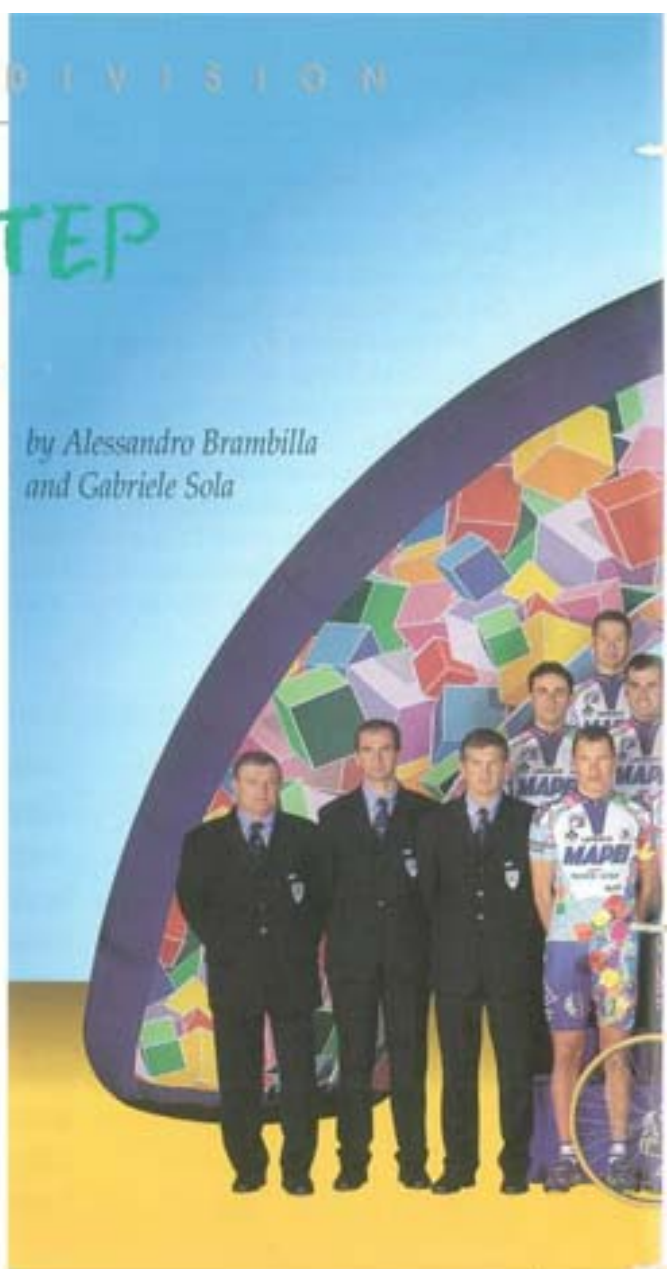
On Monday, January 18th, Mapei-Quick Step, professional cycling's Number One team, was presented to the press in the new Auditorium at Mapei's Milan headquarters. Eighty-six guests, including representatives from fifty-seven Italian and French newspapers and magazines, gathered around the most decorated riders in international cycling.

Twenty-eight of the team's twenty-nine riders representing seven different nationalities were on hand. Adriano Baffi had to be excused because he was off racing in the "Six Days of Bremen". At their side were Team President and Training Manager Aldo Sassi, Team Manager Patrick Lefevre, the three Directeurs Sportifs, (Fabrizio Fabbri, Serge Parsoni and Marc Sergeant) and the team's five doctors who are always on hand to make sure our athletes stay healthy.

Giorgio Squinzi, like a good host, welcomed the team and mapped out his directions on the road to follow in the 1999 season. The riders were introduced by Gabriele Sola, Mapei-Quick Step's PR and Press Officer who introduced old acquaintances like heavy hitters Johan Museeuw, Proel Tonkov, Andrea Tafi and Tom Steels, and new acquisitions, among whom were the Number One in the world classification, Michele Bartoli, and the young Axel Merckx. At the press conference the basic lines of attack for this year's racing season were announced, starting with the all-out assault on the Tour de France, with a super-team captained by Tonkov and Bartoli, the World Championships, and onward through the important Northern Classic races. The Tour of Italy will be entrusted to the younger riders, Di Grande, Noè, Van Heeswijk, Bettini, e Figueras, led by the grand master, Tafi, and finally the Tour of Spain, with Tonkov, Tafi and Merckx on the starting line.

The most applauded of the team's well-wishers who were called upon to say a few words were Italian cycling great Alfredo Martini, Gianni Bugno, in his first year of retirement from the Mapei team and competition cycling, and the President of the Cycling League, Paolo Vantellini. The riders were asked (but were modestly reluctant) to predict the outcome of the Tour of Langkawi in Malaysia, which is the team's season debut.

by Alessandro Brambilla
and Gabriele Sola



Before the start of 1999 season the professional cycling team sponsored by the Mapei Group had achieved 384 victories. Since 1994 it has been at the top of the International Cycling Union classification. The Mapei team, now in partnership with Quick Step, has a talent for setting records: 3 Road Race World Championships, 3 Individual Competition World Cups, 3 Team Competition World Cups, 2 one-hour

CYCLING VIA SATELLITE

The Mapei Quick Step champions can now be seen on television via satellite. Turn your dish to the following coordinates to see cycling on "Rai Sat": hot bird 2 (satellite), 13° east (position), 52 (transponder), 11765 (frequency), 27,500 KS/sec (symbol rate), vertical V (polarization), 2/3 Fec. Races can also be seen via satellite on Stream. The satellite network broadcasts the Azzurro Bici Cycling Magazine on Italy's Antenna 3.





- 1 Aldo Sassi (Team President and training Manager)
- 2 Patrick Lefevere (Team Manager)
- 3 Fabrizio Fabbri (Directeur Sportif)
- 4 Adriano Baffi
- 5 Michele Bartoli
- 6 Paolo Bettini
- 7 Davide Bramati
- 8 Giuseppe Di Grande
- 9 Gianni Faresin
- 10 Manuel Fernandez Gines
- 11 Giuliano Figueras
- 12 Paolo Fornaciari
- 13 Leif Hoste
- 14 Paolo Lanfranchi

time records, a Tour of Italy, a Tour of Spain, 9 World Cup Grand Prix, 11 national titles, and 4 Italian National Team Championships.

There are 29 riders on the Mapei-Quick Step Team, all of them on bikes custom-made by Ernesto Colnago and accessorized by Latexco and Sportful. The team jersey has one more new name on it, Gas Blue Jeans. There are many new team members sporting the signature building block jerseys. They may represent seven countries, but they all had one goal: their sixteenth win of the new season brought the total number of Mapei victories since the team was formed up to the magic number of 400. They set that record as fast as they could using it as a springboard for setting even more.

The Belgian Patrick Lefevere, a team coach since 1995, is now Team Manager. Fabrizio Fabbri, the Tuscan cowboy who has been with Mapei since 1994, is still at the wheel of the lead car as Directeur Sportif. He has 2 new colleagues: Serge Parsani and Marc Sergeant from Belgium.

The Mapei-Quick Step riders undergo evaluation and plan their training programs at the Mapei Sports Center in Castellanza (Varese), Italy, under the direction of Prof. Aldo Sassi. Mapei-Quick Step is the first team to create its own sports medicine and training center.



- 15 Bart Leysen
- 16 Chann William McRae
- 17 Axel Merckx
- 18 Dirk Müller
- 19 Johan Museeuw
- 20 Daniele Nardello
- 21 Rinaldo Nocentini
- 22 Andrea Noè
- 23 Wilfried Peeters
- 24 Fred Rodriguez
- 25 Luca Scinto
- 26 Tom Steels
- 27 Tobias Steinhauser
- 28 Andrea Tafi
- 29 David Tani
- 30 Pavel Tonkov
- 31 Max Van Heeswijk
- 32 Stefano Zanini
- 33 Marc Sergeant (Directeur Sportif)
- 34 Serge Parsani (Directeur Sportif)

THE TEAM

Johan Museeuw, 34 years old, is back with the team. From Clistel, Belgium, the 1996 World Champion had an unlucky season last year, despite his beautiful win in the Tour of Flanders and two other races. At the Flanders he took a spill and broke his knee, only returning to competition in the autumn. Museeuw won the World Championships in



Above from left to right:
Peeters, Leysen, Museeuw,
Steels, Hoste, Merckx
At right standing: Di Grande,
Noè, Figueras, Bartoli,
Nardello, Faresin, sitting
Tafi and Zanini

Lugano, Switzerland, in 1996 and made Mapei a present of two World Cups. He's the team member who boasts more successes than any other professional rider, 85 in all! He's won more Grand Prix than any other rider in the history of the World Cup, a total of eight. Veteran rider Tom Steels is also back this season. Tom was Belgian National Champion in '97 and '98. The 28-year old won 15 races for Mapei in 1998, including four stages of the Tour de France. The other Belgian veterans who've distinguish themselves in those Northern Classic races are Bart Leysen, 30, and Wilfrid Peeters, 35. In 1994 Peeters took the Ghent-Wevelgem, and in 1998 he came in third in the Paris-Roubaix. Team member Pavel Tonkov, 30, was the winner of the 1996 Tour of Italy and came in second in 1997 and 1998. Tonkov, who is Russian, is the one to watch out for in the big stage races. In 1998 he won five competitions. Paolo Lanfranchi, 31, that stalwart from Bergamo, Italy, will be right up there at

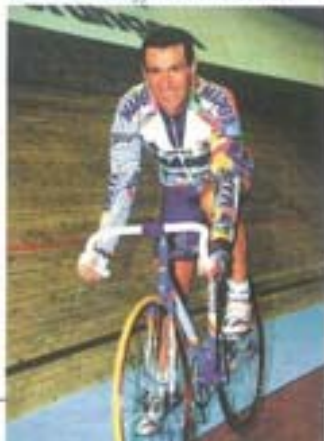
Pavel's side.

Another veteran National Champion is "The Gladiator", Andrea Tafi, 33. The Italian National Championship he won in Bergamo galvanized Tafi, who won 7 races to set his own personal season record. He is one of the team's most popular riders, as is Stefano Zanini, 31 years old, from Varese, Italy. Stefano is the only Italian to have won the World Cup Amstel Gold race and he closed 1998 with three victories including the Paris-Brussels. We'll be keeping our eyes on Daniele Nardello, 27, the dark horse who won a stage of the 1998 Tour de France and came in eighth in the Tour's final classification (2 wins in '98). The promising Neapolitan, Giuliano Figueras, 22, the Under-23 World Champion at Lugano in 1996, launched himself into the fray last year as a newly turned pro and won a race. The Sicilian rider Giuseppe Di Grande, 26, ninth in the Tour de France, will be showing us what more he can do. Gianni Faresin from Vicenza, 34, Italian National Champion in 1997, also took part in the World Cup Championships. He is a valuable supporting player that any captain would be glad to have on his team. Hailing from Milan, Davide Bramanti, 31, is another much appreciated veteran. Michele Bartoli, 29, from San Giovanni alla Vena near Pisa, is the most important new addition to the team. He is considered the world's number one in-line racer and won the World Cup for the last two years running. Among the 36 race victories in his career before the start of the new season, including 11 in 1998, he has a Tour of Flanders, the Swiss Grand Prix and two Liège-Bastogne-Liège to his credit. He won the Liège races two years running.

Mapei-Quick Step welcomed back Andrea Noè, 30, after a two year absence, Adriano Baffi, 37, and the Spanish rider, Manuel Fernandez Gines, 28. The Milanese Noè won the tough San Marino stage of the Tour of Italy. Gines, who raced for Mapei from 1994-6, has won two races including the Spanish Championships. Adriano Baffi, the oldest of the Tour of Italy stage winners, rode to 13 victories when he last raced for Mapei in 1995-6. Baffi can be said to shine especially in the

Six Days of Milan race, having won 9 of them. Cycling runs in Adriano's family: his father was also a rider. We'll see Adriano show his stuff this year at the Vigorelli Velodrome in Milan. Last year he won the Tour of Italy time trials. Cycling also runs in the family of Belgian rider Axel Merckx, 27, who has won two races since his pro debut. His father, cycling legend Eddy Merckx, won 426 races in the course of his career. Also very promising is

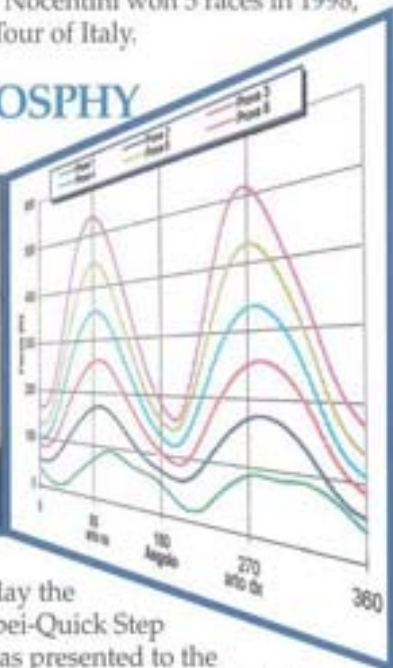
Adriano Baffi on the track



another Belgian, Leif Hoste, 22, who competed with the under-23 year olds on the Grassi Mapei Team in 1996, when he won the Belgian Time Trial Championship. Hoste turned pro last year and has two racing victories to his credit. Mark Van Heeswijk, 26, is the first Dutch rider on the Mapei-Quick Step team and another one to watch out for in those Northern Classic races, having won 3

victories in 1998. Chann William McRae, 28, with 10 wins in 1998, and Fred Rodriguez, 26, who ended last year with 3 wins, have made the team intercontinental, being Americans. The team has German riders as well, Dirk Müller, 26, and Tobias Steinhauser, 27, with three wins each last season. Müller had already worn the Mapei jersey briefly in 1997 when he won a race. Steinhauser is known in Italy for having won a Tour of the Regions while still an amateur. Paolo Bettini from Tuscany, 25, winner of a stage of the Tour de la Suisse Romande, and Luca Scinto, 31, were with the Italian national team at the World Cup in 1998. More riders from Tuscany, the cycling heartland, complete the formation: Paolo Fornaciari, 28, David Tani, 30, and the newly turned pro Rinaldo Nocentini, 22, who was second at the Under-23 World Cup in Valkenburg, Belgium. Bettini and Nocentini are alumni of the Grassi Mapei satellite team. Nocentini won 5 races in 1998, including a stage of the Junior Tour of Italy.

A WINNING PHILOSOPHY



"We want to win under the banner of drug-free cycling," declared Giorgio Squinzi to the press in the Mapei Auditorium. One of the five team doctors will be present at every race the Mapei-Quick Step Team participates in. Mapei is the first team in world cycling with its own sports medicine and training center, The Mapei Sports Center, located in Castellanza, Italy. The Sports Center reflects the Mapei philosophy.

The day the Mapei-Quick Step Team was presented to the press every seat in every row of the Mapei Auditorium was filled. While looking at the riders in their elegant blue uniform suits, Mapei President Giorgio Squinzi's eyes were shining as he answered questions from reporters.

"Mapei-Quick Step is the team with the most champions in cycling history," commented Dr. Squinzi. "And it's intercontinental, just like the Mapei Group. Seeing them all makes me proud to have chosen cycling as our main avenue of communication. We have won many great victories and our turnover has significantly increased. In 1998 Mapei Group Sales totaled more than 900 billion

lire (\$500,000,000 USD).

"I can't deny that in the spring of last year I wanted to get out of cycling. One reason was that the contract with the sports organization that managed the team was expiring December 31st. Aside from being a source of great satisfaction, it means a very big commitment for me, my family and the Mapei Marketing Department. In 1999 the investment in the team will be 50% more than it was in 1998. It was mainly my passion for the sport that kept me in it, in addition to its value as a marketing strategy."

Is it true that you wanted to get Pantani under contract?

"My plan was to get the three top Italian



riders on the same team. I had Tafi, "The Gladiator". I got Bartoli, the Number One in the classic In-Line races, and I contacted Pantani. We didn't manage to get him

because he already had contractual commitments. But it doesn't matter. For the big races Mapei-Quick Step has Tonkov who's a champion both on level ground and uphill."

Is there a special prize in store for the winner of the sixteenth victory of the season, which will make it Mapei's 400th win?

"If the sixteenth occurs during the Tour de France, yes. That would make us below our winning average because normally we would have won 40 or 50 by then, but that's okay. Communications-wise the Tour de France is like winning the Olympics or winning the World Cup in soccer. In the United States, for example, almost no one pays attention to cycling, but the Tour de France has the sports fans glued to the screen. Tonkov could win the next Tour de France, which is our main goal this season. That doesn't mean we'll neglect the Tour of Italy: we're Italian, and Mapei was founded in Italy. Giuseppe Di Grande will go all out for the title. As far as the World Championships are concerned, our team has already won three, but they were non-Italians. In 1999 the World Championship is in Italy and I hope one of the Italian Mapei-Quick Step riders wins it."

Who are the people you would like to thank? Definitely Davide Boifava. Even though



he was managing another team he let us get Bartoli and other good riders under contract. Also Ernesto Colnago, who besides supplying us with fantastic bikes, made things easier for us to sign up certain riders. He convinced several of them, including Tonkov, to stick with Mapei-Quick Step. But let me say that the one thing that really concerns me is the problem of drug abuse in cycling, even though cycling officials have already made moves to remedy this situation. In 1995 I told Verbruggen, the President of the International Cycling Union, that something had to be done about it. We at Mapei-Quick Step care about drug-free cycling and about safeguarding the riders' health. We have 5 doctors because the team splits up and races on several fronts simultaneously. We always have one of our own doctors along for every race. We are the world leaders and we have to bring our contribution to the renewal process cycling is undergoing. The practical demonstration of it is the Mapei Sports Center in Castellanza, coordinated by Aldo Sassi. It's the key resource center for Mapei-Quick Step's athletic preparation and for all the junior satellite teams we sponsor as well.



THE 1999 MAPEI-QUICK STEP JERSEY

The Mapei-Quick Step jersey contains some innovations compared to the 1998 version. The Mapei, Latexco, Colnago and Sportful logos remain, but the Quick Step logo replaces Bricobi, and the Gas logo appears for the first time. Our victory in the last World Cup Team Competition earned us the International Cycling Union badge on the jersey. On the right front side are the colorful

signature Mapei building blocks while opposite them are stylized blue and white trowel marks of Mapei adhesive. On the back is the athlete's last name.



MAPEI-QUICK STEP PARTNERS

MAPEI-QUICK STEP PARTNERS

PRINCIPAL SPONSORS

MAPEI
QUICK STEP
LATEXCO

Chemical products for construction
Laminate flooring
Latex foam mattresses

OFFICIAL SPONSORS

COLNAGO
SPORTFUL
MIC-SHIMANO
GAS

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Sportswear
Bicycle parts
Casual clothing

OFFICIAL SUPPLIERS

RUDY PROJECT
LAZER
ENERVIT

Eyewear
Helmets
Sports supplements

TECHNICAL SUPPLIERS

DE FEET
NAQI
POLAR
REEBOK
ELITE
ATAS

Socks
Massage cream
Cardio monitors
Shoes
Sports accessories
Equipment for mechanical repairs

TEAM ROSTER

EXECUTIVE STAFF

PRESIDENT AND
TRAINING MANAGER

ALDO SASSI

TEAM MANAGER

PATRICK LEFEVERE

DIRECTEURS SPORTIFS

FABRIZIO FABBRI, SERGE PARSANI
MARC SERGEANT

P.R. AND PRESS OFFICER
PUBLIC RELATIONS

GABRIELE SOLA
CLAUDY CRIQUELION

ATHLETES

ADRIANO BAFFI
MICHELE BARTOLI
PAOLO BETTINI
DAVIDE BRAMATI
GIUSEPPE DI GRANDE
GIANNI FARESin
MANUEL FERNANDEZ GINES
GIULIANO FIGUERAS
PAOLO FORNACIARI
LEIF HOSTE
PAOLO LANFRANCHI
BART LEYSEN
CHANN WILLIAM McRAE
AXEL MERCKX
DIRK MÜLLER
JOHAN MUSEELW
DANIELE NARDELLO
RINALDO NOCENTINI
ANDREA NOE'
WILFRIED PEETERS
FRED RODRIGUEZ
LUCA SCINTO
TOM STEELS
TOBIAS STEINHAUSER
ANDREA TAFI
DAVID TANI
PAVEL TONKOV
MAX VAN HEESWIJK
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TECHNICAL CHIEF PHYSICIAN PHYSICIANS

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DIRK LEENAERT
TIZIANO MORASSUT
LUGINO MORO
DIRK NACHTERGAELE
PAOLO NOE'
GIUSEPPE PAROLINI

MECHANICS

NAZZARENO BERTO
GIOVANNI DI LORENZO
ROBERTO MORA
ANDREA NIERI
GEORGE NOYES
FAUSTO OPPICI
FRANCESCO VILLA

VEHICLE MGR

GIACOMO CARMINATI

MAPEI TAKES THE CAKE FOR THE BIG 400



In its first 3 months of racing in 1999 the Mapei Quick Step Team carried on the team tradition: it just kept on winning! Adriano Baffi won the team its first victory of the new season on the track at the Six Days of Stuttgart, coming in with the same time as German rider Andreas Kappes.

Wevelgem, easily staying out in front of the compact group of sprinters. Tom gave Mapei Quick Step its third victory in four editions of the Wevelgem. The Flèche Wallonne was one of the few Classics that Mapei had never won and Bartoli managed to dominate the field even in a snowstorm.

The Mapei Quick Step task force triumphed in 30 road races in the first three months of 1999 alone. American rider Fred Rodriguez started off this year's winning trend in the first stage

of the Tour of Langkawi in Malaysia. Rinaldo Nocentini made his pro debut with panache in the same race, winning two stages. A very happy Paolo Lanfranchi was number one in the final classification. Lanfranchi followed up on his magic moment by winning the first stage at the Grand Prix of Portugal, once again coming in first in the final classification.

Bartoli's first place in the final



Mapei Quick Step's most important road racing challenge of the spring was, as always, the Paris - Roubaix and "The Gladiator" Andrea Tafi made it the fourth Roubaix victory out of five for Mapei. Tafi finished first in the hellish cobblestoned classic, immediately followed by two other Mapei Quick Step team members, Wilfried Peeters and Tom Steels. For the third time, the boys in the building block jerseys took possession of the entire podium at Roubaix.

As for the Northern Classics, Tom Steels triumphed in the Gand - Wevelgem and Michele Bartoli in the Flèche Wallonne. As in 1996, Steels took the

ranking of the Tyrrhenian - Adriatic marked the team's sixteenth victory of the 1999 season, which made it the 400th victory in the team's history. The team celebrated with a cake (and a cake fight).

Michele showed true team spirit in the Tyrrhenian - Adriatic when he helped teammate Paolo Bettini win a stage. Bettini also won the second stage of the Cechi Gori Memorial race in Rome.

Cycling fans applauded Johann Museeuw's victorious comeback with his first place in the Cross-Belgium race at Waregem. Other victories were won by Max Van Heeswijk (2), Davide Bramante (1) and dynamic newcomer Giuliano Figueras (3), who also plays a mean guitar, Stefano Zanini (1), and Luca Scinto, who won on home ground in the Tour of Tuscany. And three months into the season, Bartoli continues to be the top-ranked individual in the International Cycling Union. So far so GREAT for Mapei Quick Step in 1999!

HELL ON WHEELS: MAPEI TAKES ON THE NORTHERN CLASSICS

by Alessandro Brambilla



Peeters (l.), Tafi and Steels (r.) 1999



(l. to r.) Tafi, Ballerini and Peeters 1998



(l. to r.) Bortolami, Museeuw and Tafi 1996

PARIS - ROUBAIX

The Northern Classics are grueling races and the Paris - Roubaix is the most grueling of them all. Yet the Mapei team not only won four out of the five Roubaix it's raced since the team was formed, which is a record in itself, but it managed to take over the entire winner's podium three times with first, second and third place wins in 1996, 1998 and 1999. Here we see a few shots of those three Roubaix races that made cycling history.

SPRINTING TO GLORY

A picture of Tom Steels sprinting his way to glory at the finish line at the 1999 Gand - Wevelgem. This was the second time Tom finished in first place at Wevelgem, repeating his 1996 triumph. This year Tom battled through much of it in a driving rain over the cobblestones. Tom is one of the 3 fastest sprinters in world cycling, with 15 wins in 1998, including four stages of the Tour de France.



TAFI THE GLADIATOR BATTLES THE COBBLESTONES

At left, Andrea Tafi's winning performance in the King of the Northern Classic races, the Paris - Roubaix, where he was closely followed at the finish line by teammates Peeters and Steels. Tafi won the battle with the cobblestones despite tough competition and a flat tire. "A victory at Roubaix," gloated The Gladiator, "is worth a whole career's racing."

BARTOLI FLIES LIKE AN ARROW AT THE FLECHE WALLONNE

The Fleche Wallonne means the Arrow of Wallonie (the French-speaking part of Belgium), and Michele Bartoli shot to victory a full fourteen minutes ahead of his closest runner-up in this 200 kilometer torture test, despite rain, snow and icy cold. "It's the most spectacular victory of my career," said the thrilled Bartoli. "The race was like being in a movie with a terrifying script." (Photo below)



THE CENTER OF ATTENTION



Just a short drive outside Milan there is a quiet little building where you'll find the biggest names in professional cycling. It's the Mapei Sports Center. Mapei is the first and only professional cycling team with its own center for performing scientific testing and designing training programs. "The center opened its doors to the public in June, 1998," explains Professor Aldo Sassi, the center's coordinator. "Besides the professionals, we also assist amateurs, even those who don't race on a team.

"We didn't open the center to the public strictly as a commercial venture," Sassi emphasizes. "Designing training programs, improving performance, and research fit right in with the Mapei Group's philosophy and their investment in research. Mapei is always looking ahead. We also assist many athletes who are not on the Mapei-Quick Step team. We're trying to bring down to the grass roots level the kind of sports training that up till now was exclusively for the benefit of top-ranked athletes."

Sassi works with Dr. Enrico Arcelli, Medical Director, Dr. Giovanni Ruffini, who assists the Mapei cycling team, Andrea Morelli, Franco Impellizzeri and Luca Guercilena, all graduates of the Sports Institute, and physical therapist Stefano Frassine. Among the services the Mapei Center offers is a sports medicine complex. Some of the tests performed measure percentage of body fat and maximum oxygen consumption. Other tests evaluate the athlete's anaerobic threshold to decide where adjustments are needed in his or her training program. There is also a biomechanical laboratory that handles non-medical testing, such as determining the optimal seat position. This corrects uneven pedaling that wastes energy. We design training programs using special software expressly developed here at the center.

"We also organize seminars and courses," adds Sassi. "Right now we're involved in a research study on the production of free radicals during



The engineering laboratory and rehabilitation equipment



Some shots of testing in progress at the Center



physical exercise with Prof. Fulvio Marzatico of the University of Pavia. The center collaborates with other major institutions and universities as well.

And it's not for cyclists only. We assist athletes in other sports, too. We're even doing evaluations on Italian Olympic contestants training for the Sydney games in the year 2000. We're open all year round, so give us a call if you'd like more information."



Tel. 39/ 0331/ 575757, Fax 39/ 0331/ 575700
E-mail: mapeisport@tin.it

A GAME PLAN FOR ALL INSTALLATIONS.

Whatever the environmental conditions, from frigid Finland to steamy Singapore, spectacular sports facilities have been built all over the world with products developed by the Mapei R & D Laboratories.

Mother Nature can be unpredictable. What can be done when a sudden heat wave threatens to accelerate the hydration of freshly poured concrete, preventing it from curing properly? Or when hardened concrete cracks during a freeze-thaw cycle?

No problem! Mapei has developed a range of products to cope with extremes of temperature and/or humidity, from anti-evaporating curing compounds, to plasticizing and air-entraining admixtures for concrete. When specified by well informed architects these materials can save time and money by getting the job done right the first time.

However, not every eventuality can be foreseen. Mapei also manufactures products to repair damage caused by the elements. Cracked screeds can be repaired by using epoxy adhesives, or crazing on flat concrete surfaces sealed with a fast-hardening cementitious levelling compound.

The huge heating and cooling systems used in multi-functional sports facilities make them subject to wide temperature variations: ice-skating rinks, heated swimming pools, saunas, steam rooms, etc. These changes in temperature require the use of flexible adhesives for floors and walls. The Mapei Research and Development Laboratories have come up with installation systems that work as well at -30° as they do at $+90^{\circ}\text{C}$. The following two articles illustrate a couple of the many arenas that have been built using Mapei products not only for installing the tracks, the courts or the playing floors themselves, but also behind the scenes, in the locker rooms, bathrooms, and restaurant kitchens of these facilities: in short, everywhere from the foundation to the roof.



▲ MULTI-FUNCTIONAL ARENAS

*The Fleet Center
Boston, USA*



ATHLETIC TRACKS

*The Olympic Athletic
Track and Field
Stadium - Sydney,
Australia*

SWIMMING POOLS

Hart Leisure Centre - Fleet, U.K. ▼

FITNESS CENTERS

*Changing rooms, sauna and steam rooms
Lanz Leisure Centre - Bournemouth, U.K. ▼*

SPORT CENTERS

Snack bar in the Reebok Sports Center ▼



THE HOME TEAM'S NEW HOME SWEET HOME

Le Centre Molson is Montreal's new multi-functional sports and performing arts center and home of the National Hockey League's Montreal Canadiens.

by Louis-H. Couillard and Natasha Calandrino



Have you ever been to Montreal during a blizzard? It can get pretty scary, especially if you're not crazy about ice, snow, and howling Arctic winds. Canadians are used to all that, so it's not surprising that ice hockey is the

national sport. Picture the city in mid-blizzard, totally paralyzed under two feet of snow so far, the streets and highways impassable and even the famous Montreal Metro knocked out of service.

Do you think tonight's hockey game will be canceled because the public can't get there? ARE YOU KIDDING? Montrealers will snowmobile there, ski there, sled there, skate there or snowshoe there rather than miss seeing the Montreal Canadiens NHL hockey team! "Les Canadiens" have been many times winners of the Stanley Cup, ice-hockey's ultimate trophy.

The Canadiens are owned by Molson Breweries, Canada's oldest, which are located in Montreal. For decades the team's home base was the venerable Montreal Forum. But in 1988 Ronald Corey, the President of the team, had a vision: a new home for the Canadiens that would be more than just another hockey arena. For more than 300 years the Molson family has contributed to the

artistic, historic and economic development of both Montreal and the Province of Quebec as a whole. Continuing this tradition, Le Centre Molson would endow not only hockey fans but the entire city with a multi-functional sports and performing arts center that would be easily accessible and centrally located in the core of downtown Montreal.

In 1991, the first zoning and permit studies were initiated and an agreement was reached with Marathon Realities, the sister company of CP Rail and fully owned subsidiary of CP LTD, for the 189,000 square foot (17,600 m²) CP Rail land site immediately adjacent to the old Windsor Station heritage building, a subway and mass transit terminal.

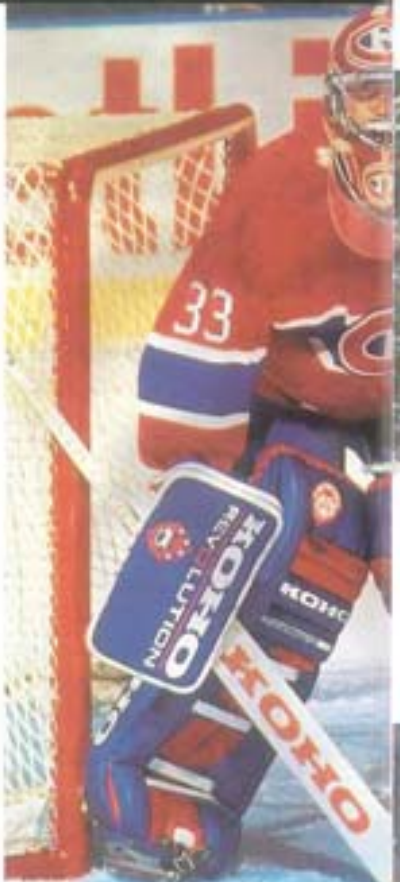
In 1993 plans were drawn up for the new 21,000 seat amphitheater hockey arena equipped with a fully automated retractable stage to accommodate such major musical and theatrical performances as the Rolling Stones, Pavarotti and Walt Disney Productions. All architectural services were provided by Les Architectes Lemay & Associés, a prominent local architectural firm with offices in Montreal and Quebec City.

PHOTO 1



Photo 1
Work begins on the new amphitheater

Photos 2 and 3
Some preliminary tests are performed on the damaged concrete floors before applying EPOBOND 30* (called EPORIP in Europe)





The main general contract, consisting of approximately 75% of the total cost, was awarded to

Magil Construction and the remaining 25% to Pomerleau, the two largest and most prominent construction firms in Montreal, for a global price of Can.\$172,000,000, not including the costs of demolition, excavation and other obligations which were contracted out separately for an additional \$28,000,000. Excavation and other preparatory work were started in October 1993.

During the winter of 1994-1995, just at the time when the concrete structural floors were being poured, an unfortunate and sudden severe cold spell hit the city, causing serious surface damage to some of the concrete floors. The damage was causing long delays, putting the already tight deadline for the completion date in serious jeopardy. They required the general contractor to call upon a specialized concrete flooring contractor, Les Planchers de Béton Candussi Ltée. of Montreal to come in and make the necessary repairs. While exploring the required corrective action,

Mike Candussi together with Alain Dion of Geroquip Inc, an important Mapei distributor, decided that the only solution to complete the work in time to meet the critical deadline was to use Mapei's EPOBOND 30 and PLANITOP 10 for thin surface repairs, and QUICKCEM TOP 102 and 202 where more important buildups up to 2" (50 mm) thick were required.

EPOBOND 30 (called EPORIP in Europe) is a two-part epoxy adhesive for new on old concrete and monolithic sealing of cracks and screeds.

PLANITOP 10 (called NIVORAPID in Europe) is a fast-drying cementitious leveling compound. QUICKCEM TOP 102 and 202 are cementitious mortars for surface repairs of damaged industrial floors. These products do not crack, even when they are not cured in moist environments.

Only when the contractors were sure that the floors were safe and reliable from a technical standpoint could the work proceed. The building is ten stories high and includes:

- 135 VIP boxes (Loggias) whose floors were clad with 6500 square feet ($\pm 600 \text{ m}^2$) of 6" x 12" (150 x 300 mm) Nero Impala natural granite supplied and installed by G. B. Ciot and Co. Ltd. using KERABOND + KERALASTIC



PHOTO 4



PHOTO 5



PHOTO 6



(called ISOLASTIC in Europe), a flexible adhesive for the installation of all types of ceramic tile and natural stone.

- 10,000 square feet ($\pm 930 \text{ m}^2$) of Dal-Tile's 1" x 1" (25 x 25 mm) mosaics and more than 25,000 square feet ($\pm 2,325 \text{ m}^2$) of Caesar's 8" x 8" (200 x 200 mm) and 12" x 12" (300 x 300 mm) porcelain tiles were installed throughout the building. All tiles, mosaics and granite were installed with Mapei products supplied by Ciot Imports, Ltd. KERABOND + KERALASTIC (called ISOLASTIC in



Europe) was used to set the mosaics which were then grouted with ULTRA/COLOR, a cementitious grout for joints 2 to 20 mm thick in ceramic and mosaic tile installations.

PHOTO 7



PHOTO 8



Photo 4
PLANITOP 10* (called NIVORAPID in Europe) is trowelled on to seal the surface cracks in the concrete

Photo 5
The surface is treated with EPOBOND 30* (called EPORIP in Europe) to improve bonding prior to repairing the cracks with QUICKCEM TOP 102*

Photo 6
QUICKCEM TOP 102* is applied to the concrete floor that was previously treated with EPOBOND 30 (called EPORIP in Europe)

Photo 7
Striking off the QUICKCEM TOP 102* and QUICKCEM TOP 202*



PHOTO 9

Photo 8
Float finishing the
cementitious mortar

Photo 9
Mosaic tiles in the
players' locker rooms
were grouted with
ULTRA/COLOR

Photo 10
Using a finishing
machine on the
concrete floors

Photo 11
6500 square feet (\pm
600 m²) of granite was
installed in the 135
VIP Loggias and
10,000 square feet of
porcelain tiles were set
in other areas of the
building using
KERABOND+
KERALASTIC (called
ISOLASTIC in
Europe)



PHOTO 10



Photo 12
ULTRA/BOND
ECO 185*,
ULTRA/BOND
ECO 200* and
ULTRA/BOND
ECO 500*, solvent-
free products with
virtually zero
TVOC content,
were used to install
carpeting

PHOTO 11

ULTRA/COLOR's special formula gives you tile joints that are perfectly uniform in color without the formation of surface efflorescence.

- All the Peerless carpeting and Vinyl cove base work throughout the building was done by Tapitec-Solflex with Mapei's ULTRA/BOND ECO 185*, ULTRA/BOND ECO 200* and ULTRA/BOND ECO 500*. The ULTRA/BOND ECO line for the installation of textile floor and wall coverings features solvent-free synthetic polymer-based products in water dispersion which have virtually zero TVOC content.

Two years and five months after the first shovel of soil was moved, Le Centre Molson was officially opened on March 16, 1996, just in time for the Stanley Cup playoffs of the 1995-1996 season. The players found that their facilities had more than doubled in their new home. "Nothing's been neglected to provide our Montreal Canadians NHL team absolute comfort, and it's normal, since our boys spend most of the hockey season here," declared Réjean Houle, the team's general manager. And nothing



PHOTO 12





TECHNICAL DATA

Project: Le Centre Molson, Montreal, QC, Canada

Built: 1993 to 1996

Commissioned by: Montreal Canadiens Hockey Club, owned by Molson Breweries Ltd.

Architects: Lemay & Associés

Contractors: Magil Construction and Pomerleau, Inc., Montreal

Sub-contractors:

Concrete repair: Les Planchers de Béton Candussi Ltée., Montreal

Ceramic tile and mosaics: National Ceramic & Granite Ltd., Montreal

Natural stone: G.B. Clot & Co. Ltd., Montreal

Carpet: Tapitec Solflex, Montreal

Mapei products used:

For the concrete:

QUICKCEM TOP 102*

QUICKCEM TOP 202*

EPOBOND 30*

PLANITOP*

For the ceramic tile installations:

KERABOND + KERALASTIC* (called ISOLASTIC in Europe)

KERAPOXY

ULTRA/COLOR*

For the carpet installations:

ULTRA/BOND ECO 185*

ULTRA/BOND ECO 200*

ULTRA/BOND ECO 500*

*Manufactured in North America

was neglected in providing the City of Montreal with a spectacular Sports and Performing Arts Center. Mapei wishes to join all the citizens of Montreal and Quebec in thanking and congratulating the Board of Directors of Les Canadiens and Molson Breweries for their vision. □



Louis H. Couillard is a consultant with the Mapei Technical Service at Mapei Canada Inc. headquarters in Laval, Quebec, Canada

**These products are manufactured by Mapei Canada Inc. and Mapei Corp (USA). Equivalent Mapei products are available in Europe, sometimes under different names.*

Photo 13

A Montreal Canadiens game in their comfortable new home



THE HARTWALL ARENA

Europe's most up to date multi-purpose sports and entertainment center was built at breakneck speed.

by Tommy Haru



PHOTO 1

The Hartwall Arena, a top entertainment venue, was recently opened in the Finnish capital of Helsinki (photo 1). The new stadium features a variety of high attraction events ranging from music to sports. International stars like Luciano Pavarotti, Jean-Michel Jarre, the magician David Copperfield and many others have already performed at the Hartwall and others, including Eric Clapton and a spectacular version of the opera Carmen are scheduled for the near future. The Arena was the venue of the Ice Hockey World Championships in 1997 and other sporting events. The multi-purpose hall, with its gross area of 34,000 sq m (371,324 sq ft), and volume of 315,000 cm³ (412,020 cubic yards), was built in only 18 months, from the first excavations to the finishing touches. The hall seats an average of 14,000 spectators and its overall project costs amounted to approximately 300 million Finnish marks. Some 40% of the financing came from the sale of private boxes, club seats and parking spaces.

Assembling the design team

The Hartwall Arena project had two clear main objectives. To build Europe's most up to date multi-purpose hall and complete it in time for the Spring 1997 Ice Hockey World Championship home matches. The project was set in motion by leasing the required site from the State. A Canadian consultant assisted with the preparation of the computer program for the space. When assembling the building design team, sufficient expertise in CAD design (Computer Assisted Design) was a mandatory prerequisite. Without it the design task could not have been completed in time.

Seppo Kilpia and Markku Valjento were selected as architects. From the start of the project, design and construction were carried out simultaneously.

Because the short tendering period failed to provide a satisfactory result, negotiations continued with the two most promising contractor candidates. A ceiling-priced project management contract concluded with the Multipurpose Hall Skanska-Palmberg Consortium stipulated that the designers employed by the Client would be retained for further planning during the contract period. In

the Contract Agreement, the Client was also bound to achieve cost savings with the Contractor according to the principle that increases in ceiling prices would not be accepted unless equivalent savings were found elsewhere, so as not to exceed the Client's overall budget.

The structure of the Hartwall Arena

The building sits entirely on excavated rock and rock in its natural state. The rock has been left visible in various places inside the hall. The floor plan is an ellipse 103 m (338 ft.) long, 133 m wide (436 ft.)

PHOTO 2





PHOTO 3

and 32 m (105 ft) high. The gross floor area is 33,900 sq m (364,866 sq ft) on six floors. The hall's frame is divided by expansion joints into four segments and the floor levels are precast concrete elements.

Mapei solutions for intensive construction

The project followed the so-called system unit procurement procedure, in which suppliers are responsible for both design and execution. The project was realized within approximately 24 months, an exceptionally tight design and construction time schedule. The foundation stone was laid in March 1996 and the job was completed in April 1997. This required an intense effort to complete work on the interior. Covering the interior floors and walls with ceramic tiles had to be done in just four months over a total area of 11,000 sq m (118,393 sq ft).

Tiling in public areas and private boxes

The hall walkways, lobbies and other public areas were covered with ceramic tiles. The total area of tile coverings on floors in public premises was 8000 sq m (86,104 sq ft). The tile chosen was a green 30x30 cm (12x12") fully vitrified tile from Grespor, supplied by Laattapiste Oy. (Photos 2 and 3). The installation substrate was prefabricated concrete which was leveled with NIVORAPID, a thixotropic cement based leveling mortar with ultra quick setting and hardening (Photo 4). Using NIVORAPID made it

PHOTO 4



PHOTO 5



PHOTO 6



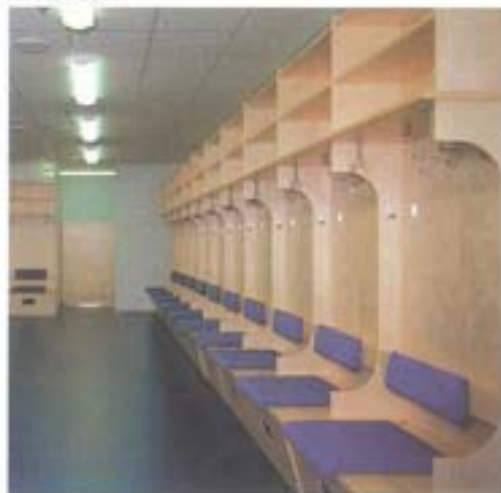
possible to begin the tile installation only 6 hours later. The tiles were laid with ADESILEX P4, the fast setting self back-buttering cement based adhesive for interiors and exteriors (Photo 5). The joints were grouted with KERACOLOR pre-blended cement based mortar. Using Mapei products was the perfect solution for managing the extremely intensive construction schedule.

The expansion joints were sealed with MAPESIL AC, a single-component silicone sealant for ceramic tile floor and wall installations. The easy workability and rapid curing of Mapei products were essential for the success of the tile setting project. Mapei's large variety of adhesives also provided the solution for areas in the Hartwall that would be heavily trafficked right from the early stages of construction. Setting tiles with KERAQUICK, the ultra fast-setting cement based adhesive for interiors and exteriors, enabled these areas to be ready for traffic only two hours after the tiles were laid. KERAFLEX SK (called LAATTAFLEX in Finland) powdered adhesive for installing ceramic tiles in interiors and exteriors was used to set the tiles on walls, staircases and steps (Photo 6).

Wall coverings in kitchens and rest rooms

10x20 cm (4x8") glazed wall tiles manufactured by Pavigres of Portugal were installed in the public rest rooms, 426 of them in all. The gypsumboard walls were waterproofed with PRIMER S, waterproofing primer in water dispersion for absorbtive

PHOTO 8



substrates. The tiles were set with KERAFLEX SK, and were grouted with

PHOTO 7





ULTRACOLOR special rapid setting and hardening cement based grout. The expansion joints were sealed with **MAPESIL AC**. The same products were used to install tiles in the numerous kitchens located around the Arena (photo 7). The tiled surfaces in the kitchens and rest rooms totaled 2,200 sq m (236,789 sq ft).



Bathrooms and locker rooms



A total area of 1700 sq m (18,297 sq ft) in the athletes' bathrooms and locker rooms were waterproofed with **MAPELASTIC** two-part cement based mortar for flexible waterproof protection of concrete after leveling the floors with **NIVORAPID**. **MAPELASTIC** was also used as a waterproofing membrane on the gypsum wall boards. 15x15 cm (6x6") glazed El Barco tiles were used on the walls and 10x10 cm (4x4") fully vitrified stoneware tiles from Cercom were used on the floors. The tiles were grouted with **ULTRACOLOR** special fast setting cement based grout and sealing the expansion joints with **MAPESIL AC** provided the finishing touch (Photo 8).



Ready for the audience in only four months



The project was a big success. Time and money were saved by using the best materials on the market for ceramic tile installations. The tile contractors, Laatta Mestarit, had a big job to do, and they rose to the occasion with Mapei products. The floor and wall coverings were completed right on schedule, just in time for the Hockey Championship's opening face-off.



Tommy Haru is Sales and Marketing Director of Heikki Haru Oy, exclusive Mapei distributors in Finland



PHOTO 9

The Technical Data Sheets for the products mentioned in this article are contained in Mapei Binder No. 1, "Ceramic Tile Installation Products".



TECHNICAL DATA

Project: Hartwall Arena Multipurpose Hall, Helsinki, Finland

Year of execution: March 1996 to April 1997

Architects: Kontio-Kilpiä - Valjento Oy

Contractors: Multipurpose Hall Skanska - Palmberg Consortium

Tile contractors: Laatta Mestarit, Äänekoski, Finland

Materials: (supplied by Laattapiste Oy)
Grespor fully vitrified ceramic tiles
Cercom fully vitrified stoneware tiles
Pavigres glazed single-fired ceramic tiles
El Barco glazed double-fired ceramic tiles

Project Coordinators: Heikki Haru Oy - Mapei distributor for Finland

Mapei products for the ceramic tile installations:

NIVORAPID
ADESILEX P4
KERAQUICK
PRIMER S
KERAFLEX SK**
ULTRACOLOR
KERACOLOR
MAPESIL AC
MAPELASTIC

*These materials are part of Mapei's European product lines

**KERAFLEX SK is specially formulated for Scandinavia

SEALANTS BEAT **THE BIG CHILL**

Repairing expansion joints in the screeds of a frozen foods warehouse took special hi-tech products, a few precautions and an ingenious stratagem.

by *Natasha Calandrino*

Even a polar bear might feel the cold in the arctic temperatures of one of Italy's largest frozen foods warehouses, the Frigoriferi del Nord in Trezzano sul Naviglio, near Milan. Major food companies store their frozen food items here before distribution to individual retail outlets. The temperature is kept at a constant -30°C (-30°F), so cold that no bacteria can survive (Photo 1). The employees who load and unload the merchandise can only work an hour at a time with half hour breaks in between to prevent the risk of serious damage to their health.

Under such extreme conditions materials themselves undergo molecular transformations, in that they become rigid and fragile. At the Frigoriferi del Nord fragility was exactly the problem that had to be solved. The heavy loads of



PHOTO 3



merchandise transported on forklifts in the intense cold formed cracks along the expansion joints in the concrete floor

(Photo 2). Making the repairs required a product that could bond strongly to the concrete, yet withstand the heavy warehouse traffic over time despite the extremely low temperatures. For this reason epoxy resin products were used that retain their physical and mechanical performance characteristics, permanently sealing the cracks in the joints.

First the degraded concrete was removed and the substrate scrubbed. It was then necessary to cover any traces of dust, consolidate the substrate and create the temperature conditions that would allow the epoxy resin to cross-link. Since the whole site could not be heated, a small tunnel-like structure was built to be placed over each section of the joint as it was being repaired. This was electrically heated to a temperature of $+30/35^{\circ}\text{C}$ (Photos 3 and 4). To consolidate the substrate and coat the dust particles, a bonding primer was needed that could penetrate deeply when brushed onto the substrate: EPOJET was used, an epoxy adhesive for new over old concrete that provides monolithic sealing of cracks in screeds and polymerizes without shrinkage. EPOJET has excellent dielectric properties and high mechanical strength

PHOTO 1

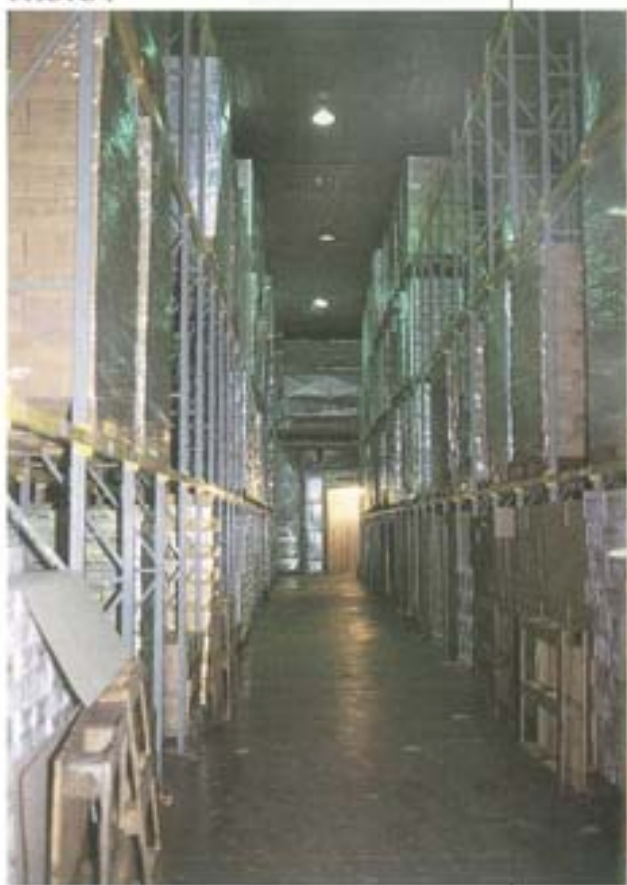


PHOTO 4



(Photo 5). Immediately afterwards the joint was reconstructed with KERAPOXY SP, a three-part epoxy sealant,

completely filling the joint that measured 15 cm (6") wide and 5 cm (2") deep (Photo 6).

Once the heated tunnel was removed, however, the joints would be exposed to a thermal shock of over 60°C (120°F), from +30/35°C to -30°C (from +92°F to -30°F) which could cause small shrinkage cracks in the seal. An ingenious stratagem was employed to compensate for any shrinkage of the material. Several cuts 2

PHOTO 5



PHOTO 6



or 3 cm deep were made into the surface with a razor blade in various spots along the length of the joints. Only 24 hours later tons of frozen food were once again rolling over them (Photo 7).

PHOTO 7



The Technical Data Sheets for the products mentioned in this article are contained in Mapei Binder No. 3, "Building Specialty Product Line".



TECHNICAL DATA

Project: Frigoriferi Del Nord
Trezzano Sul Naviglio, (Milan) Italy

Repaired: 1997

Contractor: ICBM di Bertazzi, Assago, (MI) Italy

Architect and Project Coordinator: Ing. Giuseppe Biondi, Milan, Italy

Coordination: Mapei Technical Service

Repair products:^{*}
EPOJET
KERAPOXY SP

^{*}These materials are part of Mapei's European product lines

GENOA SAILS ON

When Genoa's most famous citizen, Christopher Columbus, discovered the New World, he unwittingly set in motion the long, slow decline of his native city. For world commerce shifted from the Mediterranean basin and the rich maritime republics which controlled it, Genoa and Venice, to the new centers of the Atlantic trade, Portugal, Spain, England and Holland.

The old center of Genoa is contained within the boundaries of the former city walls that were built in 1300. It contains more than 113 hectares (279 acres) with 2,300 buildings divided into 13,000 dwellings in a tight network of narrow streets and alleyways. During the 1970's as shipping declined in the port of Genoa and new buildings went up on the surrounding hills, predominantly public housing projects, the city center began to lose population rapidly when it was already in need of renewal. In the last 30 years the buildings have continued to decay along with the social fabric. The lively city that had attracted celebrated travelers from Petrarch to Rubens through the centuries for its art and culture had become a sadly neglected ghetto.

The comeback

Happily things are starting to turn around in Genoa and Mapei products have played their part in the transformation. Mapei has long paid special attention to remodeling and urban renewal which naturally constitute a large market for construction materials. Modern technology, including formulas developed in the Mapei research laboratories, provides innovative methods and products for building the new and remodeling the old that would have been unthinkable only ten years ago. Following are four articles dealing with the Genoa of today, a city struggling to reinvent itself by reclaiming its dying urban core in what is hoped will be the catalyst for an economic and social comeback for the whole city.

The recently built Genoa Aquarium and the "City for Kids" described in the following pages may remind American (among other) readers of the Baltimore Inner Harbor renewal project and its contribution to the successful revitalization of that port city. Genoa hopes to do the same, as restoration (an example of which is described in "Restored to Life") spreads block by block into the old city, sparked by the new attractions in the harbor. The first article deals with the remodeling of an important element of modern Genoa's infrastructure, Christopher Columbus Airport.

A NEW DISCOVERY FOR Christopher Columbus

Christopher Columbus Airport in Genoa, Italy, discovered how to install a new granite floor in record time without interrupting the flow of passengers

by Natasha Calandrino



PHOTO 1



PHOTO 2



Doing renovations in public buildings can be problematic: if you put in a new floor without closing off the premises, it usually means a tough job for the installers, and if you shut down to make getting the job done easier, you inconvenience the public. How can you keep everybody happy? In the majority of cases the old floor has to be demolished to make way for the new one. However there are circumstances, like the one described below, where removing the old floor is not necessary. A new floor can be simply

installed over the old one if the proper precautions are taken to make it bond perfectly.

Avoiding inconveniencing passengers at all costs was the main goal of officials at Genoa's Christopher Columbus Airport. They were dissatisfied with the terminal's badly worn rubber flooring and needed a solution that combined fast installation with long lasting results.

Bonding granite over rubber

To avoid blocking traffic in the terminal, the new flooring had to be installed directly over the old rubber flooring. An adhesive was needed that would bond strongly to both the old rubber floor and the new 30x60 (12x24") Sardinian granite tiles, an adhesive that would perform equally well with the two different materials. Mapei technicians recommended a solution that would meet this prerequisite and enable terminal traffic to continue



PHOTO 3



unimpeded while significantly shortening installation time. This was KERALASTIC, a two-part polyurethane adhesive that was ideal for installing the granite tiles directly over the rubber. KERALASTIC forms a flexible film without shrinkage that could absorb the movement of the granite over the rubber, as well as that caused by the substantial vibration to which the airport terminal is subject. After removing the surface wax and scrubbing the rubber with water and caustic soda, a layer of KERALASTIC was trowelled on (Photo 1), over which 7,000 sq m (75,341 sq ft) of Sardinian granite was laid (Photo 2).

wide. It is ideal for heavy traffic areas because of its high mechanical strength, easy cleanability, and excellent resistance to aging.

Record time without inconvenience

The granite floor was installed in record time and, most importantly, without inconveniencing the public. The excellent results were achieved not only thanks to an expert team of installers, but to time saving, high performance products (Photos 4 and 5).

The Technical Data Sheets for the products mentioned in this article are contained in Mapei Binder No. 1, "Ceramic Tile Installation Products".



TECHNICAL DATA

Project: Christopher Columbus Airport, Genoa, Italy

Remodeled: 1995 to 1996

Contractors: VGM; Reggio Emilia, Italy

Project coordinator: Enrico Grassi, Mapei

Materials: Sardinian granite

Mapei installation products*:

- KERALASTIC
- MAPEFOAM
- MAPEFLEX PU21
- KERACOLOR LARGE GRAIN

*These materials are part of Mapei's European product lines

Grouting the granite and sealing expansion joints

Such a large floor required the creation of expansion joints. The proper sizing of these joints was the first precaution to be taken. The size was calculated based on the rule that the maximum potential movement should amount to less than 10% of the width of the joint. After the joints were formed they were filled with MAPEFOAM, a compressible polyethylene foam cord that prevents the sealant from adhering to the bottom of the joint, taking full advantage of its flexibility.

The joints were then sealed with MAPEFLEX PU21, a two-part self-leveling polyurethane sealant (Photo 3), whose flexibility absorbs the movement in the joint. MAPEFLEX PU21 is recommended for use in heavily trafficked areas. The entire floor was then grouted with KERACOLOR LARGE GRAIN, a pre-blended cement based grout for joints 4 to 15 mm



THE GENOA AQUARIUM

Built above and below the water line in the Old Port of Genoa, the city's aquarium has become one of Italy's most popular tourist attractions and the centerpiece of the rebirth of "Genoa The Proud"

by *Natasha Calandrino*



Designed by the architect Renzo Piano and his Building Workshop the Genoa Aquarium is Europe's largest marine park. The aquarium is located in the Old Port of Italy's largest harbor (almost 50 km!) and is home to 500 species of fauna, including more than 5000 specimens of fish, reptiles, amphibians, mammals, birds and insects. The complex was inaugurated during the 1992 Columbiad games in honor of the 500th anniversary of the discovery of America. Since then it has undergone continuous expansion as it rides the wave of its instant success. After the Vatican Museums and the archaeological excavations at Pompeii, the Aquarium is Italy's third most popular tourist attraction. It recently joined forces with the adjacent (propeller-less) "Nave Italia", or "The Good Ship Italy" to form a single integrated complex. Of the complex's 63,000 cubic meters (82,404 cu yd), 28,000 m³ (36,624 cu yd) are located on two floors beneath the water line that feature bio-tanks and service areas. The 35,000 m³ (45,780 cu yd) above contain the exhibits and retail spaces. (Photos 1 and 2).

A million and half visitors a year admire the acrobatic dolphins, the charming penguins and the splendidly colored sea turtles. Such a large influx, many of whom are children, required a durable floor surface that could stand up under the heavy traffic on the two floors of exhibition space. Installing 13,000 square meters (139,919 sq ft) of carpet tiles required a setting system that would give the flooring stability, preventing slippage that could create unsightly buckling, with the added danger of tripping. These concerns were addressed by using MAPEFIX, a permanent tack adhesive in water dispersion which is not inflammable and contains no harmful

substances (Photo 3). These last two considerations were especially important in a public space like the Aquarium. Practical considerations like maintenance led to the choice of carpet tiles installed with this special adhesive. The high flow of people eating ice cream and sipping soft drinks while filing in front of tanks containing monk seals or piranhas inevitably cause the carpet tiles to wear out. Because MAPEFIX has permanent



tack, the worn tiles can be replaced easily. When it dries, the MAPEFIX film retains its adhesiveness, so the carpet tiles can be removed and replaced as many times as needed (Photo 4).

The Aquarium shops

In the former "Mercantile Republic" commerce was not about to be neglected. Souvenirs of scary sharks and cute sea horses (according to several American studies, there is nothing better for calming the nerves than gazing into an aquarium), T-shirts, books, videocassettes and other items are sold in the shops on the mezzanine level which runs along the water line the entire length of the Aquarium complex. Being right on the waterfront, where salt air is especially hard on construction materials, was a factor to be taken into consideration. Marble agglomerate tiles, made of natural stone fragments mixed with a minimum amount of structural polyester resin (approx. 94% marble, 6% resin) required a rapid setting and curing adhesive system to prevent the somewhat moisture sensitive tiles from absorbing the mix water. 1,500 square meters (16,146

sq ft) of agglomerate marble flooring were set with GRANIRAPID, a two-part adhesive that met these requirements. It gave the tiles high dimensional stability and the surface was ready for traffic after only 3 hours. After carefully cleaning the concrete substrate, a thin layer of GRANIRAPID was applied (Photo 5) over it. The 124x30 cm (48"x12") tiles were back-buttered to obtain 100% transfer of the adhesive and placed on the still fresh layer of GRANIRAPID (Photo 6).

Approx. 3 to 4 hours later the tiles were grouted with KERACOLOR, a cement based grout with water-repellent additives and synthetic resins that is highly resistant to moisture. The expansion joints in the marble tile flooring were sealed with MAPEFLEX, a two-part polyurethane sealant whose special formula does not stain and makes it water resistant (Photo 7).

The Genoa Aquarium installation was a success because a team of installation professionals used innovative products that were developed through high quality research.

Photo 1
The Genoa Aquarium,
Europe's largest
marine park.

Photo 2
A few of the
Aquarium's 50 tanks.
Photos 3 and 4
Installing carpet tiles
required a setting
system that would
give the flooring
stability, preventing
slippage that could
create unsightly
buckling, with the
added danger of
tripping



PHOTO 4



Photo: Paolo Gazzoni





The Technical Data Sheets for the products mentioned in this article are contained in Mapei Binder No. 1, "Ceramic Tile Installation Products" and No. 2, "Resilient Flooring Installation Products".



PHOTO 5

Photo 5
The agglomerate marble tiles used for the floors in the shops on the Aquarium's mezzanine were installed with GRANIRAPID which gave the tiles high dimensional stability. The floor was ready for traffic in only 3 hours.

Photo 6
Installing the agglomerate marble tiles



PHOTO 6

TECHNICAL DATA

Project: The Genoa Aquarium

Year of construction: 1992

Year of remodeling: 1997

Architect: The Renzo Piano Building Workshop

Carpet tiles installed by: Luigi Tozzi, Villasanta, Milan, Italy

Project Manager: Alessandro Riboli

Coordinator: Enrico Grassi - Mapei

Materials: Interface Heuga carpet tiles
Stone Italia agglomerate marble tiles

Product for carpet tile installation*:
MAPEFIX

Products for agglomerate marble installation*:
GRANIRAPID
KERACOLOR
MAPEFLEX PU21

*These materials are part of Mapei's European product lines

RESTORED TO LIFE

How using a dehumidifying mortar in the restoration of a four hundred year old building in Genoa eliminated rising damp.

A phenomenon that is unfortunately a frequent occurrence in many old buildings is the moisture that rises from the foundations to the upper levels through capillary action in the masonry. Rising damp is one of the major causes of deterioration in buildings. This problem is usually treated superficially, using techniques and materials that are suitable

PHOTO 2 for modern buildings but are deleterious to older ones. High-tech restoration systems are needed to remove the moisture from the masonry. Macroporous mortars allow the moisture in the masonry to evaporate yet have the mechanical strength of the materials once used in the past.



PHOTO 3



Using dehumidifying mortar for vapor-permeable masonry

The restoration of the façade of the four hundred year old building built by the Spinola family was performed using exactly these hi-tech materials (Photo 1). The damage to the building caused by rising damp in the masonry was extensive.

For this

reason a line of products was selected that has been specifically formulated for the restoration of period buildings. These materials feature mechanical performance characteristics that are similar to the "antique" mortars used in the past, yet they are resistant to chemical and physical attack and have strong dehumidifying properties.

After the old lime putty



PHOTO 1



rendering was removed the stone masonry was scrubbed thoroughly and cleaned with compressed air to remove any residue. The demolition uncovered the anchor rods which were treated as follows (Photo 2): to transfer the load from the anchor rods to the masonry a layer of MAPEGROUT THIXOTROPIC mortar with controlled shrinkage was applied. To protect the anchors from attack by atmospheric agents they were treated with MAPEFER after removing the rust (Photo 3). They were then covered over with MAPEGROUT THIXOTROPIC.

Then the entire façade was covered with MAPE-ANTIQUÉ MC fiber-reinforced dehumidifying mortar. It was applied in several coats to reach the desired thickness. The façade was then finished with MAPE-ANTIQUÉ FC fine mortar for period buildings. Using these mortars was recommended because they are vapor-permeable and resistant to chemical and physical aggression. They also have mechanical properties that make them compatible with weak substrates like old masonry, thus preventing the mortar from separating or cracking (Photo 4). Mapei solutions preserve the past for the future.

The Technical Data Sheets for the products mentioned in this article are contained in Mapei Binder No. 3, "Building Specialty Product Line".



TECHNICAL DATA

Project: Building in via XXV Aprile, Genoa, Italy

Built: 1588

Restored: 1997

Contractor: Edil-Franco, Genoa
Project Manager: Geom. Alberto Ranucci
Coordinator: Enrico Grassi, Mapei

Products used for the restoration*:
MAPEFER
MAPEGROUT THIXOTROPIC
MAPE-ANTIQUÉ MC
MAPE-ANTIQUÉ FC

*These materials are part of Mapei's European product lines.

GENOA: A SAFE CITY

A space for kids that combines play with science and technology

In a part of town that figured importantly in the history of Genoa, the Old Port, some former cotton warehouses have been converted into a space where children can develop their creativity by learning through play. La Città dei bambini (the City for Kids) is the largest space ever developed in Italy for children aged 3 to 14 where learning and play are combined in a new dimension. The idea was adapted from the concept developed in the Cité des Sciences et de l'Industrie in Paris La Villette, France. La Città dei bambini features several itineraries and is animated by specialized guides. It offers younger children the opportunity of experiencing group play and developing their powers of observation, while the older ones can discover science, physics, communications and motion with the help of technology and interactive games (Photos 1 and 2).

There were two challenges to be met in designing the complex: the former warehouses, remodeled by the Renzo Piano Building Workshop, were completely open spaces. They had to be subdivided into different smaller spaces through which the various itineraries would wind. At the same time the design had to come up with an overall unifying spatial concept that enveloped play areas, learning areas, and other sections that were very different the one from the other.

Dividing up the space led to the design of an itinerary whose starting point leads to a large area for 3 to 5 year olds. This segues into the "Experiences" and "Wonders" sections for the 6 to 14 year olds. A unifying visual and spatial concept was expressed through the selection of the interior design materials.

A bold color scheme for the flooring created a recognizable itinerary (Photo 5). The carpet's background color is blue, the color of the sea, to inspire tranquility and well-being. On this background big orange bubbles of inlaid carpet define

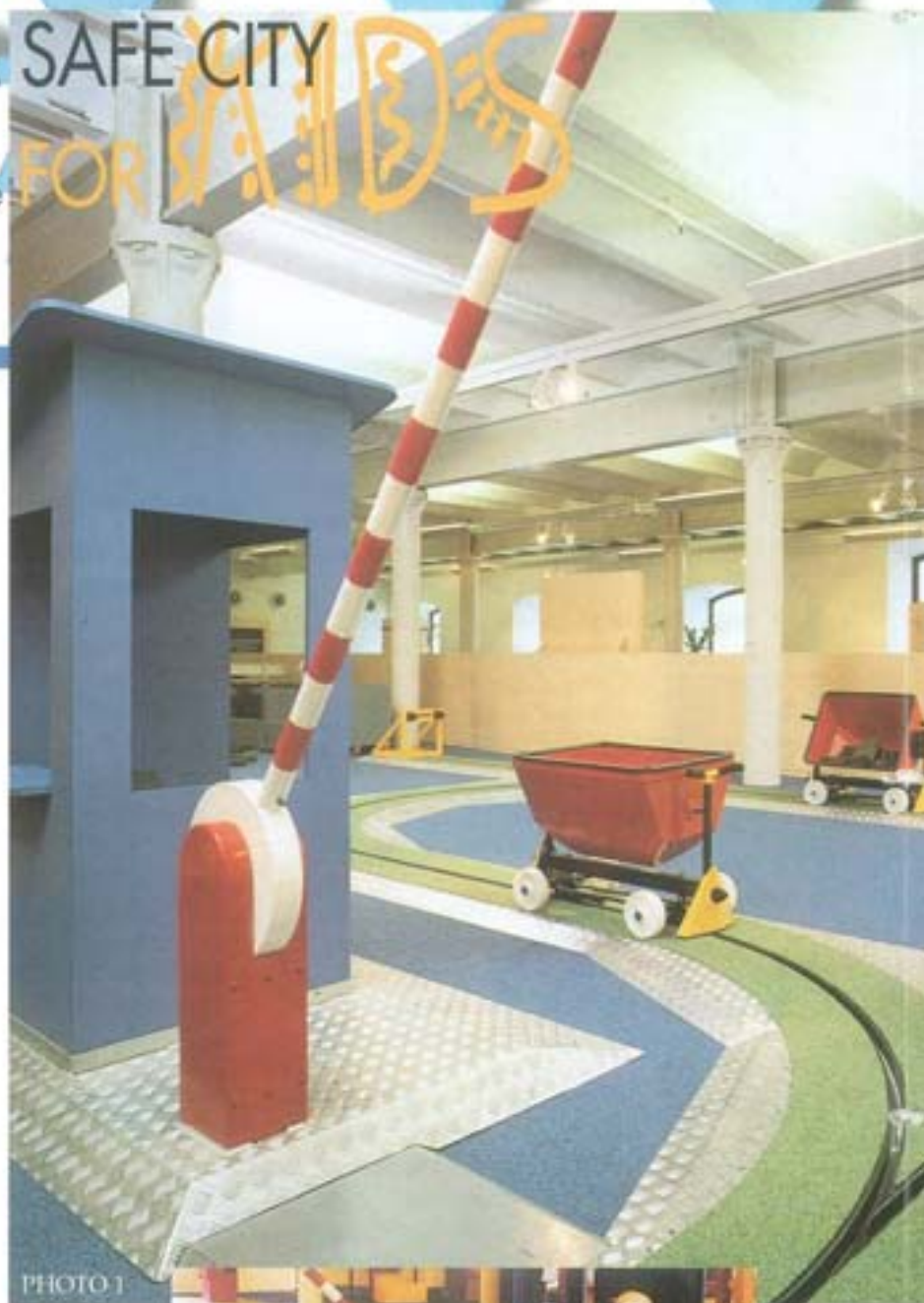


PHOTO 1



PHOTO 2

areas where the children can pause and socialize. Little paths, also orange, branch out from these, marking other turnings. The play of colors is an effective means of visual communication that simultaneously organizes and unifies the space.

Carpet tiles were selected for the flooring. Using carpet in a heavily trafficked space like this one might seem a dubious choice. But an examination of

Photos 1, 2 and 5
The space in the Città dei bambini designed for younger children





Photos 3 and 4
Installing the carpet tiles with MAPEFIX permanent tack adhesive in water dispersion. When the adhesive dries, the carpet tiles can be pulled up and replaced as many times as needed.



the flooring a few months after the opening (and 2,000 children a week) proved the decision to have been the right one. The floor always looks terrific because the carpet tiles can be replaced as soon as they are damaged or wear out. Nothing could be easier, because the carpet tiles were installed with MAPEFIX (Photo 3). After it dries, this adhesive in water dispersion doesn't lose its tack, so the tiles can be replaced at will. (Photo 4). And so easily, in fact, it's child's play. □

The Technical Data Sheets for the products mentioned in this article are contained in Mapei Binder No. 2, "Resilient Flooring Installation Products".



TECHNICAL DATA

Project: Città dei bambini, Genoa, Italy

Year of construction: 1992

Year of carpet installation: 1997

Architects: Renzo Piano Building Workshop

Carpet installers: Paviservice srl, Milan, Italy

Project Manager: Alessandro Riboli

Coordinator: Enrico Grassi - Mapei

Material: Interface Heuga carpet tiles

Carpet installation adhesive: MAPEFIX*

*MAPEFIX is part of Mapei's European product lines.



PHOTO 5

UNDERGROUND ART: THE ROME METRO

by *Natasha Calandrino and Sandro Sigismondi*

When in Rome, as the saying goes, do as the Romans do: take the Metro, and while you're down there, take in the Rome Metro Art project. You'll not only beat the traffic, you'll be treating yourself to a permanent exhibition of very modern art expressed in a very ancient medium: mosaic. During the Jubilee of the Year 2000, two million modern pilgrims are expected to pass through this underground "museum", in addition to the Metro's normal ridership.

The project

The Rome Metro Art project was sponsored by the Nestlé Corporation to create original works of art for 13 stations of the capital's Metro system rather than merely "beautifying" them with ordinary decorations. Piero Dorazio, who conceived the project and was its artistic director, chose mosaic as the medium, taking his cue from Gino Severini, the futurist artist who used the technique of the mosaic to interpret the language of modern painting. 70 internationally known artists took part in the project including Kenneth Noland, Emil Schumacher, Enrico Castellani, Beverly Pepper, Shu Takahashi, Joe Tilson, Bruno Ceccobelli, Rupprecht Geiger, Lucio Del Pezzo, Gottfried

Honneger, Luigi Veronesi, Mikhail Koulakov, Antonio Passa, Lossonczy Tamas, Paolo D'Orazio, Lee Doo Shik, Vittorio Martino, Karl Gerstner, Ulrich Urban, Giuseppe Uncini, Giulia Napoleone, Nicola Carrino, Heinz Mack, Graziano Marini, Francois Morellet, and Carla Accardi.

The mosaic travels full circle

The ancient Greeks called the art of the mosaic, "musaic"

(μουσαϊκον), because they considered it "the patient art, worthy of the Muses". It takes a lot of patience indeed to create a picture out of thousands of tiny pieces of natural stone, terracotta or glass cemented to a solid surface. The Romans later adopted this art form and the mosaic tradition continued, along with the Roman Empire, for hundreds of years. In the 4th century A.D. the Emperor Constantine made his new capital at Byzantium in the East

(later Constantinople, modern Istanbul), while the capital in the West was moved from Rome to Milan (short for Mediolanum, where then, as now, adhesives for setting mosaics were manufactured). In the 6th century, a hundred years after the West had fallen to the barbarians, the Byzantines attempted to reconquer Italy. They established a beachhead at Ravenna, where they brought artists who created what are arguably the world's most famous and spectacular mosaics.

They can still be seen there today, and it was in Ravenna that the mosaics for the Rome Metro Art Project were fashioned in the workshops of the Sicis company. The mosaic tradition had traveled full circle.

The expert artisans at Sicis handcrafted the artworks with a material originally developed by the Venetians, who took Byzantine artistry one step further. They invented a new process for making glass (known, logically enough, as Venetian or

PHOTO 1



PHOTO 2



PHOTO 3



PHOTO 4



PHOTO 5



adhesive system that is particularly flexible and resistant. In 24 to 48 hours it forms a flexible film without shrinkage that is watertight and resistant to aging. (Photos 3 and 4). The tiles were then grouted with a system that met the requirements of the project by making the joints flexible yet watertight, using KERACOLOR cement based grout

Murano glass) and started using it for mosaics. Sisis created a glass-body mosaic called "Murano enamel mosaic" for the Rome Metro as the material of choice, rather than using small ceramic tiles or vitreous mosaic, because of its strength and durability.

Installing the mosaic on panels

Bringing modern art to the Rome Metro was made possible by modern technology. The purpose of this architectural installation (for the project was structural and not just decorative) was to let great artists express themselves through the use of innovative materials. Setting the mosaics in the workshops and mounting them on panels, along with installing mosaic backgrounds directly onto the walls in the 13 Metro stations, all required the use of setting systems and techniques that were particularly strong, safe and fast.

The mosaics were first executed by the artists in Ravenna (Photo 1), then separated into sheets of various sizes and transported to Rome, where they were assembled and mounted on sandwich panels of aluminum alloy and extruded polystyrene. After mechanically fixing the metal panels to the station walls (Photo 2) the Murano enamel mosaic sheets were bonded to them with adhesives. The size of the sheets and the strong vibrations in the Metro system required the use of an especially flexible adhesive that could absorb small movements in the structure. KERALASTIC was used, a polyurethane



PHOTO 6

modified with FUGOLASTIC additive (Photo 5). The art was then given added shine with KERANET (Photo 6), an acid cleaner for ceramic tiles that eliminates stains and efflorescence as effectively as much stronger acids (like muriatic, hydrochloric, sulfuric acid, etc.) without emitting dangerous fumes.

Installing the mosaic backgrounds

The Murano enamel mosaic backgrounds were applied in 30x30 cm (12"x12") grids on gypsum, plaster and



PHOTO 7



PHOTO 8



Photos 12, 13 and 14 show a few of the finished stations

PHOTO 9



PHOTO 10



cement backerboards in all of the 13 stations (1,675,080 tiles were used for the backgrounds in the Coliseum station alone). After thoroughly removing old paint, the surfaces were treated with PRIMER G, a synthetic resin based primer used for surface preparation to improve the adhesion of the mosaic tiles.

The background tiles were set with GRANIRAPID, the adhesive system with fast setting and hydration, the product of advanced Mapei technology (Photos 7 and 8). GRANIRAPID is a two-part adhesive system whose extraordinary bond strength and fast drying action deliver finished results almost instantly (Photo 9). Using GRANIRAPID made it possible to complete the job quickly without inconveniencing the daily comings and goings of thousands of passengers. Here, too, the joints were grouted with KERACOLOR admixed with FUGOLASTIC elasticizing admixture (Photos 10 and 11) and cleaned up with KERANET.

PHOTO 11



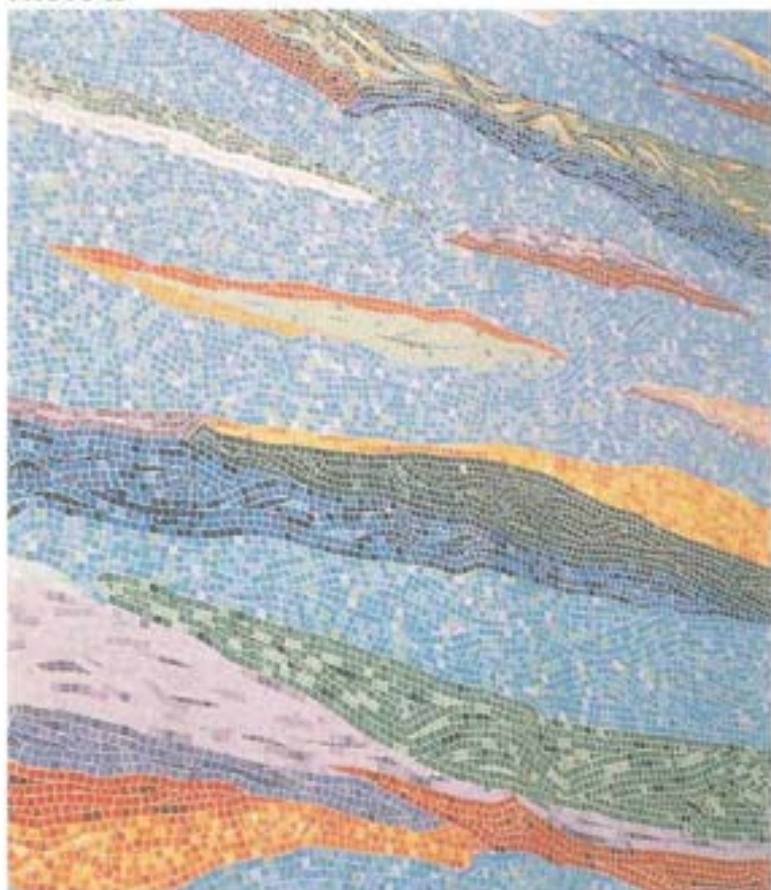
Craftsmanship and technology

With the avantgarde products furnished by Mapei, the artists and their

PHOTO 12



PHOTO 13



materials were shown to best advantage and almost 2,200 square meters (23,500 sq. ft) of mosaic were installed in record time. The challenge of combining an ancient art with modern technology was successfully met to the benefit of the entire community, thanks to the commitment and the cultural sensitivity of the companies that took part in the project.

A project worthy of the Muses! □

The Technical Data Sheets for the products mentioned in this article are contained in Mapei Binder No. 1, "Ceramic Tile Installation Products"



TECHNICAL DATA

Project: ROME METRO

13 stations, sponsored by The Nestlé Corporation:
Colosseo, Piramide, Ottaviano, Eur Fermi, Anagnina, Magliana, Bologna, Flaminio, Vittorio Emanuele, Barberini, Re di Roma, Spagna, Numidio Quadrato

Design: Arte Metro Roma

Commissioned by:

The City of Rome
ATAC CONTRAL (Rome Public Transport)
The Nestlé Corporation

Year of execution: 1996 to 1997

Designer and Artistic Manager: Piero Dorazio

Asst. Director and Co-ordinator: Paolo D'Orazio

Execution of mosaics: Sicis, Ravenna

Installers: Edil Pav di Sandro Sigismondi, Monte S. Giovanni Campano (FR)

Coordinators: Pino Mancini and Renato Soffi, Mapei S.p.A.

Materials: Murano enamel mosaic – Sicis

Mapei products used to mount the mosaics on metal panels: *

KERALASTIC
KERACOLOR + FUGOLASTIC
KERANET

Mapei products used for setting the mosaic backgrounds: *

PRIMER G
GRANIRAPID
KERACOLOR + FUGOLASTIC
KERANET

*These materials are part of Mapei's European product lines.

PHOTO 14



The Ducal Palace of Sassuolo

Avantgarde technology and in-depth chemical analysis of the original building materials resulted in a superb restoration that enabled this splendid monument to be opened to the public.

by *Natasha Calandrino and Carlo Rossi*

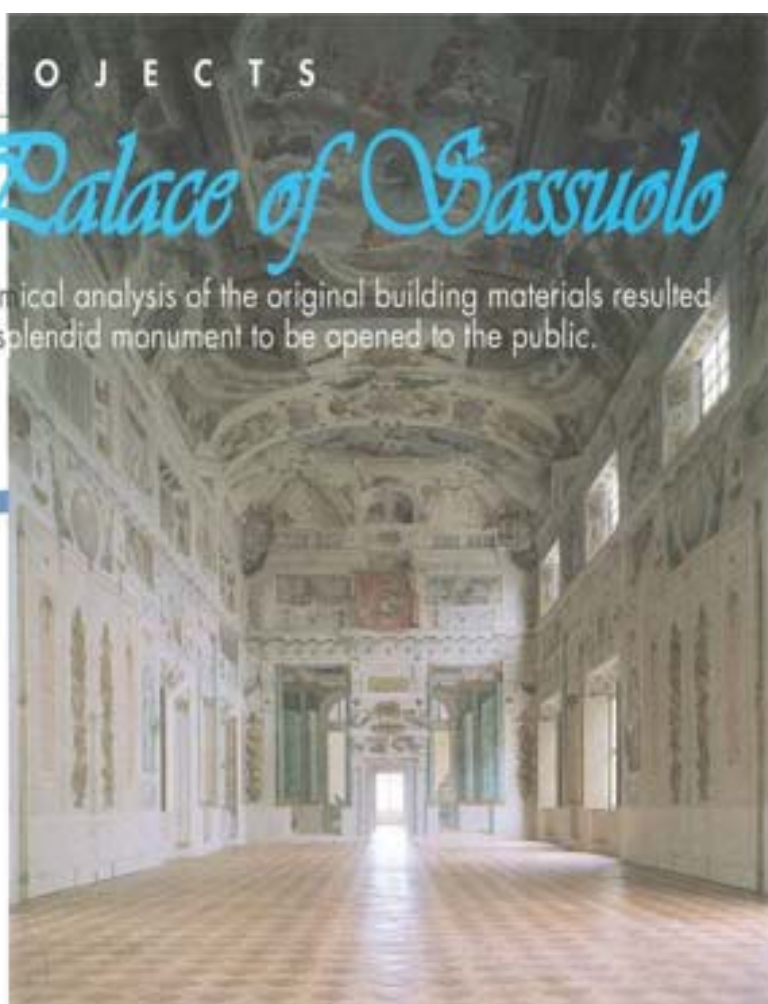
The Ducal Palace of Sassuolo is one of the most beautiful treasures of Northern Italian baroque. It was originally built as a small castle in the Middle Ages and later became a holiday retreat of the Dukes of Este. In 1598 Duke Francis the First transferred the capital of his Duchy to Modena and made plans to transform the nearby castle of Sassuolo into a showplace for his court.

The task of remodeling the old chateau fell to Bartolomeo Avanzini, a leading exponent of Roman baroque architecture, and the set designer Gaspare Vigarani, who began work in 1634. The existing building was completely altered and was redesigned as a three-story palace surrounded by formal gardens, an enormous park, stables and a fish pond (the "Fontanazzo"). Jean Boulanger, the court painter,



executed the spectacular frescoes of the vast ducal apartments.

The vicissitudes of the succeeding centuries were not kind to the palace but the structure was preserved intact. Although it had fallen into neglect it still retained much of its old grandeur. In 1987 the palace was removed from the jurisdiction of the Ministry of Defense and came under that of the Ministry of Cultural and Environmental Resources.



A committee was formed to coordinate the ten-year restoration project that culminated in the recent opening of the palace as a museum.

Restoring the floors: a winning collaboration

The restoration of the Ducal Palace of Sassuolo, sponsored by the Ministry of Cultural and Environmental Resources under the direction of the Superintendence of Artistic and Historical Resources of Modena and Reggio Emilia, included a painstaking restoration of the palace floors that had deteriorated with the ravages of time.

The seventeenth century flooring of the main floor, the "piano nobile", of the Ducal Palace was wholly restored with hi-tech products.

The Emilceramica, Mapei and Fila companies combined forces in a truly unique collaborative effort of preservation and restoration. The technical problems posed by the total state of disrepair of the antique floors made an interdisciplinary approach indispensable, with each

company contributing its own research facilities, materials and know-how. The criteria which characterized every aspect of the restoration were in-depth chemical analysis of the original materials and a faithful historical reconstruction of the techniques originally used, as required by the strict parameters of the Ministry for Cultural Resources.

Investigating the materials

In order to determine the criteria for the best restoration techniques to adopt in restoring the terra cotta floor to its

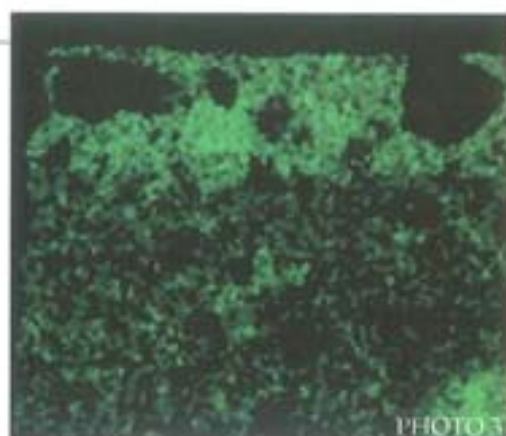
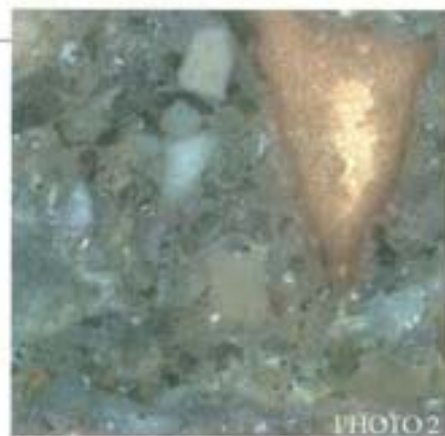
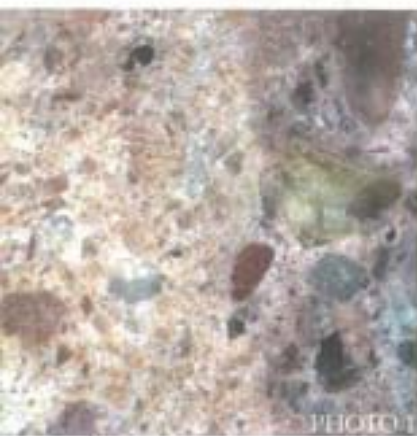


Photo 1
A "collar" 0.2 to 0.3 mm thick composed predominantly of calcium carbonate is visible on the surface of the terracotta tile. The collar is caused by lime in the mortar bed that migrates into the body of the tile itself and subsequently carbonates

Photo 2
Morphological analysis – EDAX mapping of calcium distribution (80x). The surface collar contains more calcium than the body of the tile. This confirms that the calcium has penetrated into the tile from the mortar

Photo 3
Morphological analysis under the optical microscope. The structure of the mortar appears continuous, though heterogeneous. Analysis revealed numerous micro- and macro-cavities evenly distributed throughout the matrix.

original luster, the state of preservation of the materials had to be evaluated. A preliminary examination was performed on the mortar and terracotta tiles used in building the palace. Some cracked and otherwise damaged pieces were to be restored while others would have to be replaced with new tiles, handmade like the old ones. The Mapei Laboratory examined samples from the Ducal Palace with the most sophisticated instruments, such as the SEM, the scanning electron microscope, and XRD, X-ray diffraction.

The mortar's state of preservation was determined by the soluble salt content which turned out to be very low, indicating that it had held up well. The mortar was a system originally composed of common lime mixed with primarily siliceous aggregate and "reactive silicates", e.g. clay. It developed its mechanical strength through a chemical reaction, the carbonation of the common lime, a process which occurred over the course of centuries. This long span of time, however, allowed the lime to penetrate approximately 200µ into the

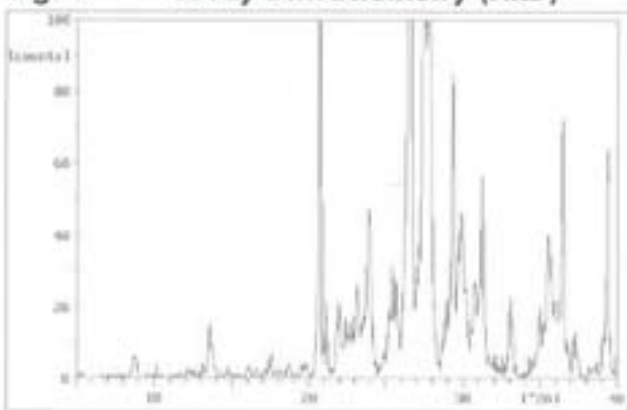
tiles before carbonating, forming a rich surface "collar" of carbonate that caused the area where the mortar interfaced with the tile to shift to the inside of the tile itself, thus weakening it. Common lime, even if mixed with "pozzolanic" materials, damages the structure of terracotta if it is not quickly converted into calcium carbonate.

The tiles analyzed showed they were composed primarily of silica with a low calcium carbonate content, a composition very similar to that of modern materials. The chemical analysis data showed they were similar to tiles fired at high temperatures with a "vitrified" body. The low amount of salts contained in the tiles was also an indication of a good state of preservation. This scientific investigation into the nature of the original materials enabled precise indications to be given as to the selection of products to be used for the restoration.

The restoration

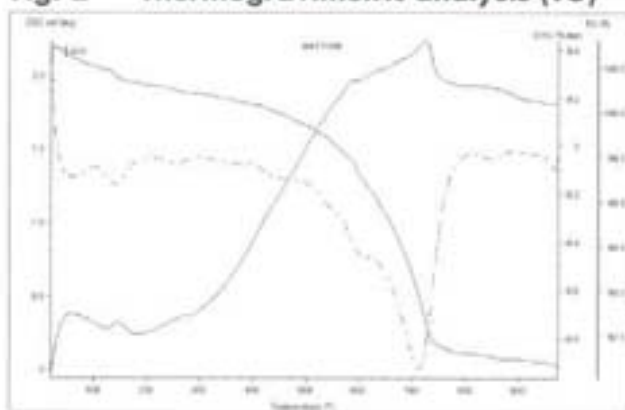
Restoration of the terra cotta was performed using products from the MAPE-ANTIQUE line of mortars for period buildings. These mortars feature

Fig. 1 X-ray Diffractometry (XRD)



The analysis shows the presence of quartz, sodium and potassium feldspar, diopside and small amounts of calcite, along with traces of the original clay (illite), confirming the predominantly silicate nature of the terracotta

Fig. 2 Thermogravimetric analysis (TG)



This analysis also confirms the siliceous matrix of the terracotta which is approx. 6% calcite. (Data and photos courtesy of the Mapei R&D Laboratories Milan - Italy)

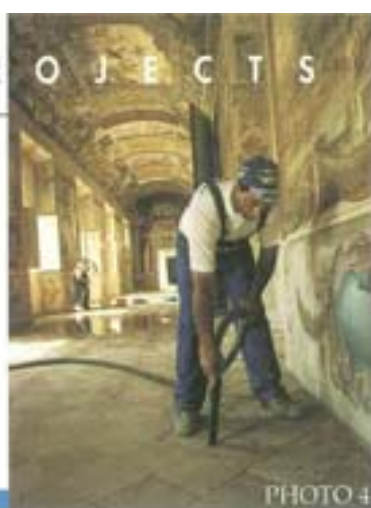


PHOTO 4



PHOTO 5

mechanical performance similar to that of "antique" mortars. Morphological analysis of the binders in MAPE-ANTIQUE mortars shows characteristics very similar to those of the original mortar. The photograph taken with the electron microscope shows the rounded structure typical of a "stabilized" system. These characteristics are a direct result of the low lime content in the MAPE-ANTIQUE system, where the concentration of lime is already minimal after only one week.

The rapid elimination of lime prevents it from penetrating into the tiles, thus eliminating the "collar" of calcium carbonate that causes the tiles to become fragile and crumble. Moreover, the low amount of salts in the formula makes the MAPE-ANTIQUE system insensitive to chemical and physical attack, retaining the physio-mechanical characteristics, the porosity and the vapor-permeability of antique pozzolan lime mortars.

The MAPE-ANTIQUE system, based on special hydraulic binders and natural sand, is especially resistant to sulfate salts, one of the major causes of degrading in period buildings. Compared to the original mortars present in the Ducal Palace, the mortar systems for period buildings of the MAPE-ANTIQUE line are so hard as to be virtually indestructible when exposed to the aggressive natural agents that gradually but inexorably caused the flooring in the palace to degrade. Despite their intrinsic porosity and the mechanical "delicacy" similar to the original mortar used in the Palace, the mortars of the MAPE-ANTIQUE line are chemically and physically insensitive to attack.

Repairing the terracotta tiles

After a thorough cleaning of the surface (Photo 4), restoration of the damaged tiles was performed with MAPE-ANTIQUE

FC/R fine-textured brick-colored finishing mortar, for cracks up to 2 to 3 mm wide, and with MAPE-ANTIQUE CC brick-colored mortar for larger size cracks (Photo 5).

Installing new tiles

Approximately 340 m² (3,660 sq ft) of new flooring had to be installed because some of the terra cotta was so damaged that it could not be repaired. New terra cotta tiles were fired with exactly the same mixes and techniques used in the past. They were set with GRANIRAPID, a two-part adhesive system formulated in the Mapei Laboratories (Photo 6). GRANIRAPID sets and cures extremely fast and is extraordinarily resistant to the aging and the vibrations caused by heavy visitor foot traffic.

The entire floor of the "piano nobile" of the Ducal Palace, 1171.65 m² (12,610 sq ft) of restored tiles and 340 m² (3,660 sq ft) of new tiles, was grouted with MAPE-ANTIQUE FC/R after the joints were scraped (Photo 7).

Cleaning, finishing and protective treatments were done by Fila. Manual applications of various Fila products gave the flooring highly effective protection against staining and heavy visitor foot traffic (Photo 8).

A majestic inauguration

On 12 September 1998 the Ducal Palace of Sassuolo was inaugurated in the presence of the former Italian premier Romano Prodi, The Commander of the Military Academy, Major General Gaetano Romeo, the Mayor of Sassuolo, Laura Tosi, Regional Councilors Luigi Gili and Ferruccio Giovanelli, and the Superintendent of Artistic and Historical Resources of Modena and Reggio Emilia, Jadranka Bentini, along with numerous visitors who admired the spectacular restoration (Photos 9 and 10).

The Ducal Palace of Sassuolo was reopened to the public after its 17th century floors were painstakingly restored. The inauguration was attended by prominent cultural and political figures. Photo 10 shows Dr. Jadranka Bentini (center), Superintendent of Artistic and Historical Resources of Modena and Reggio Emilia, leading the guests on an inaugural tour of the palace.





PHOTO 6



PHOTO 7



PHOTO 8



PHOTO 9

An added attraction was an exhibit of 83 drawings from the vast Este art collections, half of which were lent by the Louvre Museum for the celebrations of Modena's 400th anniversary of its elevation to capital city status.

The restoration of the floors of the ducal apartments was the last step in the long restoration process. The public was finally able to walk through those magnificent halls, thanks to the pooled resources of Emilceramica, Mapei and Fila, three companies that share a commitment to

scientific research, avantgarde technology and painstaking historical research. □

Our thanks to Dr. Laura Bedini of the Superintendence of Artistic and Historical Resources of Modena and Reggio Emilia for her invaluable cooperation.

Carlo Rossi is the Mapei representative for the Emilia Region.

The Technical Data Sheets for the products mentioned in this article are contained in Mapei Binder No. 1, "Ceramic Tile Installation Products" and No. 3, "Building Specialty Line".



TECHNICAL DATA

Project: The Ducal Palace of Sassuolo

Built: First half of the seventeenth century

Completion of restoration: 1998

Sponsored by: The Superintendence of Artistic and Historical Resources of Modena and Reggio Emilia in collaboration with The Superintendence of Architectural and Environmental Resources of Emilia

Project Manager: Dr. Jadranka Bentini and arch. Luciano Serchia

Contractor: Immobiliverde s.r.l., Apecchio (Pesaro) Italy

Materials: original terracotta tiles and Emilceramica hand made terracotta tiles (26x26 and 33x33 cm)

Mapei Products used for the repair and grouting of the original tiles:*
MAPE-ANTIQUE FC/R
MAPE-ANTIQUE CC

Mapei Products used for setting and grouting the new tiles:*
GRANIRAPID
MAPE-ANTIQUE FC/R

*These materials are part of Mapei's European product lines.



PHOTO 10

INDUSTRIAL CERAMICS AT SIMCER '98

A special session of the International Symposium on Ceramics, organized in cooperation with Mapei, was devoted to the subject of installing ceramic tiles.

The ninth edition of SIMCER, the International Symposium on Ceramics, was held at the Bologna Convention Center last October 5th to 8th. SIMCER is an international technical and scientific conference for people involved with ceramics on every level, consumers, scholars, contractors, installers, technicians, manufacturers, designers (of systems, components, buildings), et al. The theme of this ninth edition was "Industrial Ceramics", i.e. "traditional" widely used ceramic products that are industrially mass produced in technologically advanced plants with large production capacities.

Industrial ceramics include ceramics for use in construction, such as tiles for floor and wall coverings, brick, sanitary-ware, ceramics for use in the home, such as dishware, and ceramics for industrial use, e.g. refractors. The focus of the Symposium was on quality in the ceramics industry, referring not only to the technical and esthetic quality of ceramic tiles but also to the planning and

execution of ceramic tile installations. The latter was the theme of a special SIMCER session held on October 6th that was organized in cooperation with Mapei and entitled "Installing ceramic tiles", chaired by Giorgio Squinzi, the President of Mapei and of Federchimica, the Italian Federation of Chemical Manufacturers.

Giorgio Timellini of the Ceramic Center of Bologna and Giorgio Roncan of Mapei opened the proceedings with a discussion of international standards for setting materials and their influence on industry policy. They were followed by Prof. Mario Collepari of the University of Ancona with a report on new developments in screeding for ceramic tile floors.

Potential problems with tiling in hot, humid environments like Singapore were related by C.W. Wong of Setsco, Singapore. Problems and solutions in waterproofing tile installations in interiors and exteriors were discussed by E. H. Nolting of the Floor and Wall Covering Research Institute (Untersuchungs und Beratungsinstitut für Wand und Bodenbeläge). Mapei's Tiziano Cerulli described a special analysis of the mechanisms of tile/adhesive bonding as related to the microstructure of materials and ambient conditions. The session ended with a talk given by R.M. Reed of GTC-Geotek on methods for testing and evaluating materials. For more details, contact the Ceramic Center of Bologna at (Tel.) 39/051/51534015 or (Fax) 39/051/530085. □



THE STANDARDS FOR CERAMIC TILE ADHESIVES AND GROUT

by Giorgio Roncan

The European Union standards for ceramic tile setting materials and grout have finally arrived. After the final meetings held in mid-1998 the CEN TC67 WG3 work group, which handled adhesive and grout standards, and the CEN TC 67 WG4 work group, which covered tile installations in general, handed over the latest standards to the CEN secretariat.

The WG3 definitively approved the last standard still under discussion, the pr EN 12004 "Adhesives for tiles - Definitions and specifications". This was the last of over 400 documents drafted by the WG3 and it contained several innovations. Briefly summarizing the salient points, adhesives were classified on the basis of their chemical composition:

cementitious adhesives	type C
dispersion adhesives	type D
reactive resin adhesives	type R

Various levels of minimum requirements were established for each of these types of adhesives to comply with the EN 12004 standard and thus be authorized to display the EC symbol on the label. For the first time two categories of adhesives were defined: those used under normal conditions (with precise minimum requirements) and those used under special conditions, e.g. exterior cladding or high traffic surfaces (with higher minimum requirements, referred to as "enhanced adhesives").

Another innovation was subdividing the individual types (C, D, R) into classes according to their performance characteristics so as to make them easy to identify and select:

normal adhesives	class 1
enhanced adhesives	class 2
quick-setting adhesives	class F
non-slip adhesives	class T
adhesives with extended open time	class E

The standards dictate what information must be carried on the packaging: the name of the product, its manufacturer, the product's identification code, the shelf life and storage instructions, the type and class of adhesive (as described above), and exact instructions for preparation and application, along with specifying the field of application (e.g. interiors, exteriors, walls, floors, etc.).

The TG67 WG3 finally filled a big gap by finishing the "grout for tiles" standards. Four testing standards were defined to identify the following characteristics: resistance to abrasion, shrinkage, compressive and flexural strength, water absorbency and chemical resistance. "Definitions and specifications" were listed, as they were for adhesives, and these materials were also grouped by chemical composition:

cementitious grout	type CG
reactive resin-based grout	type RG.

CG materials were in their turn divided into two classes:

normal cementitious grout	class 1
enhanced cementitious grout	class 2

The latter class covers products with high resistance to abrasion and low water absorbency. These products must also have clear information on the packaging regarding preparation, application and field of application.

The CEN TC 67 WG4 work group recently published its final version of the "Guidelines for planning and executing ceramic tile installations". Addressed to architects and installers, the standard contains instructions regarding all the steps required for proper installation in interiors and exteriors. It defines the materials to be used, the types of substrates and their requirements, and provides exact instructions for planning and executing the installation, either with adhesives or a bed of sand and cement. The requirements for complying with the standard are specified, including the appearance of the tiles, level surfaces, straight joint lines, leveling and waterproofing.

An ISO work group (ISO 189 WG3) was set up over a year ago to prepare worldwide standards for adhesives and grout for ceramic tiles. The group has already met several times. So far progress has been positive and the members are hopeful that they will finish their work relatively quickly, keeping in mind that the ISO commissions only meet twice a year at most. The new ISO standard will incorporate much of the findings of the CEN TC67 WG3 work group, taking into consideration, however, the needs of countries outside the European Union.

For those interested, details on the testing methods for adhesives are available in English through UNI; Via Battistotti Sassi 11b, 20133 Milan, Italy, Tel. 39/ 02/ 700241 - Fax 39/ 02/ 70106106. The testing methods for grout will also be available shortly. □

The CEN TC67 WG3 work group is chaired by Giorgio Squinzi (Mapei); the CEN TC67 WG4 group is chaired by Spencer Ford (H&R Johnson) and the ISO work group by Craig Hamilton (Mapei Corp USA).

Giorgio Roncan is Mapei's Technical Assistance Manager and Secretary of the TC WG3 work group.

® MAPEFONIC SYSTEM

This certified minimal thickness sound control system for isolating impact noise on ceramic tile and stone flooring was developed in the Mapei research and development laboratories for residential, commercial and industrial installations.

by Francesco Stronati

Soundproofing floors in homes offices, hotels, hospitals, schools, museums, etc. is a very common problem, and one that is often difficult to solve, especially when remodeling. Conventional soundproofing methods involve laying acoustical insulation directly on the concrete slab, and then screeding for the new flooring installation. Because acoustical insulation is composed of compressible layers, they require a screed at least 4 to 5 cm thick with welded mesh reinforcing. Such thicknesses are often impossible in new or existing installations. The thickness of the substrate can be even more problematic when



developed the **®MAPEFONIC SYSTEM**, the minimal thickness sound control system (total 9.5 mm) that allows you install new ceramic tile or stone flooring directly over it with a significant reduction in noise. The **®MAPEFONIC SYSTEM** reduces impact noise by $\Delta_{LW} = 17.6$ dB (tested in compliance with ISO 169/6 standards) and the new floor is ready for traffic only 24 hours after installation. The system is composed of:

installing ceramic tiles over existing ceramic tile flooring in residential remodeling. To solve the problem, Mapei, in collaboration with Siplast,

- **floor covering**
Ceramic tile, terra cotta, stone.
- **substrate**
Existing flooring or new cementitious screed.



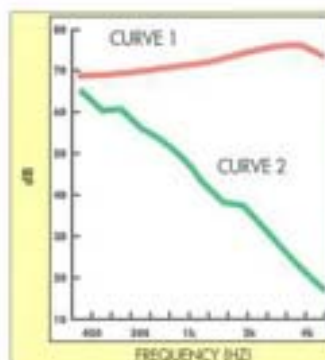
Applying MAPEFONIC PAD over MAPEFONIC GLUE



Spreading MAPEFONIC MORTAR on MAPEFONIC PAD



Laying ceramic tiles over MAPEFONIC MORTAR



The graph compares the noise levels generated by a standard impact machine recorded in a room situated below an area with a reinforced concrete floor, Curve 1, and the same concrete floor over which the MAPEFONIC SYSTEM has been applied, Curve 2

®MAPEFONIC SYSTEM

Certified according to:
Certificate No. 31697-01
Performance data:

Avis Technique C.S.T.B. 13/97-709
Galileo Ferraris Institute of Turin
Noise reduction Δ_{LW} : 17.6 dB;
Noise level index
in standard impact test L_{iNW} : 59.4 dB

Performance levels comply with ISO standards: 140-6: 1978
140-8: 1997
717-2: 1997

• **Mapei products**

This system consists of a kit containing five Mapei products for the installation of 24 m² of flooring and acoustical insulation (divisible in units of 6 m²):

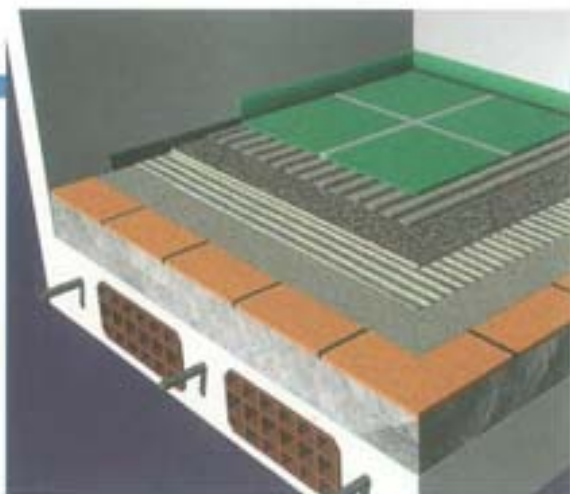
• **MAPEFONIC STRIP:**

Adhesive tape to place around the edges of the floor to prevent sound transmission.

• **MAPEFONIC GLUE:** Acrylic water dispersion adhesive for installing MAPEFONIC PAD.

• **MAPEFONIC PAD:** Filled bituminous acoustic tiles (500 x 500 x 9.5 mm.) with fiberglass reinforcing and composite sound-absorbing cushion back.

• **MAPEFONIC MORTAR:** Ultra-fast setting cementitious adhesive



The "MAPEFONIC SYSTEM" installed over existing flooring

walls. Apply the MAPEFONIC GLUE, then lay the MAPEFONIC PAD, placing the joints of the pad installation diagonally to the joints in the flooring. About two hours after installing the MAPEFONIC PAD, set the ceramic tiles with the MAPEFONIC MORTAR. The width of the joints should be

calculated by the size of the tiles, but not less than 2 mm. Grout the joints with MAPEFONIC GROUT. Then set the baseboards over a length of MAPEFONIC STRIP folded back up over the edge of the surface of the flooring. This prevents sound from being transmitted to the structure of the building which would weaken the effectiveness of the

insulation.

Use MAPESIL AC or MAPESIL LM to seal the joints between the baseboards and the flooring. The "MAPEFONIC SYSTEM" for soundproofing is certified by the Galileo Ferraris Institute of Turin and complies with the Avis Technique C.S.T.B. 13/97-709. The system's performance also



Grouting with MAPEFONIC GROUT



Installing baseboards: fold the MAPEFONIC STRIP back up over the edge of the surface of the flooring. Remove the excess MAPEFONIC STRIP with a cutter



for installing ceramic tiles and moisture-stable stone directly over the MAPEFONIC PAD.

• **MAPEFONIC GROUT:** special fast-setting grout for filling joints in the ceramic tile flooring.

The MAPEFONIC SYSTEM is extremely easy to install. Remove the protective plastic film from the MAPEFONIC STRIP and place the tape around the base of the



complies with ISO standards 140-6: 1978, 140-8: 1997, 717-2: 1997. □

Francesco Stronati is a consultant with the Mapei Technical Service at the Milan, Italy, headquarters.

The Technical Data Sheet for "MAPEFONIC SYSTEM" is contained in Mapei Binder No. 1, "Ceramic Tile Installation Products".



CRYOGENIC CONCRETE

Renovating a liquefied natural gas plant necessitated a battery of laboratory tests to choose the right materials and a special admixture for preparing concrete to withstand extremely low temperatures.

by Gianluca Bianchini, Gianni Bebi, Giovanni Canetta, Domenico Ferrari and Filiberto Finzi

PHOTO 1



Photo 1
A view of the renovated plant

Photo 2
Building the piles for the foundations

Photo 3
Starting to cast the outer wall

PHOTO 2



The Italian National Gas Monopoly, "Snam", recently renovated its re-gasification plant in Panigaglia in the Gulf of La Spezia. Here liquefied natural gas (LNG) arrives by sea and is then transformed back into the gaseous state by a simple heating process before being channeled into the national gas network.

The Panigaglia plant, designed in 1971 to receive LNG from Libya, was modernized to allow SNAM access to more widely diversified sources and to comply with current international regulations (API 620, BS 7777):

The project prerequisites

The renovation was performed by PDM of Pittsburgh, Pa., USA. The plant consists of two tanks, each of which holds 50,000 cubic meters (65,400 cubic yards) of liquid methane at a temperature of approximately -160°C (-290°F). Plans for renovating the two tanks were drafted by the Center for Structural Analysis of Milan and included:

PHOTO 3



PHOTO 4



Photo 4
Positioning and anchoring the precast beams

Photo 5
Detail of the dense network of reinforcing

Photo 6
Cryogenic tests on concrete samples taken from the casting

- Building a foundation of pilings for new exterior walls. These were designed to give the new walls independent foundations to prevent them from resting even partially on the foundations of the tanks;
- Building prestressed reinforced concrete walls around the tanks to contain potential LNG leaks from the inner tanks (double containment) and to protect the tanks from external accidents (fire, explosion, impact, earthquake, etc.);
- Building a platform on the roof of the tanks to support the pipeline of the liquefaction system. Because the roof could not support heavy loads, this platform was cantilevered over the new prestressed reinforced concrete wall.

Drawing by Fotob for Snam

PHOTO 5



Precautions also had to be taken to make the concrete resistant to atmospheric aggression. The plant is on the seashore and is exposed to freeze-thaw cycles. According to European regulation ENV 206 it is exposure class 4b. In addition, the soil contains a high level of sulfates.

The concrete was required to have a static mechanical resistance of 40 N/mm² and a resistance of 15 N/mm² when the forms were removed after 24 hours. To place the concrete correctly and prevent the formation of gravel nests caused by the dense network of reinforcing,



PHOTO 6

the concrete had to be workability class S4 (16-20 cm / 6-8" slump) after pumping. The concrete would have to retain that workability for at least 60 minutes because of the long time it would take to place it.

The laboratory tests

A battery of lab tests was performed both at ambient and at low temperatures to measure the behavior of the fresh mix, along with the mechanical strength and the cryogenic performance of the hardened concrete, i.e. its ability to maintain its mechanical properties substantially intact after exposure to the temperatures of the LNG storage tanks (-167° C / -302° F). During this preliminary stage two types of cement were tested: Cem III/B 32.5 and Cem II/A-D 42.5 with a minimum microsilicate content of 7%. Aggregate from three different quarries in the area was also analyzed along with the superplasticizing (or hyperplasticizing) admixtures of four different manufacturers.

The following tests were performed to determine the choice of the components

PHOTO 7



*Photo 7
This quarry was chosen to supply the aggregate for the concrete*

*Photo 8
Work progresses on the two tanks simultaneously*

and the classification of the mix design:

- Analyses of various aggregates to verify their compliance with UNI 8250 Class A standards;
- Analyses of various cements and water;
- Performance of admixtures;
- Selection of proportion and grading of aggregate;
- Trial mixes;
- Mechanical strength tests at various ages;
- Testing for permeability;
- Resistance to freeze-thaw cycles;
- Cryogenic and thermal shock tests in liquid nitrogen.

Choosing the admixture

The tests led to the choice of a Cem II/A-D 42.5 silica fume cement in compliance with European regulations ENV/UNI 197 and the adoption of a water/cement ratio of 0.40 - 0.42. This water/cement ratio resulted in an effective mechanical strength that was always higher than 60 N/mm² and in some cases even reached 80 N/mm². To maintain the required workability MAPEFLUID X404 was used, an acrylic based hyperplasticizer specially formulated for concrete with low loss of workability and high mechanical strength. Simply by varying the dose of MAPEFLUID X404, quality concrete could be placed winter and summer until the

PHOTO 8



project was completed. The almost 9,000 cubic meters (11,770 cubic yards) of concrete required for the walls around the tanks were produced in the eight month period between January and August of 1996. It is interesting to note that the effective dose of MAPEFLUID X404 was always lower than the one prescribed in the lab tests.

An air entraining agent created microbubbles of air in the mix for resistance to freeze-thaw cycles. Besides the normal samples taken as required by law, cylindrical samples were collected by coring while the work was in progress to corroborate the findings obtained during the testing of the mix. □

On the opposite page, a SEM electron micrograph: the concrete matrix is so compact that it looks like glass



PHOTO 10



*Photo 9
Taking core samples for cryogenic testing*

*Photo 10
A detail of the core samples*

*Photo 11
The project as it nears completion*

The Project Committee

Snam obliged the contractors submitting bids to provide for testing and analysis at laboratories of their choosing, using samples selected by the contractors but subject to Snam's control and corroboration. A Project Committee¹ was formed to formulate an alternate mix design. The Committee engaged the Technobase company to design and test the mixes and the Ismes company of Bergamo for the cryogenic testing. The Committee worked with the University of Pisa (Prof. Bartelletti), with Engineer Tognon as a consultant; CTG (Engineers Ursella, Cangiano and Ginmenez); Ismes (Dr. Viglieno and Dr. Comassi); and Italcementuzzi (Geom. Canco and Dr. Mazzenga).

¹Engineer Giovanni Canetta: technical coordination, liaison with production and project management. Gianni Bebi: alternate mix design, supervision of testing and technical controls during casting. Engineer Domenico Ferrari: technical consultation. Engineer Filiberto Finzi: supervision of cryogenic testing.

Cryogenic concrete

Cryogenic concrete is defined as that used in structures designed to withstand low or very low temperatures. It is used almost exclusively for liquefied gas storage tanks. Concrete is by nature an extremely heterogeneous material whose component parts have different physical and chemical properties. Their volume is also variously

composed: 65% aggregate, 27% cement, 3% water, and 5% air. Even if the paste formed by cement, water and air can be considered to be substantially homogeneous, the aggregate consists of several different kinds of material. We know something about the variation of water crystals at -100°C and much research has been done on cement. How air expands is also a known quantity. The aggregate, however, is an unknown commodity and only in rare cases is it

homogeneous. Moreover, the behavior of concrete at temperatures between $+80^{\circ}\text{C}$ and -20°C is well documented, whereas it is impossible to determine in advance and with any certainty how (and how much) dimensional variations of the individual components affect cement mixes at temperatures below -100°C .

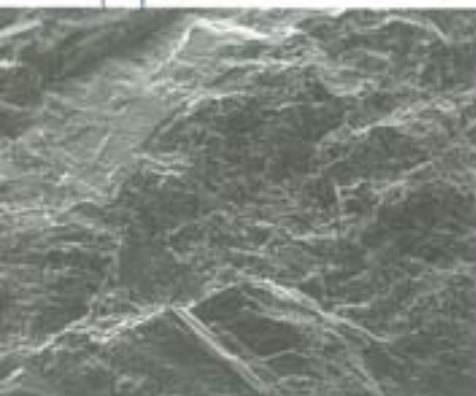


Photo: Laboratorio R&D Mapei



PHOTO 11

Gianluca Bianchin is the sales and technical Mgr. of Mapei S.p.A.'s Admixtures Division.

The technical data sheets for the products mentioned in this article are contained in Mapei Binder No. 4, "Admixtures for Mortar and Concrete".



TECHNICAL DATA

Project: LNG Plant, Panigaglia, La Spezia, Italy

Built: early 1970's

Renovated: 1996

Commissioned by: Snam SpA, Milan, Italy

Project Supervisor: Snamprogetti SpA, Milan

General Project Planner: PDM Inc, Pittsburgh, Pa, USA

Civil planning and Project Management: CeAs Centro di Analisi Strutturale Srl, Milan

Research/mix-design: Technobase, Pallazzolo S/O

Contractors: Co.E.Stra SpA, Florence
Soc. Edilizia Tirrena, La Spezia

Concrete manufactured by: Italcementuzzi SpA, Milan

Technical consultant: Gianluca Bianchin, Mapei

Admixture for concrete: MAPEFLUID X404*

* MAPEFLUID X404 is part of Mapei's European product lines

THE

DURABILITY METER

by Mario Collepardi

With the advent of European Union standards, the durability of structures in reinforced concrete and prestressed concrete has become an important criterion and in some respects is of more a determinant factor than its resistance. Unlike resistance, the durability of concrete cannot be directly measured without exhaustive long-term testing in aggressive environments to measure its behavior over time.

However, no durability meter exists as of yet that we can stick on a beam or a column to form an instant judgement of the material's performance in the long run. Until someone invents one, the commission of experts that gathered to draft the European Union standards* for the durability of concrete adopted an empirical approach. Based on observation deriving from over a century of experience in a given aggressive environment (soil, sea, high mountains), all structures with a water/cement ratio above a certain critical value have a high probability of their concrete degrading within 50 years. Consequently the commission of experts first identified and classified the principal types of environments (environmental exposure classes) and then established strict limits for the w/c ratio, following the general principle that the more aggressive the environment, the lower the limit for the w/c ratio, so as to guarantee the durability of the material.

It should be emphasized that the w/c ratio is a not insignificant economic factor, because reducing it costs money: in fact, to reduce it one has to decrease the parameter represented by the numerator (w), or increase the denominator (c), or both, which is more effective. Each of these operations has a



Cartoons from the Walt Disney Mickey Mouse Collection 145, with our thanks

cost. Reducing the amount of water means adding a plasticizer to compensate for the slump loss in the mix caused by reducing the water. Increasing (c) obviously means increasing the cement content. It follows that to go from just any old concrete to durable concrete (with a very well defined limit to the w/c ratio dictated by the European standards) can potentially (but not necessarily) mean higher costs. Without going into technical details that we have published previously [1], we can hypothesize two situations:

A) Structures that, besides requiring durability, require a low w/c ratio to develop high mechanical strength. Reinforced and prestressed concrete structures fall into this category as well as almost all precast reinforced and prestressed concrete elements whose R_{ck} is generally from 30 to 50 MPa. Their w/c ratio has to be low (0.55 to 0.45), and is almost always equal to, or lower than, the limit set for obtaining durable concrete even in very aggressive environments. It's obvious that for these structures the extra cost for the level of durability dictated by the EC standards is nil, because in order to give the concrete the required mechanical strength, it has to be prepared with a low w/c ratio, which gives it the required level of durability as well.

B) Structures that do not require high mechanical strength because of their light static load (e.g. floors, tunnels, etc.). Here the concrete has to be prepared with a low cement content, i.e. a high w/c ratio. Even if the static and dynamic stresses on these structures are negligible, the moment they are in an aggressive

environment (rain, frost, salts, etc.) they are subject to other types of stresses (erosion, formation of ice, corrosion of the reinforcing, etc.). To resist these stresses, the mix water has to be reduced and the cement content increased to bring the w/c ratio in line with the limit set by the regulations.**

Basically, the concrete has to be rendered less porous, less penetrable by atmospheric agents and thus less vulnerable to aggressive environmental attacks. Changing the w/c ratio in order to increase the durability of the material is reflected in increased costs and also in increased R_{ck} , even though the latter is not required for static purposes.

How much more does this durability cost? Rarely more than 1.1% of the total cost for infrastructure projects exposed to

= 187,500 lire (\$107.00), which is less than 0.2% of the total cost of the condo unit. We mentioned earlier that durability costs more: in this case it came to 0.2% more. However, it would be more appropriate to refer to it as an investment, and a very small one at that, to reduce the burden of emergency repairs that would be inevitable without using a durable concrete that can protect itself, and most importantly, its reinforcing, from slow, inexorable environmental aggression. □



environmental aggression, and even less for residential buildings (0.2 to 0.6%). As an example, take a condo apartment whose total cost is estimated at 100 million lire (\$57,000 USD). The condo unit's share of the total amount of concrete in the building (from foundation to roof) is approx. 75 m³. Assuming an R_{ck} of 30 MPa with the cost of concrete at 90,000 lire (\$51.00 USD) per m³, the cost of concrete for the condo unit is 6,750,000 lire (\$3,857.00 USD), or 6.8% of the total.

The w/c ratio of concrete with an R_{ck} of 30 MPa, using CEM II A/L 42.5 cement with a fluid consistency and a dosage of 305 kg/m³ of cement, is approx. 0.65. This amount is above the limit set for reinforced concrete in generically aggressive exteriors in exposure class 2a (i.e. without specific environmental aggression, such as freeze-thaw cycles, seawater, sulphates in the soil, etc.). The w/c ratio must therefore be reduced from 0.65 to 0.60 (with an increased cement content of approx. 25 kg/m³) to make the durability of the concrete comply with the European standards. This lowering of the w/c ratio causes the resistance to increase from 30 to 35 MPa, even though this increase in the R_{ck} is not absolutely required for static purposes but reflects only the lowering of the w/c ratio for increased durability. The cost of durable concrete in this case is comparable to that of concrete with an R_{ck} of 35 MPa (92,000 lire/\$52.57 USD per m³). Basically, adopting durability criteria resulted in higher quality concrete with an increase in the R_{ck} from 30 to 35 MPa and an increased cost of 2,500 lire (\$1.43), which is about 3% more.

Upgrading to durable concrete increased the cost by 75 x 2,500

*ENV 206

**It should be emphasized that the minimum cement content dictated by ENV 206 is too low to guarantee durability, especially when using fine aggregate (max. diameter 8 to 16 mm) and large amounts of water (180 to 200 kg/m³) to obtain very workable concrete. Obviously, while complying with the standards regarding the w/c ratio, it is nonetheless necessary to use higher dosages of cement than those required by ENV 206 in order to obtain durable concrete.

Bibliography

[1] Mario Collepardi, *The Durability of Concrete: Theory, Practice and Specifications. Part III: "Durable concrete in compliance with Italian and European standards", an article in L'Industria Italiana del Cemento (the "Italian Cement Industry" magazine), no. 677, pp. 357-370, May 1993.*

This article was adapted, with our thanks, from pp. 108-111 of issue no. 707 of L'Industria Italiana del Cemento magazine, published in February 1996.

Mario Collepardi is Professor of the Science and Technology of Materials at the Faculty of Engineering of the University of Ancona (Italy).

MAPEFLUID X404

A product of Mapei research, MAPEFLUID X404 is an admixture with exceptional properties that is patented worldwide.

by Gianluca Bianchin, Tiziano Cerulli and Pasquale Zaffaroni

Drawings and electron microscope photos courtesy of the Mapei R&D Laboratories

MAPEFLUID X404 is a new hyperplasticizing liquid admixture for preparing high quality concrete with remarkably little slump loss. MAPEFLUID X404 is a formaldehyde-free 30% water solution of acrylic polymers that effectively disperses cement granules.

The benefits

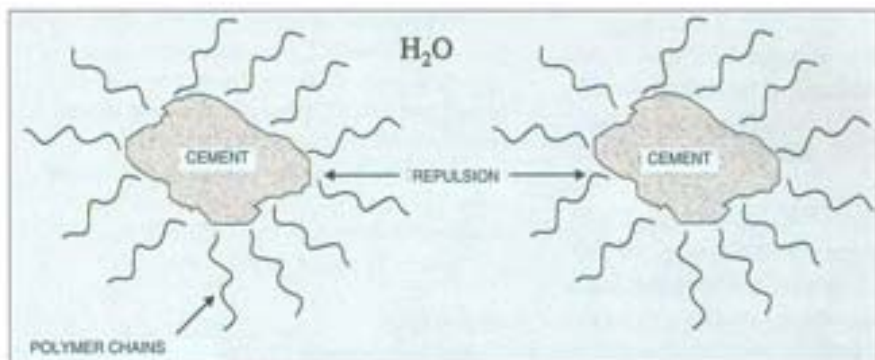
Using MAPEFLUID X404 gives you these advantages over conventional sulphonated naphthalene or sulphonated melamine-based superplasticizing admixtures:

- MAPEFLUID X404 can be used at very high dosages (in exceptional cases even 15% by weight of cement). This enables you to prepare mortar and concrete with a very low water/cement (W/C) ratio. Reducing the water/cement ratio increases mechanical strength as well as durability.

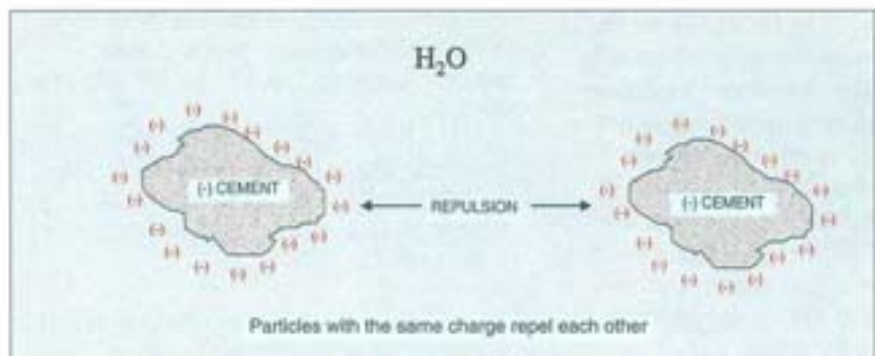
- Concrete with MAPEFLUID X404 retains slump for long lengths of time, even from 6 to 8 hours. This enables the concrete to be transported from the batching plant to the work site and then placed without having to add more water, which reduces



Using MAPEFLUID X404: Marco Polo Airport, Venice, Italy



Steric hindrance Repulsion caused by mass effect *Dispersing Flow effect*



Z-Potential Electrostatic repulsion *Dispersing Flow effect*

both mechanical strength and durability. This advantage is even greater at high ambient temperatures.

- Variation in setting time is negligible at low and medium dosages. At higher dosages, even though MAPEFLUID X404 has a retardant effect on cement mixes, it does not affect hardening or development of early mechanical strength.

MAPEFLUID X404 possesses these properties because of its special action mechanism. Contrary to normal admixtures that affect the electrostatic charges of the particles in the cement mix, MAPEFLUID X404 does not change the electric charge that surrounds the cement granule, the so called Z potential (see insert at end of article), but acts according to the

mechanism known as "steric hindrance". Because it does not cause the formation of net electric charges, MAPEFLUID X404 is not sensitive to the variations in the type or quantity of salts present in the mix water that result from the release of lime by the cement. This is why it stays workable for long lengths of time.

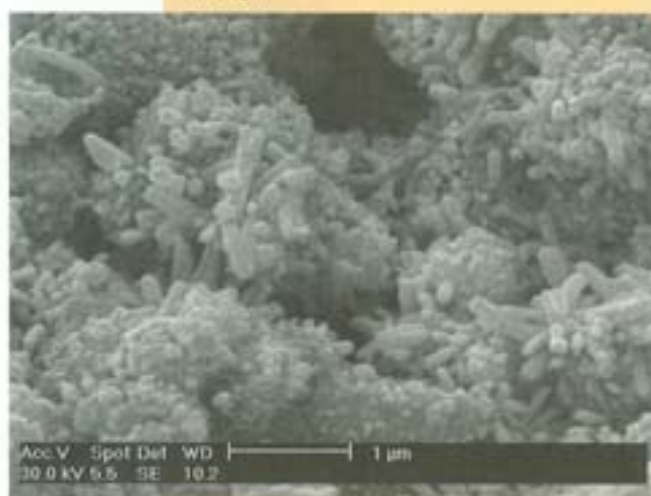
Conclusions

In brief, these are the winning characteristics of MAPEFLUID X404, the acrylic admixture that is patented worldwide: it can be used in a very wide range of dosages, with reduction of the W/C ratio to very low levels (<0.30) yet with high fluidity. It stays workable much longer than concrete prepared with conventional admixtures (unless very complicated and costly systems are used) and develops high mechanical strength even in precast concrete.

Gianluca Bianchin is Admixtures Div. Mgr., Tiziano Cerulli is Head of Laboratory Analysis, and Pasquale Zaffaroni is Mapei's Product Manager. All three are based at the Milan, Italy, headquarters. □

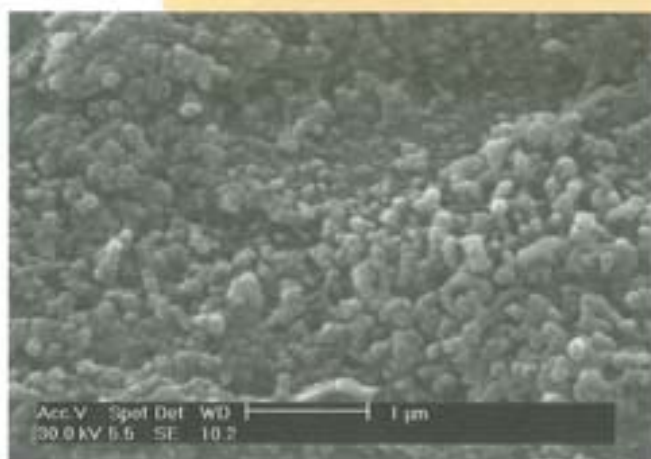


Electron microscope photo (SEM) 20,000x
Cement paste with a high water/cement ratio
Note the spaces between the "needles" of C-S-H that result in low mechanical strength



Electron microscope photo (SEM) 20,000x
Cement paste with a medium-low water/cement ratio obtainable only with a good superplasticizer (e.g. sulphonated naphthalene).
The spaces between the needles of C-S-H are reduced, resulting in high mechanical strength

Electron microscope photo (SEM) 20,000x
Cement paste with a very low water/cement ratio obtainable only with MAPEFLUID X404.
The spaces between the needles are virtually invisible, resulting in extremely high mechanical strength.

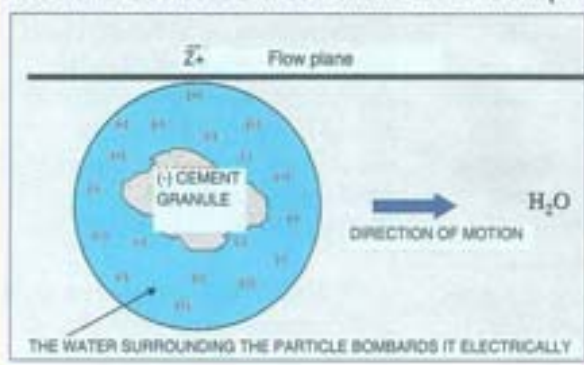


THE Z POTENTIAL

Definition: the value of the electric charge surrounding the cement granule measured on the flow plane of the particle in the fluid (water).

As the drawing shows, the value of the Z Potential depends, among other things, on:

- the type of superplasticizing admixture used (sulphonated naphthalene or sulphonated melamine);
- the strength of the ions (type and quantity of salts present) in the water that come into contact with the cement granules. As the strength of the ions increases with the normal reaction of cement hydration, the effect of the mix water on the cement granules increases. This causes the value of the Z Potential to decrease and results in a loss of slump.



PLANICRETE

A latex that improves plasticity, increases bond strength, and retains water and workability.

by Francesco Stronati

Many installers and contractors often ask for a product to make a mortar bond more strongly to difficult substrates, for example when applying cement-based rendering on a concrete wall or bonding a thin screed to the concrete slab underneath. Forms can sometimes leave concrete too smooth, even damaged, by traces of form release oils, neither of which conditions helps bonding. For substrates that require leveling, the leveling mortar must be bonded as strongly as possible because the system will be subject to static and dynamic loads that could weaken the functionality and the durability of the whole structure.

The answer to this problem is PLANICRETE, a synthetic rubber latex for modifying cementitious mixes that was developed in the Mapei research laboratories. PLANICRETE is a water



dispersion of a special synthetic elastomer that is resistant to water and to the alkalinity in cement-based products. When mixes modified with PLANICRETE harden, they bond strongly to the substrate and have higher flexural strength and resistance to freeze-thaw cycles. They also have better chemical resistance to acids, diluted alkalis, saline solutions and oils. PLANICRETE can be used in both interiors and exteriors, even in areas that are permanently immersed in water. Using PLANICRETE, however, does not eliminate the need to remove loose particles, cement laitance and traces of form release oils from the substrate.

cleaning the slab, a bonding slurry should be prepared of 2 to 3 parts of the same binder that was used for the screed mixed with one part of PLANICRETE and one part water. This slurry should be spread on the slab with a brush or trowel, and while it is still fresh, the screed should be poured over it. (Photo 1). For stronger bonding and increased mechanical strength, the mortar for the screed can be mixed with Planicrete diluted 1:3 with water. The same

mix can be used to fill holes in cementitious screeds or concrete floors, for making adjoining screeds level or for building up a screed or concrete slab. PLANICRETE can also be used to prepare bonding slurries for MAPECEM or TOPCEM screeds.

Mixing mortar for rendering

To prepare cementitious mortar to use as rendering over masonry or reinforced concrete walls, the procedure is as follows: First mix a scratch coat of sand and cement admixed with PLANICRETE diluted 1:1 with water. Apply the scratch coat with spray or trowel. As soon it begins to harden (and before it hardens completely), apply the rendering mortar with a trowel or spray. The mortar should be prepared by mixing sand and cement with PLANICRETE diluted in water 1:3.

PLANICRETE can also be used as an admixture for NIVOPLAN (pre-blended mortar for leveling

When a cement screed is not thick enough for floating, it has to be bonded to the concrete slab underneath. After thoroughly

A bonding slurry for cementitious screeds and mortar for repairing concrete floors

A bonding slurry for cementitious screeds and mortar for repairing concrete floors

When a cement screed is not thick enough for floating, it has to be bonded to the concrete slab underneath. After thoroughly

PHOTO 1



Concrete modified with PLANICRETE in the Old Port of Quebec City, Canada

PHOTO 2

walls), usually in a ratio of 2 liters per bag.

Leveling substrates subject to permanent immersion in water

When applying a thin leveling coat (from 1 to 10 mm) on the sides or bottom of a reinforced concrete tank or a swimming pool before waterproofing or installing ceramic tile, the operation can be facilitated by applying KERACRETE POWDER (a blend of sand and cement) mixed with PLANICRETE diluted with water 1:1. In addition to enhancing bonding because it retains the water in the mix, using the latex in this case allows the cement to hydrate perfectly, giving the leveling compound high



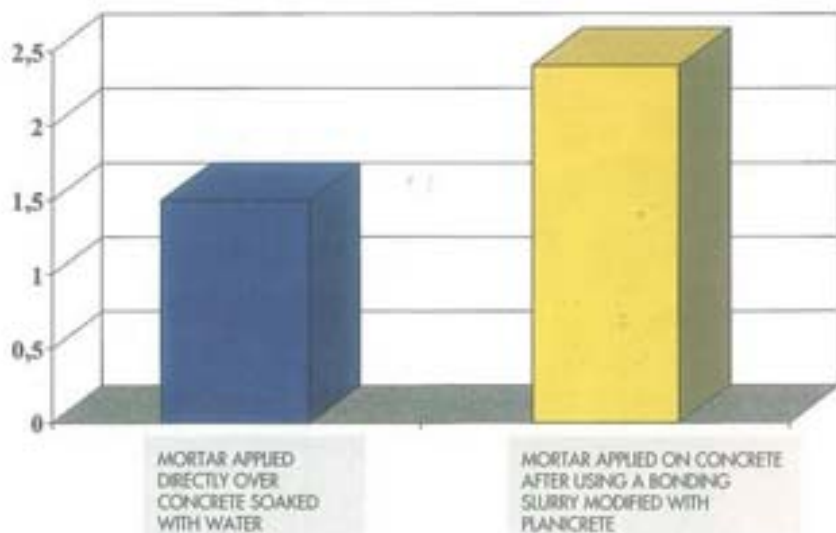
Preparing a screed at the headquarters of Colnago Bicycles outside of Milan, Italy

mechanical strength even when applied in thin coats.

Finally, PLANICRETE can be used as an admixture for IDROSILEX PRONTO, (pre-

blended cementitious osmotic waterproofing mortar) in a ratio of 2 liters per bag of product when applying it on difficult to bond cementitious substrates. □

The graph compares the bonding of cementitious mortars applied over concrete with and without PLANICRETE bond slurry. The tests consisted of preparing a cementitious mortar with a water/cement ratio = 0.5 and an aggregate/cement ratio = 0.3 and applying it over concrete, in the first instance over concrete soaked with water and in the second after first applying a bonding slurry. The slurry was mixed with 1 part of the same cement that was used to prepare the mortar and 1 part PLANICRETE diluted 1:1 with water. The tests were performed after curing 28 days at +23°C and 50% RH. The results showed that the application of the slurry modified with PLANICRETE greatly increased the adhesion of the mortar to the substrate.



Francesco Stronati is a consultant with the Mapei Technical Service at Mapei headquarters in Milan, Italy.

The products mentioned in this article are manufactured by Mapei in Europe.



The Technical Data Sheet for PLANICRETE is contained in Mapei Binder No. 3, "Building Specialty Line".

GETTING A GRIP ON LATEXES

by Antonio Falco

One of the things we get asked most often at the Mapei Technical Service in Milan is how to make a cementitious product (rendering, ceramic tile adhesive, leveling compound, etc.) bond perfectly to a substrate. "Should we use a latex?" they ask.

What exactly is a latex?

Often you hear people ask for a latex when they want a product to improve adhesion. Latexes are often confused with primers such as isolating compounds, fixatives, and consolidating compounds. Generally both latexes and primers are white liquids. However, although they may resemble each other physically, chemically they can differ considerably from one product to the next. All latexes are by no means equal. They have to be distinguished one from the other. Each has a different degree of fluidity and viscosity, and each has a characteristic odor due to its chemical composition.

What latex should you use?

There are so many different products on the market that it can be difficult to choose the right one to do the job. A buyer can make an informed choice by reading various manufacturers' technical literature and then checking their claims through practical testing. Aside from making sure that the properties of the latexes meet the requirements for the

intended use, it is important to read the technical data sheets for the solids content, i.e. the raw material present by weight in the finished product. For example, "20% solids content = 200 g of resin per kg of product". Latexes generally consist of synthetic resins in water dispersion, so the lower the solids content, the higher the water content. For example, a specific cementitious mix might call for a latex with a 20% solids content. If a latex containing only 10% solids were used instead, the mix would only contain half the rubbery substance required for it to be fully effective. This example gives you some idea of the technical and economic benefits of making an informed choice. It should be pointed out that no latexes are commercially available with a 100% solids content.

How do latexes and primers work?

Some latexes improve the cohesion of hydrated cement granules, so they are effective when added to the fresh mix. On the other hand, if you apply them onto a substrate that is already dried or hardened, they create an anti-adhesive film. Other latexes known as "Primers" penetrate into the substrate and bind solid particles together to make them compact. They saturate the pores of a substrate to make them absorb evenly. Some primers are used to isolate or waterproof a substrate.

Deciding when to use a latex and selecting the right product should be done after careful evaluation. Below we list several kinds of substrates along with the most common problems associated with them, indicating where latexes should be used.

For concrete

The problem: bonding a cementitious mortar to a concrete wall or floor with a surface that isn't very porous, or so smooth that fresh mortar is hard to bond to it.



The solution: first make sure the substrate is free of any substances that can interfere with bonding, especially form release oils. Remove them by high pressure cleaning, shotblasting, scarifying, etc. After proper substrate preparation, admix the cementitious mortar with a latex such as PLANICRETE to improve adhesion.

Caution: It is dangerous to brush a coat of pure latex directly on the surface of the concrete. It might not be totally absorbed, creating an anti-adhesive film.

For insufficiently solid renders, leveling coats or screeds

The problem: if the substrate is insufficiently solid throughout its thickness, applying latex on the surface to fix the loose particles would merely form a crust that eventually would tend to separate from the substrate. The same principle applies even if the weak section is only a few millimeters deep.

The solution: completely remove the weak layer.

Substrates with traces of oil, grease, wax or form release oils

The problem: any product applied over these substances will inevitably become loose if the substrate is not thoroughly degreased beforehand.

The solution: where oil or grease has penetrated deeply into porous substrates, remove that section by shotblasting or scarifying. Replace the entire substrate if necessary.

Bituminous membranes

The problem: it is absolutely impossible to make any type of cementitious product adhere to a bituminous membrane or render, especially when new. Bituminous membranes are designed to provide flexibility and are composed of plasticizers that can migrate to the surface. This can cause them to detach. Moreover, bituminous membranes have very low cohesive strength which is also affected by temperature, so they cannot withstand the stresses caused by a more rigid covering.

The solution: cover the bituminous membrane with a floating screed (for example, a reinforced screed at least 5 cm thick; on walls, apply a scratch coat at least 2 cm thick over galvanized metal lath).

Painted substrates

The problem: identifying the type of paint and the type of product to be applied over it.

The solution: When applying a cementitious leveling compound, even if only a few millimeters thick, over **water-based paint or distemper**, the paint must be removed.



It does not provide enough mechanical resistance to support a more rigid material. If the substrate is **enamel**, first sandpaper the surface, then use a latex admixture such as LATEX PLUS or latex-modified adhesive systems like GRANIRAPID or KERABOND + ISOLASTIC when preparing the cementitious product to apply over it. **Epoxy or polyurethane paint**, or other types of paint, are always unreliable substrates. Never use a latex on them.

Substrates with traces of adhesive from previous flooring

The problem: identifying the type of existing adhesive and the kind of product to be applied over it.

The solution: if the existing adhesive is cement-based, test the adhesive's mechanical strength before applying cementitious products over them. Remove them if they don't seem solid, or consolidate them with special products (not latexes) that penetrate throughout the entire thickness, like PRIMER EP or PROSFAS. Old adhesives used for textile coverings or resilient flooring must be removed if a rigid covering (ceramic tile, stone, wood, etc.) is to be installed over them. If the new covering is textile or resilient, and not subject to heavy traffic, BITUPRIM primer can be used to improve bonding.

Any type of existing floor or wall coverings

- **Ceramic tile:** degrease thoroughly, then use a cementitious product modified with a latex such as PLANICRETE or LIVIGUM

- **Painted or waxed wood or parquet floors:** Abrade the surface finish, then use a product admixed with a latex that has elasticizing properties to compensate for the expansion of the wood, for example LATEX PLUS.

- **Metal and metal derivatives:** remove all traces of grease and rust. The product



to be applied over them needs not only an elasticizing latex but also additives that protect against chemical attack, like MAPEFER.

• **Gypsum and gypsum derivatives:** These substrates react chemically with cementitious binders, forming a salt called "ethringite" that expands, causing the material covering them to separate. In this case brushing on a coat of pure latex can be effective. To improve the bonding of the two materials, apply a primer such as PRIMER G between them to neutralize their "hostility". The latex primer must have isolating properties so the two materials do not come into contact with each other. The primer bonds with the material above and below it. However, using the primer does not mean that surface preparation can be omitted. The gypsum must be completely dry (with residual moisture no higher than 0.5%) and sanded, if necessary, if the surface is not porous enough to absorb the product. The latex chosen must be compatible with gypsum. This will be indicated on the technical data sheet and on the packaging.

For all the substrates mentioned above, the basic rule still holds: without proper substrate preparation, no latex exists that can guarantee bonding. □

Mapei latexes and primers

ISOLASTIC: elasticizing latex for cementitious adhesives. Used full strength in substitution for water, or diluted with water in a 1:1 ratio, mixed with KERABOND and KERAFLOR only. Solids content: 35%.

GRANIRAPID "B": latex for cementitious adhesives. Used full strength mixed with GRANIRAPID "A" only. Solids content: 21%.

KERACRETE: latex for cementitious adhesive mortars. Used full strength mixed with KERACRETE POWDER or sand and cement. Solids content: 21%.

FUGOLASTIC: latex for cementitious grout. Used full strength mixed with KERACOLOR FINE GRAIN or LARGE GRAIN. Solids content: 10%.

PLANICRETE: latex for cementitious screeds, mortars and bonding slurries. Always used diluted with water in a ratio of from 1:1 to 1:4, mixed with sand and cement. Solids content: 40%.

MAPELASTIC "B": flexible latex waterproofer. Used full strength mixed with MAPELASTIC "A" only. Solids content: 50%.

LATEX PLUS: Elasticizing latex for cementitious adhesives and leveling compounds. Used pure mixed with KERAQUICK and NIVORAPID. Solids content: 34%.

PRIMER G: isolating primer, fixative, and sealer for gypsum surfaces, dusty cementitious surfaces or overly absorbent surfaces prior to applying cementitious products in general. Used full strength or diluted with water in a maximum ratio of 1:3, depending on the absorbency of the substrate. Solids content: 20%.

PRIMER S: isolating primer and waterproofer to protect surfaces against potential water seepage (e.g. gypsumboard, gypsum, chipboard, etc. in shower enclosures). Used full strength in more than one coat. Solids content: 40%.

PLASTIGUM LEGANTE: elasticizing latex for cementitious leveling compounds for use on wood or metal substrates. Used full strength mixed with POWDER CF only. Solids content: 47%.

LIVIGUM: latex for cementitious smoothing coats, and fixative primer and sealer for dusty or absorbent cementitious substrates. Always diluted with water in a ratio of from 1:1 to 1:6. Solids content: 45%.

ADESIVIL C: latex for cementitious smoothing coats. Used full strength or dilute with water, depending on the thickness. Solids content: 55%.

MAPEFER "B": latex waterproofer and isolating compound for cementitious mortar for protection of reinforcing bars. Used full strength mixed with MAPEFER "A" only. Solids content: 30%.

MAPEFINISH "B": latex waterproofer for cementitious leveling compounds for protecting concrete surfaces. Used full strength mixed with MAPEFINISH "A" only. Solids content: 24%.

To round out this product line, we should mention, last but not least, a latex that improves adhesion even when applied full strength over the substrate. This product is AQUALPRIM R, a polychloroprene resin-based anchoring primer to be used before applying cementitious smoothing compounds over difficult surfaces. However, the bond strength of this product is not designed for rigid flooring or flooring that generates surface stresses. The products should not be used where moisture is present. It can be used for textile floor coverings in areas not subject to heavy traffic.

The descriptions of all the materials mentioned in this article are for general reference only. To select a latex product or a two-part cementitious system, please read the technical data sheets for more detailed information on the specific properties and uses of each product.

Antonio Falco is a consultant with the Mapei Technical Service in Milan, Italy.

N.B. The materials mentioned in this article are part of Mapei's European product lines.



WARNER VILLAGE CINEMAS



by Claudio Menabue and Natasha Calandrino



Much of the rest of the world seems to regard America and Americans with a certain amount of fascination because of their diversity, the bright lights of their cities, their wide variety of lifestyles and their way of doing things on a grand scale. And it's doing things on a grand scale that brought the Warner Village Cinemas to Italy.

Warner Village Cinemas is a joint venture between the world's largest entertainment company, Time Warner, Inc. which dominates the international cinema market, with 654 screens in 8 countries, Village Roadshow Ltd., Australian entertainment company that

controls a total of 936 screens in 15 countries, and Focus Srl, an Italian film production company.

This colossal multinational is introducing their "Multiplex" concept to Italy where 21 Multiplexes with 200 new screens are planned to open in the next three years. The Warner Village Multiplex was conceived to offer the highest quality in service, technology and comfort built in from the ground up, as the construction of the pilot project showed. The pilot Multiplex was built in Vicenza, an hour west of Venice, and more are already under construction in Bolzano, Brescia and other cities all over Italy. The Vicenza building, 4,500 sq m (48,434 sq ft), is entirely of prestressed concrete that was assembled on site and is surrounded by ample parking and recreation areas. The selection of Mapei products was a great opportunity for our company because of the size and originality of the project. Homogeneous PVC was used throughout the interior, including the risers under the seats and the areas beneath the screen. Carpet tiles were laid in the aisles. These materials were installed by an extremely professional team after the underlying surfaces were given the appropriate preparation.

Waterproofing products

During the first stage of assembly, the prestressed panels were joined with EPORIP, a two-component epoxy resin for the monolithic sealing of concrete elements that polymerizes without shrinkage and is watertight after hardening. Waterproofing the entire structure was essential since sections of the substrate were subject to rising damp. PRIMER G, a synthetic resin based primer, was then used to consolidate surfaces and facilitate the adhesion of the waterproofing mortar. After approximately 3 to 4 hours a vapor barrier was formed by applying

*Photo 1
PIANOCEM F was used for leveling the risers to obtain an absolutely flat surface*

*Photo 2
Special care was taken in building the aisle steps and the front sections below the screens*

PHOTO 1



PHOTO 2



PHOTO 3



PHOTO 4



TRIBLOCK, a 3-component epoxy cement mortar that forms a compact, completely watertight layer after hardening.

An absolutely flat and linear surface

The leveling process was accomplished in a remarkably short time, considering that laying PVC requires an absolutely flat, linear surface. For this reason different leveling compounds were used depending on the type of surface to be treated. To fill depressions in the floors, NIVORAPID was used, a cement based leveling compound that dries so fast that the PVC could be laid only 4 to 6 hours later. To build up the level of the substrate with a fast hardening self-leveling smoothing compound, ULTRAPLAN MAXI was used for thicknesses up to 3 cm. Special care was taken in the aisles and the areas below the screens. These were leveled with a final coat of ULTRAPLAN. To obtain an ultra-flat surface on the risers prior to installing the PVC, PIANOCEM F was applied, a cement based leveling and smoothing compound for new and existing substrates that preps them for floor and wall coverings. Here it was used as a finishing compound in several coats.

After leveling and smoothing was completed, the PVC was installed with ADESILEX V4 on the level sections of the theaters. ADESILEX V4 is a universal acrylic adhesive in water dispersion with excellent resistance to aging that is not flammable and contains no hazardous substances. ADESILEX VZ was used to install the PVC on the risers. This a polychloroprene contact adhesive formulated for areas where instant setting is required.

One more reason the installation had to be done with extra special care to make the flooring lay absolutely flat was reducing the risk of tripping and falling, especially important when hundreds of kids are playing and running in the aisles



*Photo 5
A detail of the PVC flooring
with the carpet tiles and
seats installed over it*

*Photo 6
The line of blue carpet
guides patrons along the
aisles and into the rows of
seats*



Our thanks to Carmel Coscia, Marketing Director of Warner Village Cinemas, for her much appreciated cooperation.

*Photo 3
Installing the
homogeneous PVC in
level areas required
using a contact
adhesive with high
early grab:
ADESILEX V4*

*Photo 4
A glimpse of the
finished job in one of
the 9 theaters where
perfectly installed
flooring over ultra-
flat surfaces let you
get to your seat
without risk of
tripping*

during screenings of animated cartoons. Mounting the 2,106 super-comfy seats in the 9 theatres of the Multiplex was the final touch before opening the doors to the public. Well, almost the final touch: we hear the popcorn's terrific. □

Claudio Menabue is the Mapei representative for the Brescia area of Italy.

The Technical Data Sheets for the products mentioned in this article are contained in Mapei Binders No. 2 "Resilient Installation Products" and No. 3 "Building Specialty Line".



TECHNICAL DATA

Project: Warner Village "Pyramids" Multiplex, Torre di Quartesolo, Vicenza, Italy

Year of construction: 1997

Project Mgr. and Contractor: Incos S.p.A., Vicenza

PVC installation: Studio Ambiente Snc, Brescia

Coordinator: Claudio Menabue, Mapei

Materials: Sommer homogeneous PVC

Mapei products used for substrate preparation:*

EPORIP
PRIMER G
TRIBLOCK
NIVORAPID
ULTRAPLAN
ULTRAPLAN MAXI
PIANOCEM F

Mapei products used for PVC installation:*

ADESILEX VZ
ADESILEX V4

*These materials are part of Mapei's European product lines

MOMA MIA, COME SEI BELLA!

Modern art housed in an ultra-modern granite installation, complete with ULTRA/COLOR grout.



The architectural firm of Helmuth, Obata & Kassabaum and the internationally acclaimed architect Mario Botta received special mention at the announcement of the prestigious Marble Architectural Awards '97 for their collaboration on the design of the San Francisco Museum of Modern Art (SFMOMA). The awards are given for projects completed in North America that feature innovative use of natural stone.

Described as extraordinary, majestic, a triumph, and one of the best museums of our time, the \$60 million dollar building was conceived in the tradition of modernist design. Since this was Botta's first U.S. building, HOK worked with him as the architect of record, helping to develop ideas that would comply with local codes and construction practices. Project manager Mark Otsea, AIA, observed that, "In the 40 years of HOK's existence, this is the first time that we were the architect of record while someone else was the designer."

The exterior of the museum is sleek and striking with its stepped-back brick and stone facade. A soaring truncated cylinder emerges from the center of the SFMOMA, finished with black and white bands of stone that are in the architect's signature style. To the rear, the building consists of a five-story tower that houses galleries as well as the museum's curatorial and administrative offices. The entrance of the museum is flooded with natural light and offers generous open spaces. The full-height central atrium



On this page, the Swiss architect Mario Botta and his creation, the San Francisco Museum of Modern Art (SFMOMA)

On the opposite page, the interior of the museum and a detail of grouting its granite floor

illuminated by the skylit cylinder is a key feature of the interior space. The cylinder also adds warmth and additional natural light to the galleries.

Grouting the granite

The interior flooring is a field of black stripes, a longtime signature of Botta, and consists of alternating flamed and polished Peribonka Black Granite in 6"x3"x 1,1/4" (15x90x3 cm) tile slabs. Peribonka (an anorthosite rock) was chosen over a Cambrian granite from Canada, and a black granite of American origin. "Finely polished Peribonka is known for its iridescence and depth, much like a pearl blue granite," says Ed Zimmerman, U.S. Sales Director for Granicor which supplied 11,350 square feet (1,054 sq m) of polished and 10,275 square feet (954 sq m) of flamed Peribonka for the project. "Its large coarse grains of mostly feldspar give it a distinctive look among the black granites." To ease the concern of many regarding the use of polished granite in a heavily trafficked facility, surfaces are



maintained with a non-slip sealant.

Mapei's ULTRA/COLOR Charcoal grout worked well throughout the museum to tie together both light and dark

surfaces. Developed in the Mapei research laboratories, ULTRA/COLOR is a rapid-setting and hardening grout for ceramic tile and natural stone. Using ULTRA/COLOR eliminates the biggest problem encountered in conventional cement based grouts, the formation of surface efflorescence.

The flamed and polished striping is also found ascending the museum's main staircase walls in 6"x3"x 3/4" (50x90x1.5 cm) configurations. Polished black granite is used on elevator walls in 4"x4"x 3/4" panels (120x120x 2 cm) and polished 18"x18" (46x46 cm) tiles on the cab floors. Also, the bases of two support columns in the atrium are treated with granite stripes, but in 2" thickness.

The installation of the stone design was handled by project manager Cindy Quan of the Artistic Tiling Company of San Jose, California. "All grout lines are 1/8" (3 mm) instead of 1/4" (6 mm) for a tight, smooth look," said Quan. "The concrete substrate was mud-set with a float finish which took about three days to cure, after which we set the stone with an all-purpose thin-set. The walls, floors and elevator interiors were done without any complications because all the materials, especially the cut stone, were properly specified."

International in scope, SFMOMA's permanent collection consists of over 15,000 works, including 4,700 paintings, sculptures and works on paper; approximately 9,000 photographs; 1,500 architectural drawings, models and design objects; and a growing collection of works related to the media arts. The collection, representing Californian, American and international artists, is the most comprehensive resource for modern and contemporary art on the West Coast.

Unquestionably, SFMOMA, is contributing significantly to artistic efforts and interests not only in San Francisco, but along the West Coast. This would not have been possible without the collaborative efforts of all those involved in the museum's

development. "The museum was a learning experience for all of us," sums up Mark Paia, AIA, the museum project architect. "Our combined ideas and expertise and the selection of materials have created a building that supersedes anything that might have resulted from independent efforts." □

The Technical Data Sheet for ULTRA/COLOR is contained in the Mapei Corp (USA) and Mapei Inc. (Canada) "Resilient and Ceramic" Binder, and, in other countries, in Mapei Binder no. 1, "Ceramic Tile Installation Products" under the name ULTRACOLOR



TECHNICAL DATA

Project: SFMOMA, San Francisco, CA, USA

Design: Mario Botta and Hellmuth, Obata & Kassabaum, San Francisco office

Materials: Black Peribonka Granite from Granicor

Grout used for the granite installation: ULTRA/COLOR

ULTRA/COLOR is the name of the North American formulation of ULTRACOLOR, a similar product manufactured by Mapei in Europe.

Some architectural concrete with your espresso!

by Mario Collepardi

We used to see a television commercial frequently in Italy with Nino Manfredi saying, "Coffee is one of life's pleasures. If the coffee isn't good, where's the pleasure?" Every time I'm in France I think of it when I ask for a real Italian-style espresso and I'm served their disappointing watered down version of one. Other Italians might think my distaste for French espresso exaggerated, considering how much stranger the (decidedly non-espresso) coffee tastes to us Italians when we travel to the States or Germany.

However, for me, France means beauty combined with efficiency, a sense of balance and good taste. So it's hard for me to accept that their usual excellence fails when it comes to a little thing like a cup of coffee, especially when they have exactly the same technology for making good espresso (good quality coffee beans, correct roasting, and the espresso machine) that we have in Italy.

But then, since I love and admire France and the French, I have to forgive them the coffee when, in between long sips of "espresso", I notice one of their splendid public buildings in architectural concrete. Since, after coffee, my second passion is concrete, the unkind thoughts I momentarily entertain about France are redirected toward Italy, where architectural concrete is as disappointing as French coffee. With a few exceptions (maybe someone in France makes a good cup of coffee?), Italian concrete buildings are generally ugly.

Obviously I do not refer to their architectural side, since Renzo Piano, Vittorio Gregotti, Gae Aulenti, and Vico Magistretti (see the interview in the article following this one) are every bit as talented as their foreign colleagues. I refer, rather, to the "skin" of the concrete, its color and texture, that magical effect



Photo courtesy of Caffè Lavazza

that can be seen, for example, in the architectural concrete in buildings designed by Tadao Ando or Santiago Calatrava in Japan, France, Switzerland and the USA. Architectural concrete is made to be seen and a beautiful skin is especially important.

However, appearance should not be neglected even in infrastructural engineering projects where concrete can have a significant visual impact on the environment. Take a highway bridge. The choice of color is important if the bridge is to blend in with the surrounding landscape. Using cements currently on the market, with the proper advance planning practically any shade from white to charcoal-grey can be obtained without the slightest difficulty. A spectacularly successful case in point are the viaducts of the Vittorio Veneto - Lago Santa Croce highway in Italy. Seen from the floor of the Santa Croce Valley, the dark grey of the concrete pylons resembles the color of the surrounding rock, making them seem like slivers of natural stone.

The essential rules for making beautiful architectural concrete involve most of all taking the same technical precautions necessary for preparing high performance concrete, i.e. appropriately graded stone aggregate to prevent segregation of the mix during pouring;

Fig. 1



Fig. 2



high cement content to obtain a tenacious, uniform surface and prevent bleeding or formation of honeycombs; proper control of workability with superplasticizing admixtures to prevent gravel nests (if the concrete is too dry) or water accumulating on the inner surface of the forms (if the fluidity of the mix is accompanied by segregation).

These are measures that must be taken by the concrete manufacturer, but additional precautions must be taken by the contractor, most importantly regarding the material used for the shuttering which gives architectural concrete its surface texture. It is impossible to achieve the warm tactile and visual effect of architectural concrete with a classic wood grain if the wood of the forms does not itself have a distinct, even grain (see Figure 2). It is likewise important that the shuttering have a super smooth surface if one wants to reproduce the transparent polish typical of the concrete structures of Tadao Ando. The forms also have to be perfectly joined during the pouring stage to prevent leakage of the mix through the joints with the resulting formation of gravel nests on the surface of the concrete.

Another important requirement for obtaining a good surface finish, also the contractor's responsibility, is the quality of the form release oil used to facilitate

the removal of the concrete and the method of applying it, so as not to stain the surface or mar the texture: a very thin layer of oil (preferably not mineral oil, for sanitary reasons) should be evenly applied to the surface of the shuttering. In any case, using recycled mineral oils should be avoided, and even more so applying them spottily, in order to achieve a decent surface without stains from an excess of dark-colored form release oil.

If some architect wants to take creativity one step further, there is still room for an even more innovative look in architectural concrete: colored concrete based on white cement, either in a solid shade or swirled with color (see Fig. 1). It's not an impossible goal, nor an unaffordable one, especially for an avantgarde or prestige building: unless we are resigned (as we are to French espresso), despite the technical progress in the field, to being served anonymous-looking concrete with lackluster skin. □

Mario Collepari is Professor the Science and Technology of Materials at the Faculty of Engineering of the University of Ancona (Italy)

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CONCRETE IDEAS

Restoring a building in architectural concrete that was designed by Vico Magistretti.

An interview with Giuseppe Biondi, the engineer in charge of the restoration



Photo by Giuseppe D'Alagni



In 1960 an apartment building designed in architectural concrete by the architect Vico Magistretti was erected in Milan on a site surrounded by one of the city's rare and far between gardens. Almost forty years later the building was in need of repairs to arrest an ongoing process of decay before it caused more serious problems. The task of restoring the exterior required the services of an expert professional who would respect the original Magistretti design yet come up with a long lasting solution to the problem. We put a few questions to Giuseppe Biondi of Milan, the engineer whose job it was to find that solution.

Exactly what problems did the Magistretti building have?

The concrete exterior (Photo 1) showed symptoms of carbonation, which occurs when the free lime released by the hydration of the cement reacts with the carbon dioxide in the air. Carbonation weakens the concrete covering the reinforcement rods, causing the entire structure to decay. This condition affected approximately 20% of the exterior, especially the upper floors because they

are more exposed to the elements.

The client demanded a repair job that would be long lasting, so we not only had to repair the exterior but also to protect it.



What techniques did you use for the repairs?

The restoration was done in two stages: the first involved demolishing the concrete that was loose or insufficiently resistant until we reached the intact, solid surface beneath. Reconstruction was done later using hi-tech materials that would be compatible with the original concrete yet provide adequate protection.

How were the repairs done?

The first stage involved removing the layer of concrete covering the reinforcing bars so we could get at the rods beneath that were in an advanced state of corrosion. These were thoroughly sandblasted down to the bare metal. We could tell how deeply the carbon dioxide had penetrated into the concrete by treating it first with phenolphthalein which revealed variations in color on the surface of the concrete. Once demolition was completed the clean reinforcing bars were treated with MAPEFER, a cement based mortar that contains hydraulic binders and corrosion inhibitors. The MAPEFER was brushed on. (Photo 2).

The concrete covering was reconstructed with MAPEGROUT THIXOTROPIC, a fiber-reinforced mortar with controlled shrinkage and high mechanical strength that bonded strongly to the old concrete (Photo 3). Using MAPELASTIC, a two-part



PHOTO 1



PHOTO 2



PHOTO 3



flexible mortar for waterproofing concrete, provided the protection needed to prevent future carbonation (Photo 4). ELASTOCOLOR, a special flexible vapor-permeable protective paint was then applied over it.

How was it that you came to use Mapei products for the repair work?

Several years ago I attended a Mapei seminar where I learned about MAPELASTIC and what it can do. I realized that the product was unique as a protective compound because it has a low modulus of deformation that can absorb the movement in concrete that is caused by freeze-thaw cycles. I'm a structural engineer and so concrete plays a very large part in my work.

I grew up in a typical post-war house built

with concrete panels that used to crack periodically. Over the years I saw every kind of repair job imaginable done on them to stop this phenomenon but none of them held up more than two years. After the seminar I decided to try MAPELASTIC on my parents' place so I could check how effective the product was and see if what they said about it was true. This was six or seven years ago and up till now there have been no problems with cracking at all. This successful experiment convinced me to use the product on a larger scale, like the Magistretti building.

Did working on architectural concrete where the surface is important influence your choice of materials?

As a technician I have to offer the client the product which offers the best guarantee of long lasting results. I had left the client the choice of using a clear or a colored protective treatment for the concrete, pointing out that if we used a transparent product, the repaired areas would really look obvious because they were dark grey, which was very different from the original grey of the building. Brushing on MAPELASTIC gave us a surface with an even appearance. It preserved the original Magistretti design without covering over the lines and the little holes left from the forms that are an integral part of the look of architectural concrete.

How did you preserve the original color of the building?

To obtain the same finish I asked the Mapei laboratories to formulate a paint that was the same color, and it had to stay that color without fading. The answer was a customized shade of ELASTOCOLOR that was perfect for this beautiful example of Italian architectural concrete.

PHOTO 4



TECHNICAL DATA

Project: Condominium, Milan, Italy

Built: 1960

Restored: 1998

Project Engineer and
Manager: Giuseppe Biondi,
Milan

Repair products:*
MAPEFER
MAPEGROUT THIXOTROPIC
MAPELASTIC
ELASTOCOLOR

*These materials are part of
Mapei's European product
lines



WALLGARD GRAFFITI FIGHTERS

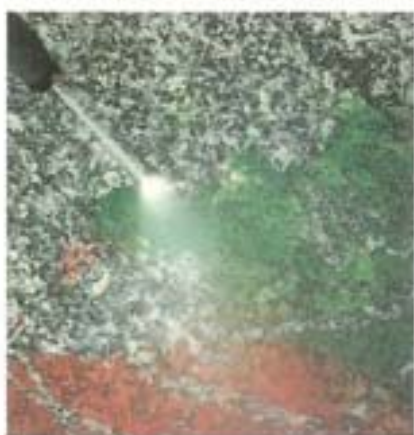
You haven't lost the war against graffiti. You just never had the right weapon! Now there's WallGard Graffiti Barrier that forms a protective graffiti-repellent barrier and WallGard Graffiti Remover Gel, the gel detergent that cleans graffiti-damaged surfaces.



There's graffiti and there's graffiti. Some (not much) of it may look like art, and maybe it does add a bit of color in drab places. But most of it is an eyesore that can drive you up the wall, especially of it's YOUR wall those graffiti "artists" are spray painting.

Now Mapei has come up with a new graffiti-fighting system. It's called WallGard and it features two products: WallGard Graffiti Barrier protective barrier and WallGard Graffiti Remover Gel detergent.

- WallGard Graffiti Barrier is a water emulsion of polymer waxes specially formulated for reversible graffiti - resistant protection of all surfaces. It protects marble, granite and all natural stone surfaces from conventional spray paints. It also protects all other porous or non-porous surfaces. WallGard Graffiti Barrier creates a repellent barrier against oil and water that prevents graffiti from penetrating deep into surfaces but does not hinder permeability. Most importantly, it does not alter the appearance of the surface treated. WallGard Graffiti Barrier can be applied with a brush, roller or



airless spray on all clean surfaces. It is easily removable with a high pressure cleaner and hot water (about 80°C).

Some surfaces like polished marble, ceramic tile or materials that are not very absorbent may become slightly opaque when treated. A preliminary test should be performed on these materials. For best results the product should be applied up to the string-course, or to the expansion joints or gutters. WallGard Graffiti Barrier is ready to use and is available in 5 and 20 kg drums. It does not need to be diluted with water or solvents. (N.B. The product should not be used to consolidate surfaces).

- WallGard Graffiti Remover Gel



is a gel detergent manufactured from a formula developed in the Mapei research laboratories. It removes all types of graffiti without damaging the underlying surface. Simply rinse off with water, using a hose or a high pressure cleaner. Its gel consistency lets Wallgard Graffiti Remover Gel stay on the surface a long time, so the graffiti doesn't penetrate further into the substrate.

Leave the gel on for 5 to 10 minutes, then simply rinse with water while scrubbing with a hard-bristled brush. Wallgard Graffiti Remover Gel is perfect for brick or concrete block facings, architectural concrete, unpainted plaster and metal, and for areas



where high pressure cleaning is not practical. (N.B. The product should not be used to remove smog residue.) Available in 5 kg drums.

WALLGARD GRAFFITI FIGHTERS*

WALLGARD GRAFFITI BARRIER

Product identification

Consistency:	thin liquid
Color:	white
Density:	0.98 g/cm ³
Brookfield Viscosity:	30 cps
Solids content:	14%
Shelf life:	12 months in original packaging
Health Hazard EC 88/379:	no
Inflammability:	no



Application data:

Drying time:	20 minutes at +20°C
Application temperature:	+8°C to +35°C
Coverage:	30 to 150 g/m ²

WALLGARD GRAFFITI REMOVER GEL

Product identification

Consistency:	gel liquid
Color:	yellow
Density:	0.85 g/cm ³
Brookfield Viscosity:	30 cps
Shelf life:	12 months in original packaging
Health Hazard EC 88/379:	yes: can irritate skin and eyes
Inflammability:	no



Application data:

Leave on for:	5 to 10 minutes at +20°C
Application temperature:	+8°C to +35°C
Coverage:	100 to 200 g/m ²

* WALLGARD is manufactured by Mapei in Europe.

The Technical Data Sheets for WallGard Graffiti Barrier and WallGard Graffiti Remover Gel are contained in Mapei Binder No. 3, "Building Specialty Line". The WallGard products are part of Mapei's European product lines.



PLANO 3

A fast-curing self-leveling smoothing compound for use in thicknesses from 3 to 10 mm that is high strength and easy to pump.

by Francesco Stronati

Using a leveling compound over cementitious substrates or existing ceramic tile floors before installing new flooring can be an important concern when very large surfaces need leveling in supermarkets, airports, factories, etc., especially when the job has to be done in a hurry.

The Mapei research and development laboratories have developed PLANO 3, a fast-curing self-leveling smoothing compound for use in thicknesses from 3 to 10 mm that is easy to pump and allows you to install a new floor in record time. PLANO 3:

- Is mixed with water to form a fluid, easily workable mix with excellent self-leveling properties;
- Is easy to pump so it saves you a lot of time;
- Has a setting time of about 60 to 100 minutes, depending on ambient temperature and humidity. This enables you to obtain a perfectly level surface even when applying more than one coat because they bond perfectly to each other;
- PLANO 3 does not require high mechanical resistance in the substrate, so it is very versatile;
- Has an excellent quality/price ratio.

Substrate preparation

PLANO 3 can be used for smoothing various types of substrates:

- Absorbent cementitious substrates: remove any dirt and loose material, then apply a coat of PRIMER G diluted in water in a ratio of 1:3. This fixes any traces of dust and closes the pores of the



substrate to maximize PLANO 3's self-leveling action.

- Existing ceramic tile flooring: must be perfectly anchored to the substrate and cleaned thoroughly with water and caustic soda, then rinsed. No primer is needed before applying PLANO 3 unless the surface of the tiles is difficult to bond, in which case a coat of MAPEPRIM SP is recommended.
- Anhydrite substrates: must first be primed with MAPEPRIM SP or PRIMER G and must have a residual moisture content of less than 0.5%.

Preparing and applying the mix

Mix PLANO 3 with water in a ratio of 5.5 liters per 25 kg of powder with an electric agitator. We recommend mixing only enough product as can be used within 20 to 30 minutes at a temperature of about +23°C. For applications over large surfaces a continuous mixer can be used to obtain a homogeneous paste. A rendering pump can be used to pump the product over 100 meters. PLANO 3 can be applied on the substrate with a rubber

float or metal trowel. Because of its high self-leveling properties PLANO 3 immediately provides a level surface that is perfectly suitable for installing flooring in PVC, rubber, linoleum, wood, ceramic tile, and stone. If two coats of PLANO 3 are required, we recommend applying the second coat as soon as the first is ready for traffic (about 3 hours at +23°C). PLANO 3 hardens so quickly that you can install:

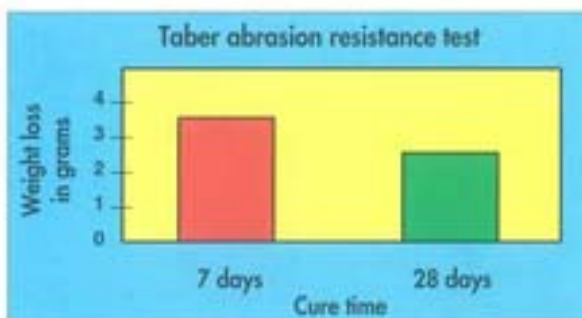
- Moisture sensitive flooring about 24 to 48 hours after application, depending on the ambient temperature and humidity and the thickness of the application.
- Ceramic tiles after about 6 to 8 hours.

A highly resistant substrate

Another very important property of PLANO 3 is its high mechanical resistance to compression, impression and abrasion, so it is suitable for heavy traffic areas. Taber abrasion testing in the laboratory demonstrated PLANO 3's high resistance to wear even at very early ages. At 7 and 28 days cure time at a temperature of +23°C and 50% relative humidity, the weight loss of the samples analyzed was found to be 3.5 and 2.5 grams respectively.

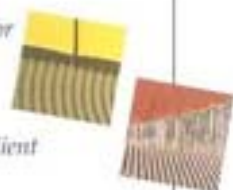
The Technical Data Sheet for PLANO 3 is contained in Mapei Binder No. 1 "Ceramic Tile Installation Products" and No. 2 "Resilient Installation Products".

Francesco Stronati is a consultant with the Mapei Technical Service at the Milan, Italy, headquarters.



The graph shows the resistance to abrasion of samples of PLANO 3 aged 7 and at 28 days at +23°C and 50% relative humidity. The Taber abrasion test ground samples with special abrasive disks and then weighed them after 200 revolutions. This is a very severe test that wears down conventional cementitious leveling compounds completely after a very low number of revolutions. PLANO 3 is manufactured by Mapei in Europe.

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THE MOSAIC FOREST

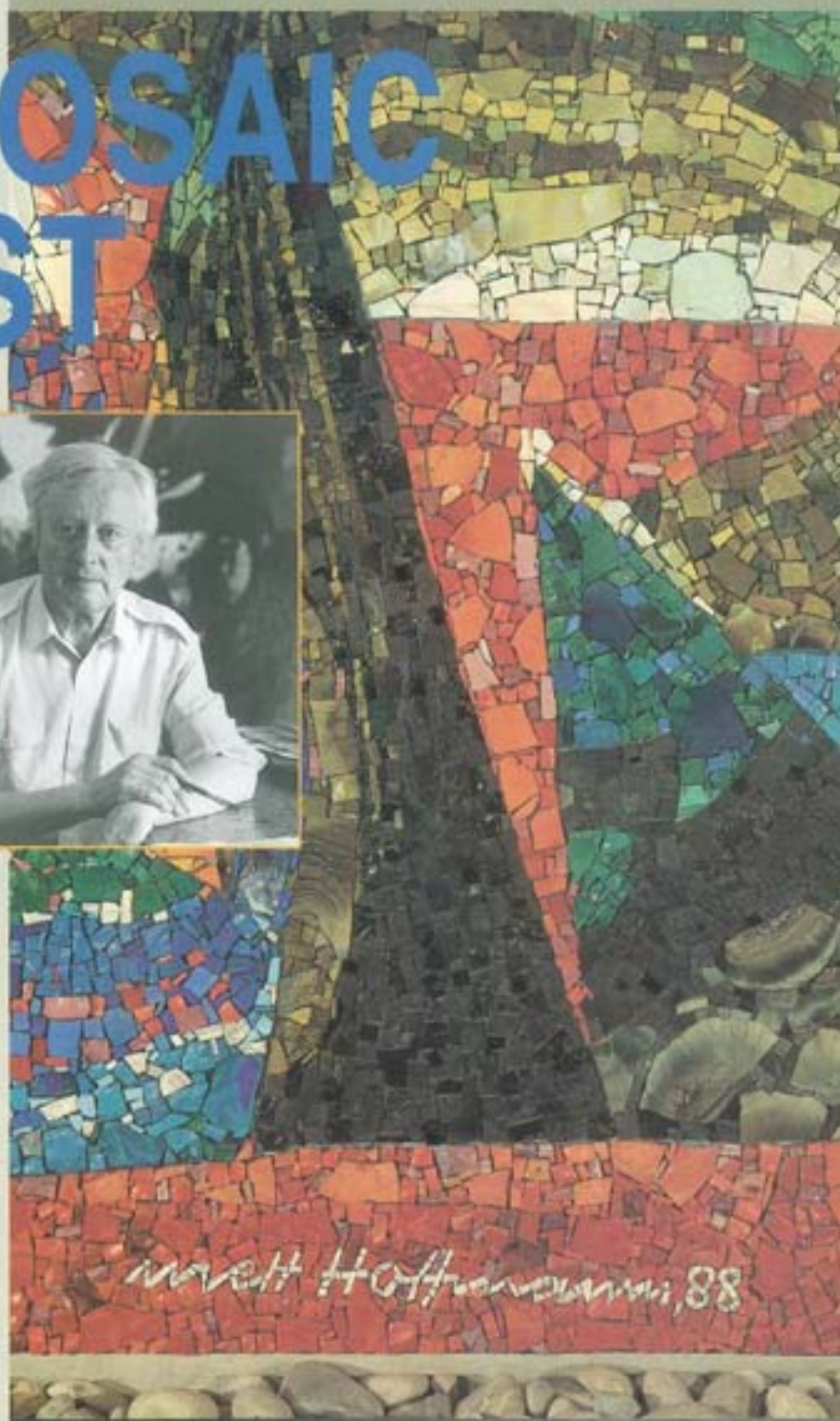
There exists a forest in the city of Luxemburg, a forest made of glass, designed and executed by the late artist, Mett Hoffmann, member of the Grand Ducal Institute of Arts and Letters, when he was at the height of his creative powers. In 1987 Hoffman was commissioned to create a large piece. After weighing the many the pros and cons, the artist decided to do the work in mosaic. He thus fulfilled one of his life's dreams, that of reviving the technique of the mosaic, one of the noblest and most ancient forms of artistic expression.



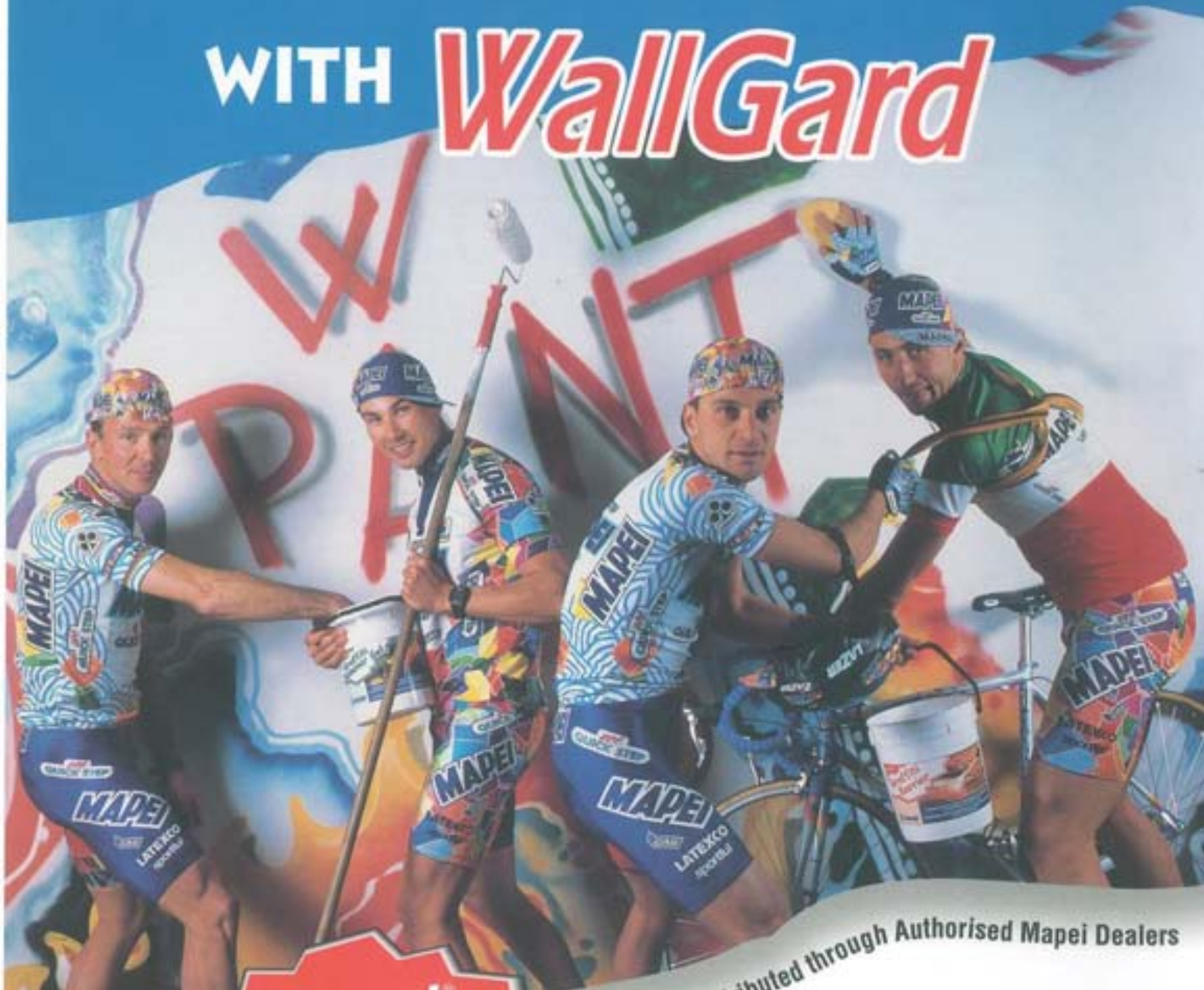
After experimenting with materials from four or five European countries, in the end Hoffmann opted for Italian materials. He was fascinated by the finesse and brilliance of some colored glass-bodied mosaic tiles sent him by the Vetricolor company of Venice. But before proceeding he had to find quality setting materials that would enable his work to stand the test of time. Hoffmann chose Mapei's KERABOND + ISOLASTIC high strength adhesive system for a long lasting installation with a perfect finish. The artistic genius of Mett Hoffmann and these hi-tech products brought his forest to life. The sylvan four seasons unfold in a fusion of space, time and color that seduce the eye and soothe the spirit.

Mett Hoffmann passed away a few years after completing his magic forest but his art continues to delight all those who cross the Bridge of Europe in Luxemburg. □

N.B. KERABOND and ISOLASTIC are part of Mapei's European product lines.



IS GRAFFITI A PROBLEM? JUST WASH IT OFF WITH *WallGard*



WallGard[®]
graffitiFIGHTERS

WallGard is distributed through Authorised Mapei Dealers

...MAPEI helps you fight graffiti with **WallGard Graffiti BARRIER**, the water emulsion of polymeric waxes specially formulated for reversible graffiti-resistant protection of all surfaces, and **WallGard Graffiti REMOVER GEL**, the gel detergent that removes all types of graffiti without damaging the underlying surface. Just rinse it off with water!

