

PGE Arena Gdańsk

GDAŃSK – POLAND

KEY FACTS

- Considered the most beautiful football arena constructed in Poland for UEFA EURO 2012™
- MAPEI's door-opener for National Stadium in Warsaw
- Wide range of building line solutions applied, MAPEFLEX PU 45 being a real hit (2 500 "soft cartridges" of 600 ml delivered to the building site)



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Let's present the project...

Constructed within 26 months, being classified as UEFA IVth category football stadium, PGE Arena has joined the group of most modern and beautiful sports facilities in Europe. The façade of total surface of 4,5 hectares is made from 17 000 polycarbonate elements. Its color is not accidental, as Gdansk is known as World's Capital of Amber. 45 meters high, 236 meters long and 203 meters wide, the stadium may contain 42 000 spectators. The shape of tribunes offers very good visibility and acoustics. The parking is open for 2000 passenger cars and 200 busses. Natural grass adapted to maritime climate was brought in from Holland. The stadium was appreciated as the best in the category of "Architecture & Design" of Stadium Business Awards 2011 international competition.

...and MAPEI contribution

It all started back in the second half of the year 2010, when MAPEI Technical Advisors were invited – being already the ninth company to struggle with the topic – to solve efficiently the precast concrete stands reprofiling problem. These elements were previously prepared in a plant few hundred kilometres from Gdańsk and transported afterwards to the stadium area, where they were laid like simple blocks. According to the construction trade practices the distance between the prefabricates in their final position should be of 30 mm – whereas in Gdańsk it fluctuated from 10 till 80 mm. To repair this, the narrow joints were extended, meanwhile the too wide ones needed to be filled. This action should be executed with a product of a resistance similar to the one typical for prefabricates and which would adhere permanently to the substrate. The problem consisted in the surface of the blocks - smooth and non-absorbent, because of the anti-adhesion agents used for their manufacturing. Every attempt was a complete failure and the repair layer stayed attached maximum for two weeks. MAPEI, unlike other building chemistry manufacturers, proposed a solution based on monolithic crack sealing product EPORIP, which guarantees adequate adherence of the repair mortar MAPEGROUT TISSITROPICO. Extra amount of this mortar was applied to have it smoothen afterwards, obtaining an even and aesthetic appearance of the substrate. The test came out well and MAPEI joined the group of the companies which actively contribute to the development of one of four most important sports infrastructures in Poland.

The damages (the ones already present and the ones executed intentionally through graining the surfaces of dimensionally misfit adjoining elements) of the precast concrete stands were filled with MAPEGROUT 430 mortar.

Soon after, to the MAPEI Technical Advisors another challenge was issued. On the top deck of the stadium, a 4 m tall concrete wall was placed to fix the concrete stands' elements with metal rods. In total there were 1000 rods placed along the perimeter, one every 0,5 meter. In the spots where the rods ran through the wall, 20 x 20 cm holes were drilled, with a 4 cm deep cavity from the inside covered with a metal cushioning layer and a nut. After cutting off the ending of the rod behind the nut, the external surface of the stadium's top deck ought to constitute a smooth, unicolored surface, properly protected from concrete and installed metal fixing elements corrosion. The head of the rod, the cushioning layer and the nut were protected with a corrosion inhibiting mortar MAPEFER 1K, whereas the cavity was filled with a repairing mortar MAPEGROUT 430, modified with a curing and reducing hydraulic shrinkage admix, MAPECURE SRA. This solution was especially recommended, as strong winds at the stadium "crown" level are a pretty common phenomenon which is able to enhance the shrinkage in the fresh repairing mortar layer. After successful attempts, nearly 1000 holes were filled. Every one of them required round 5 kg of MAPEGROUT 430. This action was followed by smoothening the surface with MONOFINISH, protecting it from harmful atmospheric agents with ELASTOCOLOR PRIMER and applying two coats of dark grey ELASTOCOLOR PITTURA paint.



The mentioned ELASTOCOLOR PITTURA paint resulted useful in many other stadium zones:

- Grey color: in the corridors leading to the vomitorium, to create an elastic and washable protective layer on round 1000 m²; on the beams over the glass entrances to the commercial zone and to the Main Banquet Hall on the VIP level (primarily the beams were to be developed with architectonic concrete, but the final effect did not meet the investor's expectations); on the staircases leading to the VIP level.
- Yellow color: on the cashiers' roofs.
- Yellow, red, green and blue colors: over the entrances to each sector and the ceilings in the corridors leading to them.

MAPEFLEX PU 45 appeared in the stadium works, when on the precast concrete stands, the 1,2 m wide and 3 steps high prefabricated stairs had to be installed. These blocks needed to be fixed gravitationally, but also spot-bonded and sealed along the perimeter in a way which would inhibit water penetration from the bottom. The polyurethane sealant and adhesive in one – **MAPEFLEX PU 45** – “**caught up**” on this building site and became so widely used, that after installing the prefabricate stairs, another 1000 (600 ml each) soft cartridges were delivered to fit the needs of a whole range of applications.

When the works on the observation deck commenced, it resulted that the difference between levels of the precast concrete stands and the terrace pavement was of 1 till 3 cm. Maintaining this difference may have put the supporters present at the observation deck at a certain risk. The repair layer should be at least of 20 MPa resistance, smoothly finished off and permanently adherent to the support. These requirements could be complied with the application of a ready-for-use, hydraulic mortar TOPCEM PRONTO, laid on a bonding bridge made from EPORIP. Later on, TOPCEM PRONTO, after having perfectly passed the test on the 100 m² observation deck, happened to find its use in many other stadium zones which demanded a very quick works time completion just for passing to other works stages – sealing freshly filled cavities after transferring the sewage channels, natural stone installation after only 48 hours, bonding the parquet, after only 4 days.

The efficiency of the proposed solutions resulted in the fact that MAPEI Technical Advisors started to accompany the single site's managers during daily round at 5 o'clock in the afternoon. Finally, the problems were being identified and solved in real time. This caused that on the PGE Arena Gdańsk Stadium the time came up for NIVOPLAN PLUS: it resulted that the silicate block walls needed to be reprofiled on the depth of 5 mm. The contractors considered this too shallow to apply a machine plaster. The ease of application of NIVOPLAN PLUS, despite the grand surface, made the smoothing down process rather effortless. Another salvation occurred in the ECO PRIM GRIP product, when ceramic tiles needed to be installed directly on the low adherent smooth precast concrete surface. This promoting primer with silica aggregate made the screed's surface rough enough to make the tiles installation safe and effective (with high performance ADESILEX P9 adhesive and cementitious grout KERACOLOR FF) with no fears regarding the further durability of the floor submitted to intensive foot traffic loads.

Another peculiar solution was invented in the kitchen spaces, which are intended to constitute a base for the stadium restaurants. In the project there was provided a heavy waterproofing insulation, on which a cementitious adhesive and grout would have been applied. However, the ceiling, not smoothen down enough revealed a substantial unevenness (up to 2,5 cm) and the time remaining for the substrate preparation before the ceramic covering installation was to elapse 24 hours later. The end result was to prime the substrate with ECO PRIM GRIP, providing a proper adherence. After 2 hours, the surface was leveled with thick layer leveling mortar ULTRAPLAN MAXI. On the next day, the waterproofing layer was done with MAPELASTIC. Finally, ceramic tiles were fixed with cementitious adhesive ADESILEX P9 and grouted with KERAPOXY or KERAPOXY DESIGN epoxy mortars. Unlike the primal solution, the protection from aggressive chemical agents was guaranteed thanks to the ceramic covering and a non-absorbent, impermeable grout.



The kitchen works were followed by the lock rooms and baths with two relaxation swimming pools and Jacuzzi for the football players and other competitors. The area designed for the swimming pools was situated below the floor level and required an effective sealing. 5 pipes were supposed to run through the floor and carry water to each pool, which would eventually overflow and go back down. In such way the pools would have been always supplied in fresh and clean water. Moreover, it resulted that, despite the swimming pool works completion approaching deadline, there was no suitable contractor to undertake this task. It was the moment for DagoTech to make its entrance applying MAPEI system solutions. In the lower parts of the floor adequate roundings were executed with a fast-setting cementitious binder-LAMPOCEM, easy to apply also on vertical substrates, without the need of shoring. The substrate was primed afterwards with MAPETHENE PRIMER and, as the next step, sealed with MAPETHENE SA, a self-adhesive elastic, bitumen membrane, 1,5 mm-thick and of a high ability of crack bridging. The waterproofing membrane was installed on the water height level (on round 1,1 m). Unfortunately, other surprises occurred as well. Instead of brass pipes determined primarily in the project, designed to carry in the water, PVC pipes were provided. Their installation could be executed only with a product highly adherent to plastic materials. The chosen one was ADESILEX PG4, an epoxy adhesive, which not only bonds to concrete different types of materials, but also thanks to its thixotropic properties can be applied with a simple trowel on vertical, horizontal and ceiling substrates. After having a concrete basin installed, it was necessary to form its bottom with a leveling and repairing mortar NIVOPLAN PLUS, modified with a synthetic rubber latex PLANICRETE. The waterproofing layer in the basin was created with MAPELASTIC and a sealing rubber tape MAPEBAND. Because the time was running really fast and only few days were missing from filling the pool with water, the pool tiles installation was executed with a fast setting, highly deformable cementitious mortar ELASTORAPID, which guaranteed a safe tiles and stone installation in areas submitted to high loads and which can be used in swimming pools after 3 days only. The joints were filled with impermeable, epoxy, easy to keep clean KERAPOXY grout, the expansion joints were sealed with the silicone sealant MAPESIL AC.



In the middle of the 10-shower bath, water outlets were designed to carry out water from the pavement with special decline. Additionally, incisions were made in the substrate which hosted a 5 cm high metal construction to fix outlet gutters. As the area around them needed to be filled in and sealed, the incisions were filled up to 4 cm with a fast setting binder LAMPOCEM with water repellent properties, whereas the top layer was made with KERAPOXY epoxy grout. The whole room was afterwards insulated on the walls with MAPEGUM WPS and on the floors with MAPELASTIC. The ceramic tiles, according to the expected deadlines were installed with thick layer adhesive KERAFLEX MAXI S1, ADESILEX P9 and ADESILEX P9 EXPRESS. Again, the grouting process was carried out with KERAPOXY, except for the anti-slip R13 category tiles, where its more plastic consistency variant was used – KERAPOXY DESIGN. Expansion joints and sealing works were done with MAPESIL AC, the mirrors were fixed with MAPESIL LM.



Other interesting applications of MAPEI products on the Gdańsk stadium:

- LAMPOCEM – rapid hardening, cementitious binder, thanks to its fast setting properties (3 minutes in +20°C) was applied in installation of every stair balustrade on the external stadium stairs.
- MAPEFILL – this no-shrink, high-flow mortar found its use in filling the voids between installed metal construction and its concrete base.
- MAPECOAT I 24 – this epoxy paint intended for protecting the concrete surfaces against aggressive chemical agents was used for painting on the concrete pavement over 42 000 numbers indicating the seats for supporters.

MAPEI PRODUCTS: ADESILEX P9, ADESILEX P9 EXPRESS*, ADESILEX PG4, ECO PRIM GRIP, ELASTOCOLOR PITTURA, ELASTOCOLOR PRIMER, ELASTORAPID, EPORIP, KERACOLOR FF, KERAFLEX MAXI S1, KERAPOXY, KERAPOXY DESIGN, LAMPOCEM, MAPEBAND, MAPECOAT I 24, MAPECURE SRA, MAPEFER 1K, MAPEFILL, MAPEFLEX PU45, MAPEGROUT 430, MAPEGROUT TISSOTROPICO, MAPEGUM WPS, MAPELASTIC, MAPESIL AC, MAPESIL LM, MAPETHENE PRIMER, MAPETHENE SA, NIVOPLAN PLUS*, PLANICRETE, TOPCEM PRONTO, ULTRAPLAN MAXI.

*product manufactured and distributed locally.

TECHNICAL DATA

- **Name of building intervention:** PGE Arena Gdańska / Gdańsk / Poland
- **Type:** SPORT (STADIUM)
- **Period of construction:** 2008-2011
- **Period of MAPEI intervention:** 2010-2011
- **Intervention by MAPEI:** specialized solutions of building line including re-profiling, renovation and protection of pre-casted concrete elements of spectators' stands; waterproofing; walls protection inside & outside; installation of ceramic tiles in kitchens, locker rooms & bathrooms
- **Designer:** RKW Rhode-Kellermann-Wawrowsky
- **Contract Manager:** Marek Surmacewicz
- **Construction Manager:** Piotr Glowacki
- **General Contractor:** Consortium Hydrobudowa – Alpine
- **MAPEI Distributor:** DAGOTECH, Dariusz Górak, Gdańsk
- **MAPEI Coordinators:** Ireneusz Ropel, Michał Molenda, Piotr Dawidowicz.

MAPEI PRODUCTS	MATERIAL INSTALLED	SUBSTRATE	QUANTITY OF PRODUCT	SURFACE	INSIDE/ OUTSIDE	NEW/ RENOVATION	PRODUCT LINE
	DO NOT COMPLETE FOR BUILDING PRODUCTS						
ADESILEX P9			62 000 kg		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
ADESILEX P9 EXPRESS			3750 kg		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
TOPCEM PRONTO			10 000 kg		OUTSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
EPORIP			300 kg		OUTSIDE	NEW	PRODUCTS FOR BUILDING
ECO PRIM GRIP			500 kg		INSIDE	NEW	PRODUCTS FOR BUILDING
ADESILEX PG4			210 kg		INSIDE	NEW	PRODUCTS FOR BUILDING
PLANICRETE			100 kg		INSIDE	NEW	PRODUCTS FOR BUILDING
LAMPOCEM			2500 kg		OUTSIDE/INSIDE	NEW	PRODUCTS FOR BUILDING
MAPEBAND			4000 m		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
MAPEGUM WPS			6000 kg		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
MAPELASTIC			18 000 kg		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
MAPETHENE SA			180 m ²		OUTSIDE	NEW	PRODUCTS FOR BUILDING
MAPETHENE PRIMER			40 kg		OUTSIDE	NEW	PRODUCTS FOR BUILDING
MAPEFER 1K			80 kg		OUTSIDE	NEW	PRODUCTS FOR BUILDING
MAPEGROUT TISSOTROPICO			2500 kg		OUTSIDE	NEW	PRODUCTS FOR BUILDING
PLANITOP 400			4000 kg		OUTSIDE	NEW	PRODUCTS FOR BUILDING
MAPEGROUT 430			4000 kg		OUTSIDE	NEW	PRODUCTS FOR BUILDING
ELASTOCOLOR PITTURA			3000 kg		OUTSIDE/INSIDE	NEW	WALL PROTECTIVE & DECORATIVE COATINGS
ELASTOCOLOR PRIMER			800 kg		OUTSIDE/INSIDE	NEW	WALL PROTECTIVE & DECORATIVE COATINGS
MAPECURE SRA			50 pcs		OUTSIDE	NEW	PRODUCTS FOR BUILDING
MAPEFLEX PU 45			2500 pcs 600 ml		OUTSIDE/INSIDE	NEW	PRODUCTS FOR BUILDING
KERACOLOR FF			5000 kg		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
KERAPOXY			2000 kg		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
ELASTORAPID			3150 kg		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
KERAFLEX MAXI S1			6250 kg		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
NIVOPLAN PLUS			3000 kg		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
MAPESIL AC			1200 pcs		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
KERAPOXY DESIGN			2000 kg		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
MAPESIL LM			120 pcs		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
MAPEFILL			1250 kg		OUTSIDE/INSIDE	NEW	PRODUCTS FOR BUILDING
PRIMER G			1500 kg		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
MAPENET 150			6000 m ²		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
KERABOND T			12 500 kg		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
PLANOLIT 315			6500 kg		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE
ULTRAPLAN MAXI			8500 kg		INSIDE	NEW	PRODUCTS FOR CERAMICS & STONE

