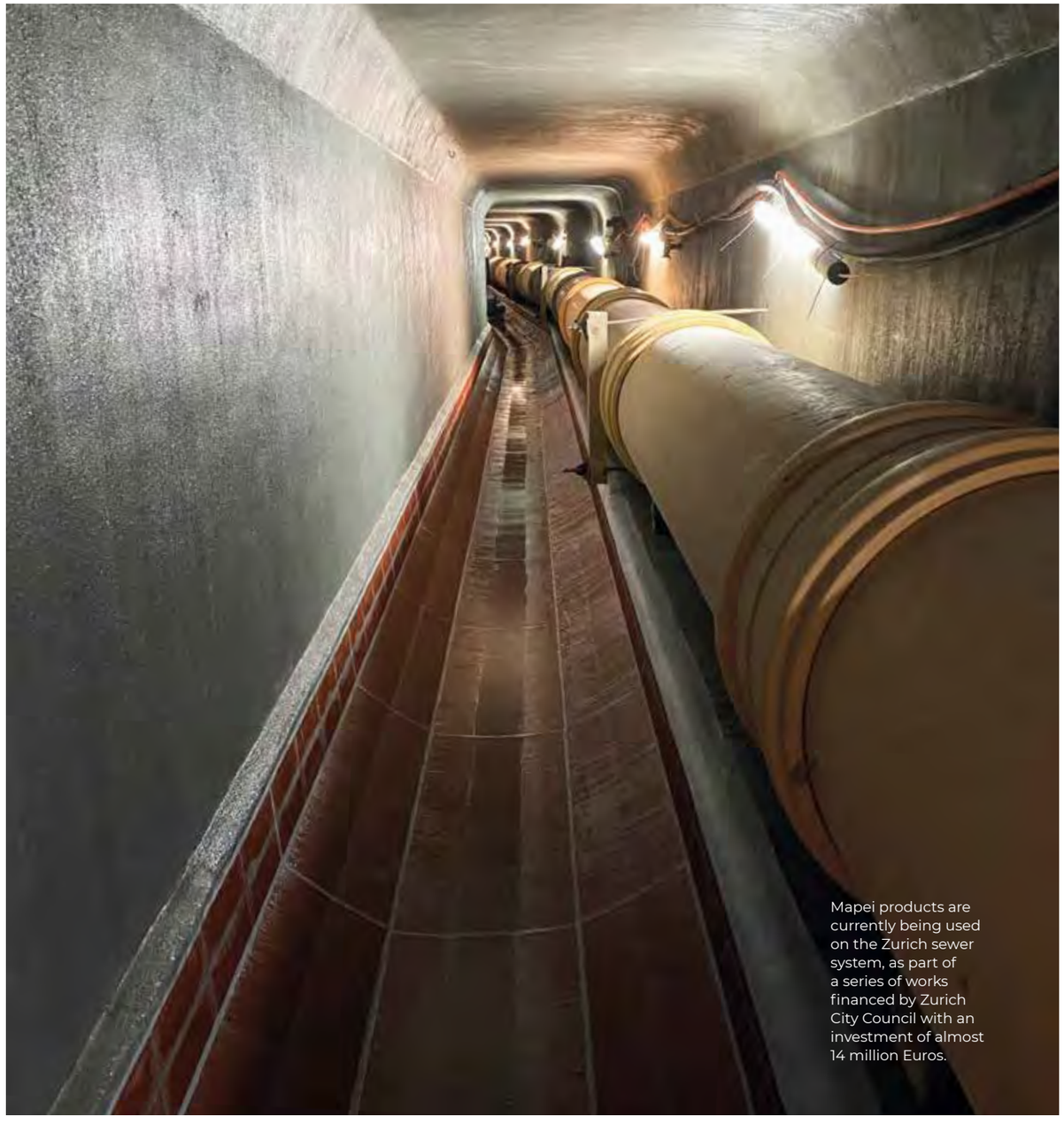
Zurich (Switzerland)

Maintenance work on the sewer systems

WHEN CARRYING OUT REPAIR WORK, CEMENTITIOUS MORTARS, EPOXY RESINS AND PRODUCTS FOR CERAMIC COVERINGS ALL PLAY A FUNDAMENTAL ROLE



Mapei products are currently being used on the Zurich sewer system, as part of a series of works financed by Zurich City Council with an investment of almost 14 million Euros.

The city of Zurich boasts a long tradition in the construction of cutting-edge sewer systems, ever since the first modern type of sewer was constructed in the Selnau district in 1860. By 1960 a modern sewerage system covered the entire city, while today, Zurich's almost 1,000 km-long system of sewer channels caters for the needs of more than 45,000 buildings, directing 200,000 m^3 of waste water along various pipe networks and channels up to the water-treatment plant in Werdhölzli.

Control and maintenance of the sewer systems

To guarantee the complete functionality of the sewer system, checks are carried out on a regular basis in order to identify and repair any signs of degradation as early as possible.

In fact, the channels in the sewer system have a service life of around 80 years, after which they are no longer suitable for use and have to be repaired or replaced. For a system extending for 1,000 km, like the one in Zurich, this means that around 12 km of channels need to be repaired every year. For these interventions, methods and technologies have to be adopted that reduce the impact work has on normal activities at street level.

Renovation of the channels accessible on foot

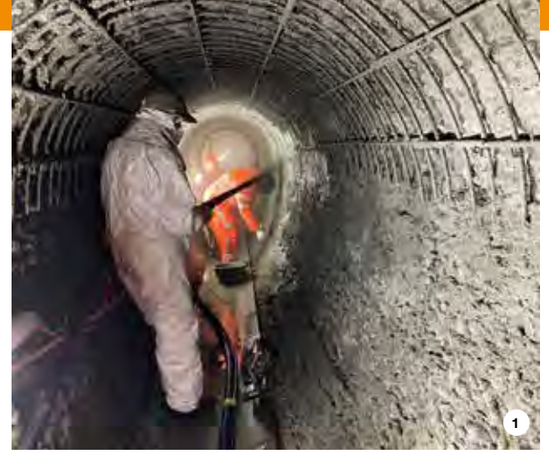
The channels of the Zurich sewer system accessible on foot are mainly made from reinforced concrete and are circular, rectangular or oval in shape. They are constantly subject to degradation due to various phenomena: attack from carbon dioxide, due to the formation of condensation on the concrete surfaces, or corrosion to the concrete and steel reinforcement, due to the penetration of chlorides and other pollutants. Apart from attack of a chemical nature, there are also mechanical and static loads and stresses that can provoke subsidence, leaching, corrosion and cracking. Damaged sections of channels are repaired immediately to prevent the risk of them contaminating drinking water.

Concrete repair with cementitious mortars

Cementitious construction materials and epoxy resins play an important role in these types of application because of the benefits offered by their binding power.

Amongst the repair materials specifically developed by Mapei for use in sewer systems, the ones that stand out in particular are the cementitious mortars applied using the wet-spray method, which are resistant to attack from sulphates and chemical agents, and cementitious coatings specifically formulated to resist wear caused by gases and other aggressive agents. Amongst these cementitious mortars there are MAPEGROUT THIXOTROPIC, MAPEGROUT T60 and MAPEGROUT EASY FLOW, all compliant (and classified as R4) with the requirements of EN 1504-3 European standard regarding products for protecting and repairing concrete structures. What is more, they also meet the requirements of Zurich City Council specifications for this type of use. Their workability, high pumpability and reduced rebound make repair work on sewer systems much easier, starting from handling and transport practices and use in confined spaces.

And this is why they are currently being used on sections of the Zurich sewer system, for a total length of 2,000 m, as part of a series of works financed by Zurich City Council with an investment of almost 14 million Euros.



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1-2. Cementitious mortars are being used to repair concrete in the Zurich sewer network, such as MAPEGROUT T60, MAPEGROUT THIXOTROPIC and MAPEGROUT EASY FLOW. Therefater, MAPEFINISH HD and MONOFINISH HD are used to create a protective coating on the concrete surfaces of the sewer channels.

Protection with MAPEFINISH HD and MONOFINISH HD

After applying the repair mortar, and if required by the designers, the concrete surfaces are normally protected by coating them with a manual application of a 3-6 mm layer of MAPEFINISH HD two-component cementitious mortar or MONOFINISH HD one-component cementitious mortar, both with high resistance to sulphates. These two mortars meet the requirements of European standard EN 1504-2, which evaluates the performance properties of products and systems for repairing concrete surfaces and their impact on the durability of reinforced concrete structures. MONOFINISH HD and MAPEFINISH HD both offer high resistance to attack from chemical agents and sulphates. Also, their high resistance to biogenic sulphuric acid and abrasion (class A5 according to Böhme standards) guarantee long-lasting protection against pollutants, leaching and abrasion.

Installing and grouting ceramic coverings with KERAPOXY

In certain stretches of the Zurich sewer system, it was decided to create ceramic coverings and bond them to the concrete elements. These types of coverings are particularly suitable for this kind of environment because of their resistance to mechanical stresses and chemicals, as well as for the lower of amount of cleaning required and for their hydraulic performance properties.

In this particular case, ceramic materials such as klinker and porcelain tiles were chosen to cover the channels of the Zurich sewers.

And to ensure strong and durable bonding with the concrete elements, Mapei proposed epoxy adhesives in water dispersion such as KERAPOXY two-component, anti-acid epoxy mortar, which is highly resistant to acids and abrasion and may be used both as adhesive and grout.

Compared with traditional epoxy adhesives, KERAPOXY has the advantage of being able to be used in particularly damp conditions, which helps eliminate problems typically encountered with traditional adhesives associated with the lengthy installation times required and the need to operate on substrates with more than 4% residual moisture content, while guaranteeing excellent adhesion.

To guarantee a perfect bond of the various ceramic elements inside the sewer channels, KERAPOXY was applied using the double-buttering method to eliminate any gaps or voids between the elements.

The joints were grouted, again using KERAPOXY, at least 12 hours after the installation operations. Because of the properties of the product, solvent does not need to be used to finish off joints and to clean tools: an undeniable advantage when carrying out these operations in a confined area such as that of a sewer network.

Because the work was carried out in different stages, to restore the waterproofing capacity of the expansion joints, MAPEBAND FLEXROLL membrane was applied and bonded in place with ADESILEX PG4.

Find out more
MAPEGROUT EASY FLOW

3. To guarantee the waterproofing capacity of the expansion joints, MAPEBAND FLEXROLL membrane is being applied and bonded in place with ADESILEX PG4.
4. The ceramic covering on the lower surfaces of the sewer channels is being installed and grouted with KERAPOXY mortar.

TECHNICAL DATA
Sewerage network, Zurich (Switzerland)
Year of construction: 1953
Period of repair: 2022-ongoing
Owner: Zurich underground works authority, Zurich recycling and waste management authority
Design: Hunziker Betatech, Ingenieure
Main contractor: Jak. Scheifele AG
Mapei coordinator: Maurizio Barletta, Mapei Suisse (Switzerland)

MAPEI PRODUCTS

Repairing concrete elements: Mapegrout T60, Mapegrout Thixotropic, Mapegrout Easy Flow
Finishing concrete surfaces: Monofinish HD, Mapefinish HD, Triblock Finish
Installing and grouting ceramic coverings: Kerapoxy
Waterproofing expansion joints: Mapeband Flexroll, Adesilex PG4

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