

Saint-Denis (France)

Underground powerlines

THE PROJECT - THE FIRST OF ITS KIND IN FRANCE – INVOLVES BORING OUT TUNNELS IN A HIGHLY BUILT-UP AREA WITH ROAD, RAIL AND RIVER INFRASTRUCTURES



In preparation for the 2024 Paris Olympic Games, and construction of the Olympic and Paralympic Village in particular, work is ongoing in Paris and its outskirts to run powerlines underground and free-up more than 80 hectares of land. In fact, by 2024, the local provider RTE (Réseau Transport Electricité) is planning to run four 225 kilovolt powerlines underground, which are going to substitute 15 km of cables running on 27 pylons and pass through the towns of Saint-Denis, Villeneuve-la-Garenne and l'Île-Saint-Denis, close to the French capital. This intervention is part of the Mesil (Mise en Souterrain d'Initiative Locale) project. The sheer size of the project is awe-inspiring – and the first of its kind in France – and will involve boring out deep tunnels in a highly built-up area where numerous road, rail and river infrastructures are located. Work is carried out on extremely important pow-

erlines that feed the Gare du Nord railway station, Line 13 of the Paris Metro and the entire area to the north-west of the city (with a population of more than 800,000). There are other sites currently ongoing in the same area which means work needs to be very carefully coordinated, also taking into account the future reorganisation of the urban layout with 2 km of tunnels at a depth of 50 m.

To overcome the challenges of this part of the project, RTE opted for the construction of an underground tunnel through which the new powerlines will pass: an appropriate solution for a particularly congested and densely populated area. The tunnel, around 2.5 km long, is 3 m in diameter and runs at a depth of 50 m. For the tunnelling work, carried out by a 120 m long TBM with a diameter of 3.9 m called Ambra, 120,000 liner segments had to be installed.

Backfill grouts with Mapei two-component systems

While tunnelling, a TBM leaves an annular void between the ground and the extrados of the segments when they are placed in position and this void has to be filled as the TBM advances. Depending on particular site constraints and decisions taken by the main contractor, the voids may be filled with grouts or two-component grout, in which component A is made from water, bentonite, cement and a set retardant and component B is a set accelerator.

The two-component system proposed by Mapei, thought to be the most suitable for this site by the main contractor Spie batignolles, had already been used on other sites such as Lots T2A and T2B of the 15 Line South of the Grand Paris Express project (see *Realtà Mapei International* no. 92), the extension of the safety tunnel for the RER C in

IN THESE PAGES

Excavating the tunnel with a TBM called Ambra. Mapei products for tunnelling made works easier.



TOP. The entrance to the tunnel constructed to run powerlines underground.

Meudon and site SMP4 for the Tunnel Euroalpin Lyon Turin (TELT). Because of the constraints imposed by the mechanical properties required, along with the high pressures due to the sheer depth of the tunnel, a preliminary study had to be carried out in the Mapei laboratories. The products proposed are the following:

- MAPEQUICK CBS SYSTEM 3: a liquid product used as accelerator of cement-based mixes for injection, particularly suitable for extremely fluid mixes with a very high content of water.
- MAPEQUICK CBS SYSTEM 1: a liquid retarding agent with plasticizing effect which inhibits the setting times of cementitious mixes for long periods. It is specifically designed for cementitious mixes that need long workability times, for example, because of long transportation times or long pumping distance.
- MAPEBENT API 2: a natural sodium bentonite suitable

for every type of civil engineering application fields. It conforms the international API specifications about materials to be used for drilling fluids and bentonite based slurries and can be used in every civil engineering application fields, especially where a quick activation of bentonite in water is required and where the mix should have an easy pumpability and high volumetric stability.

This article was taken from issue N° 52 of Mapei et Vous, the magazine published by Mapei Group's subsidiary Mapei France, whom we kindly thank.



Find out more
MAPEBENT API 2

TECHNICAL DATA

Mesil RTE, Seine Saint-Denis (France)
Period of construction: 2021-2024
Period of the intervention: 2021-2022
Intervention by Mapei: supplying products for injections and TBM works

Owner: RTE (Réseau Transport Electricité)
Project manager's assistant: Arcadis
Contractors: Spie batignolles génie civil, Spie batignolles fondations, Spac and Setec TPI
Works direction: Setec
Mapei coordinators:

Mapei UTT Technical Services, Edgar Doledec, Jérôme Darras
Photos: Edgar Doledec, Vincent Collin, Pascal Tournaire

MAPEI PRODUCTS

Bentonite: Mapebent API 2, Mapedisp FLS

Backfill grout admixtures: Mapequick CBS System 3, Mapequick CBS System 1

For further info on products see mapei.fr, mapei.com and utt.mapei.com

Bergen (Norway)

Løvstakken Tunnel

PRODUCTS FOR INJECTIONS TO OVERCOME THE PRESENCE OF AN AQUIFER

The Løvstakken tunnel has been constructed to provide a new link between the Fyllingsdalen district with Kristianborg and the Årstad district. To create this link, two parallel tunnels, each around 3 km long, were excavated directly into the mountain: a main tunnel for the twin-track Bybanen tramline and a safety tunnel that can also be used by pedestrians and cyclists, the longest of its kind in Europe.

Two chambers, each measuring 200 m in length, were also excavated on the western side, in Fyllingsdalen, and will be used as an underground storage area and a maintenance centre for the Bybanen trams. The two chambers will be directly connected to the tramline tunnel. The tunnels and chambers were constructed using traditional tunnelling methods and a total of around 500,000 m³ of excavated material was removed.

Mid-way through 2019, the team unexpectedly hit a fault zone with groundwater. In some points, up to 1,000 litres per minute were pouring out of the bored holes. As a result, the additional pre-injections requested made operations much more difficult. The conditions of the rock represented a particularly difficult challenge for the team. Systematic pre-injections were carried out to move the water before continuing with the main operations, and

then post-injections were applied where further sealing was required.

Admixtures and grouts for concrete and products for injections

For this intervention Mapei AS, the Group's Norwegian subsidiary, supplied numerous admixtures for the mix-design of the concrete (DYNAMON SX-23*, MAPE-TARD SD-2000, MAPEAIR 25* and MAPECURE CCI-2000) and for the shotcrete (MAPEQUICK AF 118 N, MAPEQUICK AF D03 and MAPEQUICK AF-2000), mortars for the shotcrete (GROUT TECH 5000*, GROUT TECH SYSTEM W* and MAPEI MICRO*) and products for the injections (MAURING*, RESFOAM 1KM, RESFOAM 1KM AKS and ZINK-BOLT*).

*These products are distributed on the Norwegian market by Mapei AS.



Find out more
RESFOAM 1K-M



TECHNICAL DATA

Løvstakken Tunnel, Bergen, Norway
Period of construction: 2018-2022
Main contractor: Marti Norge
Owner: Bybanen Utbygging
Mapei coordinators: Kenneth Gundersen, Roy Hansen, Rune Espeseth and Hans Olav Hognestad, UTT, Mapei AS (Norway)