

Organyà (Spain)

## Tres Ponts Tunnel



THE INFRASTRUCTURE GREATLY IMPROVED CIRCULATION FOR THE PYRENEES REGION'S INHABITANTS

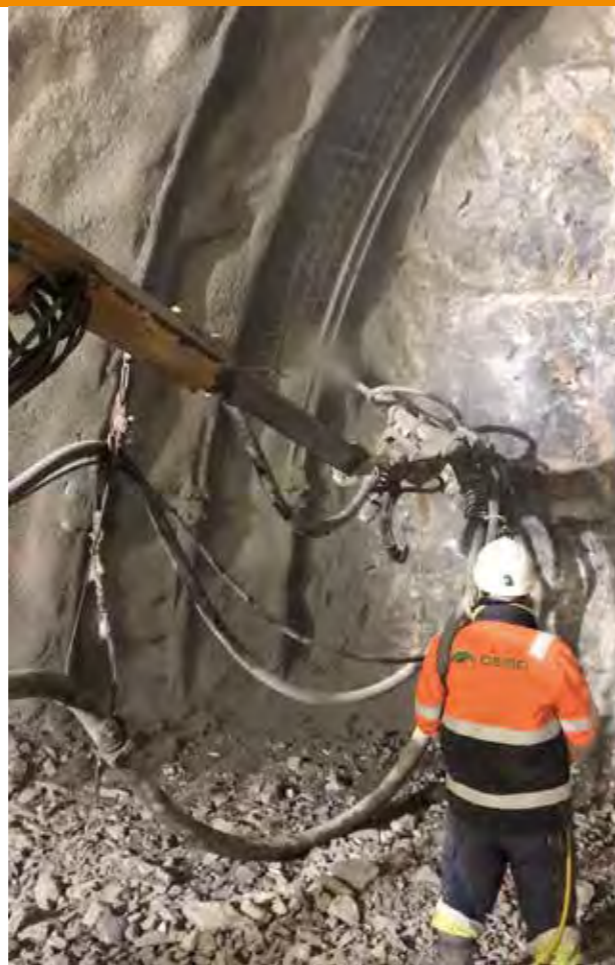
Opened in November 2021 after 4 years of construction work, the new Tres Ponts tunnel, running parallel to the River Segre, is located along the C-14 road in the Alt Urgell region (Pyrenees) between the towns of Organyà and Montant de Tost. Thanks to the tunnel, residents of the region no longer have to negotiate narrow roads with tight, hazardous bends, often interrupted by landslides caused by bad weather. Construction of the tunnel (for a total cost of more than 35 million Euros) commenced in 2018 and was completed in 36 months, as stipulated in the initial project, which included not only the excavation of the tunnel, but also widening of the roads adjacent to the tunnel. With its inauguration, the infrastructure greatly improved circulation for the region's inhabitants, as well as for the entire north-south communications axis between the cities of Lleida and Andorra.

#### Underground construction work

The Tres Ponts tunnel is 12.6 m wide, 7.9 m high and 1.3 km long and has two 3.5 m wide lanes, one for each direction. Two sidewalks alongside the road (1.5 m wide) were also constructed, as well as two emergency tunnels (4.10 m wide) that exit onto a road closed to traffic, in order to allow the drivers to evacuate the tunnel in the event of dangerous situations. The rock excavated and extracted during tunnelling was transformed into aggregates used directly in the production of the concrete used for the gallery. This led to considerable savings from a sustainability perspective by reducing both transport and storage areas and consumption of natural resources. Mapei Spain's UTT team also worked on the site, recommending the most suitable admixtures for the concrete used in the construction work and providing an ongoing consultancy and technical service as work progressed to

**ABOVE.** Opened in November 2021 after 4 years of construction work, the new Tres Ponts tunnel is located in the Alt Urgell region (Pyrenees).





**ABOVE, LEFT.** The use of Mapei admixtures enabled the formulation of a concrete mix design with high quality spray pattern, even at low temperatures.

**RIGHT.** Applying shotcrete admixed with MAPEQUICK AF T100.

**IN THE FACING PAGE**

Top, left: lining the tunnel surfaces with concrete admixed with DYNAMON SX T. In the middle, left: MAPEFIBRE IT39NV fibers were added to the concrete mix.

On the right: constructing the base layer of the tunnel floor with concrete admixed with DYNAMON SX T and MAPEPLAST N16.

optimise the various phases and application of the recommended products.

Excavation and pre-lining of the tunnel were carried out according to criteria adopted with the construction method for shotcrete tunnels. This method consists in spraying concrete mixed with set-accelerators so that the concrete immediately bonds to the surface without having to use formworks. The concrete mix design supplied had to guarantee a quality spray pattern, even at low temperatures (which are common in winter in the area), and included high-performance admixtures to guarantee optimum application.

**Supplying the right admixtures**

The Mapei UTT team worked on site to help formulate the mix design and during tunnelling operations, recommending DYNAMON SX T, a superplasticizer which is distributed in Spain by Mapei Spain (its counterpart on the international market is DYNAMON SX). This product, based on modified acrylic polymer, was used to formulate concrete with low water/cement ratio, high mechanical strength, long slump retention, and extended workability.

These characteristics made it ideal for the shotcrete, where a lower water/cement ratio (0.38-0.41) is needed, along with good plasticity, an essential requirement to optimise the mix. This admixture is also very versatile and adapts to various types of aggregate, such as in this case in which a high percentage of the materials obtained during tunnelling was used.

Apart from DYNAMON SX T1, MAPEQUICK AF T100 alkali-free, inorganic salt-based liquid accelerant (which is also manufactured and distributed in Spain by Mapei Spain) was also added to the mix prior to spraying. These two products work together to form an admixture system ideal for fast-setting shotcrete.

MAPEFIBRE IT 39 NV structural polypropylene fibers were also added to make the concrete more ductile in the post-failure phase, enabling loads to be distributed more evenly and eliminating the need to install metal mesh on the substrate.

Once tunnelling had been completed, DYNAMON SX T1 was again used in the lining for the internal surfaces where the concrete needed to have high workability, be easy to apply at the fresh state and have excellent me-

chanical properties at the hardened state.

For other concrete mixes used on site, DYNAMON SX T1 was mixed with the liquid admixture MAPEPLAST N16, a plasticizer used to formulate concrete with medium mechanical strength. This concrete mix was used to construct the base layer of the floor in the tunnel.

*This article was taken from Realidad Mapei 31/2022, a magazine published by Mapei Spain, whom we would like to thank.*



**Find out more  
DYNAMON SX**

**TECHNICAL DATA**

**Tres Portos tunnel,** Organyà (Province of Lleida), Spain  
**Period of construction:** 2018-2021  
**Period of Mapei intervention:** 2018-2021  
**Intervention by Mapei:**

supplying admixtures and fibers for the mix design for concrete and shotcrete  
**Owner:** Infraestructures Cat  
**Design:** Ayesa - Kreum  
**Main contractor:** Acciona - Copcisa  
**Subcontractor:** Obras

Subterràneas  
**Mapei coordinator:** Marc Benito, Mapei Spain

**MAPEI PRODUCTS**  
**Concrete admixtures:** Dynamon SX T\*, Mapeplast N16\*, Mapequick AF T100\*  
**Fibers:** Mapefibre IT 39 NV

\*These products are manufactured and distributed on the Spanish market by Mapei Spain

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