

# Tunnel of Lonato



TREVI EUROPE

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**The new Brescia-Verona High-Speed/High-Capacity railway line is a key project of the Milan-Verona railway link. It is part of the Turin-Trieste line which, in turn, is part of the wider system connecting Spain to the Ukrainian border.**

The project, whose implementation has been entrusted to the CEPAV DUE consortium, has been commissioned by Rete Ferroviaria Italiana, while the High Supervision and Construction Works Supervision have been entrusted to ITALFERR.

The new Brescia East-Verona railway line is about 48 km long, crossing two regions, 11 municipalities and mostly running alongside the A-4 freeway.

The most complex and articulated project of the entire work is undoubtedly the Lonato Tunnel, entrusted to SELI OVERSEAS. It will be about 8 km long (7.9 km to be precise) and will pass under the A4 freeway.

The demanding consolidation and foundation works have been entrusted to Trevi, a leading company in the execution of special foundation works.

The initial section of the railway line interferes with the A4 Milan-Venice freeway, and subsequently with significant buildings, in terms of size and extension, located in the industrial area of the Lake Garda city.



TREVI Tunnel of Lonato  
Image source: TREVI - Finanziaria Industriale S.p.A.

The small amount of overburden, in particular along the undercrossing of the A4 freeway and the buildings, imposed the decision to carry out consolidation prior to mechanized excavation, in order to minimize subsidence phenomena.

The purpose of the consolidations is to improve the physical-mechanical characteristics of the soil behind the excavation section - behind the piers and the cap - for a thickness of about 3 m.

Thanks to the collaboration between TREVI, SELI, CEPAV DUE and all the parties involved, the consolidations, and the inevitable technological and design implementations, that are necessary for a project as articulated and complex as the Lonato tunnel, are taking place according to the estimated schedule.

Therefore, one of the fundamental infrastructures in the development of the connections in the region and all of Northern Italy is currently taking shape.



TREVI Tunnel of Lonato  
Image source: TREVI - Finanziaria Industriale S.p.A.

## THE PURPOSE OF TREVI'S WORK

The purpose of Trevi's work is to pre-consolidate the soils surrounding the new Lonato tunnel to allow the passage of the TBM without causing any subsidence.

The initial design entailed that the sections to be consolidated had to be treated with three different types of drilling, all starting from ground level.

1. Sub-vertical drilling
2. Sub-horizontal drilling (remotely controlled by the HDD technology), with direction perpendicular to the tunnel axis.
3. Sub-horizontal drilling consisting of a radius of curvature, also remotely controlled, with direction longitudinal to the axis of the tunnel.

The poor capacity of the soil to be permeated by the mixtures hypothesized by the project and the complex drilling geometry, led us to seek new design solutions.

Thanks to the tests carried out in the test field that we set up on site, we were able to reshape the project mesh and develop more performing mixtures suitable for the soil.



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Image source: TREVI - Finanziaria Industriale S.p.A.

In particular, four fundamental observations emerged from the test field:

- The adoption of a combination of cement and silicate-based chemical mixtures.
- The use of cement mixtures with low cement content, to obtain better rheological features, that is, a better balance in the soil thus deformed.
- The adaptation of the project mesh by increasing the number of valves per linear meter.
- And finally, the selection of sub-vertical drilling operations, carried out mainly at the head of the tunnel and no longer at floor level.



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## NEW APPROACH

To apply this new approach, A4 Autostrade was asked to drill from above, thus carrying out sub-vertical drilling entirely occupying the emergency lane in both directions without interrupting the freeway traffic.

Therefore, this work made it possible to refine and therefore shorten working times, thus improving consolidation work between the tunnel and the freeway.

Hence, when the work is completed, especially from the inside of A4, 89,475 linear meters of drilling and grouting will be carried out, using about 10 million litres of mixture.

As of today, we are completing the intervention phase on A4, and the first results of the post-treatment tests show a clear improvement in the mechanical characteristics of the consolidated soils. Obviously, the continuation of the interventions will be subject to further post-treatments. The new Brescia-Verona High-Speed/High-Capacity railway line is a key project of the Milan-Verona railway link. It is part of the Turin-Trieste line which, in turn, is part of the wider system connecting Spain to the Ukrainian border.

Source: TREVI - Finanziaria Industriale S.p.A.