

Trevi Group involvement with the Lonato Tunnel

Trevi is employing several soil stabilisation techniques to prevent subsidence as part of the development of the high-speed Brescia-Verona railway line

“Four fundamental observations emerged from the test field”

The new 48km long Brescia-Verona high-speed/high-capacity railway line, a key part of the Milan-Verona railway link, which is part of the Turin-Trieste line that in turn, is part of the wider system connecting Spain to the Ukrainian border. It crosses two regions, 11 municipalities and mostly runs alongside the A4 freeway.

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 most complex and articulated project of the entire work is undoubtedly the Lonato Tunnel, entrusted to Seli Overseas, it will be 7.9km long and will pass under the A4 freeway while the demanding consolidation and foundation works have been entrusted to leading specialist foundation works operation Trevi.

The small amount of overburden, in particular along the under-crossing of the A4 freeway, informed the decision to carry out consolidation before mechanised excavation, to minimise the occurrence of subsidence.

The purpose of the consolidation works 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 3m.

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.

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 tunnel boring machine being used to excavate the tunnel 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. The first of these was sub-vertical drilling, followed by sub-horizontal drilling (remotely controlled by the HDD technology), with the direction perpendicular to the tunnel axis. The final technique was 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 hypothesised by the project and the complex drilling geometry, led Trevi engineers to seek new design solutions.

Thanks to the tests carried out in the test field that the team set up on-site, Trevi was able to reshape the project mesh and

develop more performing mixtures suitable for the soil. Four fundamental observations emerged from the test field. The first was the adoption of a combination of cement and silicate-based chemical mixtures. Secondly, 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 third observation was the adaptation of the project mesh by increasing the number of valves per linear metre. And finally, the selection of sub-vertical drilling operations carried out mainly at the head of the tunnel and no longer at floor level.

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.

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

When the work is completed, especially from the inside of A4, 89,475 linear metres of drilling and grouting will have been carried out, using about 10 million litres of mixture.

As of today, Trevi is 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-treatment tests, which will be useful to evaluate the effectiveness of the grouting treatments. ▼

In order to prevent subsidence during the excavation of the tunnel for the Brescia-Verona rail tunnel Trevi employed multiple drill techniques

