

Italy



Name: Società Italiana Gallerie (Italian Tunnelling Society)

Type of Structure: Scientific, non-profit

Number of Members: About 800 members (inc. 80 corporate members)

ASSOCIATION ACTIVITIES DURING 2019 AND TO DATE

Congress

03-09/05/2019 World Tunnel Congress, Naples: Tunnels and Underground Cities: Engineering and Innovation meet Archaeology, Architecture and Art, Naples

03/12/2019 S. Barbara Congress & Adolfo Colombo Lecture: L'ingegneria e l'imprenditoria italiana del secolo scorso: tra scienza, tecnica ed emozioni, Milan

Technical Visits

The association also organized several technical site visits to relevant underground construction sites in Italy and abroad:

22/02/2019 - Railway link Torino-Ceres

12/04/2019 - Subway Line 1, Naples

28/06/2019 - Subway Line 4, Milan

12/07/2019 - High speed railway line Milano, Genova

27/09/2019 - Brenner base Tunnel, Fortezza, Bolzano

08/11/2019 - Fondo valle Sangro road SS652, Chieti

Courses and Seminars

04/04/2019 I reciproci apporti di scavi minerari e gallerie civili nel campo della geologia, geotecnica e delle tecniche costruttive, Politecnico di Torino

03-04/05/2019 ITA-CET Course:

Tunnelling 4.0 Information technology for the Design, Construction and Maintenance of Underground works, Naples

04/05/2019 ITA-CET Course:

Communication and stakeholders' engagements. Naples

06/12/2019 1st ITACET PhD Students conference, Politecnico di Torino

Others

SIG is also a Sponsor of the Level II Masters in Tunnelling and Underground Constructions, at the Politecnico di Torino and at the Politecnico di

Milano and of the Level II Masters in Geotechnical engineering at the Sapienza University in Rome and at the Federico II University in Naples. These collaborations aim to bridge the gap between Universities and Industry and to support the growth of future industry leaders.

Since 1976, the Journal "Tunnels and Major Underground Works" is SIG's pride and glory. It is currently published once every three months and it reached issue 132 in December 2019.

The periodical presents technical and scientific articles, as well as Editor's letters, news about construction works and tenders around the world, bulletins from the Italian tunnelling market, reports on technical visits, scheduled training courses and international congresses.

The association members take part in the ITA-AITES working group (WGs) and in the SIG working groups. Members proactively collaborate with national and international colleagues to exchange expertise and experience, divulging technical, scientific and business know how in underground construction. SIG WG "Research" published in May 2019 the guideline on "Damages of segmental lining". A free copy can be downloaded from the SIG website.

The SIG YM Group, with 180 young tunnellers as of December 2019, actively supports SIG activities and connects young professionals from both University and Industry. The group has also established a fruitful collaboration with the other ITA Member Nation YM Groups.

SIG has also published, in May 2019, the booklet "The Italian Art of Tunnelling 2019" collecting statistics on existing Italian tunnels and technical sheets about construction technology in recent application.

In 2019 SIG organized the ITA-AITES World Tunnelling Congress in Naples, which was attended by nearly 2,700 participants, with 2000 of these delegates from 73 different nations. 230 exhibitors and sponsors, 730 scientific contributions, 180 podium presentations



and 400 e-poster presentations are some of the impressive figures of WTC. Additional special AAA (Archaeology, Architecture and Art) off-site events, including special sessions and keynotes, were arranged during the congress. Finally, a great social program was organized including a free concert at the San Carlo Theatre (one of the oldest opera houses in Europe) offered by the Association to all WTC attendees, on the 6th of May.

CURRENT TUNNELLING ACTIVITIES RAILWAY PROJECTS

Milano – Genova High Speed Railway

The project is part of the Rhine-Alpine Corridor on the trans-European transport network (TEN-T core network). The project involves the construction of two single-track tunnels, with a total length of 37km, connected by cross passages every 500m. The tunnels, which are excavated for 65% by conventional methods and 35% by TBM, are located in the complex Apennines range between Piedmont and Liguria.

Brenner Base Tunnel

The BBT runs for 55km between Tulfes/ Innsbruck and Fortezza and when considering the Innsbruck by-pass, it runs for a total 64km, making it the longest underground railway stretch in the world. The works include the construction of two single track tunnels (9m dia.) with underground safety areas every 20km and an exploratory/service tunnel (6m dia.). Two of the main sites are on the Italian side: Mules 2-3, which is the last stretch on Italian border; and the Section under passing the Isarco river, which is the southern segment of the tunnel before entering the station at Fortezza.

Turin – Lyon, Mont Cenis base tunnel

The new Lyon-Turin railway link is the main project of the whole Mediterranean corridor and is highly strategic as it is the missing link in the corridor which aims to connect southwestern Europe with Central and Eastern Europe. The Mont Cenis base tunnel includes two 57.5km long tubes, 45km on the French side and 12km on the Italian side, with about 170 communication bypasses located every 333m. Four intermediate accesses, five central ventilation systems and three underground security areas are also planned. Complementary works as the Maddalena survey gallery, in Chiomonte, Susa Valley, were completed in February 2017.



Napoli Bari High Speed Railway

It is included in the ‘Scandinavia–Mediterranean’ corridor of the Trans-European Railway Network (TEN-T) that, in Naples, sees the division of the Corridor in a southerly direction, with the stretch from Naples–Palermo, and to a south easterly direction with the Naples–Bari line. Seven functional and construction sections are foreseen for an overall cost of the investment of about €6bn: Napoli–Cancello, Cancello–Frasso, Frasso–Telese, Telese–Vitulano, Apice–Irpinia, Irpinia–Orsara and Orsara–Bovino with the first 2 sections currently under construction. The second two were awarded in summer 2019 and the last three close to the tender process. All sections have many kilometres in tunnels, under passing the Appennini mountain chain with difficult geological & geotechnical condition.

CURRENT TUNNELLING ACTIVITIES HIGHWAY PROJECTS

Variante di Valico (A1 Bologna – Florence), Santa Lucia Tunnel

Extension of the Appennine section of the A1 motorway, between Bologna and Florence. The entire project consists of 66.6km with about 50% of the alignment excavated by TBM and conventional tunnelling. The Santa Lucia Tunnel length is about 7.6km and is excavated by an

EPB machine with a diameter of 15.87m, Europe’s largest TBM.

CURRENT TUNNELLING ACTIVITIES METRO PROJECTS

Naples Line 1 and 6

The Naples Metro Lines 1 and 6 are included in an integrated metro system serving the whole city that today embodies six underground railway lines and four funiculars. This is one of the largest infrastructure projects currently under construction in Italy and will see the service expanded with two rail lines, 93km of track and a further 30km of new light rail connecting 114 stations.

Rome Line C

Line C is the third Metro Line in Rome. It is one of the strategic infrastructure projects in Italy and is one of the biggest European construction projects. The overall investment is about €3.8bn. Line C is the first metro line in Italy to be fully automated. Line C crosses the entire city of Rome like a backbone, from the east to the north-west. It extends for about 25.5km (18km underground), with 30 new stations (20 underground).

Milan M4

The new Line 4, with a length of 15km is entirely underground from Linate to Lorenteggio. Currently the central stretch

passing through the historical city centre is under construction using 2 x 9.1m diameter EPBMs that allows one track plus a station platform in each tube to limit station works from the surface.

FUTURE TUNNELLING ACTIVITIES RAILWAY PROJECTS

Napoli Bari High Speed Railway

The alignment has an overall length of about 178km from Naples to Foggia and 121km of railway line must still be built for the completion of the line that will run mainly underground (about 68km in bored and cut and cover tunnels). As mentioned before the sections Irpinia-Orsara and Orsara-Bovino (40km) are close to the tender process with 37km out of 40km in tunnel. The most complex underground works are in these two sections, not just for the length of the longest tunnel (with 27km length Hirpinia Tunnel will be the longest railway tunnel in Italy), but mainly because of the geological and geotechnical context in which tunnels have to be constructed. The Hirpinia tunnel crosses reliefs in the Southern Apennines with structurally complex formations (scaly clay) featuring methane gas and a high level of tectonisation with particularly critical mechanical behaviour due to swelling and squeezing condition together with geomorphological conditions linked to a high level of surface erosion and slipping and complex landslides typical of Apennine reliefs and the high seismic condition. The completion of the work is scheduled for December 2026.

Palermo-Catania-Messina new railway line

The Palermo-Catania-Messina line is part of the Scandinavian-Mediterranean Core Corridor no. 5 (Helsinki-La Valletta) of the Trans-European Networks-Transport (TEN-T). The alignment has an overall length of about 180km from Fiumetorto (close to Palermo) to Catania and a length of 42km between Fiumefreddo (close to Catania) and Giampilieri (toward Messina). Eight functional and construction sections are foreseen for an overall cost of the investment of about €8bn. Nearly 50% of the alignment will be built in tunnel and all the tunnel sections (7 out of 8) are currently in an advanced design phase. The tender process for the first tunnel sections (Fiumefreddo-Giampilieri with 37km of tunnels out of 42km of line and with the new underground railway station of Taormina), is scheduled in summer 2020.



Verona-Fortezza new railway line

As part of the Southern Access to the Brenner Base Tunnel, four functional lots have been identified, giving priority on the sections that currently have limits of performance and speed. The section n. 1 from Fortezza to Ponte Gardena has a length of about 23km. The final design has been completed and the tender (design and build) is scheduled in summer 2020. The section includes the Scaleres Tunnel (about 16km long), and the Gardena Tunnel (about 6km long), separated by a short stretch on a viaduct crossing the Isarco River. The overall development of all the underground works is approximately 62km, including the two twin-bore tunnels, connection tunnels, lateral adits and complementary works. The main tunnels will be bored with a maximum overburden of 800m, in the Bressanone Granite and Quartz Phyllites with good geotechnical properties, except for fault zones. Both conventional and TBM excavation is foreseen.

FUTURE TUNNELLING ACTIVITIES HIGHWAY PROJECTS

Grona di Genova

The project, called "Grona di Ponente", foresees the construction of a new carriageway, the widening of the existing A10 highway in the section which crosses the municipality of Genoa, as well as the strengthening of the A7 and A12 highways. The project consists of over 70km of road, of which 53km are in tunnels, 25 tunnels, of which 12 on the highways and 13 on the interchanges, 21 bridges and viaducts, of which 11 are new and 10 are existing.

FUTURE TUNNELLING ACTIVITIES METRO PROJECTS

Rome Line C

The T3 extension is currently in progress (3km of twin single-track tunnels, 2 new stations and 2 multi-functional shafts) in the historical centre of the city. In 2018 the two EPBMs started from San Giovanni Station toward the Fori Imperiali Area; in mid 2019 the TBMs passed near the Colosseo and the Basilica di Massenzio: important consolidation and protection interventions have been carried out to protect the archaeological and monumental heritage. Currently the TBMs are approaching to Piazza Venezia.

Metro 2 Torino

The first phase of the preliminary design of line 2 of the Turin Metro (MTO2) was completed in November 2018. The final route of the MTO2 is about 27km long with 33 planned stations. The alignment will connect the south-west side of Turin city (Orbassano) with the north and north-east areas of San Mauro T.se and Rebaudengo, crossing the metro line 1 in the Porta Nuova railway station. The construction works of the line will start in 2022 and the completion is expected by 2038.

STATISTICS

- 1. Length of tunnels excavated in 2019**
TBM – 32.5km/Conventional – 13.6km
- 2. Amount (EUR) of tunnelling/
underground space facilities
awarded in 2019:**
€1bn

EDUCATION ON TUNNELLING IN THE COUNTRY

- Politecnico di Torino, Turin – Master in "Tunnelling and Tunnel Boring Machines"
- Politecnico di Milano, Milan – Master in "Tunnel Engineering"
- Università di Roma "Sapienza" – Master in "Geotechnical Design"
- Università di Napoli "Federico II" – Master in "Geotechnical Engineering for Infrastructures"

Master degree level

- Politecnico di Milano, Milan
- Politecnico di Torino, Turin
- Università di Roma "Sapienza"
- Università di Napoli Federico II
- Università di Bologna "Alma Mater Studiorum"
- Università Politecnica delle Marche