Highspeed

Four powerful Herrenknecht TBMs for the rail link Stuttgart–Ulm. Subsection of a 1,500 km long high speed magistrale across Europe.

Hightech

Multi-mode TBM at Filder Tunnel. Maximum safety in difficult geology requires precise tunnelling technology: The convertible Herrenknecht Multi-mode TBM (ø 10.82 m) bores with screw conveyor or belt conveyor discharge.

Highlights

Gotthard, Crossrail, Doha, S21: Herrenknecht tunnelling technology creates unique rail connections.

Contractors:
- Filder Tunnel ARGE ATCOST 21 / Boßler Tunnel ARGE ATA
- Porr Bau GmbH Tunnelbau
- G. Hinteregger & Söhne Baugesellschaft m.b.H.
- Östu-Stettin Hoch-und Tiefbau GmbH
- Swietelsky Baugesellschaft m.b.H.
- Albvorland Tunnel
- Implenia Construction GmbH

Pioneering Underground Technologies

www.herrenknecht.com
The model adopted last year of publishing the Annual Activity Reports produced by the Member Nations in a separate magazine has proven very successful. The Executive Council received very positive feedback from the Member Nations and other entities from the tunnelling community. For this reason, we decided to repeat the publication in 2018 and will probably adopt it regularly in the future. It is great to think that perhaps because of this new way of disseminating their activities, the Member Nations became more motivated, as the number of reports received this year increased to 48, the highest number ever received! The previous method of presenting only parts of the reports during the General Assembly was very limited. The wealth of information simply could not be digested due to the time restrictions on the presentations and the lack of availability for later consultation. Good examples of current active Member Nations are the best motivation for new actions in other parts of the world. The value to the industry of the information relating to potential or new projects is also very significant. It will benefit not only our industry but society itself. I do encourage all Member Nations to submit their reports next year.

Olivier Vion
ITA Executive Director

For the second year, the activity reports are presented in a dedicated magazine. This year we have received reports from all Member Nations out of the 75 Member Nations (including New Zealand joining this year). Thanks to the work done by each Member Nation, the ITA secretariat and Tunnelling Journal, we can share with all of you the various activities done by the ITA Member Nations, as well as discover more about present and future tunnelling activities all over the world. This year, more Member Nations shared figures about the length and output of constructed tunnels. This magazine will be given out to all delegates at the WTC. We really do hope that you will enjoy reading this magazine and invite you to share your comments so it can be constantly improved.
ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

During the last year the Australasian Tunnelling Association has continued to promote the benefits of the underground environment to society through a range of activities, events, publications and working groups.

Activities and events: Our highlight activity for 2017 was the 16th Australasian Tunnelling Conference run over 3 days in Sydney. This was well attended with over 550 Registrants, 130 technical papers and attendees from 20 countries. Two ATS awards were presented at the conference, the David Sugden young tunnellers writers award to R Conners and the Allen Neyland memorial award to E Taylor.

The ATS is involved in monthly technical sessions run by the four Australian Regional Groups, and the Australian Shotcrete Society. In addition, the ATS has held several training events in 2017 including a Metro Tunnel Symposium in Brisbane and a Shotcrete workshop in Perth, as well as supporting two commercial conferences in Sydney.

Publications: The ATS Journal was published twice in the last calendar year in conjunction with the international publication, Tunnelling Journal.

Working Groups: The ATS has a number of members active in WG’s with 2 Animater, 1 Vice Animater, 7 Participating members and approximately 8 Corresponding members.

CURRENT TUNNELLING ACTIVITIES

Australia:

Image 1: LendLease/Bouygues JV is continuing with the design and construction of the $A2.65bn NorthConnex in Sydney, twin 9km long road tunnels linking the M1 to the M2 and M7 motorways. The project is planned for completion by 2019. The project requires the use of 17 roadheaders.

Image 2: CPB/Samsung/John Holland JV is continuing with the design and construction of the $A2.7bn M4 East project (WestConnex Stage 1B) in Sydney. The project includes twin 3-lane road tunnels, each 5.5km in length and requires 18 roadheaders to mine the tunnels through Hawkesbury Sandstone and Ashfield Shale. The project is planned for completion by 2019.

Image 3: CPB/Samsung/Dragados JV is continuing with the design and construction of the $A4.3bn New M5 project (WestConnex Stage 2) in Sydney. The project includes twin 3-lane road tunnels, each 9km in length and requires 18 roadheaders to mine the tunnels through Hawkesbury Sandstone and Ashfield Shale. The project is due to open to traffic in 2019.

Image 4: Salini-Impregilo-NRW JV has commenced the design and construction of the $A1.15bn Forrestfield Airport Link in Perth. The project includes twin 8km tunnels excavated by two TBMs and three stations.

Image 5: Sydney Metro City and South West Tunnels and Station excavation contract has been awarded to the John Holland/CPB/Ghella JV. The contract involves the construction of twin running tunnels, each 15km long, between Chatswood and Sydenham and six new underground stations. Five TBMS have been ordered and will commence excavation later in 2018.

Image 6: In December 2017 the CPB/John Holland JV was awarded the West Gate Tunnel Project which involves twin 3.8km long road tunnels under Yarraville in Melbourne, diameter TBMs have been ordered to excavate the 2.8km long tunnel and the 4km long rail section. The project is scheduled to be completed by the end of 2022.

Image 7: In December 2017 the CPB/John Holland, Bouygues and Capella JV was awarded the Cross River Rail – Brisbane Metro Tunnels and Stations contract which includes the construction of twin 3-lane road tunnels, each 9km long, between South Yarra and five underground stations. Four TBMS will be ordered to excavate the running section between the two stations and will be mined by roadheaders.
3-lane road tunnels, and requires 18 of the tunnels through Yarraville and Ashfield Shale, open to traffic in 2019.

The CPB/John Holland/contract involves the excavation later in 2018.

WestConnex Stage 1B (M4 East), Sydney, NSW;
• WestConnex Stage 2 (New M5), Sydney NSW;
• Forrestfield Airport Link, Perth, WA;
• Western Harbour Tunnel, Construction to commence in 2019 for completion by 2023.

Sydney Metro West – Sydney
This will be a new metro style underground rail line between Parramatta and the Sydney CBD.

STATISTICS
1. Length or volume excavated - % mechanized / % conventional during 2017:
Australia
• Length of bored tunnels by TBM completed in 2017 (excluding pipejacking): 1,923m

2. Amount (USD or EUR) of tunnelling/underground space facilities awarded in 2017:
Australia
• €5,000M

3. List of tunnels completed:
Australia
• Amaroo Main Sewer
• Maroonah Aquaduct

4. List of tunnels under construction:
Australia
• WestConnex Stage 1B (M4 East), Sydney, NSW;
• WestConnex Stage 2 (New M5), Sydney NSW;
• Forrestfield Airport Link, Perth, WA;
• Sydney Metro City and Southwest, Sydney, NSW;
• WestGate Tunnel, Melbourne, Vic;
• Melbourne Metro Rail Project, Melbourne, Vic;

FUTURE TUNNELLING ACTIVITIES
Cross River Rail – Brisbane
The tender for the Tunnels, Stations and Development PPP contract will commence in April 2018 for award by April 2019. This contract will include the construction of twin running tunnels each 5.9km long and four underground stations.

Snowy 2.0 Hydro Project – New South Wales
Tenders for the 2000MW civil works contract which will include 27km of TBM tunnels are expected to be called in the first half of 2018.

North East Link – Melbourne
There will be a road link between the existing M80 Ring Road and the Eastern Freeway. It will include twin tunnels each 5km long. Tenders are expected to be called in the first half of 2019.

Inland Rail Project – Queensland
The 126km long Gowrie to Kagaru section of the Inland Rail Project in south east Queensland will include three single track rail tunnels totaling 8.5km in length. The Inland Rail Project is a 1700km freight rail link from Melbourne to Brisbane. Tenders for this section of the project are expected to be called in 2019.

WestConnex Road Tunnels – Sydney
Stage 3A (M4-M5 Link – Main Tunnel Works Contract) 2 x 4 lane tunnels, 8.5km long to commence construction in 2018 for completion by 2022. Stage 3B (M4-M5 Link – Rozelle Interchange Contract) includes substantial mined tunnel works to connect the mid-tunnel point of the main tunnel works with surface roads and future Western Harbour Tunnel. Construction to commence in 2019 for completion by 2023.

Western Harbour Tunnel – Sydney
The second under harbour road tunnel in Sydney will connect the proposed Rozelle Interchange (WestConnex Stage 3b) with the existing Warringah Freeway on the North Shore.

Northern Beaches Link – Sydney
This road tunnel will connect the northern beaches area of Sydney with the Warringah Freeway and the proposed Western Harbour Tunnel.

F6 Stage 1 – Sydney
Twin 3-lane road tunnels, each 4km long, from the New M5 (WestConnex Stage 2) at Arncliffe to Kogarah.

Sydney Metro West – Sydney
This will be a new metro style underground rail line between Parramatta and the Sydney CBD.

IT Member Nation Activity Reports 2017
ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE
ÖGG: 66th Geomechanics Colloquium, October 12th and 13th, 2017 in Salzburg
760 participants from more than 30 countries took up the invitation to join the congress in Salzburg.

Topics of the event, including 3 workshops, were:
• Geomechanical aspects of current tunnel construction projects,
• Maintenance of underground infrastructures,
• Engineering documentation quo vadis?
• Pressure Tunnel Design and Monitoring
• Guideline for the Geotechnical Design of Underground Structures with Conventional Excavation
• Injections
• Rock Mechanics in Eurocode 7

As usual the evening events took place in the unique ambience of the old town of Salzburg.

Montanuniversität Leoben, Southern Railway Link – from east to west through Semmering and Koralm – 2 huge railway tunnels under construction, Chair of Subsurface Engineering, 30th November 2017 in Leoben

250 participants responded to the invitation to the seminar regarding the construction lots of the Semmering Base Tunnel, Koralmtunnel and all the tunnels between. Fascinating presentations from shaft sinking, special solutions in very deep and shallow tunnels, to BIM were given by geotechnical engineers, consultants, construction companies and clients.

Regarding the Baltic-Adriatic Trans-European (TEN) rail corridor, which will connect Poland, the Czech Republic, Slovakia, Austria and Italy, good construction progress was made on the Austrian section, called the Southern Railway Link.

One of the main projects along this route is the 27km long double tube Semmering Base Tunnel. Tunnel works, which are split into 3 lots are carried out by ARGE Impleinio-Hochtief, ARGE Swietelsky-Implein and Marli AG.

Fig 1: Attendees of the 66th Geomechanics Colloquium in Salzburg

The other main project is the 32.9km long Koralmtunnel, where tunnelling works were also split into 3 lots. Lot KAT1 – already finalised. Lot KAT 2, carried out by ARGE STRABAG-Jäger and Lot KAT3, carried out by PORR with breakthroughs planned in 2018. In KAT2 about 90 percent of the 19km long TBM section has been driven by two Double shield TBMs. Within the 11km long western section KAT 3, about 90 percent of NATM works are done in the North Tube has been October 2015 and will be the hard rock section.

BBT – Brenner Base Tunnel
To underpass the Alps east, the longest railway world, the Brenner Base length of 64km, is under construction. The connection will close the very efficient European south link that will stress the connection between Germany, Austria and Italy.

Research@ZaB—Research Development as well Education Centre for Construction and Operations Underground Structures
The creation of sustainable and increasingly developing in facilities. In terms of construction, maintenance this leads to for construction, transport.
was made on the projects along this route under the double tube Semmering project, which are carried out by ARGE ARGE Swietelsky-AG.

FUTURE TUNNELLING ACTIVITIES

Fig 4: Koralms Tunnel (2 x 33km)

Fig 5: Schematic layout of the Brenner Base Tunnel (BBT SE)

The creation of sustainable infrastructure is increasingly developing in underground facilities. In terms of construction and maintenance this leads to greater challenges for construction, transport and energy providing companies. The same is the case for emergency organisations, who ensure the safety of the users of the infrastructure. Within the project "Research@ZaB—Zentrum am Berg" an underground facility for research, development, education and training purposes will be established. The centre should meet the requirements of public institutions, whilst also representing a “development factory” for private companies as well as universities.

BBT – Brenner Base Tunnel

To underpass the Alps running west-east, the longest railway tunnel in the world, the Brenner Base Tunnel with a length of 64km, is under construction. The connection will close the gap and bring a very efficient European north-south link that will strengthen the connection between Germany, Austria and Italy.

Research@ZaB—Research- and Development as well as Training and Education Centre Focusing on the Construction and Operation of Underground Structures

The creation of sustainable infrastructure is increasingly developing in underground facilities. In terms of construction and maintenance this leads to greater challenges for construction, transport and energy providing companies. The same is the case for emergency organisations, who ensure the safety of the users of the infrastructure. Within the project "Research@ZaB—Zentrum am Berg" an underground facility for research, development, education and training purposes will be established. The centre should meet the requirements of public institutions, whilst also representing a “development factory” for private companies as well as universities.

11th Austrian Tunnel Day, October 10th, 2018, Salzburg Congress, Austria

With the following topics:
• Special challenges of current construction sites
• Important regulations for tunnelling
• Innovation and Tunnelling 4.0 – the future of tunnelling!

STATISTICS

1. Length or volume excavated - % mechanized/% conventional during 2017: NO DATA AVAILABLE
2. Amount (USD or EUR) of tunnelling/underground space facilities awarded in 2017: NO DATA AVAILABLE
3. List of tunnels completed: NO DATA AVAILABLE
4. List of tunnels under construction: SEE THE REPORT ABOVE
Belgium

Name: ABTUS-BVOTS (Association Belge des Techniques et de l’Urbanisme Souterrains – Belgische Vereniging voor Ondergrondse Technieken en Stedebouw)

Type of structure: Non-profit, open association

Number of members: 21 individual members, 51 corporate members

ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

In 2017 the Belgian Tunneling Association continued to promote underground solutions to resolve congestion problems, the crossing of waterways and other sensitive areas. Through 2017 several site visits were organised, as well as our annual study day with this year’s topic “the use of urban underground”.

We awarded our yearly academical award to two promising young engineers. We also continued our close cooperation with the French Tunneling Society AFTES, with whom we share the same magazine T&MES, and participated in their 3 yearly congress in Paris.

CURRENT TUNNELLING ACTIVITIES

In 2017 only a few activities were ongoing:

• In preparation for the future Oosterweel Connection in the north of Antwerp, some works were carried out. Several sewage systems going towards the water treatment plant in the north-east of the city needed to be placed at a much lower level, as well as other cable and pipeline ducts. This was done using deep shafts in diaphragm walls and several pipe jacks with diameters ranging from DN 2,000mm to DN 3,500mm.

• In Brussels the rehabilitation of the road tunnels of the city’s inner ring started. These quite old tunnels are being completely refurbished and will get an up-to-date control system.

• In Alost a large cut-and-cover tunnel project (Boudewijnlaan) was started to solve the congestion problems at the crossroads.

• In Mechelen a conventional tangent tunnel has been built to connect the road on one side of the railway station to a newly build underground park area. This project was executed in combination with the new railway by-pass.

• In Uccle in the south-west of Brussels a TBM was used to build a 1.3km underground storm water basin. With an inner diameter of 4.2m, the basin can contain 20,000m³ and will prevent floods during heavy rainfall.

FAVORITE TUNNELLING ACTIVITIES

• In Brussels the tender for the extension of the metro from the north station towards the new NATO-building will begin. At the same time the existing metro line will be adapted at the south station, so that the whole line can be upgraded into a fully automated subway system.

• In Antwerp the works for the Oosterweel Connection (the closing of the northern motorway ring) are starting up, commencing with the adaptation of the interchange at the left bank of the Scheldt river. During this year the tenders for the immersed tunnel under the Scheldt river, as well as the cut-and-cover tunnels under the Straatsburg dock will start.

• Looking further ahead, a second railway track from Antwerp’s main shunting station towards the harbour needed. This will be a single track, 16km long, underpass the Albert motorways, and to avoid the dense urban surface.

• In Brussels the existing railway link with its 6 saturation point. The tangents will be bored by TBM tunnels. The need is to determine the start of the works of the new control and safety system.

• In Antwerp the works for the Oosterweel Connection (the closing of the northern motorway ring) are starting up, commencing with the adaptation of the interchange at the left bank of the Scheldt river. During this year the tenders for the immersed tunnel under the Scheldt river, as well as the cut-and-cover tunnels under the Straatsburg dock will start.

• Looking further ahead, a second railway track from Antwerp’s main shunting station towards the harbour needed. This will be a single track, 16km long, underpass the Albert motorways, and to avoid the dense urban surface.

Belgium
In Brussels, the existing north-south railway link with its 6 tracks has reached saturation point. The link needs to be extended by 4 extra tracks (each in a separate tunnel of some 10km long) that will be bored by TBM under the existing ones. The need is there, but funding will determine the start of this project.

In Brussels the existing north-south railway link will be renovated. It will be brought up to modern standards with new control and safety systems.

The road tunnels on Brussels’ inner ring will be further rehabilitated.

**STATISTICS**

1. Length or volume excavated - % mechanized/% conventional during 2017: Roughly 1,600,000m³ were excavated - with 3% by mechanized and 97% by conventional means

2. Amount (USD or EUR) of tunnelling/underground space facilities awarded in 2017: About €120M

3. List of tunnels completed: Tangent tunnel in Mechelen was completed but is not commissioned yet. It will be in service at the end of 2020 at the earliest.

4. List of tunnels under construction: Renovation of the road tunnels in Brussels

**ABOTUNEL**

ABOTUNEL was re-launched on 2017 with a Congress in Cochabamba, Bolivia. The Congress was attended by more than 150 participants and had excellent speakers (16) from Austria, China, Colombia, Argentina, Italy, Brazil and Bolivia.

The next ABOTUNEL activities will consist of conferences and the renewal of our website.

**CURRENT TUNNELLING ACTIVITIES**

Abotunel renewed its technical committee and has been established and will organize lectures and conferences and a new congress for 2019.

**FUTURE TUNNELLING ACTIVITIES**

ABOTUNEL Congress 2019 will be launched by the end of the year

**STATISTICS**

As ABOTUNEL is currently in the process of re-organisation, complete statistics are not yet available.
Bosnia and Herzegovina

Name: Association of Consulting Engineers Bosnia and Herzegovina – ITA BH (Udruzenje Konsultanata Inženjera Bosne i Hercegovine – ITA BH)

Type of structure: Non-profit, open association

Number of members: 15 members

ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

Several activities, including lectures and presentations at engineering events were developed throughout 2017.

CURRENT TUNNELLING ACTIVITIES

• Construction of two double tube tunnels (Pećuj and Rilićice) on the Corridor Vc on the highway Sarajevo – Zenica began in 2016; Pećuj tunnel length - 1000m; Rilićice tunnel length - 520m; Value of works - €107M. Client - PC Autoceste FB&H. Excavation of both tunnels was finished in 2017. The expected project completion is in 2018. Funding is provided through the international financial institutions of the OPEC Fund for International Development and the European Bank for Reconstruction and Development (EBRD). The works are being carried out by the JV Euro-asfalt and Strabag AG (Photo 1).

• Completion of the reconstruction of the Kalovita brda road tunnel on the Ljubogoshta-Pale motorway. Reconstruction began in 2017 and finished in the same year. The value of works was €750,000. The works were carried out by “Romanija putevi”, and the client was “Putevi Srpske”. (Photo 2)

• Completed excavation of the hydro tunnel for the irrigation of the Bilećko polje. The tunnel length is 1800m. The works were carried out by Integral inženjering, and the client was Hidroelektrane na Trebišnjici.

• Start of excavation of the water supply tunnel on the Dobar Hydropower plant. The tunnel length is 12.125m with a diameter of 4.6m. The works are being carried out by Integral inženjering, and the client is Mjesoviti Holding ENS – MP a.d. Trebinje. The value of the works on the tunnel is €67M. Completion is expected in 4 years. The headrace tunnel passes through two different geological zones. The inlet structure is located near the riverbed of the Zavidolska river and is 3.5km from the Pošćenje dam. The grid and gate to enable the tunnel closure for water control and tunnel maintenance are already designed and ready for construction. Two access tunnels (Straževica, at a length of 830m, and Vodostan at a length of 295m) are also designed and ready to be constructed (Photo 3).

FUTURE TUNNEL ACTIVITIES

• Construction of the drainage tunnel for the Bilećko field – Phase I. The project includes the construction of a hydro tunnel to a length of 1,720m, with a circular cross-section of 2.7m. The tunnel is straight, with a vertical grade of 0.40%, and will be reinforced-using a concrete single-layer lining with a thickness 25cm, constructed using the New Austrian Tunnelling Method. The project also includes construction of an entrance structure with a catchment tank and gallery to a length of 16m, exit structures to a length of 11m, two channels with a catchment tank and vertical manhole, and an aqueduct bridge and culvert. The works are being carried out by Integral inženjering, and the client is a Mixed Holding – Power Utility of the Republic of Srpska, Trebinje. The value of works on the tunnel is €4.6M.
Micro tunnels are under construction in Mostar for the main sewage collector. The Contractor is Ludwig Pfeiffer Hoch-und Tiefbau GmbH & Co. The value of the works is €5.5M. The expected completion date is in 2018.

**Modernization Project. The Project is financed from the loan from the World Bank and the European Investment Bank.**

- Construction of the Žaba tunnel with a length of 830m, and the Vranduk II - 1060m. The client is PC Ceste FBiH.
- Construction of the Čaklovići – Počitelj. The Works are under construction in Mostar, the tunnel length is 1.5km. The client is PC Ceste FBiH.
- Construction of the 2700m Kvanj hydro tunnel - Ribnica near Kakanj. The Works are expected to start in 2018 after finding a second Contractor. The previous contract with Strabag was terminated. The supply tunnel length is 1.5km. The client is PC Elektroprivreda BiH.

**STATISTICS**

1. Length or volume excavated - % mechanized/% conventional during 2017: 20% mechanized/Microtunnels)/ 80% conventional
2. Amount (USD or EUR) of tunnelling/underground space facilities awarded in 2017: €5.5M
3. List of tunnels completed:
   - Drainage tunnel – Bileća near Bileća, hydro tunnel - Ribnica near Kakanj
4. List of tunnels under construction:
   - Highway tunnel Pećuj, Highway tunnel Ričice, hydro tunnel Dabar, Micro tunnels in Mostar
Almost every month, CBT organised evening presentations (twelve) for members and non-members, on different themes, including academic research, case histories, new technologies etc. Corporate members were invited to deliver presentations about projects and their technologies.

The traditional “Echoes of the WTC” event was held after WTC-Bergen, with presentations about news from the General Assembly, Working Group activities, technical papers from Brazilian authors and summaries of the technical sessions. The event had a live internet transmission.

On December 4th, for the first time, “Tunnel Day” was held, with a ½ day program. The chosen topic was “rock bolts”, and included a presentation based on Working Group and ITAtech material, and two round tables with participation from owners, contractors, designers and bolt manufacturers. The day finished up with a barbecue, sponsored by corporate members.

The Young Member group was also active, with 4 activities, including a site visit and 3 joint presentations by a Young Member and a Senior Tunnelling Specialist.

CURRENT TUNNELLING ACTIVITIES
2017 was hard in terms of the economic stagnation and political crises, with investment from the Public sector as well as from the Private sector in infrastructure projects being very small. No significant new works are reported for the year 2017, only the continuation or completion of works that were already ongoing, or contractual milestones for ongoing concessions contracts.

The Highway BR-116/SP Concession concluded its doubling at Serra do Caáxal (hilly area) and opened for traffic in December, with four NATM road tunnels ready for traffic.

The water supply ring network for São Paulo's great area are under construction in order to connect its water supply system. The Jaguari and Atibainha connection completed a length of 6.4km of the existing ring, 55%, is comprised of tunnels.

Works in progress are:
- i. Tunnels on the ring road São Paulo great area;
- ii. Tunnels on the ring road Sebastião (north coast);
- iii. Tunnels on the ring road Caraguatatuba (north state);
- iv. Tunnels on the Tamoio from the city of Caraguatatuba (north state); and
- v. Tunnels on the Blue Line from the city of Salvador (Bahia).

FUTURE TUNNELLING ACTIVITIES
São Paulo Metro line 6 is expected to be resumed in early 2018, mostly works and detailed design.

In the coming years, an economic crisis in the country expects that the Metro line project will be resumed (in Porto Alegre, Horizonte, for example) and the expansion in order to a future four-line system. The expansion will be carried out in several tunnels.
order to connect its water reservoirs. The Jaguari and Atibainha reservoirs had their connection completed and commissioned. A length of 6.4km of the extension, around 55%, is comprised of tunnel.

Works in progress are:

i. Tunnels on the ring road sector north in the São Paulo great area;
ii. Tunnels on the ring road in the city of São Sebastião (north coast of São Paulo state);
iii. Tunnels on the ring road in the city of Caraguatatuba (north coast of São Paulo state);
iv. Tunnels on the Tamoios Roadway doubling from the city of Caraguatatuba to the city of São José dos Campos (São Paulo State); and
v. Tunnels on the Blue Line Expressway in the city of Salvador (Bahia state).

FUTURE TUNNELLING ACTIVITIES

São Paulo Metro line 6 - Orange, is expected to be resumed by the second semester of 2018, mostly for underground works and detailed design.

In the coming years, as the economic crisis in the country eases, it is expected that the Metro line projects will be resumed (in Porto Alegre and Belo Horizonte, for example) as well as the expansion of current networks (São Paulo, Rio de Janeiro, Brasilia).

Federal Railway Network concessions contracts are to be extended. All Brazilian regions will have a railway network expansion in order to increase capacity. The expansion will be comprised of several tunnels.

STATISTICS

1. Length or volume excavated - % mechanized / % conventional during 2017:
   12,695m, and 1,159,000m³,
   99.5% conventional/0.5% mechanized TBM

2. Amount (USD or EUR) of tunnelling/underground space facilities awarded in 2017:
   US$350,000,000

3. List of tunnels completed:
   • Sabesp Atibainha
   • Serra do Capiçal
   • PB Energia

4. List of tunnels under construction:
   • Contorno de São Sebastião-Atibainha - SP
   • Rodocanal Norte - SP
   • Nova Subida Tamoios - SP
   • Nova Subida Petrópolis - RJ
   • Metrô-SP Linha 4
   • Metrô SP Linha 6 (contract stalled)
   • Contorno Jaraguá do Sul - SC
   • PCHs (TBM) - SC - Small Hydropower Project
   • Young Member and Specialist.
ASSOCIATION ACTIVITIES IN 2017

TAC 2017 Workshop – Tunnelling and Underground Spaces: The Urban Challenge

100 tunnelling industry professionals met October 12 and 13 in Montreal to hear from international practitioners on: Practical Implementation of Risk Management in Tunnel Projects; Ground Stabilization; NATM; and the New ASCE Guidelines on Trenchless Technologies. The program also included a presentation by Han Admiraal and Antonia Cornaro representing ITACUS on Rethinking Design and Construction of Tunnels and Underground Spaces in the Urban Environment. The workshop concluded with a site visit to the Atwater Tunnel Project.

TAC 2017 Awards Dinner

2017 was the sixth year that the Tunnelling Association of Canada presented achievement awards to recognize deserving individuals and projects in the Canadian tunnelling industry. TAC’s Canadian Lifetime Achievement Award was presented to long-time TAC member and former TAC President, Boro Lukajic. The Eisenstein Scholarship (value of $6,000 CAD) was presented to Tim Packulak of Queen’s University. Full 2017 TAC Achievement Awards details are posted on the TAC website at http://www.tunnelcanada.ca/achievement_awards.html.

Chapter Activities

TAC’s Ontario and British Columbia chapters continue to be very active running up to eight meetings (each) annually and featuring presentations on Canadian and international tunnelling projects. The Ontario Chapter closes the year with December social, attended by 85 members and non-members in 2017. The BC Chapter opens the year in January with a combined meeting with the Vancouver Geotechnical Society.

CURRENT TUNNELLING ACTIVITIES

The Canadian market is surprisingly busy. Ontario and British Columbia are seeing good activity in Quebec, Alberta and others. There is a number of projects underway, some in the planning stages and others in the tendering stage, which seem to be a good outlook for the future. Some projects include:

- Mid-Halton Outfall and Interconnect Tunnel, Ontario: The project is well underway with marine work and rest of project to follow.
- Ottawa Combined Sewer Overflow (CSST), Ottawa, Ontario: The project consists of 6km of 3m rock with segments. Construction has commenced; the project is to be completed in late 2018.
- Trafalgar & Derry Rd feeder tunnel, Region, Ontario: The project is currently in construction and tunnels to be completed in 2018.
- Washburn Second Feeder tunnel, Region, Ontario: The project is currently in construction and tunnel drives in along the Prospect Street, which will be constructed in the Queenston shale formation. Diversion tunnel will contain interbedded limestone and shale.
- Romaine-4, Quebec: The project consists of a 1550MW on the river, with the diversion tunnel containing roadway and the project is now under construction.
- Cockburn and Cairns project, Winnipeg, Manitoba: The project is a 1.3 km of 1.2m diameter sewer by micro-tunnelling and the project is now under construction.
- Valley Line LRT, Edmonton, Alberta: The project is a 200m NATM tunnels as part of the project awarded to Tarmac.
- John Hart Generating Station Replacement Project, British Columbia: The project is a 1.8 km of heavy civil mechanical and electrical works including tunneling and heavy civil construction.
- BluEarth Renewable’s Deep Cove Wind Project, British Columbia: The project is a 4.5 km of heavy civil mechanical and electrical works including tunneling and heavy civil construction.
- John Hart Generating Station Replacement Project, British Columbia: The project is a 1.8 km of heavy civil mechanical and electrical works including tunneling and heavy civil construction.

ITA_Reports_INNER_PAGES_APRIL_2018.qxd:Layout 1 7/4/18 12:00 Page 14
TAC Young Members

TAC continues to reach out to young members holding two dedicated Year meetings in the Greater Toronto Area and participating in one lecture Queen’s and Ryerson Universities. The YM Group is also participating in the tunnelling course at Ryerson University.

CURRENT TUNNELLING ACTIVITIES

The Canadian market is steady, especially in Ontario and British Columbia, with increased activity in Quebec, Alberta and Saskatchewan. There are a number of projects currently underway, some in the prequalification stages and others in the tender stage, and there seems to be a good outlook for projects to come on the horizon. Examples of current projects include:

- Mid-Halton Outfall and Zone 1 Interconnect Tunnel, Oakville, Ontario: The project is well underway with shafts and tunnelling complete. Pipe installation, marine work and restoration is still ongoing.
- Ottawa Combined Sewage Storage Tunnel (CSST), Ottawa, Ontario: The project consists of 6km of 3m diameter through rock with segments. General construction has commenced; the project is scheduled for completion in late 2019.
- Trafagar & Deny Rd Feedermain, Halton Region, Ontario: There are multiple shafts and tunnels to be constructed for this project. Tunnelling will be in mixed ground conditions, utilizing various TBMs of differing sizes. A main portion of the work is to be performed with an EPB TBM that installs 3m ID prefabricated concrete segments.
- West Whitby Trunk Sanitary Sewer, West Whitby, Ontario: Drive utilizing a rock TBM. Currently constructing the shafts and tunnelling will begin shortly.
- Washburn Second Feedermain, Halton Region, Ontario: The project should be awarded shortly and consists of multiple tunnel drives in along the Guelph line and Prospect Street, which will be in bedrock of the Queenston shale formation that may contain interbedded layers of siltstone.
- Romaine-4, Quebec: The final 245MW site to be constructed as part of the total 1550MW on the river. Work has begun on the diversion tunnel awarded to EBC.
- Cockburn and Caronias Sewer Relief Project, Winnipeg, Manitoba: Installation of 1.3 km of 1.2m diameter and 525m of 2.7m diameter sewer by microtunnelling.
- Valley Line LRT, Edmonton, Alberta: Construction of two 500m long soft ground NATM tunnels as part of a $186m P3 project awarded to TransEd Partners.
- John Hart Generating Station Replacement Hydro Project, British Columbia: Underground works have just completed, and the project is now transitioning from the tunnelling and heavy civil works to the mechanical and electrical works to commission the new generating station.
- BluEarth Renewables Narrow Inlet Hydro Project, British Columbia: 1.2km conveyance tunnel. Excavation works have commenced on both with the former expected to continue throughout 2018 while the latter is expected to be completed in 2018.
- Second Narrows Water Supply tunnel, Vancouver, British Columbia: 1.1km tunnel with 6m diameter to connect the suburbs of North Vancouver and Burnaby below the Burrard Inlet. This will involve pressures exceeding 6 bar. Tunnelling to commence in 2018 and be completed in 2022.

FUTURE TUNNELLING ACTIVITIES

The outlook for Canadian tunnelling continues to look promising. There are numerous projects under design and scheduled to be let for tender in future.

In Ontario, these include: Toronto’s Coxwell Bay-passage Tunnel, Don River & Central Waterfront (10.9km of 6.3m diameter), York’s West Vaughan Sewage System Project (14km of 3m diameter), OP Rail Tunnel from Windsor to Detroit (2km); and Ontario Power Generation’s Deep Geologic Repositories tunnels for nuclear waste.

In Quebec, these include: Montreal’s Metro Blue Line east extension adding five new stations to the line to reach Anjou, Larginge retention pool to manage storm water (3.7km of 2.7m diameter tunnelling) and tunnels to be constructed for the REM light rail train project, which includes a new 2km downtown tunnel, 3km airport tunnel, and major refurbishing of the existing 5km Mont-Royal tunnel to meet NFPA 130 standards for fire safety. The REM will be the fourth largest automated transportation system in the world after Singapore, Dubai and Vancouver.

In the prairies, planned investments in buried infrastructure continue to generate interest from tunnelling companies across North America. Winnipeg have approved Contract 5 for the Cockburn and Caronias Sewer Relief Project, which will include 1.3km of trenchless tunneling with piping up to 2.4m diameter.

In British Columbia, Vancouver’s Annacis Main No. 5 Water Supply Tunnel beneath the Fraser River connecting the suburbs of New Westminster and Surrey is in the planning stages with construction anticipated to begin in 2020. The Annacis Outfall Sewer Tunnel is expected to be completed in 2018. Future projects also include Translink’s 5km long Millennium Line Broadway Extension project, with planning and design work underway and construction expected to begin in 2019 with final commissioning expected late 2022.

Other upcoming projects of note in the mining sector include Seabridge Gold’s KSM project. Overall, the current Seabridge conceptual design shows more than 100km of tunnels including twin 23km-long ore conveyance and access tunnels as well as numerous other drainage tunnels and galleries. Some major pipeline projects in British Columbia also have tunnels planned along their alignment. Kinder Morgan’s Trans Mountain Expansion Project is planned to go through a 3.8km diameter, 2km long tunnel under Burnaby Mountain.

STATISTICS

1. Length or volume excavated - % mechanized / % conventional during 2017: Data not available.
2. Amount (USD or EUR) of tunnelling/groundwork services provided in 2017: Data not available.
3. List of tunnels completed: Notable tunnelling projects recently completed include the: $9.1bn Eglinton Crosstown LRT in Toronto; $2.1bn Confederation Line in Ottawa; and 107MW Upper Lillooet Hydropower Project in British Columbia.
4. List of tunnels under construction: See above.
MAIN ACTIVITIES 2017

1.- Seminars and Conferences
   • Las Leñas Bi-National Tunnel (Chile-Argentina)
   • Development plan for El Teniente-Codelco Mine.
   • Base Tunnels in Austria
   • Materials and Supplies for Tunnels
   • Agua Negra Bi-National Tunnel (Chile-Argentina)
   • Development of tunnels for underground mining (Antofagasta)
   • International symposium: Large-scale underground projects

2.- Training
   • International Workshop – Risk Management in Tunnelling

3. Technical Lectures
   • Drilling fluids for tunnels and underground spaces – Company AMC Chile S.A.
   • Control of seismic activity in the “El Teniente” mine
   • Inspection by laser scanner in tunnels and underground spaces – Company GEOCOM

44. Publications
   • 4th version “Guide for materials and products for tunnelling”
   • Directory with Companies members of CTES-CHILE 2017.
   • “Fundamentos del diseño de túneles” ("Bases for tunnel design"). Support of CTES-Chile to the authors/publisher.

Number of members: 103 Members (81 are companies from the industry) Corporate Members: 4 Category Premium, 33 Category Gold, 44 Category Associated and 22 Individual members.
ACTIVITIES

ALREADY SCHEDULED FOR 2018:

• ITACET Workshop on Mechanized Tunnelling
• 5th version of the seminar “Materials and Supplies for Tunnels”
• Participation of the Chilean delegation in WTC2018 - Dubai
• National Congress of Tunnels and Underground Space
• Technical lectures (lectures by member-companies during all year)
• Photo awards CTES-Chile 2018
• CTES meeting with academic entities

Project Pipeline 2017 - Comments:

• The last commodities boom period has pushed forward a large number of massive underground infrastructure projects for the mining sector, together with the development of new power plants, new expansions of the Metro Santiago network and road tunnels. A significant portion of Projects listed in the project pipeline have, so far, been developed to a certain extend. However with the current economic slowdown experienced in the country, several projects have been cancelled, postponed and/or re-structured.
• Anyhow, it is expected that these large mining projects shall continue to be developed, even if at a slower pace. Additionally, the country has an increasing demand for energy, which cannot be covered just by the construction of new hydro-power plants. Public investment in infra-structure, mainly from the Railway Authority (EFE) and the Ministry of Public Works (MOP) are expected as anti-cyclic measures to counteract the economic depression generated by the end of the mining boom.

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<td>Tunnel La Concepción 2 x 3500m</td>
<td>Hydropower plant Alto Maipo (over 70 km of tunnels, shafts and caverns)</td>
<td>Chuquicamata Underground Mine - Aquae Tunnels, Ventilation tunnels, Deep shafts and inner facilities</td>
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ACTIVITIES

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• National Congress of Tunnels and Underground Space
• Technical lectures (lectures by member-companies during all year)
• Photo awards CTES-Chile 2018
• CTES meeting with academic entities
2017 ACTIVITIES
The Colombian Tunnelling Committee participated in the WTC 2017, in Norway with members of Working Group 3 (Contractual practices in underground construction) and Working Group 2 (Research).

Some members were part of a joint Task Group (TG 10) currently undertaking an evaluation of FIDIC forms of contracts in order to produce a FIDIC Standard Form of Contract for Underground Construction Projects.

Designated by the Colombian Society of Engineers to be part of the review team for the proposed manual for Tunnelling design and construction developed by the National Highway Institute of Colombia. A specific task force has been created within the CCT.

The Colombian Tunnelling Committee has the following local Working Groups:

- **WG3**: Contractual practices in underground construction
- **WG6**: Maintenance and repair of underground structures
- **WG12**: Sprayed concrete use
- **WG15**: Underground and environment
- **WG19**: Conventional tunnelling
- **YM**: ITA Young Members Group

CURRENT TUNNELLING ACTIVITIES
In Colombia in 2017 several works were carried out in terms of tunnels and the use of underground space. As was expected, many works started in previous years were successfully completed last year.

- The country is also developing works in the El Toyo tunnel that runs for 9.84km at the city of Medellín, and the 2.5km Mulatos tunnel that connects the central coffee region with the city of Medellín.
- The national road 40 which includes the crossing of the Central Cordillera includes the construction of 8.6km of tunnel called La Linea, and 23 additional tunnels with a total length of 8.6km were inaugurated.
several works were developed last year. Developing works in the district of Medellin, 9.84 km in length, and the 2.5 km Mulatos, which includes the central coffee region of Medellin. The central Cordillera includes 8.6 km of tunnel called La Linea, and 23 additional tunnels. This will improve the connection between the capital Bogotá and the main port on the pacific coast - Buenaventura.

- Between Bogotá and Villavicencio, four tunnels with a total length of 2.21 km were inaugurated.

FUTURE TUNNELLING ACTIVITIES

The committee will organize the "Tunnelling Symposium" in 2018, in which all Working Groups will participate with topics covered during the year. The committee will publish its first academic article about tunneling that will be developed with all the Working Group’s research. In 2018 the committee will create the Young Members Working Group and it will promote the participation of young engineers in the development of the Colombian Tunnelling Committee.

STATISTICS

Vehicle operation costs had a reduction of 30% and transport times decreased by about 20% due to new tunneling projects. More than $1.4M was invested in infrastructure last year in the country. About 25 km of tunnels were put into operation in 2017. Around 180,000 jobs were created in the development of tunneling works in 2017.
Costa Rica

Name: Asociación Costarricense De Obras Subterráneas
Type of structure: Non-profit, open association
Number of members: 35 individuals and 3 companies

MAIN ACTIVITIES
First National Congress on Underground Works (33 participants)
  • Conference on segmental lining and pipe jacking
  • Internal Bulletin

TUNNELS – UNDERGROUND WORKS
Rio Macho hydroelectric tunnel
Second tunnel of the plant, parallel to the original one
  • Excavation diameter: 3.2m
  • Length: 1800m
  • Construction method: Conventional
  • Owner: Costa Rican Institute for Electricity (ICE)

FUTURE TUNNELLING ACTIVITIES
  • Central America Regional Course on Tunnel Planning and Financing (May 2018)
  • Technical tour to a local hydro project
  • Course on tunnelling for students

PPP Hydroelectric project: Los Negros 2 (2.3km, 14m²)
Contractor: Ghella, concrete lining finished in 2017
AN EVENT TO MEET, LEARN AND CELEBRATE IN CHINA

The ITA Tunnelling Awards organized by the International Tunnelling and Underground Space Association (ITA-AITES) will identify and celebrate outstanding achievements in tunnelling and underground space development and promote international recognition of the industry’s remarkable contributions to engineering and to society.

- A contest for 9 categories  
- A 1 day conference during the CTUC*
- An award ceremony banquet

> ENTRIES

Entries from every corner of the world are welcome in 9 categories. Submissions are to be received by May 31st 2018 through our dedicated website: awards.ita-aites.org - Contact: awards@ita-aites.org

> ATTEND THE CONFERENCE AND BANQUET

The 2018 ITA Awards Conference will be held on November 7. This conference will be integrated in the course of the CTUC* (from 5 to 7 November 2018). On November 7, a banquet dinner will close the event during which the winners will be announced and the awards presented. Book conference and banquet from the dedicated website: awards.ita-aites.org or contact us at awards@ita-aites.org.

*China Tunnelling and Underground works Conference
Croatia

Name: Croatian Association for Tunnels and Underground Structures – ITA Croatia
Type of structure: Society, non-profit organisation
Number of members: Persons: 20, Corporate: 5

2017 - ACTIVITIES
Main activities:
Annual congress: SEE Tunnel 2017 Zagreb, Zagreb, May 4-5, 2017
Working Groups: None

Publications:
Proceedings of the congress in Zagreb: SEE Tunnel 2017 Zagreb
E-book, with printed cover and contents

Book publication:
Tunnels 2 – Collection of 6 ITA/AITES Guidelines on Tunnelling
Prepared for SEE Countries
Planned publishing:
volume: 600 pcs
1st issue: 200 pcs., Dec. 31, 2017
E-book, with printed cover and contents

TUNNELS – UNDERGROUND WORKS
Tunnel Grič
• In the city centre, Zagreb has reopened its renovated pedestrian tunnel Grič, on July 6, 2016
• The tunnel was constructed in 1943
• During WWII it was used as a shelter during air raids
The tunnel will be further used as a performance location and as an exhibition place for the Museum of senses

• Length: 350m with width W=100m
• Width 3.5m, height 5.
• Exits: 2 portals and 4 main street
• Info: wikipedia

Tunnel Učka, 2nd tunnel
• Second tube of the highway Rijeka-Pula
• Length L = 5630m, ax to the first tube
• Currently in the design construction
• Should start construction by conventional method
• Will enable a full highway from Rijeka to the Ist
• It is part of Bouygues highway concession
Zagreb has reopened pedestrian tunnel Grič, constructed in 1943, used as a shelter, and as an exhibition of senses.

- Length: 350m with wider central hall L=100m
- Width: 3.5m, height: 5.5m
- Exits: 2 portals and 4 side exits on the main street

Tunnel Učka, 2nd tube
- Second tube of the high-speed road Rijeka-Pula
- Length L = 5630m, axis distance 25-30m to the first tube
- Currently in the design procedure for construction
- Should start construction using conventional methods
- Will enable a full highway connection from Rijeka to the Istria peninsula
- It is part of Bouygues’ Istrian Ypsilon highway concession

Tunnels on the Zagreb-Macelj highway toward Slovenia - AZM concession
- 6 tunnels on the highway that is a concession project which are partly maintenance works as part of the regular procedure of the concession, the concessionnaire is STRABAG
- There are 6 tunnels on the route, 2 of them with are single tube: Sv.Tri Kralja (1725m) and Brezovica (590m) that are expected to be constructed during the 2nd phase of construction
- Preparations are ongoing for the 2nd phase

FUTURE TUNNELLING ACTIVITIES
Main activities:
- Promotion of the book: TUNNELS2 - Guidelines of ITA/AITES
  Zagreb, March 15, 2018
- Education:
  - Promotion of Tunnelling: Master study concept for SEE
  Zagreb, May 4, 2017
- Training seminars:
  - Using underground space in urban areas, Convention of Chamber of Engineers, Opatija, June 14-16, 2018

Tunnels on Pelješac Peninsula
- As part of the Pelješac Crossing that includes a 2.4km bridge, on the Pelješac peninsula there are 2 tunnels tendered for construction in 2017 through limestone conditions as part of a highway

Preparations are ongoing for the 2nd phase.
The Czech Republic

Name: Czech Tunnelling Association
Type of structure: Non-profit, open association
Number of members: 51 individual members, 42 corporate members

ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE
In 2017 the Czech Tunnelling Association (CzTA) continued with organising the “Tunnelling afternoons” – which are public lectures for those involved in underground construction. Lectures were given on the following themes:

• The Radlice radial Road
• Rock Blasting
• Tunnels on the D3 Motorway
• The new Metro Line D
• Current Tunnel Construction Project Abroad
• Ejpovice Railway Tunnel

In addition, the CzTA continued with publishing the “Tunel” journal and organising technical excursions abroad to underground construction sites.

CURRENT TUNNELLING ACTIVITIES
In 2018 the Czech Tunnelling Association (CzTA) will continue with its usual activities:

1) “Tunnelling afternoons” which will be held looking at the following topics:
   - Prague and its historic underground workings
   - The preparation and planning of tunnels in the Czech Republic
   - Foreign tunnel construction projects II
   - Unreinforced lining, the composite action of primary and final linings

2) CzTA will hold a technical trip to tunnel construction sites in Stockholm.

3) The publishing of “Tunel” journal will continue – with four issues per year.

FUTURE TUNNELLING ACTIVITIES
CzTA will hold the 14th international conference ‘Underground Construction Prague 2019’ in Prague on 3rd – 5th June 2019. The conference is endorsed by the International Tunnelling and Underground Space Association (ITA).


STATISTICS
1. Length or volume excavated - % mechanised/% conventional during 2017: 3724m; 80.1% mechanised/19.9% conventional

2. List of tunnels completed:
   - Ejpovice Rail Tunnel

3. List of tunnels under construction:
   - The Hlavník tunnel

Ejpovice railway tunnel

Denmark

Name: Danish Society for Underground Works
Type of structure: Non-profit, open association
Number of members: 187 participants

ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE
In 2017 the Danish Society for Underground Works worked to promote the use and advantages of tunnelling and underground engineering both towards the industry as a whole. This has included cooperating with the ITA Committees and many other national and regional societies, arranging events and meetings. In September 2017 the Danish Society arranged a trip to Gothenburg, Sweden, where they visited many ongoing infrastructure projects in the neighbouring country and other European countries.

CURRENT TUNNELLING ACTIVITIES
Tunnelling and underground engineering in Denmark during the period included tunnels for roads, utilities and for storm water control. The following is a selection of projects:

- Copenhagen Metro C
  - 18 bored tunnels and 17 stations.
- Copenhagen Metro E
  - Northern Harbour; 4 km of underground track and 2 stations.
- Copenhagen Nordhavn
  - 1 km of Cut & Cover tunnels through existing railway.
- Damhusåen Reservoir
  - 2.5 km of bored tunnels.

FUTURE TUNNELLING ACTIVITIES
Expected projects in 2018 include:

The tunneling activities will increase with many new projects within the next horizon. Some of the major

ITA MEMBER NATION ACTIVITY REPORTS 2017
ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

In 2017 the Danish Society for Tunnels and Underground Works worked actively to promote the use and awareness of tunnelling and underground construction both towards the industry and society as a whole. This has included participation in the ITA Committees and Working Groups on the international level and on the national and regional scene including arranging events and member meetings. In September 2017 the Danish Society for Tunnels and Underground Works arranged a trip to Gothenburg, Sweden to visit the many ongoing infrastructure project in our neighbouring country at the moment.

The Danish Tunnelling Society’s Young Members group promoted 2 presentations and technical visits to construction sites. Furthermore they co-arranged and participated with more than 10 young members in the 1st ITA Young Members Regional Event in the Hagerbach Galleries in Switzerland.

CURRENT TUNNELLING ACTIVITIES

Tunnelling and underground space activities in Denmark during the past five years include tunnels for road, rails, metros, utilities and for storm water and flood control. The following is a selection of major projects:

• Copenhagen Metro Cityring; 30km TBM bored tunnels and 17 underground stations.
• Copenhagen Metro Extension to the Northern Harbour; 4km bored tunnels and 2 stations
• Copenhagen Nordhavnsvej Road Tunnel; 1km of Cut & Cover tunnel below an existing railway.
• Damhusåen Reservoir Tunnels, 2 x 3km of pipe jacking

FUTURE TUNNELLING ACTIVITIES

Expected projects in the coming 5 years

The tunnelling activities in the coming years will increase with many new projects on the horizon. Some of the major projects that will start construction within the next 5 years are:

• The Fehmarn Belt Fixed Link – an 18km immersed tunnel for road and rail connecting Denmark and Germany. The works have been contracted. Actual start of work is awaiting Authority approval in Germany. The tunnel will by far be the world’s longest immersed tube.
• Copenhagen Metro Extension Southern Harbour – The Copenhagen Circle metro, which is due to open its 17 underground station for operation in 2019, will be extended by 8km of TBM tunnels and 2 underground stations to connect the southern harbour residential area into the network of the Copenhagen metro. The Civil works contract was awarded in February 2018 and construction will start later in 2018.
• Road tunnel below the Northern Harbour in Copenhagen – 1,5km of immersed or cut & cover tunnel under the northern harbour of Copenhagen is in the planning process. It will contain 2x2 road lanes and be a continuation of the Nordhavnsvej tunnel opened for traffic in December 2017.

STATISTICS

1. Length or volume excavated - % mechanized/% conventional during 2017: Not released
2. Amount (USD or EUR) of tunnelling/underground space facilities awarded in 2017: Not released
3. List of tunnels completed:
   • Copenhagen Metro Circle line (2x15km TBM Tunnel)
   • Copenhagen Metro Extension to Northern Harbour (2x2km TBM tunnel)
   • Damhusåen Reservoir Tunnels (2 x 3km pipe jacking)
4. List of tunnels under construction: Above
**Egypt**

**Name:** Egyptian Tunnelling Society  
**Type of structure:** Non Governmental, non-profit, open association  
**Number of members:** 300 members, 12 corporate members

**ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE**

In 2017 the Egyptian Tunnelling Society continued working to show society the benefits of the underground environment, both through the implementation of technical events, and the dissemination of materials via technical events.

Several activities, like Lectures and Presentations at engineering events were developed through 2017.

The lectures titles were:

1. Introductory to Minimum Measure for Fire Protection in Rail Tunnels
2. Applications of Ground Freezing on Shafts and Tunnels
3. Structural Analysis of Retrofitting and Development of Road Tunnels
4. Construction of Ismalia Road Tunnels with Special References to Clogging Effects and Wear

**FUTURE TUNNELLING ACTIVITIES**

- A new LRT line joining the end of line 3 (4B) at Adli Mansour Station to the new Administrative Capital with a total length of 67km and 12 stations has already been studied and tendered. Construction is planned to start July 2018 for 2 years.
- Rehabilitation and development of Elraml Teram – Alexandria city with a length of 14km and 22 stations; The study phase and preparation of tender documents are currently under on-going. It is planned to start implementation April 2019.

**STATISTICS**

1. Length or volume excavated: 4km - % 100 mechanized /0 % conventional during 2017
2. Amount (USD or EUR) of tunnelling/ mechanized /0 % conventional during 2017
3. List of tunnels completed: Metro Line 3 Phases 3A, 3C
4. List of tunnels under construction: Metro Line 3 Phase 4A

**CURRENT TUNNELLING ACTIVITIES**

In the last year tunneling in Ecuador mainly concerned projects, all under construction:

- Hydroelectric Projects
- Metro Line
- Mines
- Improvement of Water and Sewage systems

**Hydro Power Projects**

Several hydro plants are under execution in Ecuador. Most of them including complex underground structures, such as head tunnels, caverns for powerhouse, tailrace and access tunnels. The most relevant are:

- The Minas San Francisco HPP, 275MW, which has recently finalized: a 14km headrace tunnel was completed in 2017 by mechanized excavation (TBM, about 10km) and methods (4km), internal diameter of 4.8m lined with honeycomb segments.

The Delsitanisagua HPP, 180MW, is under execution (95% advance): all the underground structures were completed last year - an 8km long 4.1m internal diameter running tunnel, excavated by conventional method.

Some private HP Projects, such as free-flow headrace tunnels, like Rio Verde, Sigchos (18.5MW) and execution, like Rio Verde, Sigchos (18.5MW) and their construction of underground structures, such as head tunnel, caverns for powerhouse, tailrace and access tunnels.

**Metro Line**

Quito Metro Line 1 is under construction. Single tube, 20km long, single tube, diameter running tunnel underground stations. 3 EPB-TBMs are working the construction. The total estimated project is: 53% (Fat Excavation of the tunnel) began in February 2017 and 3km was bored, advance rate higher than expected. The civil works of the stations were completed in the first quarter of the year.

The Project is the Cut & Cover Method. The project is considered a case study for the construction of underground station in a square, of UNESCO heritage.
CURRENT TUNNELLING ACTIVITIES

In the last year tunnelling activities in Ecuador mainly concern the following projects, all under construction:

- Hydroelectric Projects
- Metro Line
- Mines
- Improvement of Water Supply and Sewage systems

Hydro Power Projects:

Several hydro plants are under execution in Ecuador, most of them including complex underground structures, such as headrace tunnels, caverns for powerhouse, tailrace and access tunnels. The most relevant are:

- The Minas San Francisco HPP, 275MW, which has been recently finalized: a 14km headrace tunnel was completed in 2017 by mechanized excavation (DIS-TBM, about 10km) and D&B methods (4km), internal diameter of 4.9m lined with honeycomb segments.
- The Delsitanisagua HPP, 180MW, is under execution (95% advance) of underground structures have been successfully completed last year - an 8km-long headrace tunnel of 4.1m internal diameter - a pressurized vertical shaft and horizontal tunnel, steel lined, excavated by conventional methods.

Some private HP Projects are also under execution, like Rio Verde Chico (10MW), Sigchos (18.5MW) and Due (49.7MW), with the construction of underground facilities, such as free-flow headrace tunnels.

Improvement of Water Supply and Sewage networks

Important cities like Quito, need to improve their existing water supply system; due to the typical morphology of the city, this has lead to the adoption of tunnelling and microtunnelling technology.

About 3km of tunnels have been executed over the last few years for water or sewage pipe installation, mainly by conventional methods, with small diameters between 2.2 and 2.4m, depending on the pipe diameter to be installed.

FUTURE TUNNELLING ACTIVITIES

Future activities in the underground will continue in the same areas; hydro projects (new projects and projects to be completed), refurbishment of existing hydro tunnels, water supply and drainage-sewage systems and mining facilities.

Concerning hydro power projects, the Ecuadorian government is analysing the possibility of building 2 new mega projects, Santiago and Cariñena. Both of them feature underground structures.

On-going hydro projects such as Quijos (1.5km of tunnel driven in very difficult geotechnical conditions, such as old river deposits) currently on stand-by, and Mazar-Dudas (0.5km long headrace tunnel) should be finalised during 2018.

Quito Metro Line 1 is expected to be completed in the first quarter of 2019.

Mining activities will continue to grow over the coming months; several priority projects have been identified and are under investigation.

Regarding water supply and sewerage, several projects will be assigned this year:

- The Vindobona Water-Treatment System, owner EPMAP (Water Public company of Quito), with more than US$8200M of investment, is a challenging project which includes the execution of 30km of tunnels, mechanized excavation by EPB-TBMs, 3.7m internal diameter.
- A water transmission pipeline, Pakulillo-Bellavista, owner EPMAP (Water Public company of Quito), with more than US$130M of investment, and 40km of extension; this project is vital for the future water supply of Quito. The final layout includes several underground facilities, for a total of about 2.5km of horizontal and inclined tunnels, including cross-passages below existing roads. Tunnels have been designed to be excavated by conventional methods.

STATISTICS

1. Length or volume excavated - % mechanized/ conventional during 2017: About 25km of tunneling, 45% mechanized - 55% conventional
2. Amount (USD or EUR) of tunnelling/ facilities awarded in 2017: About US$50.000.000.
3. List of tunnels completed:
   - Minas San Francisco HPP, Headrace tunnel 14km.
   - Delsitanisagua HPP, Headrace tunnel, 8km.
   - Access tunnels to Fruta del Norte mine, 2x3km.
4. List of tunnels under construction:
   - Quito Metro Line 1, about 10km of tunnel by EPB-TBMs.
   - Improvement of the sewage network of Quito, various projects.
   - Rio Verde Chico and Sigchos HPP headrace tunnels.
ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

• Success Stories for Building Underground Space – seminar
• Nordic Grouting Symposium 2019 in Finland: Organisation committee work
• 4 Scholarships for students active in studies
• Co-Sponsor in the project “New Rock Stress Data from Finland Related to the Update of World Stress Map”
• Participating in the work of the FISE Qualification of Professionals in the Building, HVAC and Real Estate Sector in Finland

CURRENT TUNNELLING ACTIVITIES

Blominmäki Underground wastewater treatment plant (under construction):
• The treatment plant will process the wastewater of 400,000 residents (2020)
• By 2040 - 150,000m³ of wastewater will flow through the new treatment plant daily
• More info: https://www.youtube.com/watch?v=D9PwTx4ArQ0

Helsinki Metro Western Extension to Espoo (under construction):
• Helsinki metro will be extended to the west in two phases: 8 + 5 new stations.
• The first phase was ready in autumn 2017.
• The metro will operate along an underground rail line of 21km, in twin parallel tunnels.
• In addition to the stations, a total of 23 shafts will be built for pressure equalisation, ventilation and smoke extraction. The shafts will also be used as emergency exits.
• More info: https://www.lansimetro.fi/en/home/

Töölö Parking Facility:
• An underground parking facility in Helsinki City Centre for 800 cars
• Planned to be ready in 2019

Waste Water Treatment Plant Mikkeli:
• The Waste Water Treatment Plant in Mikkeli is responsible for producing drinking water and treating wastewater for about 55,000 inhabitants in the city and its surrounding areas.
• Expected to begin operating in 2020.
• More info: www.valio.fi

The Helsinki Olympic Stadium (under construction):
• Modernization and renewal project 2016 – 2019
• Total excavation volume 145 000m³ including underground tunnel
• More info: www.stadion.fi

FUTURE TUNNELLING ACTIVITIES

Jokerei Light Rail (Planning):
• One of the key projects for orbital cross-region public transport in capital area
• The City Councils in Helsinki and Espoo approved the construction of the Jokeri Light Rail in June 2016. The aim is to start the construction work of the line in 2019.
• The planned length of the line is approximately 23km (15.5 miles), the line will have 33 stops.
• More info: http://raidejokeri.info/?page_id=695

City Rail Loop Pisparratta (Waiting for the decision)
• The City Rail Loop is a planned urban railway line for commuter trains under Helsinki city centre.
• The city plan has been approved but the decision on the construction has not yet been verified.
• More info: https://www.liikennevirasto.fi/pisara/

FinEst Link (Feasibility study):
• Information, statistics and research about the cities of Helsinki and Tallinn and the increasing mobility between them.
• A proposal to build a railway tunnel linking Estonia
• More info: http://www.statitics

STATISTICS

Underground (UG) Space Rock Surface:
• Area = 2,074km²
• Volume 12 657 457m³
• UG spaces altogether
• Helsinki’s surface area
• 1m² underground space
• 100m² surface area
• VALIO EMMENTAL CHEESE E700G holes!!!
• Tunnels altogether 29:
• 194km of technical purpose
• 34km of traffic tunnels
• 30km of tunnels with purpose as emergency
• 14km of parking cavities
• 22km of tunnels for Finland

Name: Finnish Tunnelling Association – MTR - FTA
Type of structure: Non-profit, independent association
Founded: 1974
Number of members: 78 Individual Associate Members, 26 Corporate Affiliate Members
Incomes: Annual fees and conferences as a main source of incomes
ELLING

A proposal to build a 92km under-sea railway tunnel linking Finland and Estonia.

STATISTICS
Underground (UG) Spaces in Helsinki with Rock Surface:
- Area = 2,074km²
- Volume 12 657 457m³
- UG spaces altogether = 336
- Helsinki’s surface area = 215,12km²
- 1m² underground space for every 100m² surface area = 1%
- VALIO EMMENTAL BLUE LABEL CHEESE E700G has on average 20% holes!!

Tunnels altogether 293km:
- 194km of technical tunnels
- 34km of traffic tunnels
- 30km of tunnels with a secondary purpose as emergency shelters
- 14km of parking caverns
- 22km of tunnels for other purposes.
France

Name: Association Française Des Tunnels Et De L’espace Souterrain
French Tunnelling and Underground Space Association

The Aftes Premises Moved In 2017 To 42 Rue Boissière In Paris At The New Headquarters Of Ponts Alliance.

Type of structure: Association registered under the 1901 Act

Number of members: 942 members = 527 French individuals, 143 foreign individuals, 78 retired, 37 students, 120 French collectives, 10 foreign collectives, 27 others (schools, bookshops).

ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

Technical committee: The activity of the Technical Committee was very significant in 2017, with more than 25 working groups involving more than 300 members. Three recommendations are already nearing completion and ready for swift publication: Working Group 16: “Taking into account the effects of excavation on neighboring buildings in the design and construction of underground structures”. GT 12: “Organization of emergency services and associated means during underground works”. GT 35: “Management and use of excavation materials”.

Underground Space Committee: The Underground Space Committee has carried out several awareness-raising activities with an audience ranging from the professional and institutional world to academics, particularly with students who will be tomorrow’s distribution and development vectors for the ideas of AFTES. The committee also intends to strengthen its participation in international associations (ITA, ITACUS, ACUUS, IACUS) and develop collaborations with institutions and public and private bodies. On November the 16th, 199 people took part in the Architecture and Town Planning day in the basement of the “Cité de l’Architecture” in Paris: 7 sessions, 15 conferences and a round table were in the programme.

Education Committee: The 2016-2017 class of the TOS Master’s course was of a very high standard. The 11 graduate students were hired on permanent contracts at the end of their Master’s degree. The 2017-2018 class of the TOS Master will welcome 12 students (out of 60 applications received). 2017 was also marked, in particular by the consolidation of the AFTES youth group, which mobilises around the TOS Masters alumni network on one hand, and the young professionals on the other.

Materials, Equipment, Products Committee: The main objective of the Committee was to give better visibility to manufacturers and suppliers of the equipment, materials and products intended for the construction of tunnels, underground spaces and their operation. Earlier, in the spring 2017, a communication plan was put in place at the WTC International Congress in Bergen.

Communication Committee: AFTES changed its publisher for the publication of the Tunnels & Underground Space magazine in January 2017. The journal is now published quarterly. A special Congress issue was also published in November 2017 (Congress Paris). The website http://www.aftesasso.fr is rich in information and has high levels of traffic. The 138 recommendations referenced on the site resulted in 9,844 downloads in 2017.

Congress Committee (Paris – 13-15th November 2017 “The value is underground”): The congress was a great success with 4,018 participants representing 56 countries. Singapore was the guest of honour at this event. 152 companies were registered as exhibitors and ten different countries were among the exhibitors. The congress gave rise to 17 sessions and 88 papers. The international element was strongly supported by the special session on operation of underground constructions co-organized with the ITA-COSUF committee and by the AFTES Awards ceremony. 387 people took part in the gala evening, during which the prizes were awarded to the winners of the 2017 Awards.

EVENTS

Ten events took place in 2017 and bear witness to the sustained activity of AFTES:

• January 17, 2017: Construction site visit for the 2000 diameter collector in Paris
• January 27, 2017: Equipment in the construction of tunnels in Lyon
• February 23, 2017: Visit to the extension of Line 4 Lot 01 in Paris
• February 28, 2017: AFTES Tuesday/RAF evening conferences in Paris
• March 10, 2017: Visit to the EDF hydropower development of Livet-Gavet in Grenoble
• May 5, 2017: Rhône-Alpes geology and tunnels in Lyon
• May 16, 2017: Safety and emergency services in the construction of tunnels in Paris
• June 23, 2017: Major underground development projects/Metro Train-Route to Lyon (a record. 254 were present)
• July 7, 2017: The hydroelectric development of La Coche in Aigueblanche
• September 28, 2017: International volunteering in companies, RER A renovation, SGP and satellite radar interferometry in Paris

TOS Masters Course (2016-2017)

The diplomas were awarded to:

• Julie Aï Hout, Civil Engineering Engineer from Aleppo University (Syria) and PhD in Civil Engineering from INSA Lyon, hired by Bouygues TP
• Salah Eddine Chatouani, civil engineer at ENPPE, hired by Eiffage TP
• Alejandro Cortes Fuentes, civil engineer at the University of Santiago de Chile and at the Central School of Lyon, hired by Geos
• Pauline Faraglia, civil engineer at INSA Lyon, hired by Egis Tunnels
• Rabah Gasmi, civil engineer at the Polytechnic School of Algiers, hired by Systra
• Hadi Karam, civil engineer at the Lebanese University of Roumeh, hired by Egis Rail
• Aude Montbot-Boullard, civil engineer at INSA Lyon, hired by Bouygues TP
• Yassin Naouz, civil engineer at Mohammadia school in Rabat, hired by Arcadis
• Frederic Payen, civil engineer at ESITC Cachan, hired by Eiffage TP
• Jean Quere, engineer in civil engineering at ENSE3 in Grenoble, hired by Bessac
• Alfredo Vazquez, civil engineer at the University of Cuenca (Ecuador) and Polytech Paris, hired by Arcadis
CURRENT TUNNELLING ACTIVITIES

Main projects under construction:

PARIS EOLE
The extension of the railway line RER E to the west includes the construction of 8km of tunnel between Saint-Lazare and Nanterre in a very dense urban area.

PARIS Extension of Metro line 14 North
From Saint-Lazare to Maine de Saint-Quen, 2 TBMs are on the home stretch of the boring of the 5.8km tunnel of the extension of the line 14.

NICE tunnel for the West-East Tramway
Final works for the construction of a 3.2km tunnel in a dense urban area.

RENNES Metro line B
Realisation of 15 stations for a 14km tunnel.

TELT Lyon - Turin
The 57.5km long international tunnel linking France and Italy, will receive a major part of the passenger/freight traffic through the French and Italian Alps. Initiating this huge project, the TBM Federica is digging 9km of an exploratory gallery in the axis and in the diameter of the future base tunnel.

ANDRA - BURE
Construction work on the underground laboratory began in 2000 in the commune of Bure. The experimental laboratory, 445m deep, is composed of a set of galleries where many tests and studies have been conducted. It allows, in particular, a study of the geological parameters intended to confirm the design choices of the future Storage Centre.

SIAIX: Safety Tunnel – 1.5km
GAVET: Hydraulic gallery – 9.3km
COCHE: Hydraulic gallery – 0.3km

FUTURE TUNNELLING ACTIVITIES

Main projects for the short term:

PARIS RATP: Extension of line 14 South to Orly airport.
PARIS Grand Paris: Lines 15 South, 14 North, 16 and 17 South
TOULOUSE: Metro Line 3 - Aerospace Express
GRAND LYON: Road tunnel project “Ring of the sciences”
TELT: Lyon Turin railway – to be continued

STATISTICS
1. Length or volume excavated - % mechanized/% conventional during 2017: 10km (80% mechanized and 20% conventional)
2. Amount (USD or EUR) of tunnelling/underground space facilities awarded in 2017: €800M
3. List of tunnels completed:
   - Safety tunnel in the “tunnel du Chat”
   - New tunnel of the Chambon
4. List of tunnels under construction:
   - PARIS EOLE, PARIS Extension of Metro line 14 North, NICE tunnel for the West-East Tramway, RENNES Metro line B, TELT Lyon – Turin, ANDRA - BURE

www.barchip.com
ASSOCIATION ACTIVITIES IN 2017

Activities
• DACH-meeting (German, Austrian, Swiss Tunnelling Committees) in Germany (technical seminar and site visit)
• STUVA Conference ‘17, Separate Segments on “Tunnelling” and “Tunnel Operation”, attended by more than 1900 participants and 200 exhibitors
• Inaugural Meeting of Young Engineering Professionals “STUVA YEP”

Working Groups
• Financing of tunnels via PPP/BOT-projects
• Recommendations for contracts with low potential for conflict
• Requirements for refuge chambers
• Life-cycle costs calculation
• External communication of DAUB
• Digitization and Building Information Modeling (BIM) in tunnelling
• Selection of tunnelling machines
• Planning and implementation of occupational health and safety concept on underground worksites

Publications (recently finished)
• Recommendations for Face Support Pressure Calculations for Shield Tunnelling in Soft Ground

Publications of DAUB can be found in/on
• Journal “tunnel” (www.tunnel-online.info)
• German Handbook of Tunnelling ("Taschenbuch Tunnelbau", published annually)
• Recommendations are available for download from website (www.daub-ita.de); the majority is bi-lingual (German/English)

Future Activities
• Regular meetings with Austrian and Swiss colleagues
• Munich Tunnel Symposium, 8 June 2018, Munich
• InnoTrans Tunnel Forum, 18-21 September 2018, Berlin

CURRENT TUNNELLING ACTIVITIES

About 174km of traffic tunnels are under construction in Germany in 2017.
• As in the previous year, the main activities relating to inner-urban rail tunnelling are taking place in Stuttgart, where some 9.7km of urban and rapid transit tunnels are under construction at the turn of the year 2016/2017. This includes 4.7km in Karlsruhe, 6.8km in Munich, and 2.3km in Berlin. Further tunnelling amounting to less than 2km is underway in Dortmund and Nuremberg.
• The main-line rail tunnel construction works in the greater Munich area, in the context of the tunnelling projects implemented (a total of 47km), the so-called new Wendlingen–Ulm Line, 47km from Karlsruhe to Stuttgart, 21km to Ulm, and 59km by the new Wendlingen–Ulm Line. This involves the upgrading of new Karlsruhe and the upgraded Hanau–Würzburg Line. 35% of these main-line projects employ the single-shield tunnel boring machines for a further 61% of the excavated volume.
• Road tunnels constitute the majority of cases for other transportation tunnels that have been subject to pronounced fluctuations in recent years. About 28km of road tunnel construction in Germany, for instance, involving the waterproofing and the majority of cases for projects are concerned with the construction of road tunnels.

FUTURE TUNNELLING ACTIVITIES

About 200km of traffic tunnels are under construction but not yet started in 2017.
• There has again been a significant increase in the number of Underground rapid transit tunnels (context, the planned construction of the many suburban rail, and the planned extension of the Munich, comprising the new Munich, the respective proportions are conspicuous among the planning; these projects being planned for the next years and their construction (partly at the pre-planning) has been the subject of a further 61% of the excavated volume.

German Tunnelling Committee

Name: Deutscher Ausschuss für unterirdisches Bauen e. V. (DAUB, German Tunnelling Committee)

Type of structure: Registered non-profit and restricted association (limited to 30 individual members)

Number of members: 30 members

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TUNNELLING

In 2017, the main activities in urban rail tunnelling are undertaking in many cities, with some of the main rapid transit tunnels being completed at the turn of the year. The main-line rail tunnels largely relate to works in the greater Stuttgart area. Of the tunnelling projects currently being implemented (a total of 122km), some 47km are accounted for by the major project “Stuttgart 21 rail hub” and some 59km by the new Wendlingen–Ulm rail route. Further main-line tunnels are being constructed in conjunction with the upgraded/new Karlsruhe–Basle section and the upgraded Hanau–Nantenbach line. 35% of these main-line rail tunnel projects employ the shotcreting method, with tunnel boring machines (TBMs) used for a further 61% of the current excavated volume.

Road tunnel construction, like the two other transportation tunnel segments, has been subject to pronounced contracting fluctuations in recent years. Currently, about 28km of road tunnels are under construction in Germany. In this connection, shotcreting predominates in the majority of cases as far as trenchless projects are concerned.

FUTURE TUNNELLING ACTIVITIES

About 209km of traffic tunnels are projected but not yet started in 2017. There has again been a slight decrease in the number of Underground, urban and rapid transit tunnels (about 52km). In this context, the planned volume for the city of Munich, comprising just about 30km, is conspicuous among the projects still planned. Almost 10km of tunnels are being planned for the Hamburg Metro (partly at the pre-planning stage). Further tunnel construction schemes, all accounting for less than 3km in each case, are scheduled for the cities of Frankfurt/Main, Nuremberg, Berlin, Düsseldorf, Stuttgart and Dortmund.

Regarding the planned volume of main-line rail tunnels (about 45km), it should be noted that roughly half of it is accounted for by the tunnels approved for the new/upgraded Karlsruhe–Basle rail line (excavation length: some 19km). Some 8km of tunnels are planned in conjunction with the new Rhine/Main–Rhine/Neckar route and the Nuremberg–Fürth route. A further 5km of main-line tunnels are still to be awarded for the Stuttgart 21 rail hub project.

The planned volume of projected road tunnels (about 113km) remains largely unchanged in comparison with the previous year. On account of the German state’s revamped planning requirements, the scheduled volume has dipped considerably in recent years.

STATISTICS

Detailed statistics available at https://www.stuva.de/statistik

Length-related classification according to federal states for future transportation tunnels, with the number of registered transportation tunnel projects given in brackets.

Waterproofing in the Albabstieg Tunnel, new Wendlingen–Ulm rail route (Source: Deutsche Bahn AG)
**Greece**

**Name:** Greek Tunnelling Society  
**Type of structure:** Non-profit association with membership  
**Number of members:** 365 members, 3 corporate members

**ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE**  
In 2017 the Greek Tunnelling Association continued working to promote the environmental, social, technical and economic advantages of the construction and operation of tunnels and underground space.

A new Council Board was elected during the national General Assembly of the 12th – 7 – 2017 for the period between July 2017 – July 2020.

A new and modern website was constructed (www.eesye.gr) and has been in use since the end of 2017.

Three issues of the electronic magazine of the Greek Tunnelling Society were published.

A technical visit was carried out at Eupalinos tunnel at Samos.

**CURRENT TUNNELLING ACTIVITIES**

**Aposelemis Tunnel (Crete)**  
A 3.43km long tunnel on the Water Diversion Project for enrichment of the Aposelemis dam reservoir in Crete island. It was constructed using a double shield TBM (4.35m final lined internal diameter). It crosses various geological formations (nate limestone, shale and phyllite formations and Dolomite/Limestone), and various faults and fracture zones, large karst caves and zones with gases were encountered. Tunnelling works, which were assigned to INTRAKAT S.A., began in March 2015 and completed in July 2017.

**Ionia highway Tunnels**  
During 2017 four twin tunnels with a total length of 11.2km were completed and became operational along the new highway alignment connecting Ron-Antirion Bridge and Ioannina: The Makyneia tunnel (542m), the Klokova tunnel (2950m), the Kallidromo tunnel (1200m), and Ampelia tunnel (900m).

**Athens METRO**  
Since March 2012 the J&P – AVAX S.A., GHELIA SPA. ASTROM TRANSPORT S.A joint venture has been assigned the construction of the Athens METRO Line 3 extension to Piraeus. The 7.6km long new Metro line 3 will consist of 6 modern Metro Stations. 6.5km of the tunnels were constructed using TBM. The Metro Extension to Piraeus will serve approximately 132,000 passengers on a daily basis. Tunnelling excavation works are almost completed. Civil works for the permanent lining of shafts and NATM tunnels are in progress.

**Thessaloniki METRO**  
Basic characteristics of the main METRO line include: 13 modern center platform stations arranged along 9.5km long tunnels (with two independent single track tunnels) constructed mostly (~80%) by two EPB - TBMs, and a 50,000m² depot in the Pylea Region. The excavation of the two independent single-track tunnels is completed. AKTOR ATIE was assigned in 2013 the construction of the extension line to Kalamaria which includes 5 stations and 4.78km tunnels. The excavation and lining of the twin single-track tunnels is 85% completed.

**Korinthos – Patra highway**  
The new Korinthos – Patra highway which was fully completed in 2017, includes five new tunnels that became operational last year: Mavra litharia twin tunnel (1200m long each), Platanos twin tunnel (1900m long each), Volimis single tunnel (550m) at the southern branch of the highway, Panomos single tunnel (650m) at the southern branch of the highway, and the Panagopoula twin tunnels (4000m long each).

The four other tunnels, that are all on the Southern Branch of the highway, which became operational in 2016 are: The Chehldoni single tunnel (480m), the Dorveni single tunnel (629m), the Agira single tunnel (800m), and the Akreta single tunnel (350m).

**Athens – Thessaloniki Highway (E-75)**  
The new Evagglalisos - skolitha highway alignment section which includes 3 twin tunnels of a total length of 1.1km became operational since 7-4-2017: T1 dual carriageay twin tunnel (2000m long), T2 dual carriageay twin tunnel (6000m long) which is classified as the longest in Balkans (SE europe) and Platanomos T3, dual carriageay twin tunnel (2700m long).

Moreover, an upgrade of the Katerini Cut & Cover tunnel is currently ongoing. The upgrade mainly concerns placement of fire resistant panels in order to enhance fire resistance of the structure, construction of new drainage system with firetraps, and signals and ventilation system.

**Tithorea – Domokos railway – Central Greece**  
The project involves the construction of the New 106km long Double High Speed Railway Line Tithorea – Lioyliako – Domokos which deviates from the existing mountainous alignment. The design speed is 160-250km/h. The alignment crosses the Kallidromo mountain with twin tunnels – each 9.038m long - that follow a flat course through the Sperchios river valley and end up at Lianokladi Railway Station. Further to the north it crosses the Othris Mountain with twin tunnels, each 6,380m long. Both tunnels were completed in 2017 and are currently being tested with pilot operations.

**Rododaphni (Agio) – Psathopigorgos (Panagopoula Tunnel) (Infrastructure)**  
The project involves the construction of the infrastructure for the new 21.5km long double railway line, between Rododaphni-Psathopigorgos of the Athens-Patras line. The civil works of the Panagopoula twin tunnels were almost completed within 2017 and included tunnelling works approximately 4.800m long per branch, entrance and exit cut & covers and cross adits every 500m.

**FUTURE TUNNELLING ACTIVITIES**  
**New Athens Metro Line 3**  
**“ALIOS VEIKOY – GOLDFRUIT**  
*Design and Built Contract* that will consist of 15 stations includes tunneling works completed by fit-out, rails, third rail systems, rail electrical systems, rail signaling systems. The shortlisted are:

- The Greek-French consortium Terra, Vinci and Siemens
- The Greek-Italian-French consortium J&P Avax, Ghella and Ansaldo
- The Greek-Italian consortium Ansaldo and Hitachi Rail
- The Spanish-Greek consortium Archiconad and Mytiliniad

The Invitation to Tender for the design, construction, fit out, control and commissioning of the 12km long Line 3 of the planned Construction Plan, which is expected approximately 1,500m long, is expected to be awarded in Summer 2018. The tender is planned to be conducted in 2 phases: the stipulations of Direct procurement by entities of water, energy, transport and telecommunications sectors (EL.164/243/2016) with Greek Law 4412/16. The Award will include the advantageous offer, in full, on the basis of a best quality-price ratio.

**Central Athens railway bridges area.**

- The €66M project, which will be assigned to INTRAKAT – SIDRIDOR uses the construction of a four-track rail corridor, 614m long, in a fully underground area.
### FUTURE TUNNELLING ACTIVITIES

**New Athens Metro Line 4 - Section A**

- **ALSOS VEIKOY – GOUDI** - A €1.8bn Design and Build Contract. The 13km long, fully automated new Athens METRO line 4, will consist of 15 stations. The project includes tunnelling works, underground stations, station fit-out, mechanical and electrical systems, rail Infrastructure and rail systems. The shortlisted interested parties are:
  - The Greek-French consortium of GEK Terna, Vinci and Siemens.
  - The Greek-Italian consortium of Aktor, Ansaldo and Hitachi Rail Italy.
  - The Spanish-Greek consortium of FCC, Archirodon and MYTILINEOS.

The invitation to Tender for the Main (Design & Build) Contract (Stage B) is estimated to be completed by the end of 2018. Planned Construction Period will be 8 years starting - midsummer 2019. The Tender will be conducted in accordance with the stipulations of Directive 2014/25/EU on procurement by entities operating in the energy, water, transport and postal services sectors (E.L.194/243/28032014) and in line with Greek Law 4412/16. The criterion for the Contract award will be the most advantageous offer, in financial terms, on the basis of a best price-quality relationship.

**Underwater road link connecting Salamina - Perama in Attica region** - Estimated cost – €400m.

A competitive dialogue process is underway between the preferred three interested parties which include METKA, TERNA, VINCI CONCESSIONS-VINCI HIGHWAYS-ACTOR CONCESSIONS. The project concerns the design, construction, financing, operation, maintenance and exploitation of an approximately 15km long highway which includes an 1.2km long immersed tunnel and three tunnels with a total length of 2km.

**Central Athens railway Station – Three bridges area.**

The €60m project, which was assigned to INTRAKAT – SIDIRODROMIKA ERGA JX, involves the construction of a 2.86km long four-track rail corridor, 60% of which will be in a fully underground alignment.

**Smirthi – Echinous highway axis**

A contract is planned to be awarded shortly for the construction of two bidirectional tunnels approximately 120m long each along the new highway alignment connecting Xanthi – Smirthi – Echinous - Greek-Bulgarian borders.

**Immersed road tunnel connecting Lefkada island – Aetoloakarnania**

A project concerning the design, construction, financing, operation, maintenance and exploitation of an approximately 4km long highway which includes an 0.6km long immersed tunnel (plus 0.5km entrance and exit). The project is currently under planning.

**North Motorway of Crete (BOAK)**

A concession project concerning the design, construction, financing, operation, maintenance and exploitation of an approximately 200km long highway which includes a significant number of tunnels (total length ~20km). The project is currently under planning.

### STATISTICS

**1. Length or volume excavated - % mechanized/% conventional during 2017:**

- **90%**

**2. Amount (USD or EUR) of tunnelling/underground space awarded in 2017:**

- **€66M**

**3. List of tunnels completed:**

- Apollolemos, Mavri lthania, Platamonas, Vollinis, Panoromos, Panagopoulos, Makyneia, Klokova, Kaldona, Ampelia, T1 and T2 Tempi, Platamonas T3, Kalidromi, Othris, Panagopoulos

**4. List of tunnels under construction:**

- Athens METRO extension to Piraeus, Thessaloniki METRO

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### HUNGARY

**Name:** Hungarian Tunnelling Association

**Type of structure:** Non-profit, open association

**Number of members:** 62 members, 21 corporate members

**ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE**

- The XXIIIrd Széchy Károly Memorial Lecture to the Hungarian Academy of Sciences in Budapest, February, 2017 (common with Hungarian Academy of Sciences: Section of Engineering Sciences, Geotechnical Department of Hungarian Chamber of Engineers, and Hungarian ISSMGE).

- The (annual) General Assembly of the Association was held on 29th of March.


- Saint Barbara Day, annual meeting of our Association (7th December).

Several activities, like Lectures and Presentations at engineering events were developed through 2017.

### CURRENT TUNNELLING ACTIVITIES

At this period there was no tunnelling (mechanized or traditional). There are pending infrastructural investments (motorways and railways) with tunnels in different phases of planning.

### FUTURE TUNNELLING ACTIVITIES

There are pending infrastructural investments (motorways and railways) with tunnels in different phases of planning. There is no expected tunnelling in 2018.

**STATISTICS**

- **1. Length or volume excavated - % mechanized/% conventional during 2017:**
  - **90%**

- **2. Amount (USD or EUR) of tunnelling/underground space facilities awarded in 2017:**
  - **€66M**

- **3. List of tunnels completed:**
  - Apollolemos, Mavri lthania, Platamonas, Vollinis, Panoromos, Panagopoulos, Makyneia, Klokova, Kaldona, Ampelia, T1 and T2 Tempi, Platamonas T3, Kalidromi, Othris, Panagopoulos

- **4. List of tunnels under construction:**
  - Athens METRO extension to Piraeus, Thessaloniki METRO
Iceland

Name: Icelandic Tunnelling Society
Type of structure: Independent Society of corporate and ordinary members, founded 1974
Number of members: 45 members, 17 corporate members

ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

Four board meetings and an annual meeting with invited speakers. Occasional seminars.

CURRENT TUNNELLING ACTIVITIES

Vadlaheidi Tunnel: Breakthrough reached late April 2017 on this 7.2km long road tunnel in North Iceland. Problems encountered due to gothermal activity and hot water inflow (up to 65°C), a fault collapse and large inflows of cold water. Project delayed for almost two years. Completion expected late 2018.

Nordfjordur Tunnel: This 7.5km long road tunnel in East Iceland was opened for traffic in November 2017.

Bakkí Tunnel: This 1km long industrial transport tunnel in North Iceland was opened for use in November 2017.

Dyrafljot Tunnel: Excavation work on this 5.6km long road tunnel in Northwest Iceland started in September 2017. Completion expected 2020.

Burfell II Hydroelectric Plant, South Iceland (100MW). All underground excavation was completed early 2017.

FUTURE TUNNELLING ACTIVITIES

Some future tunnelling projects are being planned such as the Fjardarheidi Tunnel, an approximately 13km long road tunnel in East Iceland. Also some underground hydroelectric projects are being planned.

STATISTICS

1. Length or volume excavated - % mechanized/% conventional during 2017: Approximately 2km, drill&blast
2. Amount (USD or EUR) of tunnelling/underground space facilities awarded in 2017: Approximately €70M
3. List of tunnels completed: Bakkí Tunnel - 1km Nordfjordur Tunnel - 7.5km Burfell II, hydroelectric plant
4. List of tunnels under construction: Vadlaheidi Tunnel - 7.2km Dyrafljot Tunnel - 5.6km

Iran

Name: Iranian Tunnelling Association (IRTA)
Type of structure: Non-profit, open association
Number of members: 760 individual (non-student) members, 480 student members, 181 corporate members

ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

• Holding monthly technical seminars
• Publishing bi-annual “Tunnelling and Underground Space Engineering” Journal together with Shahrood Technical University
• Holding 3rd Regional and 12th Iranian Tunnelling Conference in November 2017
• Holding technical meetings with contractors and consultants on current project challenges

CURRENT TUNNELLING ACTIVITIES

Several Metro Lines are under construction in Tehran, Qom, Mashhad, Tabriz, where work on tunnels and underground stations are being continued. It should be noted that Tehran’s metro line 6 was amongst the 4 finalists in the “Major Project of the Year (Over €500M)” category of the ITA Tun 2017. This line is 31.2km long and consists of 27 stations of south-east to north-west of Tehran passing through the city center.

• Road Tunnels: More than 108km of Road Tunnels are under construction with the Alborz Tunnel being the longest road tunnel of 6400m length
• Rail Tunnels: More than 157km of Rail Tunnels are under construction
• Water transfer Tunnels: More than 185km of Water Tunnels are being constructed
• Metro Lines: A total 95km of Metro Tunnels are currently under construction

FUTURE TUNNELLING ACTIVITIES

• Completing and expanding the road
Completed early in 2017, the Fjardarheidi Tunnel, a 7.5km long road tunnel in East Iceland, is also being excavated – % mechanized / % conventional during 2017: % mechanized

1. Length or volume excavated - % mechanized / % conventional during 2017:
- More than 100km of tunnels with various usages constructed during 2017;
- Almost 30% of these tunnels are constructed by mechanized means.
- Metro Lines: 50km
- Water transfer Tunnels: 30km
- Road Tunnels: 10km
- Rail Tunnels: 10km

2. Amount (USD or EUR) of tunnelling / underground space facilities awarded in 2017:
- The value of tunnel projects in 2017 is approximately US$1bn.

3. List of tunnels completed:
- Amir-Kabir urban tunnel in Tehran, Arash-Esfandyar-Niayesh Tunnel in Tehran, Zagros Water Tunnel

4. List of tunnels under construction:
- Kerman Water Tunnel; metro tunnels in cities such as Tehran, Qom, Mashhad, Tabriz and numerous road and railway tunnels

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Metro Lines: A total of 95km of Metro Tunnels are currently under construction

FUTURE TUNNELLING ACTIVITIES
- Completing and expanding the road and railway networks by more than 126km is planned for the future
- Completion and development of metro lines in numerous cities by about 120km is planned for the future
- More than 100km of Water Tunnels have been designed and are ready for the start of the construction phase

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Italy

Name: SIG – Società Italiana Gallerie
Type of structure: Non-profit, open association
SIG is a scientific non-profit association, founded in 1974; it mainly promotes and coordinates studies and research in the field of tunnelling and underground construction works. SIG is a founding nation of ITA.
Number of members: 670, 85% individual members and 15% corporate members

ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE
In 2017 the Società Italiana Gallerie (SIG) continued working actively as a reference point for Tunnelling and Underground Works in Italy, promoting the dialogue within the industry, sharing knowledge and best practices and providing professional training.

From the last months of 2016, SIG organized several congresses, such as:
• SIG International Conference & Expo/Tunnel - Bologna 20th - 21st October 2016
  Challenging and Demanding Tunnelling projects: design, construction and management
• ITACET and SIG Course – Rome, 1st December 2016
  Mechanized Tunnelling: Challenging case histories
  Handling and reuse of spoil material resulting from tunnelling excavation
• SIG International Conference – Samoter 2017 – Verona, 23rd - 24th February 2017
  Long and Deep Tunnels for Railway Infrastructure – Design and Construction
• SIG Conference for Santa Barbara 2017 – Naples, 1st December 2017
  Roman underground road network in Naples & 6th SIG Degree Award Ceremony

The association also organised several technical site visits to relevant underground construction sites in Italy and abroad, such as the Folio Line sites in Norway, the Genoa-Milan high-speed railway, the Metro Milan M4 and to the Brenner Base Tunnel.
SIG is also a Sponsor of Level II Masters in Tunnelling and Underground Constructions, activated in Italy at the Politecnico di Torino, the Politecnico di Milano and the Sapienza University in Rome and at the Federico II University in Naples. These collaborations aim to bridge the gap between Universities and Industry, in order to support the growth of future industry leaders.

During 2017, the SIG Young Member Group of the Italian Tunnelling Society, which was founded in 2016, continued to grow, collaborating with the SIG WGs and organized its first workshop in December 2017 in Naples. More than 20 YMs took part to the workshop, which represented an opportunity to discuss the Group activities, to share experiences and to build up a stronger network as well as to start developing the YMs road map to the World Tunnelling Conference 2018.

CURRENT TUNNELLING ACTIVITIES
Railway Projects:
• Milano – Genova High Speed Railway: This is also known as Terzo Valico dei Giovi, which represents one of 30 European priority projects, and is a new HS line that will improve railway connections between the Liguria port system with the main railway lines of Northern Italy and the rest of Europe. The project is part of the Rhine-Alpine Corridor, which is the one of the corridors of 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 a 65% through conventional methods and for 35% by TBM, are located in the complex Apennines range between Piedmont and Liguria.

• Brenner Base Tunnel: The BBT runs for 55km between Telfes/Innsbruck and Fortezza and, considering the Innsbruck bypass, it runs for a total of 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, the Section 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 Brenner Base Tunnel, before entering the railway station at Fortezza.

Highway Projects:
• Variante di Valico (A1 Fiorenzo, Santa Lucia and the Appennini sector) motorway, between Bologna and the last stretch on Italian border, and the Section under passing the Isarco river, which is the southern segment of the Brenner Base Tunnel, before entering the railway station at Fortezza.

Metro Projects:
• Naples Line 1 and 6: Lines 1 and 6 are included in the integrated metro system in Rome. It is one of the biggest European c

Buonomo Municipio To

Above left: The Turin L

Image 430x887 to 496x966

Image 517x718 to 685x860

Image 718x717 to 843x859
Highway Projects:

- Variante di Valico (A1 Bologna – Florence), Santa Lucia Tunnel: Expansion of the Appennine section of the A1 motorway, between Bologna and Florence, which is a strategic stretch that links northern and southern Italy and plays a major role in the movement of people and goods between Europe and the Mediterranean. The entire project is 66.8km long.

Buonomo Municipio Torrione Incoronata archeology

with about 50% of the alignment excavated by TBM and conventional tunnelling. The Santa Lucia Tunnel length is about 7.9km and is excavated by an EPB machine which has a diameter of 15.87m and represents the largest tunnel in Europe.

Metro Projects:

- Naples Line 1 and 6: The Naples Metro Lines 1 and 6 are included into an integrated metro system serving the whole city that today embodies an underground railway lines. It is a part of the largest infrastructure projects that have to be constructed. The Naples Metro network will be the largest railway tunnel in Italy, but mainly because of the geological and geotechnical context in which tunnels have to be constructed. The excavation is proposed to be performed with a maximum critical mechanical behavior due to swelling and squeezing conditions together with geomorphological conditions linked to a high level of surface erosion, sliping and collapse activity typical of Apennine reliefs, and the high seismic condition. The Tender process is scheduled in 2019 and the completion of the work for December 2026.

- 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 (16km underground), with 30 new stations (20 underground).

- Milan M4: The new Line 4, built entirely underground and 15km long from Linate to Lorenteggio, will provide a fast connection along the east/south-west route passing through the historical centre of the city. It involves a light and fully automated driverless metro system, with automatic platform screen doors and a CBTC signaling system.

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 is still to 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 in the final design phase and 37km out of 40km are in tunnel. The most complex underground works are in this section, not just for the length of the longest tunnel (at 27km length Hirpinsu 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 complex structural deformation (locally clay) featuring methane gas and a high level of rock stability. This is achieved with a high level of seismic condition: The Tender process is scheduled in 2019 and the completion of the work for December 2026.

- Palermo-Catania-Messina new railway line: The Palermo-Catania-Messina new railway line is still to be built for the completion of the section that crosses the Sicilian coast, with 30 new stations and 2 new stations and 2 new lines, including the 2 twin bored tunnels, connection tunnels, tunnels, and tunnels, and tunnels, and tunnels. The tender (design and build) is scheduled in 2019 and the completion of the work for December 2026.

- Rome Line C: The T3 stretch construction 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 EPB TBMs will start from San Giovanni Station.
toward the Fori Imperiali Area; in mid-2019 the TBMs will pass near the Colosseo and the Basilica di Massenzio: important consolidation and protection interventions have been carried out to protect the archaeological and monumental heritage.

**FUTURE ASSOCIATION ACTIVITIES**
- SIG Conference - Naples, 11th May 2018 - The Italian historical underground network: via per mons excisa when tunnelling meet Archaeology, Architecture and Art
- SIG International Conference - SAE - Bologna, 18th-19th October 2018 - 1st Young Member Conference: Tunnelling 4.0 - Innovation and new technologies in underground Design & Construction
- SIG Conference for Santa Barbara 2018 - Rome, 30th November 2018

**STATISTICS**
1. Length (km) of tunnels excavated during 2017:

2. Amount (EUR) of tunnelling / underground space facilities awarded in 2017: €2 billion.

3. List of tunnels completed:

4. List of tunnels under construction:

**FUTURE TUNNELLING ACTIVITIES**
Toward the subsurface formation of the expressway in the center of Tokyo, concerned authorities established Working Groups to discuss the proposed plans. They will examine the estimated project cost, the draft of the section and route to the underground, but the timing of construction is not indicated.

**STATISTICS**
1. Length or volume excavated - % mechanized / % conventional during 2017: 25%/63%
2. Amount (USD or EUR) of tunnelling / underground space facilities awarded in 2017: About US$30bn
3. List of tunnels completed: No statistics
4. List of tunnels under construction: 570
Tunneling is the largest shield-tunneling project in Japan, in this project started in February of this year.

The face formation of the project is the center of Tokyo, the estimated project section and route to cut the timing of the indicated.

In Japan, conventional during excavation - %

919.6m tunnelling/ Surface facilities awarded S$30bn

Completed: No statistics

Under construction: 570

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Korea

Name: Korean Tunnelling and Underground Space Association
Type of structure: Non-profit, open association
Number of members: 2747 members, 67 corporate members

ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE
Established in 1992 as a non-profit incorporated association, KTA is the tunnel-oriented national organization to comply with the international aims of ITA. Most of the KTA members are tunnel engineers, but not limited to the civil engineering field and recent expansion into the field of fire, disaster prevention and ventilation within tunnels, among others, are noteworthy.

In 2017, KTA hosted several international and domestic conferences. The short list is as follows:

- International Conference on Tunnels and Underground Spaces (ICTUS17) endorsed by ITA : 2017.08.29~30, Ilsan Kintex (60 international/domestic participants)
- The Joint-Forum on Tunnel Safety and Future Technology KTA-Wonju Regional Office of Construction Management (MOLIT) : 2017.06.01, Wonju (200 domestic participants)
- 2017 KTA Tunnel Construction Policy Forum : 2017.11.02, Seoul (170 domestic participants)

A total 11 Working Groups in KTA
- Joint seminar: WG-tunnelling & Support and KICT, 2017.08.01, Seoul
- KTA-Annual WG Activity Reports: 11 WG activity reports
- KTA-Annual WG Technical Reports
  - Development of thin spray-on liner (TSL)
  - Amendment to ventilation standard for road tunnel in Seoul
  - Underground data centre considering EMP protection
  - Investigation technology ahead of tunnel face in TBM tunnelling
  - Design standard for small-size subsea tunnel

Publications:
- “Tunnels and Underground Space in KOREA 2017” (in commemoration of 25th anniversary)
- Domestic technical journal “Tunnelling Technology” (6 issues in 2017)
- Quarterly magazine “Nature, Human Being and Tunnel”

Several activities, like Lectures and Presentations at engineering events were developed through 2017.

Young Members promoted 2 Lectures and 2 technical visits to industries and construction sites.

CURRENT TUNNELLING ACTIVITIES

Boryung-Taean Subsea Road Tunnel Construction

- Dia. 8.1m Slurry Shield TBM
- Main Infra for 2018 Winter Olympics in Pyeong Chang

Boryung-Taean Subsea Road Tunnel Construction

FUTURE TUNNELLING ACTIVITIES

- NATM passing through faults
- Undersea route length connecting Route 77
- Max. depth of 80m

- Youngjong Island 3rd C

- Incheon (North Port) Subsea Road Tunnel Construction
- Honam-Jeju Subsea Tunnel
  - Connecting the Korean Island
  - Total length of 167km (73km)
  - Project cost will be above 15trillion KRW
Incheon (North Port) Subsea Road Tunnel Construction

- NATM passing through highly fractured faults
- Undersea route length of 6.92km connecting Route 77
- Max. depth of 80m

Honam-Jeju Subsea Tunnel Project

- Connecting the Korean Peninsula and Jeju Island
- Total length of 167km (Undersea section of 73km)
- Project cost will be about $15bn

Youngjong Island 3rd Connection Way Project

- Connecting Incheon hub airport and Seoul metropolitan area
- The 3rd connection way, after the previous two long-span marine bridges
- Consideration of transport security and weather accidents

STATISTICS

1. Length or volume excavated - % mechanized / % conventional during 2017:
   - Railroad tunnel: 99.4km
   - Road tunnel: 208.0km

2. Amount (USD or EUR) of tunnelling / underground space facilities awarded in 2017:
   - About US$8.5bn

3. List of tunnels completed:
   - Wonju-Gangneung High-speed Railway Tunnel
   - Inje-Yangyang road tunnel
   - Incheon (North Port) Subsea Road Tunnel

4. List of tunnels under construction:
   - Boryung-Taean Subsea Road Tunnel
   - Jinhae-Guyjae Main Gas Pipe Line Tunnel
   - Yulchon Thermoelectric Power Plant Tunnel
   - Gunjang Energy GE-3 PJT Subsea Tunnel
ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

In 2017 members of the Macedonian Tunnelling Association were mainly active in reviewing the main design of the railway tunnels on corridor VIII as follow:

- Section Kicevo – Border with Rep. of Albania (11 tunnels)
- Section Beljakovce – Kriva Palanka (13 tunnels)
- Section Kriva Palanka – Border with Rep. of Bulgaria (22 tunnels)

Also, members of ITA Macedonia were consultants of the Macedonian Enterprise for State Roads concerning the tunnelling activities on two sections of corridor X:

- The motorway on Section Demir Kapija – Smokvice (2 tunnels)
- The motorway on section Kicevo – Ohrid (2 tunnels)

Several activities, like Lectures and Presentations at engineering events were developed throughout 2017. Young Members promoted 2 Lectures and 2 technical visits to industries and construction sites.

CURRENT TUNNELLING ACTIVITIES

- Members of ITA Macedonia are involved in organising the "XVI Danube-European Conference on Geotechnical Engineering", and "Risk Analysis in Tunnelling" seminar which will be held in June 2018.

FUTURE TUNNELLING ACTIVITIES

- Organising seminars for tunnel construction methods for the engineers which will be involved in the realisation of future tunnels in Macedonia.
- Members of ITA Macedonia will take an active role in the construction of future tunnels through the consultancy of Macedonian public enterprises for State roads and railways.

STATISTICS

1. Length or volume excavated: 0 % mechanized / 100 % conventional during 2017
2. Amount (USD or EUR) of tunnelling and underground space facilities awarded in 2017: €34M
3. List of tunnels completed:
   - 2 tunnels (T1 and T2) on the Demir Kapija - Motorway, Smokvice
4. List of tunnels under construction:
   - Tunnel “Preseka” on the Kicevo - Ohrid motorway

Macedonia

Name: Macedonian Tunneling Association (ITA Macedonia)
Type of structure: Non-profit, open association
Number of members: 50 members
Lectures and engineering events were held in 2017.

Two Lectures were held for industries and enterprises involved in tunnelling.

TUNNELING projects will be in the Danube-European Technical Engineering and in Tunnelling seminar in June 2018.

TUNNELING engineering will be held for tunnel construction engineers which will be held in the Danube-European Technical Engineering and in Tunnelling seminar.

nedonia will take the construction of future consultancy of enterprises for State enterprises.

The excavation of tunnels in the facility awarded in the future will take place in the construction of future consultancy of enterprises for State enterprises.

Excavation: 0% conventional during the construction of the Demir Kapija - Ohrid.

Excavation: 0% conventional during the construction of the Kicevo - Ohrid.

Excavation: 0% conventional during the construction of the Kicevo - Ohrid.

Technology for underground construction.

- Alkali-free set accelerators for shotcrete
- Products for mechanized tunneling: foaming agents for soil conditioning, polymers, sealants, lubricants
- Products for grouting and consolidating
- Products for concrete repairing, protection and coating
- Products for waterproofing: synthetic waterproofing membranes, waterproofing accessories

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Malaysia

Name: The Institution of Engineers, Malaysia
Type of structure: A non-profit, learned society whose primary function is to promote and advance the science and profession of engineering in any or all of its disciplines and to facilitate the exchange of information and ideas related to engineering.

Number of members: Over 40,000 members inclusive of corporate members, graduates, associates and students. It is the Secretariat of ASEG, Engineers, APEC Engineers and International Engineers.

ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

Tunnelling and Underground Space Technical Division of The Institution of Engineers, Malaysia (IEM TUSD) has been very active and continued working to undertake activities related to the promotion and advancement of the science and engineering of tunnels and underground space technologies. Six talks, 3 courses/seminars and 2 technical visits have been conducted in 2017.

IEM, together with IEM Training Centre (IEMTC), organised the first Southeast Asian Conference and Exhibition in Tunnelling and Underground Space 2017 (SEACETUS 2017) in Kuala Lumpur on 18th – 19th April 2017, which was well attended by 370 participants with over 20 exhibitors. Separately IEM also organized a Two-Day Short Course on Principles for Tunnel Design which was supported by ITACET Foundation. Both events are endorsed by IEM, IEM Academy (IEMASB) and IEMTC also conducted ITACET Training courses in 2000, 2006, 2010, 2015 and 2017. Hence IEM is committed to growing tunnelling and underground space technology training and education.

Being an active Member Nation of ITA, IEM submitted a bid to host the World Tunnel Congress 2020 and has successfully won the bid at the recently concluded ITA-ATES 43rd General Assembly in Norway. On 6th October 2017, IEM organized a One-Day Short Course on TBM Technology with Herrenknecht which is part of the satellite events of the World Tunnel Congress 2020. A joint China/Malaysia Seminar is in the pipeline scheduled in September 2018.

CURRENT TUNNELLING ACTIVITIES

Klang Valley Mass Rapid Transit (Line 1 & 2), SBK Line & SSP Line

The Klang Valley Mass Rapid Transit (KVMRT) is the first largest-of-its-kind transport infrastructure project in Malaysia, which involves the construction of a rail-based MRT system, together with the existing urban rail network, and will form the backbone of the public transport system in the Greater Kuala Lumpur/Klang Valley region. Line 1 (SBK Line) - The 51km long alignment, runs underground for a distance of 9.5km in twin bored tunnels beneath the centre of Kuala Lumpur while the rest of the alignment is elevated. The line, with 31 stations of which 7 are underground, was recently completed ahead of time with substantial cost saving (i.e. MYR2bn from the budgeted MYR28bn). The Government of Malaysia has allocated MYR32bn for the implementation of the MRT Line 2 (SSP Line) in which the construction and tunnelling is on-going. The 52.3km line will include a 13.5km of underground tunnels and 38.7km of viaduct. There will be 37 stations, 26 of which will be elevated and 11 underground stations.

Ulujerial Hydroelectric Project

The Ulujerial Hydroelectric Power (HEP) scheme was initiated by the Tenaga Nasional Berhad, Malaysia to provide additional 326 Gigawatt hours (GWhr) power generation for the increase in electricity demand and to improve the reliability of the electricity supply. The HEP scheme is located in the Cameron Highlands, Pahang state, West Malaysia. The project involves the construction of an underground plant, which will house two Francis turbines with a power output of 191MW each and the construction of approximately 26km of hydraulic tunnels, of which approximately 15km is excavated by TBM and the remaining by conventional tunnelling.

Pahang – Selangor Raw Water Transfer Tunnel

In June 2009, Malaysia began a project to build the Pahang – Selangor raw water transfer tunnel. It is to be one of the longest and biggest tunnels in Southeast Asia and the sixth longest in the world – a 44.6km long, 5.2m in diameter tunnel with a water delivery capacity of 1.88m litres per day. The tunnel runs underground between Pahang and Selangor states. This huge excavation project was successfully completed in February 2014 and overcome various challenges (e.g. over 50m high empty cavern inside a mountain, pressurized spring water that shot up as much as 24.8tons of water per minute, rock burst, etc.) thanks to the strong solidarity of its multinational team consisting over 1,000 people from 15 countries.

Bukit Berapit Rail Tunnel

Bukit Berapit Rail Tunnel, at 3,300m, the twin tunnel is the longest rail tunnel in Malaysia. It is located at Bukit Berapit near Bukit Gantang, Perak state, Malaysia. It was made as part of Ipoh-Pahang Basar Electrified Double Tracking Project. The tunnel was constructed as an alternative to the old winding tracks with many tunnels.

Stormwater Management and Road Transport Tunnel (SMART)

An example of successful urban underground development to help solve urban problems, the innovative SMART project is a dual-purpose tunnel. The project provides a stormwater diversion scheme including flood-water storage reservoir and a 9.7km, 11.8m diameter bypass tunnel, sufficient to save the Kuala Lumpur city from flooding at the time of inclement weather in the foreseeable future. The project is an excellent example of creating an alternative mode of public transport infrastructure in a congested urban area.

Klang Valley Mass Rapid Transit (Line 1), SBK Line

Future Tunnelling Activities

Klang Valley Mass Rapid Transit (Line 3), Circle Line

The Circle Line which is the third line of the KVMRT project is at its reference design stage and tendering stage (build and finance contract), of which is estimated to be MYR40bn, Line 3, a 40km 30km underground and the remaining above ground stations), all other transit system and developments surrounding these major centres. The Government of Malaysia is already in negotiation and target completion in 2025.

East Coast Rail Link

To unlock the potential of the East Coast Economic Region (ECER), it is a key enabler for the east (Kelantan, Terengganu and Pahang) states that can connect economic areas and provide Kuala Lumpur/Klang Valley, a high impact infrastructure to form the backbone of ECER’s transport infrastructure in the existing road/expressway network. KTMB East Coast Line at 689km railway (including a tunnel at 5.6km) was connecting ITT Gombak with the rest of the countries. Hence, the line involves construction of 4 different locations with the first tunnel at Bukit Tinggi – Gombak, 34.6km mountain range, a second tunnel into the city centre to the southern gateway, the Kuala Lumpur - Seremban Highway.

Light Rail Transit No. 3

The Light Rail Transit (LRT) is an alternative mode of public transport infrastructure along the north-south corridor of Malaysia, linking to the western corridor of Klang Valley line would run mostly on alignment, with 2km of tunnels and 20km of viaducts. The line began in 2017 with the expected opening in 2021.

Kuala Lumpur – Singapour

The High Speed Rail (HSR) will be the model for a new transport corridor between Kuala Lumpur and Singapore. To unlock the potential of a high impact infrastructural corridor, to connect all of the major cities (e.g. Singapore, Kuala Lumpur, Singapore, Iskandar Puteri, Johor Bahru, Iskandar Puteri and the future), it needs to be positioned along the rail routes. The Asian Rail Corridor can connect all major cities in the region in Singapore, Kuala Lumpur and Bangkok to Kuala Lumpur, serving the needs of economic growth, modernising the nation, and enhancing long term competitiveness while improving the quality of life of its people. The HSR can connect the city with Singapore, and Europe, other transit system and developments surrounding these major centres. The Government of Malaysia is already in negotiation with EMRT and PT Kolin, Malaysia to expedite the implementation of the project.

East Coast Rail Link

Kuala Lumpur – Seremban

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Law Water Transfer
A tunnel was built into the central project to provide a an undersea tunnel beneath the KMRL Titiwangsa mountain range. The project was awarded to China Communications Construction Company (CCCC) at a cost of MYR55bn and construction commenced in 2016.

East Coast Rail Link
To unlock the potential growth of the East Coast Economic Region (ECER), the East Coast Rail Link (ECRL) has been identified as a key enabler for the east coast region (Kelantan, Terengganu and Pahang states) that can connect economic centres including industrial areas and provide a link to Greater Kuala Lumpur/Klang Valley efficiently. ECRL is a high impact infrastructure project that will form the backbone of ECER’s multimodal transport infrastructure in complementing existing road/expressway infrastructure and KTMB East Coast Line and ports. A total of 688km railway (including approximate 80km connecting ITT Gombak to Port Klang), involves construction of 49km of tunnel at 19 different locations with the longest, the 17.9km tunnel at Bukit Tinggi – Gombak crossing the Titiwangsa mountain range. The project was awarded to China Communications Construction Company (CCCC) at a cost of MYR50bn and construction commenced in early 2018.

Light Rail Transit No. 3
The Light Rail Transit LRT (LRT 3) connecting the Bandar Utama and Johan Setia districts in the western corridor of Klang Valley, the 37.7km line would run mostly on an elevated alignment, with 2km of tunnel. 25 stations will be positioned along the route. Construction began in 2017 with the expected completion in 2021.

Kuala Lumpur – Singapore High Speed Rail
The High Speed Rail (HSR) serves as an alternative mode of public transport between Kuala Lumpur and Singapore. It is seen to be in line with the transformation of the nation as it links two urban agglomerations to meet growing demand, catalysing economic growth and enhancing long term economic competitiveness while improving the quality of life of its people. The HSR will connect 6 cities in Malaysia to Singapore, following a coastal route. The stations that have been identified are the terminus station in Kuala Lumpur (at Bandar Malaysia), Bangi-Putrajaya, Seremban, Ayer Keroh, Muar, Batu Pahat, Iskandar Puteri and the final stop in Singapore (at Jurong East). The KL terminus station at Bandar Utama will interchange with Mass Rapid Transit (Line 2 & Line 3), Airport Line (E3L) and KTM Commuter. The alignment will be expected in tunnel for the first few kilometre heading south of the Kuala Lumpur city. The railway will travel in further lengths of tunnel (total 14.9km), on viaduct and at-grade as it heads south on its 327.7km journey before crossing the border into Singapore. The travel time will be 90 minutes. The construction cost is estimated to be MYR50- 60bn. It is looking forward to commencing construction by next year to enable operations to start in 2025.

Penang Undersea Tunnel
The Penang Undersea Tunnel is a 6.5km tunnel which will connect Butterworth, Seberang Perai in the east to George Town, Penang island in the west. When completed, it will become the first undersea tunnel in Malaysia and second in the Southeast Asia. There will be a toll plaza at the undersea tunnel. With a cost of MYR3.2bn, the tunnel will be the largest privately funded public works project in Malaysia.

APPENDIX A: List of Major Tunneling Projects in Malaysia (as in 2018)

<table>
<thead>
<tr>
<th>Project</th>
<th>Total Length of Tunnel (m)</th>
<th>Construction Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Supply</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedu/ Muda Dam - Saiong Tunnel</td>
<td>6,800</td>
<td>1967-1973</td>
</tr>
<tr>
<td>Titiwangsa Tunnel</td>
<td>*</td>
<td>1985</td>
</tr>
<tr>
<td>Upper Muar Dam</td>
<td>6,600</td>
<td>1995-1996</td>
</tr>
<tr>
<td>Sk. Kelinci Dam</td>
<td>*</td>
<td>2000-2004</td>
</tr>
<tr>
<td>Beris Dam</td>
<td>*</td>
<td>2003-2003</td>
</tr>
<tr>
<td>Sg. Selangor Dam</td>
<td>700</td>
<td>2008</td>
</tr>
<tr>
<td>Kinta Dam</td>
<td>60</td>
<td>2009</td>
</tr>
<tr>
<td>Tiara Water Transfer</td>
<td>12,600</td>
<td>2010-2011</td>
</tr>
<tr>
<td>Pahang-Selangor Interstate Raw Water Transfer</td>
<td>44,600</td>
<td>2011-2014</td>
</tr>
<tr>
<td>Langat 2 Water Transfer</td>
<td>2,530</td>
<td></td>
</tr>
<tr>
<td>Railway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KTM Gemas – Tampin Line</td>
<td>137</td>
<td>1992</td>
</tr>
<tr>
<td>K Batu Berapit</td>
<td>851</td>
<td>1993</td>
</tr>
<tr>
<td>KTM Kajang – Jalan Jaya Line</td>
<td>1,322</td>
<td>1994-1999</td>
</tr>
<tr>
<td>Ijoh – Petaling Besar Electric Double Track</td>
<td>4,400</td>
<td>2003-2004</td>
</tr>
<tr>
<td>K Batu Berapit</td>
<td>*</td>
<td>2007-2008</td>
</tr>
<tr>
<td>KTM Kajang – Jalan Jaya Line</td>
<td>3,300</td>
<td>2008-2009</td>
</tr>
<tr>
<td>KTM Kajang – Jalan Jaya Line</td>
<td>390</td>
<td>2009-2010</td>
</tr>
<tr>
<td>KTM Kajang – Jalan Jaya Line</td>
<td>9,500</td>
<td>2010-2011</td>
</tr>
<tr>
<td>KTM Kajang – Jalan Jaya Line</td>
<td>13,500</td>
<td>2011-2012</td>
</tr>
<tr>
<td>Light Rail Transit LRT No. 3</td>
<td>4,400</td>
<td>2012</td>
</tr>
<tr>
<td>KL – Singapore High Speed Rail</td>
<td>14,800</td>
<td>2013</td>
</tr>
<tr>
<td>Road/ Highway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Karak Highway – Genting Sempah Tunnel</td>
<td>1,000</td>
<td>1976</td>
</tr>
<tr>
<td>Changkat Joring Highway – Mentok Menu Tunnel</td>
<td>800</td>
<td>1978</td>
</tr>
<tr>
<td>Jelapang – Setapak – Batu Kawan Expressway</td>
<td>720</td>
<td>1980</td>
</tr>
<tr>
<td>Penang Undersea Tunnel</td>
<td>6,200</td>
<td>2004</td>
</tr>
<tr>
<td>Sewerage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pantai Trunk Sewer</td>
<td>5,400</td>
<td>2004</td>
</tr>
<tr>
<td>Hydro-electric Power</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Batang Padiang HEP</td>
<td>41,000</td>
<td>1959-1968</td>
</tr>
<tr>
<td>Temenggor HEP</td>
<td>3,100</td>
<td>1974-1975</td>
</tr>
<tr>
<td>Tebon Padiang HEP</td>
<td>4,400</td>
<td>1974-1975</td>
</tr>
<tr>
<td>Kenyir Dam</td>
<td>2,800</td>
<td>1974-1975</td>
</tr>
<tr>
<td>Permai Dam</td>
<td>30,200</td>
<td>1992-1997</td>
</tr>
<tr>
<td>Sg. Pahang HEP</td>
<td>24,000</td>
<td>1992-1997</td>
</tr>
<tr>
<td>Murum Dam</td>
<td>2,700</td>
<td>2003-2003</td>
</tr>
<tr>
<td>Beaufort Dam</td>
<td>4,500</td>
<td>2011</td>
</tr>
<tr>
<td>Half Tenom HEP</td>
<td>1,250</td>
<td>2010-2016</td>
</tr>
<tr>
<td>Ilo Jeria HEP</td>
<td>24,000</td>
<td>2011-2012</td>
</tr>
<tr>
<td>Sg. Lembing Tin Mine</td>
<td>Reaching &gt;700m deep</td>
<td>1985-1986</td>
</tr>
<tr>
<td>Klu Bakti Tin Mine</td>
<td></td>
<td>1985-1986</td>
</tr>
<tr>
<td>Batu Arau Coal Mine [Other Special Purposes]</td>
<td>Ap deep as 300m b.g.</td>
<td>1985-1986</td>
</tr>
<tr>
<td>Shimmering Water Power Project</td>
<td>970</td>
<td>2003-2006</td>
</tr>
<tr>
<td>* Not available</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2017 - ACTIVITIES
Course on Design and Construction of Tunnels
This was carried out from 19th - 20th of October, 2017.
This event was carried out in conjunction with the Civil Engineers College of Jalisco State (CICEJ)
Venue: CICEJ Civil Engineers College of Jalisco State, Mexico
Participants: 200
Members: 27
Non members: 36
Students with scholarship: 137

Master in Engineering with Orientation to Tunnels and Underground Works
Continuation of the Master Course sponsored by our three institutions, the National Autonomous University of Mexico (UNAM), together with AMITOS and the Alliance FIIDEM, are carrying out the 4th generation of the Master in Tunnels and Underground Works. Moreover, the call has just been launched for the 5th generation, for the 2018 program.

Dialogue with Students from the UNAM National Autonomous University of Mexico AMITOS has been called in to generate interest in the final year students in civil engineering and to try to entice them into the tunnelling industry. This happens on a Saturday in a meeting between AMITOS and some 50 students who have expressed their interest and are looking to gain work in the near future.

Certification for Professional Legal Experts in Tunnels and Underground Works AMITOS, represented by its XV Council of Directors, has continued with the certification of Professional Legal Experts, among its associates, for 2017.

Formation of the YMG Mexico in AMITOS AMITOS had opened the Young Member Group Mexico (GYU Mexico Grupo de Ingenieros Jovenes AMITOS), but to make it compatible with ITA, we have registered all the young engineers that were on the previous Master Courses and the ones being in the process in 2017 and 2018. Also we are registering the interested young engineers from the Mexico Politechnical Institute and other states institutions.

List of underground projects underway in Mexico
1. Water and Drainage
The projects included have been considered as strategic for the achievement of Sustainable Development, and almost all of them have been presented in the National Infrastructure Program (PNI) 2014-2018.

Table 1. Current situation of underground works for drainage and drinking water.

<table>
<thead>
<tr>
<th>Project</th>
<th>Owner</th>
<th>Current Situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.1 Nuevas fuentes de abastecimiento</td>
<td>Conagua</td>
<td>In study</td>
</tr>
<tr>
<td>V.2 Tercera Línea del Sistema Cutzamala</td>
<td>Conagua</td>
<td>In construction</td>
</tr>
<tr>
<td>V.3 P.T.A.R. Atotonilco</td>
<td>Conagua</td>
<td>In construction</td>
</tr>
<tr>
<td>V.4 Túnel Emissor Oriente</td>
<td>Conagua</td>
<td>In construction</td>
</tr>
<tr>
<td>V.5 Túnel Emissor Poniente II</td>
<td>Conagua</td>
<td>In construction</td>
</tr>
<tr>
<td>V.6 Túnel Casal General</td>
<td>Conagua</td>
<td>In construction</td>
</tr>
<tr>
<td>V.7 Túnel Río de las Comarillas</td>
<td>Conagua</td>
<td>In study</td>
</tr>
<tr>
<td>V.1 New Sources of Supply</td>
<td>Acueducto del poniente:</td>
<td></td>
</tr>
<tr>
<td>V.3 P.T.A.R. Atotonilco</td>
<td>Conagua</td>
<td>In study</td>
</tr>
</tbody>
</table>

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superficial channels that receive wastewater. • Improve the sanitary conditions of more than 300,000 people living in irrigated areas.

V.4 East Emisor Tunnel (TEO)
Hydrological and hydraulic studies concluded the need to reinforce the Main Drainage System with works to discharge up to 150m³/s and others to increase the regulation capacity in rainy seasons. The East Emisor Tunnel will reinforce the Main Drainage System of the Metropolitan Zone of the Valley of Mexico (ZMVM) for the benefit of its 20 million inhabitants, evicting sewage and rainwater, and reducing the risk of flooding. Tunnel Characteristics: Capacity: 150m³/s, length: 62km, depth: 30 to 150m, diameter: 7m

V.5 Poniente Emisor II Tunnel (TEP II)
The project takes advantage of the open-air channel of the current West Emitter, receiving the water from the new TEP II. With the construction of the TEP II, the Norponiente zone will be protected from floods and catastrophes associated with extraordinary rain events (municipalities of Naucalpan, Tlalnepantla, Atizapán and Cuautitlán Izcalli, in the State of Mexico). Tunnel Characteristics: Capacity: 112m³/s

V.6 Tunnel General Channel
With the construction of the Canal General Tunnel, flood protection will be reinforced, since it will dislodge the wastewater and rainwater of the area, working integrally with the Company’s River Tunnel and the La Caldera pumping plant. Tunnel Characteristics: Capacity: 20m³/s, length: 7.9km, depth: 25m, diameter: 5m

V.7 Túnel Río de la Compañía II
The tunnel will cover 7km with a trunk canal 2.4m wide and 1.3m deep, with gates to control the discharge of 24m³/s. It will drain effluents and rainwater from the 321km² drainage area. The tunnel will be equipped with a gate to control the discharge of 24m³/s. It will drain effluents and rainwater from the 321km² drainage area. The tunnel will be equipped with a gate to control the discharge of 24m³/s. It will drain effluents and rainwater from the 321km² drainage area.
2. Roads

Table of highway projects under construction

3. Rail Transport

Interurban Train Tunnel Mexico
The Toluca Project is under construction with a total length of 57.7km, 4.7km consists of 2 tunnels in parallel with an excavation diameter of 6.5m and a finished diameter of 7.5m, with interconnection galleries at every 250m. The TBMs used are 2 EPBMs (Earth Pressure Balanced) with a total length of 127m.

Line 12 Metro Extension
This project under construction is using the conventional method using shearing machines, with an average diameter of 11m and will have 13 ports between six and 13m, and a total length of 4.6km.

Line 3 Metro Monterrey
This project currently under construction has a total length of 7.439m of which 880m are tunnel with an average diameter of 8m.

Line 3 Light Rail Guadalajara
The project consists of a total length of 229km, with a tunnel length of 5.5km, with an inside diameter of 9.5m, and 5 underground stations. The TBM used is an EPB (Earth Pressure Balance) of 11.5m in diameter.

Shopping Centers, Parking Lots

San Luis Potosi
Construction of Underground Parking Plaza Fundadores. Due to the great tourist demand in the state of San Luis Potosi, the construction of a deep underground parking lot in the Fundidores Plaza has been projected, thus facilitating access to the center of the city of Potosi.

Morelos
Reconstruction of the Building 1 UAEU with underground parking. On January 2018 the reconstruction began of Building no. 1 of the UAEU which will have four levels, 200 parking spaces, respecting the horizontality of the original building, as well as the central part of the access, which will use a steel structure calculated to withstand an earthquake of 9° on the Richter scale. It will have emergency staircases and five C-type staircase modules, which according to the regulations of the National Institute of Educational Physical Infrastructure (INIFED), would serve as a shelter for its concrete structure, which will allow the inhabitants of the third and fourth floor to not go down to ground level in case of evacuation.

Querétaro
This Olympic Stadium project involves the construction of public underground parking of two or three levels, to mitigate the problem of the lack of parking spaces that exists in the city’s Historic Center. With this project, we plan to take full advantage of the location of the work (since it will be very close to the historic center), to highlight the practicality of undertaking such urban underground workings.

Garden Santa Fe
This is a sustainable commercial center at 35m depth, with a surface of 60,000m², four levels of parking - with 1,600 parking spaces, two levels of shopping centers, 70 commercial premises, and an installed treatment plant that allows treatment of 160,000 liters of water per day. It has photovoltaic cells for energy saving.

Metropolitan Drain Network

TUNNELS – UNDERGROUND WORKS

Teo Túnel Emisor Oriente
Capacity: 150m³/sec
Length: 62m
Finish Diameter: 7m
Shafts: 1
Portals: 1

Top II Túnel Emisor Poniente II
Capacity: 5.6m³/sec
Length: 860m
Finish Diameter: 7m
Shafts: 4

Acatlán
Length: 3.3km
Finish Diameter: 14.02m/17.52m.
Shafts: None

Labramiento Acapulco Zihuatanejo
Length: 800m
Finish Diameter: 14.02m/22.52m.
Shafts: None

Túnel Ferrocarril Manzanillo
Length: 850m
Finish Diameter: 6m/12m.
Shafts: None

FUTURE ACTIVITIES

International Summit
AMITOS has the pleasure of coordinating with the ITA, an International Summit event that will be held, at the facilities of the College of Civil Engineers of Mexico, from May 31 to June 2, 2018 in Mexico City.

On this occasion the program will be tailored to bring together the best the international and national tunnelling engineering experts to disseminate knowledge, get the best analysis in tunnelling construction, and to give the best decisions on going conventional or mechanized in the construction of tunnels and underground works. It will include best procedures and recommendations, round table discussions, and face to face talks.

5th International Symposium on Tunnels and Shafts
AMITOS and the Mexican Society for Geotechnical Engineering (SMIG) will hold the 5th International Symposium from 16th to 18th of August, combining the specialties of both technical associations. The aim is to identify the state of practice and advances in the design and construction of tunnels and shafts. In addition, the diffusion of recent international and national experiences is pursued to benefit the professional engineers, professors and interested students.

Design and Construction Tunnel Course in Guadalajara, Jal. Mexico
AMITOS and Jalisco Civil Engineers College in Guadalajara, Jalisco Mexico (CICEJ), both trade associations specializing in civil engineering, have established a commitment to provide training each year, for the new engineers and to provide updates to professionals, in everything related to underground work in the construction of the tunnels in Jalisco State. Works are conventional as well as mechanized tunnel on the Guadalajara Metro. This year, it will take place from October 18th to 20th, 2018, at the facilities of the CICEJ.
Every tunnel stands as evidence of problems solved, obstacles overcome, and partnerships solidified. Our drive has always been—and will continue to be—meeting our customers’ challenges head-on. Visit us at WTC to learn more about how The Robbins Company is utilizing forward-thinking tunneling methods to carve new paths in the tunneling industry.
are under construction and blast method
A 296km long water supply tunnel excavated by drill and mechanized tunneling method
A 12km long multipurpose 5.2m diameter is being excavated by a double shield Robbins segmental lining. So far, 25 hydropower tunnels and caverns size ranging from 2.5m to 15m have been excavated in Nepal.

The following current tunneling activities are on-going:
• More than 25 hydropower tunnels and caverns size ranging from 2.5m to 15m.

### FUTURE TUNNEL ACTIVITIES

Mainly hydro tunnels and multipurpose projects and irrigation:
- Kaligandaki-Tirau Div. Project: Tunnel = 30km
- Sunkoshi-Kamala Div. Project: Tunnel = 16.6km
- Sunkoshi-Marin Div. Project: Tunnel = 17km

3. Road tunnel projects:
- Nagdhunga to Naubara
- Hetauda to Bhimphedi
- Fast track Kathmandu (total 3 tunnels)
- Khurkot to Sindhuli
- Thansing to Toka
- Sanga pass crossing
- Yamd (Pokhara) to N.
- Dahune crossing (But)

4. Rail tunnel projects:
- Kathmandu metro = 6
- East West Electrified Line
- Rasuwagadi (China border)
- Kathmandu to Lumle tunnels

### STATISTICS

1. Length or volume excavated in 2017:
- Mechanized / % conventional

2. Amount (USD or EUR):
- Underground space excavated in 2017:
- More than US$100M

3. List of tunnels completed:

4. List of tunnels under construction:

---

**Nepal Tunnelling Association**

**List of Tunnel Completed**

<table>
<thead>
<tr>
<th>S/N</th>
<th>Project’s name</th>
<th>Headrace Tunnel</th>
<th>Penstock pipe</th>
<th>Surge shaft</th>
<th>powerhouse/staircase</th>
<th>Tunnel excavation by jumbo drilling machine</th>
<th>The 5.2m diameter Double shield TBM ready for excavation on the Bheri Babai Multipurpose Project</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Tibet Hydropower Project</td>
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<td>1,900</td>
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<td>9</td>
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<td>26</td>
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<td>27</td>
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</table>

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**NEPAL TUNNELLING ASSOCIATION**

**List of ITA Member Nation Activity Reports 2017**

**Association Activities**

**Association Activities During 2017 and to Date**

In 2017 the Nepal Tunnelling Association continued working to share knowledge and experiences by organizing a Conference.

The one day Nepal Tunnelling Conference 2017 was conducted to share knowledge and experiences. The following projects are underway:

- A 26km long water supply tunnel excavated by drill and mechanized tunneling method
- A 12km long multipurpose 5.2m diameter is being excavated by a double shield Robbins segmental lining. So far, 25 hydropower tunnels and caverns size ranging from 2.5m to 15m have been excavated in Nepal.

The following current tunneling activities are on-going:

- More than 25 hydropower tunnels and caverns size ranging from 2.5m to 15m.

### CURRENT TUNNELLING ACTIVITIES

So far 218km of tunnel mainly for hydro, water supply, irrigation, mining, road and sewerage has been excavated in Nepal.

The following current tunneling activities are on-going:

- More than 25 hydropower tunnels and caverns size ranging from 2.5m to 15m.
are under construction using the drill and blast method
- A 26km long water supply tunnel excavated by drill and blast and mechanized tunnelling will breakthrough soon.
- A 12km long multipurpose tunnel of 5.2m diameter is being excavating using a double shield Robbins TBM with a segmental lining. So far, 1.5km has been excavated without a problem.

**FUTURE TUNNELLING ACTIVITIES**
Mainly hydro tunnels and a few road tunnels have been planned and studied by the Government and private sectors. The following projects are under study:

1. Hydro tunnel projects:
   - More than 24 hydro power tunnels sizes ranging from 2.5m to 11m.
2. Multipurpose projects (Hydroelectric and irrigation):
   - Kaligandaki-Tinau Diversion Multipurpose Project: Tunnel = 30km
   - Sunkoshi-Kamala Diversion Multipurpose Project: Tunnel = 16.6km
   - Sunkoshi-Marin Diversion Multipurpose Project: Tunnel = 1km

3. Road tunnel projects:
   - Nagdhunga to Naubesi = 2.7km
   - Hetauda to Birimphedi = 3km
   - Fast track Kathmandu to Nigad = 7km (total 3 tunnels)
   - Khurkot to Sindulpul = 6.4km
   - Thansing to Toka (Kathmandu) = 4.2km
   - Sanga pass crossing = 1.5km
   - Yamdi (Pokhara) to Nayapul = 6km
   - Dahune crossing (Butwal) = 6km

4. Rail tunnel projects:
   - Kathmandu metro = 66.1km
   - East West Electrified Railway Projects with 10 tunnels of total length 26.7km
   - Rasuwagad (China boarder) to Kathmandu to Lumbeni with some tunnels

**STATISTICS**
1. Length or volume excavated - % mechanized / % conventional during 2017:
   - 1.5km by TBM and 19.68km by Drill & Blast
2. Amount (USD or EUR) of tunnelling / underground space facilities awarded in 2017:
   - More than US$100M
3. List of tunnels completed:
   - Shown
4. List of tunnels under construction: Shown

---

**Nepal Tunnelling Association**

<table>
<thead>
<tr>
<th>Tunnel under construction</th>
<th>Project</th>
<th>Type</th>
<th>Total Length (km)</th>
<th>Size (m)</th>
<th>Excavation method</th>
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<tr>
<td>1.</td>
<td>Upper Tamakoshi (455 MW)</td>
<td>Hydro</td>
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<td>TBM</td>
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<tr>
<td>2.</td>
<td>Upper Trishuli I (216 MW)</td>
<td>Hydro</td>
<td>3.82</td>
<td>3.5</td>
<td>TBM</td>
</tr>
<tr>
<td>3.</td>
<td>Upper Marsyangdi (216 MW)</td>
<td>Hydro</td>
<td>6.2</td>
<td>3.5</td>
<td>TBM</td>
</tr>
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<td>4.</td>
<td>Upper Chakhu (22 MW)</td>
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<td>6.2</td>
<td>3.5</td>
<td>TBM</td>
</tr>
<tr>
<td>6.</td>
<td>Upper Marsyangdi (216 MW)</td>
<td>Hydro</td>
<td>6.2</td>
<td>3.5</td>
<td>TBM</td>
</tr>
<tr>
<td>7.</td>
<td>Upper Chakhu (22 MW)</td>
<td>Hydro</td>
<td>2.4</td>
<td>4</td>
<td>TBM</td>
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<td>8.</td>
<td>Upper Trishuli I (216 MW)</td>
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<td>3.82</td>
<td>3.5</td>
<td>TBM</td>
</tr>
<tr>
<td>9.</td>
<td>Upper Marsyangdi (216 MW)</td>
<td>Hydro</td>
<td>6.2</td>
<td>3.5</td>
<td>TBM</td>
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</tbody>
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**Nepal Tunnelling Association**

<table>
<thead>
<tr>
<th>Future Projects</th>
<th>SN</th>
<th>Project</th>
<th>Type</th>
<th>Total Length (km)</th>
<th>Diameter (m)</th>
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<td>1</td>
<td>Kaliya HEP (900 MW)</td>
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<td>Rasuwagad storage (33MW)</td>
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<td>4</td>
<td>Nyalamchau (42MW)</td>
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<td>5</td>
<td>Kathmandu Metro</td>
<td>Rail</td>
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<td>3.5</td>
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<td>6</td>
<td>East West Electrified Railway Project</td>
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<td>Sunkoshi-Kamala Diversion Multipurpose Project (61.4MW)</td>
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ITA MEMBER NATION ACTIVITY REPORTS 2017
The Netherlands

Name: Department of Tunnelling and Underground Works (TTOW) of the Royal Institution of Engineers (KIVI) in the Netherlands

Type of structure: Non-profit, The Royal Institution of Engineers in the Netherlands is an association with individual members who are also member of the various departments of the association. The Department of Tunnelling and Underground Works is one of the larger departments within the association.

ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

In 2017 the Department of Tunnelling and Underground Works performed several activities:

• Lecture day ‘Tunnel as a system’. New projects and latest developments in tunnel techniques.
• Theme session ‘Subsoil cycle parking’. The parking of bicycles is a growing problem, especially in the area of train stations. Several parties, governmental included, presented the policy and developments in subsoil cycle parking.
• Project marathon: Site visit to 3 projects in one day: Renovation of the Maastunnel, Parking garages in Lammermarkt and the Garenmarkt in Leiden.
• ‘TTOW Young Members’ is founded, this sub-association bridges the gap between students and the full membership of the TTOW. A crowded session was held, Young Members are also invited to other TTOW activities.
• ITA evening and annual TTOW meeting

CURRENT TUNNELLING ACTIVITIES

Blankenburg (immersed tube) & Aalkeetunnel (in situ)
The Blankenburg connection on the new A24 motorway consists of 2 tunnels: the Blankenburg tunnel, which is an immersed tube tunnel under the Scheur (Nieuwe Waterweg) waterway and the Aalkeet tunnel, an in situ tunnel through a natural habitat called the Krabbeplas. Also, 20 years of management and maintenance are incorporated in the project (DBFM contract).

The Blankenburg tunnel will be about 945m in length and the Aalkeet tunnel about 510m. The whole connection will be partly paid for by toll collection.

Victory Boogie Woogie (Rotterdamsebaan) – (TBM)

In the Rotterdamsebaan project, an additional city entrance is being created for The Hague. This is by TBM tunnel – the Victory Boogie Woogie tunnel. The TBM (which has just started) is called Catharina-Amalia, after one of the daughters of the King of the Netherlands.

The twin-tube tunnel is 1860m in length (drilled section 1640m) with an inner diameter of 10m. Each tunnel tube provides two traffic lanes and every 250m there is a cross-passage.

A9 Gaasperdammerweg (in situ)

A 3km long tunnel of 5 tubes on the A9 through the Southeast of Amsterdam. The main civil works for the tunnel were finished in 2017. At the moment, the tunnel installations are nearing completion.

North/Southline (TBM + immersed)

This much awaited subway tunnel in Amsterdam will be finished this year after an amazing 16 years of construction.
Rijnlandroute (TBM)

In the Rijnlandroute project, a connection between the A4 and the A44 motorways is being established near Leiden. The twin-tube TBM tunnel is 2.5km in length. Each tunnel tube provides two traffic lanes. 15 years of management and maintenance are also part of the contract.

Zuidasdok Amsterdam (in situ)

The Zuidas project establishes an extension of the existing A10 Zuid motorway, the ring road for Amsterdam. In a combined approach, the existing public transport hub will be extended and the motorway will be directed through a series of new tunnels. There will be two tunnels, each about 1km long. Each tunnel has two tubes; one four-lane tube for transit traffic and one two-lane tube for local traffic. On top of the tunnels, new public space will be developed, also providing space for the expansion of the public transport hub.

Spaarndammertunnel (in situ – finished)

In this project – by the Municipality of Amsterdam – a new rural area is relieved from traffic congestion thanks to the construction of the tunnel. The tunnel is 470m in length and has one lane and an emergency lane in both directions. The tunnel was opened on the 5th of February this year.

Maastunnel Rotterdam (renovation)

The renovation of the Maastunnel is currently in its second half of the first year of renovation. Works are still going according to plan. Currently, the main demolition works for the traffic floor is completed and the new traffic floor is almost ready. The Maastunnel is a monument which requires a unique approach in bringing it up to the latest standards.

Other Renovation projects (renovation mainly tti):

Velsertunnel (finished)
IJtunnel (finished)
Eerste and Tweede Benedixxtunnel
Buitenveldertunnel
Noordtunnel
Stijlendertunnel
Westerscheldestunnel
Koningstunnel

FUTURE TUNNELLING ACTIVITIES

A16 – Rottenerentunnel (in situ)

The A16 motorway from the traffic junction Terheijden will be lengthened and connected to the A13 motorway near Rotterdam The Hague airport. In this connecting road, a new land tunnel is required – the Rottenerentunnel (preliminary working name). The Rottenerentunnel is planned to be opened in 2024 and will be around 2.235m in length. There will be two tubes with two lanes per tube and an emergency lane.

At the moment the tender is ongoing, in 2018 a contractor will be selected.

Renovation Eerste and Tweede Heinenoordtunnel

In 2023, the Heinenoordtunnel (1969) on the A29 near Barendrecht will undergo renovation. At the moment, research on the scope and impact of the renovation is ongoing.

Renovation Kiltunnel

Between 2020 and 2022, the Kiltunnel between Dordrecht and Gravendeel will be renovated. The tunnel safety installations will be renewed and the civil structure will be renovated where necessary.

Other Renovation projects scheduled over the coming years:

Drechttunnel
Piet Hein Tunnel
Schipluchtunnel
Roertunnel
Swaartunnel

Future tunnel projects (Renovation - after 2022):

Botlektunnel
Hubertustunnel
Thomassetunnel
Roertunnel
Swalmtunnel

STATISTICS

1. Length or volume excavated - % mechanized / % conventional during 2017:
   No mechanized tunnelling (TBM) in 2017. Conventionally excavated volume: 0m³

2. Amount (USD or EUR) of tunnelling / underground space facilities awarded in 2017:
   Zuidasdok: €990M
   Blankenburgconnection: €580M
   Rijnlandroute: €492M

3. List of tunnels completed:
   Spaarndammertunnel
   Velsertunnel (Renovation)

4. List of tunnels under construction:
   See above list ‘Current Tunnelling activities’
The last year has been one where the Tunnelling Association hosted its first ever Underground Space Conference in Lagos Nigeria, on the theme "Tunnelling and Underground Space Development in Nigeria". Nigeria was adopted as a member Nation of the ITA at the assembly held in Beirut in 2016.

The Tunnelling Association involved during the year were from Nigerian Business.

### New Zealand

**Name:** New Zealand Tunnelling Society  
**Type of structure:** The NZTS is an Industry based Technical Society of Engineering New Zealand.  
**Type of structure:** 55 individual members / 10 members from corporate sponsors

#### 2017 ACTIVITIES

**MAIN ACTIVITIES** - Quarterly technical sessions  
WGs - 2 Participating members  

**TRAINING** - Annual Short Course and support to ATS tunnelling conferences (Sydney)

**PUBLICATIONS** - Contribution to ATS journal published twice per calendar year in conjunction with Tunnelling Journal.

Also the Pipejacking Guide for New Zealand available from http://nztunsoc.org.nz

#### CURRENT TUNNELLING ACTIVITIES

**The Waterview Connection**  
The Waterview Connection opened in July 2017 and is 4.5km long, with 2.5km of twin bored three lane tunnels, the longest in New Zealand. By 2026, the link is expected to carry 83,000 vehicles a day. Delivered as a ‘road of national significance’ under NZTA’s competitive alliance model, the project cost $1.4bn and took more than five years to build.

The ‘golden link’ in the chain of the Western Ring Route around Auckland, the benefits of the scheme have been widely praised since the opening.

**The City Rail Link**  
The City Rail Link project consists of building two 3.4km twin tunnels, up to 42m under the centre of Auckland. The new line will climb roughly 70m of terrain over 3600m of rail line, which will be built through both tunnelling and cut and cover methods. It will include a pair of brand new underground stations – Aotea Station and Karangahape Road Station – in the CBD, and will involve expansion and redevelopment at Britomart and Mt Eden stations.

Construction contracts 1 and 2 (C1, C2) involve underpinning the Heritage CPO building at the current terminus station Britomart and the first sections of cut and cover tunnel within Albert St. Both contacts and the intervening sections through the Commercial Bay Development are progressing well. A stormwater diversion at Mt Eden (C6) has recently been awarded. Procurement of line wide services (C7) and the remaining main civil works packages (C3, C5) are ongoing through 2018, although at the time of writing there are delays to the C3 tender process due to the withdrawal of one of the shortlisted construction consortia.

The Central Interceptor  
Another major project for delivery enabling the stormwater and wastewater systems to keep pace with Auckland population growth is Watercare’s Central Interceptor. This a wastewater tunnel that will run between Western Springs and the Mangere Wastewater Treatment Plant. The tunnel will run underground for 13km and will be at a depth of between 22 and 110m below ground. It will cross Manukau Harbour at about 15m below the seabed. Along the route it will connect to the existing wastewater network, which will divert flows and overflows into the tunnel. The reference design phase is complete, with ongoing industry engagement and requests for tenders expected in Q2 2018.

#### Kaikoura Earthquake Recovery

On 14th November 2016, a moment magnitude (Mw) 7.8 earthquake occurred on a fault near Culverden, approximately 15km deep, and continued north-eastwards for more than 170km, at a rupture speed of around 1.8km/s (6,450 km/hr). This caused 180km of surface rupture and vertical and horizontal displacement of up to 12m along 21 faults with between 80,000 and 100,000 landslides. Of the 21 tunnels on the MNL between Christchurch and Picton with a total of only four tunnels require remedial support works, train services commenced September 2017.

#### STATISTICS

1. Length of volume excavated / % mechanized / % conv.
The last year has been eventful as the Tunnelling Association Nigeria hosted its first ever Tunnelling and Underground Space Conference held in Lagos Nigeria Themed - “Developing the Tunnelling and Underground Space Industry in Nigeria”.

Nigeria was adopted as the 74th Member Nation of the ITA at its 43rd general assembly held in Bergen, Norway.

The Tunnelling Association Nigeria was involved during the 3 day conference held by Nigerian Building and Road Research Institute to highlight the potential strategy and requirements for Research and Development.

The Think Deep Naija Campaign was launched

The Tunnelling Association Nigeria also participated in partnership with ITACUS, ISOCARP and TDUK at the World Urban Forum held in Kuala Lumpur to discuss underground space use for the New Urban Agenda.

The Tunnelling Association hosted its 2nd Tunnelling & Underground Space Conference held in Abuja Nigeria themed - Socio Economic benefit of developing Tunnelling and Underground Space Infrastructure.

Kaikoura Earthquake Recovery
On 14th November 2016, a moment magnitude (Mw) 7.8 earthquake occurred on a fault near Culverden, approximately 15km deep, and continued north-eastwards for more than 170km, at a rupture speed of around 1.8km/s (6,450 km/hr). This caused 180km of surface rupture and vertical and horizontal displacement of up to 12m along 21 faults with between 80,000 and 100,000 landslides. Of the 21 tunnels on the MNL between Christchurch and Picton with a total length of 5,508m, only four tunnels required significant remedial support works with commercial train services commencing at the end of September 2017.

STATISTICS
1. Length or volume excavated - % mechanized / % conventional during 2017:
   • 7km comprising mainly tunnel repairs and pipejacks
2. Amount (USD or EUR) of tunnelling/ underground space facilities awarded in 2017:
   • €40M
3. List of tunnels completed: NA
4. List of tunnels under construction:
   • City Rail Link
   • Panitahi and Raramai Tunnel Road Widening
   • Kaikoura Rail Tunnels
   • Lyttelton Tunnel FFS Retrofit
   • Various smaller diameter pipejack projects including Hurua No.4, Artillery Drive

- Socio Economic benefit of developing Tunnelling and Underground Space Infrastructure.

CURRENT TUNNELLING ACTIVITIES
The industry in Nigeria is obviously still at its infancy but has the potential to quickly evolve. One of the notable projects is the Mambilla hydro power project which is designed to have 3 hydraulic tunnels for a length 33km. This Project is expected to finally kick off in 2018.

FUTURE TUNNELLING ACTIVITIES
There are several projects that are being proposed for which concepts are being developed. Organisations have been encouraged to work with State governments to develop programmes that integrate the use of the underground space.

Some of these potential projects are:
• Review of existing Transport Master Plans to integrate underground options (Lagos State Transportation Master Plan)
• Integrated water and sewage management
In 2017 the Peruvian Tunnelling Society continued working to show the benefits of the underground space facilities through the implementation of events, and the dissemination of technical and social media presentations.

Several activities, like Lectures and Presentations at engineering schools, were developed during 2017.

### ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

In 2017 the Peruvian Tunnelling Society continued working to show the benefits of the underground space facilities through the implementation of events, and the dissemination of technical and social media presentations.

### CURRENT TUNNELLING ACTIVITIES

The tunnelling activity in Peru was awarded three prizes during the ITA Tunnelling Awards in Paris in November; Einar Broch got the Lifetime Achievement award, Tobias Andersson, Skanska, the Young Tunneller of the year, and Ola Kvammen, Lemminkäinen, received the prize for the Project of the Year less than €50M, on behalf of The Fjærland Powerplant.

In 2017 we also arranged our yearly conference, gathering together more than 700 tunnellers.

We have also arranged our 4-5 yearly courses/seminars on different topics.

### FUTURE TUNNELLING ACTIVITIES

The high activity within infrastructure development will continue in the coming years. As an example; the public budget for road development will be, on average, 10% higher over the next 6 years when compared to the 2017 level.

Within rail, the Follo line project will continue for several years and will eventually open for traffic in 2021. The next large infrastructure project will be the Ringeriks project, which will include a 40km long rail tunnel in addition to some shorter tunnels both for rail and a new highway running between Sandvika and Hønefoss.

Nye veier will continue road building along the E18 from Porsgrunn to Stavanger. The same goes for the new E6 between Hamar and Lillehammer, and the new E6 both south and north of Trondheim.

The same also goes for The Norwegian Public Road Administration. They have just signed the first contract for Rogfast. This project will include the longest and deepest subsea tunnel. The project is a part of the Infrastructure program “Ferry free connection between Kristiansand and Trondheim”. This program will also include many other tunnel projects.

Among the coming hydro power projects, are: Leikanger powerplant (13km), Tolga powerplant (10km), Opø powerplant (5km) and the Elne power plant (6km). In other words, the tunnel market in Norway is strong and will continue to be so in the years to come.

### STATISTICS

1. **Length or volume excavated - % mechanized / % conventional during 2017:**
   - 22,401m with TBM, 73,790m with drill and blast
   - Total 7.8Mm³ rock was excavated in 2017

2. **Amount (USD or EUR) of tunnelling / underground space facilities awarded in 2017:**
   - Not released

3. **List of tunnels completed:**
   - Several tunnels were completed in 2017, among these we can find: Filefjellstunnelen E16 (8km), Larvikstunnelen E18 (3km), parts of the Tosen powerplants started production in 2017, and the awarded Fjærland powerplants started production in 2017.

4. **List of tunnels under construction:**
   - 73 tunnels under construction

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**Peru**

Name: Asociación Subterráneas – Aparados

Type of structure: Non-profit, open association

Number of members: 100 members, 10 corporate members

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**Norway**

Name: Norwegian Tunnelling Society

Type of structure: Non-profit, open association

Number of members: 1000 members, 100 corporate members

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ASSOCIATION ACTIVITIES
DURING 2017 AND TO DATE

In 2017 the Peruvian Tunnelling Association continued working to show society the benefits of the underground environment, both through the implementation of technical events, and the dissemination of materials via technical and social media.

Several activities, like Lectures and Presentations at engineering events were developed through 2017. Especially in the colleges, because the dissemination of knowledge is fundamental.

Last year, we received notable recognition from the company – VINCI - of one of our members (Soletanche-bachy Peru).


CURRENT TUNNELLING ACTIVITIES
TUNNEL & MINING 2017 – Congreso Latinoamericano de Túneles y Obras Subterráneas.

We were sponsors of the important event in Lima – Perú. The Association President, Lewis Eng. was recognized for his exceptional career in the civil engineering sector and in tunnelling.

At the event, much experience was gained internationally, and many working methodologies were exchanged. Opportunities arose for the holding of conferences in universities and within private companies, which need further consultation and technical work. Peru is a country where civil engineering is fundamental to the future of many of its long term projects.

APTOS seeks to help change society, and to disseminate the work that can be achieved with tunnelling, it may be more expensive at the beginning of the project but the durability and security over the years is irreplaceable.

The experience of Lewis Eng. and his opinion and analysis is invaluable to his assistants and colleagues.
Poland

Name: Subcommittee of Underground Construction of Polish Committee on Geotechnics

Type of structure: Non-profit, open association

Number of members: 67 members, 6 corporate members

ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

In 2017 the Polish Tunnelling Society (full name: Subcommittee of Underground Construction of Polish Committee on Geotechnics) continued working on the promotion of the underground space use in Poland. The Society co-organized several events, one of which was the conference endorsed by ITA - The 13th International Conference on Underground Infrastructure of Urban Areas (UIUA 2017), October 25-26, 2017. During this event a special ITA session took place with the participation of distinguished guests from ITA: Tarcisio Celestino, Martin Herrenknecht, Soren Eskesen, Ruth G Haug, Eric Leca, Davorin Kolic, Giuseppe Lunardi, Olivier Vion and Tim Babendererde. On the second day of the conference the Polish Tunnelling Society organized a technical trip to Cracow, including a sightseeing tour of the "Wieliczka" Salt Mine.

The PhD thesis by Maciej Ochmański (a Member of the Board of the Polish Tunnelling Society) titled "Numerical analyses of the effects of tunnels construction" from two universities: Silesian University of Technology in Poland and University of Cassino and Southern Lazio in Italy, was awarded 'Best PhD Thesis of 2016' by the Polish Committee on Geotechnics.

CURRENT TUNNELLING ACTIVITIES

Road Tunnel in Warsaw – a part of the south city ring
The tunnel will be 2,700m long, 3 lanes in each direction; construction method - cut and cover.


Construction of the 2nd metro line in Warsaw, extensions of the existing central part:
* In the east direction (3 stations, 3.1km) - Astaldi S.p.A.
* In the west direction (3 stations, 3.4km) – Gücimak & Saray İnşaat ve Taşhane A.Ş.


FUTURE TUNNELLING ACTIVITIES

Road Tunnel under Lublin Poland
An over 2km tunnel on line from Kraków to Zakopane.

Rail Tunnel in Łódź – Łódź Fabryczna and Łódź station
Length of the tunnel – underground stations: 2.5km; construction method - TBM + cut & cover
Design and build tender works begun, construction October 2018. Due date 2020. Contractor: Energoprojekt PBDiM Młynk Mazowiec

Construction of the 2nd metro line in Warsaw, further extensions:
* In a north-east direction (5 stations, 2 parallel tunnels, approx. 9km) – Astaldi S.p.A.
* In a west direction (5 parallel tunnels, approx. 6km) – Astaldi S.p.A.
FUTURE TUNNELLING ACTIVITIES

Road Tunnel under Luboń Mały – south Poland
An over 2km tunnel on the S7 motorway from Kraków to Zakopane.
Construction works in progress, the method of construction - ADECO RS. Due date 2020.
Contractor: Astdid S.p.A. (below)

Rail Tunnel in Łódź – Tunnel connecting Łódź Fabryczna and Łódź Kaliska stations
Length of the tunnel – over 3km; 2 underground stations; Construction method TBM + cut & cover.
Design and build tender completed, Design works begun, construction should start in October 2018. Due date 2022.
Contractor: consortium of Energopol Szczecin and PBDM Mińśk Mazowiecki.

Construction of the 2nd metro line in Warsaw, further extensions:
- In a north-east direction (3 stations, 2 parallel tunnels, approx. 4km)
- In a west direction (5 stations, technical station, 2 parallel tunnels, approx. 6km)
Two separate design and build tenders are in progress. Contractors should be announced in the first quarter of 2018. (Above right – expected due dates, parts drawn in red and black).

Road Tunnel under Swina river in Swinoujscie – north Poland
The 1.44km tunnel will connect the islands of Uznam and Wollin. The construction method is by 12m diameter TBM. Due date is 2022. The design and build tender was completed but the result questioned. The Contractor should be announced again in the first quarter of 2018.

Road Tunnel on the S3 motorway, Bolków-Kamienna Góra – south Poland
A 2.3km tunnel on the S3 motorway from Bolków to the state border. Due date 2023.
Two Road Tunnels on the S19 motorway, Via Carpatia, section Rzeszów - Barwinek
Four road tunnels (1.35km, 1.75km, 1.6km, and 1.2km) on the S19 from Rzeszów to the state border. The conceptual design is under progress. Due date 2023.

STATISTICS
1. Length or volume excavated - % mechanized / % conventional during 2017: 60% mechanized / 40% conventional
2. Amount (USD or EUR) of tunnelling / underground space facilities awarded in 2017: €380,000,000
3. List of tunnels completed:
- Road Tunnel in Warsaw, part of south city ring (2.7km)
- Construction of 2nd metro line in Warsaw, extensions of the existing central part (6.4km)
- Road Tunnel under Luboń Mały – south Poland (~2km)

4. List of tunnels under construction:
- Road Tunnel in Łódź – Tunnel connecting Łódź Fabryczna and Łódź Kaliska stations
- Road Tunnel under Swina river in Swinoujscie – north Poland
- Road Tunnel on the S3 motorway, Bolków-Kamienna Góra – south Poland
- Four Road Tunnels on the S19 motorway, Via Carpatia, section Rzeszów - Barwinek

ITA MEMBER NATION ACTIVITY REPORTS 2017
ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

In 2017, the CPT organized an event on the Public Works Contract Code (CCP), accompanying the revision of the existing Code at the Legislature level. The new code was promulgated in September and entered into legislation on the first day of 2018.

The workshop on “The Execution of Tunnels and Complex Geotechnical Works, what changes with the CCP revised?” was held on February 2, 2018 at the LNEC, Lisbon.

The event integrated lectures delivered by engineers and lawyers. The opening was attended by the Secretary of State for Infrastructures.

A new WG on BIM was created, integrated preferentially by young people, employees in owners companies, universities, research institutes and industry.

CPT participated in the ITA’s WG actively, through meetings and paper contributions. During 2017 the CPT secured participation in the WTC2017 in Bergen and at the AFTES Congress (October, Paris), and in internal meetings of the BEFIP group.

CURRENT TUNNELLING ACTIVITIES

Conclusion of the Águas Santas Tunnel, A4 Motorway
Owner: BRISA Concessões
Owner Designer and Consultant: Coba, S.A.
Contractor: Ramalho Rosa Cobetar - Conduril - Amândio Carvalho

Designer: Geodata
Excavation Cross-section: ~240 m²
Total length: 370 m
Excavation vol 1.6 x 10⁵ m³

Lisbon Drainage Tunnels
Tendered in December 2017, EPC contract for two drainage tunnels (4.5 and 1.3km long) with an internal diameter of 5.5 - 6m.

Alto Tâmega Hydroelectrical System (under construction)
Gouveães dam (turbination+reverse pumping)
• Tano river
• Dam height 35m
• 6.9km tunnels, 750m shafts, 1.25 x 10⁵ m³ caverns
• Nominal power 4 x 220MW
• Designer: Dam to designate Hidropower ACCIONA
• Contractor: Ferrovial Agroman MSF Engenharia

Alto Tâmega-Gouveães Dam

DAIVÕES dam (turbination)
• Dam height 77.5m
• Tunnels, 600m
• Nominal power 2 x 59MW
• Tâmega river
• Designer: Jesus Granell Hidropower ACCIONA
• Contractor: Ferrovial Agroman MSF Engenharia

The Minho line ancient railway tunnels.
The electrification of the tunnels will be carried out using catenary support, of the elastic suspension type. The maximum speed allowed by this 110km/h.

At the level of its external tunnels that lie along the tunnel totaling 1471m in length:
• São Miguel da Carete, about 260m long.
• Tamel, built in 1878, about 230m long.
• Santa Lucrecia, built in 1878, about 230m long.

All tunnels were subjected to rehabilitation works aimed at the vault over the catenary.
The Minho line ancient railway tunnels

The speed allowed by this type of support is 110km/h.

At the level of its extension, the three tunnels that lie along this section, totalling 1471m in length, are:
• São Miguel da Carreira, built in 1876, about 260m long.
• Tamel, built in 1878, about 980m in length.
• Santa Lucrecia, built in 1878, about 230m long.

All tunnels were subjected to rehabilitation works and waterproofing of the vault over the catenary.

FUTURE TUNNELLING ACTIVITIES

Lisbon Metro

Yellow Line extension (ring closure)

• 1.5 km tunnels (conventional method and Cut&Cover)
• 2 stations

Oporto Metro

• Yellow line extension: 1.1km tunnels and 3 stations
• New Pink line (G): 2.7km tunnels, 4 Stations.
• The call for tenders for the executive projects of the extension of the Yellow line and the new Pink line was carried out in September.
• International call for tenders for construction (mid of 2018)
• The works contracts may be started at 2019.
• Total investment: ~€200M

Albufeira (Algarve) stormwater drainage tunnel, preliminary design and site investigation

Jardim do Mar Tunnel,
Bi-directional road tunnel, ~700m long, Madeira Island, Portugal. Tendership for design during February 18. Works are to start in 2019.

STATISTICS

1. Length or volume excavated - % mechanized / % conventional during 2017:

4,370m, 100% Conventional

2. Amount (USD or EUR) of tunnelling / underground space facilities awarded in 2017:

€30M

3. List of tunnels completed:
Aguas Santas, New Tunnel North

4. List of tunnels under construction:
See Current Activities

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**Russia**

**Name:** Russian Tunnelling Association  
**Type of structure:** Public Organization  
**Number of members:** 417 members, 68 corporate members

### ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

In 2017 the Russian Tunnelling Association continued working to show society the benefits of the underground environment, both through the implementation of technical events, and the dissemination of materials via technical and social media.

In February 2017 a report and election Conference of the Russian Tunnelling Association was held, in which Ivanichkov Vladimir Ivanovich was elected as the First Deputy Administrator of the RTA — the Head of Executive Directorate. In August 2017 the replacement of the chairman of the Board of Directors of the Association took place — Matveyev Konstantin Nikolayevich was elected to this position.

In the second half of the year the Board of the Association elaborated a program, intended to improve the activity of the organisation, which is being implemented now.

### CURRENT TUNNELLING ACTIVITIES

In October 2017 Saint-Petersburg hosted the Scientific and Technical Forum "Trends, issues and perspectives of underground development in Russia" and in November 2017 a technical panel on the topic "Modern mechanical rubber goods from EPDM for production of high quality unitized lining of transport tunnels".

Young professionals from member organizations (RAF) and students from higher education institutes together with experienced professionals participated in these events. The participants of the events had an opportunity to attend real production and construction facilities.

The bulk of underground space development in Russia is performed now within the long-term Moscow Metro Development Program. Within this Program 21 subway stations were constructed and put into operation during 2011-2016. 27 motorised tunnel-boring machines, including raise climbers for two-lane and inclined tunnels, were involved in the construction of the main line tunnels. 29km of subway lines and 8 subway stations, 4 of which have already been put into operation, were constructed in Moscow in 2017.

In Saint-Petersburg over 6.5km of main line tunnels were constructed in 2017. Works on the building of the “Novokrestovskaya” subway station, located near Zenit Arena Stadium, which will host the World Football Championship 2018, were performed. It is anticipated that in the days of public events terminal capacity may reach 30,000 passengers an hour on entry and up to 25,000 passengers an hour on exit.

At the “Novokrestovskaya” subway station a new entry and exit system is being introduced using rolling and hinged doors. The rolling doors are intended for normal operation of the subway and will operate automatically, whilst the hinged doors are intended for use during passenger evacuation from the tunnel to the platform in emergency situations.

The construction of the second Baikal tunnel — a high-priority facility on the program for the Baikal-Amur Mainline (BAM) and the Trans-Siberian Railway (Transsib) modernization — is coming to completion. The drilling process is performed with use of a tunnel-boring machine. According to recent records 6,372m (of the total length of 6,682m) have already been passed. The tunnel linkage is to be done at the end of Q1 2018. The length of drainage galleries, passed by rock tunnelling, is 3,247m.

According to plans, the facility commissioning deadline is 2019. The new Baikal tunnel will considerably increase the carrying capacity of the Severobaikalsk – Lena section of Baikal-Amur trunk.

In 2017 a project for a highway tunnel to be constructed under the Sevastopol Bay in the Crimea was approved. The tunnel, with a length of about one kilometer will join the North and South sides of the city under the Black Sea in Sevastopol.

### FUTURE TUNNELLING ACTIVITIES

In the years to come the bulk of underground construction work will still be associated with implementation of the Moscow Metro Development Program. Construction of about 90km of main line tunnels and commissioning of 41 subway stations, including 28 stations of the Third interchange circuit, is on the cards. Construction of subway lines will also start in the territory of New Moscow.

In 2017 the second Baikal tunnel in Baikal-Amur trunk will be put into operation.

In 2018 the construction of tunnel under the Sevastopol Bay in the Crimea will start.

### STATISTICS

1. Length or volume excavated - % conventional during 2017:  
   74% / 26%

2. Amount (USD or EUR) of tunnelling / underground space facilities awarded in 2017:  
   NA

3. List of tunnels completed:  
   NA
In 2017 the TUCSS continued working to show society the benefits of the underground environment, both through the implementation of technical events, and the dissemination of materials via technical and social media.

Several activities, like Lectures and Presentations at engineering events were developed through 2017.

CURRENT TUNNELLING ACTIVITIES

In 2017 TUCSS has provided the following activities/training for members and engineers

A series of Monthly Seminars as follows:

• 19 January 2017
  “Unlined Mined Rock Caverns for Oil & Gas Underground Storage – Comparison with Civil Underground Excavations” by Mr. Yan Jintang
• 16 February 2017
  “Innovations in Precast Segment Componentry” by Mr. Christophe Delus
• 16 March 2017
  “Singapore’s Land Transport Authority: 20 years of Sprayed Concrete Lining (SCL) tunnelling” by Mr. Massimo Marotta
• 20 April 2017
  “Project Success: 80% Psychology 20% Strategy The 3Cs of Partnering – Clients Contractors & Consultants leading to 3Cs of Necessities – Communication, Collaboration & Commitment” by Mr. Philippe Degrange
• 18 May 2017
  “Passenger Linkway Using a Rectangular TBM” by Dr Oskar Sigl
• 15 June 2017
  “Tunnel Segment Repair” by Mr Totapally Krishna Mohan Sharma
• 20 July 2017
  “Cable Transmission Tunnel” by Mr Neil Smith
• 16 November 2017
  “Design and Applications of Large-Size Shield TBMs” by Prof. Han Yali

TUCSS Training Course

• 6 & 7 April 2017
  TUCSS provided a training course together with the like-minded society in Singapore on “Challenges in the Design and Construction of Tunnel and Underground Structures”

TUCSS Conference

• 7 & 8 September 2017
  TUCSS organised the “Symposium on Innovation and Challenges in Asian Tunnelling 2017” covering a range of topics with speaker from Japan, Korea and Singapore

TUCSS Annual Lecture

• 20 October 2017
  “Some Challenges, Lessons and Successes with Recent Underground Construction in Singapore” by Mr. John Busbridge.

FUTURE TUNNELLING ACTIVITIES

TUCSS will continue to provide the following training in 2018:

• Monthly Seminars
• Training Courses/Workshops
• Conference/Symposium
• Annual Lecture

ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

In 2017 the TUCSS continued working to show society the benefits of the underground environment, both through the implementation of technical events, and the dissemination of materials via technical and social media.

Several activities, like Lectures and Presentations at engineering events were developed through 2017.

Underground Storage – Comparison with Civil Underground Excavations” by Mr. Yan Jintang

- 16 February 2017
  “Innovations in Precast Segment Componentry” by Mr. Christophe Delus
- 16 March 2017
  “Singapore’s Land Transport Authority: 20 years of Sprayed Concrete Lining (SCL) tunnelling” by Mr. Massimo Marotta
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  “Project Success: 80% Psychology 20% Strategy The 3Cs of Partnering – Clients Contractors & Consultants leading to 3Cs of Necessities – Communication, Collaboration & Commitment” by Mr. Philippe Degrange
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  “Passenger Linkway Using a Rectangular TBM” by Dr Oskar Sigl
- 15 June 2017
  “Tunnel Segment Repair” by Mr Totapally

FUTURE TUNNELLING ACTIVITIES

TUCSS will continue to provide the following training in 2018:

• Monthly Seminars
• Training Courses/Workshops
• Conference/Symposium
• Annual Lecture
**Slovenia**

Name: Slovenian Society for Underground Structures  
Type of structure: Non-profit association  
Number of members: 115 members, 29 young members

**ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE**
- 11th International Tunnelling and Underground Structures Conference (23rd November 2017, Ljubljana, Slovenia)  
- Participation at WTC 2017 in Bergen, Norway

**CURRENT TUNNELLING ACTIVITIES**

Karavanke Tunnel  
Execution design for upgrading the existing single bidirectional transalpine base tunnel with a second tube to form a twin highway tunnel tube system. The total tunnel length is 8km with more than 1000m of overburden. The tunnel passes through very heterogeneous rock materials from perm, carbon to triassic formations, squeezing ground and difficult hydrogeological conditions.

Second Track of the Divača-Koper railway line  
Building permit design changes for upgrading the existing single track railway between Divača and Koper with a second track. The new railway line passes through 8 tunnels (T1-T8) with a total length of 20.5km. All tunnels are single-tube tunnels; tunnels T1, T2 and T8 are designed with service tubes, which are to be used for rescue operations, while tunnels T4 and T7 have transverse exit tubes. The route of the second track runs on different formations of carbonate rocks characterised by numerous karst features (sinkholes, cracks, caverns, tunnels, underground caves, chasms etc.). The degree of karstification of individual areas is high.

Karavanke Railway Tunnel  
Detail design for the security and technical upgrade of the near 8km long Karavanke railway tunnel, which was put into service in 1906. The scope is to remove the double-track line in the tunnel and build a single-track line, restore the damaged parts of the structure, arrange drainage and the catenary and to set up an intervention corridor for signalling, system telecommunication devices, systems to ensure fires and for safe and efficient accident evacuation.

Tunnel Golovec  
Preparation of tender documents for the rehabilitation of the three lane highway tunnel length of 1160m. The works involve removal of the carriageway, implementation of a drainage system to collect the excess ground water.
a single track railway Koper with a second line passes through a total length of nine single-tube tunnels; 8 are designed with 8km long Karavanke tunnel was put into service in 2017 to remove the double-track and build a new single track line. The tunnel passes through very heterogeneous rock material from perm., carbon to triassic formations, squeezing ground and difficult hydrogeological conditions.

Third Development Axis – South Building permit design for the execution of a new road link from the access point to Ljubljana–Oberözb motorway near Novo mesto to the Maine access point. Total length of the planned expressway amounts to 17.9km, and includes three bridges, four viaducts, two cut-and-covers, a 2.4km long tunnel under the Gorjanci hills, 10 overpasses, 9 underpasses and two lay-bys. The project is planned to be completed by the end of 2021.

Karavanke Tunnel Start of construction for upgrading the existing single bidirectional transalpine base tunnel with a second tube to form a twin highway tunnel system. Total tunnel length is 8km with more than 1000m of overburden. The tunnel passes through very heterogeneous rock material from perm., carbon to triassic formations, squeezing ground and difficult hydrogeological conditions.

FUTURE TUNNELLING ACTIVITIES
Tunnel Štrihovec Building permit design of an 810m long single tube, twin tracks railway tunnel. Excavation of the tunnel will take place in layers of siltstones with pieces of fine-grained sandstone and marl. Due to unstable slopes, the design foresees excavation under a Corinthian slab and portal structures on piles.

Tunnel Golovec Preparation of tender documents for the rehabilitation of the twin tube – three lane highway tunnel with a total length of 1160m. The works include the removal of the carriageway and implementation of a drainage layer in order to collect the excess groundwater and prevent further flooding of the carriageway and tunnel inner lining.

Tunnel Pekel Building permit and detail design of a 1.5km long double-track railway tunnel, as an upgrade of the railway line Maribor – Šentilj – state border. The tunnel with a cross section about 135m² has a maximum overburden of 90m and less than 10m when crossing the existing highway H2. The last is the main challenge as the tunnel runs through a low-bearing layer of clay and highly weathered marl causing a risk of road deformation. Therefore, a stiff support system with two sidewalls is foreseen.

Štrihovec Tunnel

Pekel Tunnel
ASSOCIATION ACTIVITIES
DURING 2017 AND TO DATE
XII and XIII Master Aetos

In 2017 the AETOS Master, combining both online and in-class teaching reached its 12th edition. It was attended by people from all around the world speaking Spanish. The duration was from September 2016 to June 2017. September 2017 saw the 13th edition begin. The Masters has been ITA endorsed since 2015.

Technical Meetings
On 22th June 2017, we held the Technical Meeting “International achievements of Spanish Tunnelling Firms”. On the occasion different Technical Guides prepared by the AETOS Work Group were also introduced. The AETOS Honoured Member elected this year was presented.

Publication
In October 2017 AETOS produced, in cooperation with the Revista de Obras Publicas from the Colegio de Ingenieros de Camino, Canales y Puertos (professional Association of Masters in Civil Engineering) a book on Tunnels, as in previous years.

TUNNELLING ACTIVITIES
*Túnel Padornelo-Lubian* HSR 6.4km
(Design revision & technical Supervision)
*Túnel de Alberta* HSR Vitoria – Bilbao – San Sebastián, Tramo: Legutiano - Escoriatza. Subtramos I y II. 4.8km
Túnel Viaria “Plaza de las Glorias”. (Barcelona) including advanced 3D numerical modelling

STATISTICS
1. Length or volume excavated - % mechanized / % conventional during 2017:
2. Amount (USD or EUR) of tunnelling / underground space facilities awarded in 2017:
3. List of tunnels completed
   *Túnel Padornelo-Lubian*
   *Túnel de Alberta*
**ACTIVITIES**

Lubian** HSR 6.4km technical

**HSR Vitoria – Bilbao Tramo: Legutiano – Lamos I y de las Glorias**.

advanced 3D imaging excavated - % conventional during

EUR) of tunnelling / facilities awarded

completed Lubian

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ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

During 2017 the association has been re-organized and re-named the Swedish Rock Engineering Association (Svenska Bergteknikföreningen). Four permanent working groups constitute the backbone of the association. These working groups are “Yearly Congress”, “International”, “Competence Development” and “Young Members”. The association works towards a sustainable use and development of Swedish underground space. The main activity is to arrange an annual Swedish congress. In 2017 the congress gathered 480 delegates. During 2017 the Young Members arranged a regional event in cooperation with ITAYM at LKAB mine in Kiruna. Discussion with ITACUS continued during the year with the aim of establishing a Think Deep Sweden group during 2018. The association is also actively participating in research and development projects with the purpose of developing the underground space industry.

CURRENT TUNNELLING ACTIVITIES

Citybanan, Stockholm
In July 2017 the new commuter train link through Stockholm was opened.

E4 Förtbitart Stockholm
(Stockholm By-pass)
This mega project includes an 18km long road tunnel with an excavation volume of 6,500,000m³. During 2017 the construction activities have been ongoing along the complete route. Major tunnelling works are ongoing within several contracts.

Västlänken, Gothenburg
Västlänken (West Link) is a large railway project in the center of Gothenburg in order to convert the present terminus into a through station for commuter trains. The project is built in a dense urban environment with very complex geotechnical conditions with a mix of loose clay and hard rock. During 2017 work started on the first sections within two ECI contracts and two design & build contracts were let. Construction activities will commence during the first half of 2018.

Relocation of the city of Kiruna
Due to ongoing controlled collapses above the large Kiruna iron ore mine, the city needs to be re-located. This is a major undertaking that has been ongoing for some time. During 2017 construction activities related to the new city centre have been ongoing.

FUTURE TUNNELLING ACTIVITIES

New Stockholm metro
An extensive expansion of the Stockholm metro is planned with three new lines. This will include major tunnelling works and is the next mega project in Stockholm.

New bus terminal at Slussen Stockholm
Slussen is the area around the lock between lake Mälaren and the Baltic Sea. This is a hub in Stockholm and a very busy area and is now being re-constructed with new bridges, water works etc. In addition a large bus terminal will be built underground. These tunnelling works will commence during 2018.

Ostlänken, the East Link high speed rail
New high speed rail south of Stockholm. Design ongoing.

SKB Forsmark, final repository nuclear fuel
Planning is continuing regarding Sweden’s final repository for spent nuclear fuel. During 2017 the process of getting the necessary permits have been ongoing.

New sewage tunnel through Stockholm
A 14km sewage tunnel will be built under Stockholm in order to upgrade the sewage system and connect the western parts of Stockholm to the major underground sewage plant at Henriksdal. Construction works will start during 2018.

Varberg railroad tunnel
The West coast link is still missing a double track through the city of Varberg. During 2019 construction works will start on the new 9km section, 3km of rock tunnel will be built.

STATISTICS

1. Length or volume excavated - % mechanized / % conventional during 2017:
No statistics available.

2. Amount (USD or EUR) of tunnelling / underground space facilities awarded in 2017:
>€600M

3. List of tunnels completed:
Citybanan Rail tunnel in Stockholm

4. List of tunnels under construction:
Stockholm by-pass
West link Gothenburg

Sweden

Name: Swedish Rock Engineering Association
Type of structure: Non-profit, open association
Number of members: 84 corporate members from public and private clients, contractors, suppliers, mining companies, consulting firms, institutions and research organizations.
Slussen Stockholm

Round the lock between Baltic Sea. This is a hub very busy area and is now with new bridges, water a large bus terminal will. These tunneling works 2018.

Link high speed rail south of Stockholm.

Repository nuclear fuel regarding Sweden’s

Slussen:
Copyr Bengt Agerfjord

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Photo credit: Catherine Bassoli Photography
ITAMember Nation Activity Reports 2017

**Switzerland**

Name: Swiss Tunnelling Society (STS)

Type of structure: Non-profit, open association

Number of members: 492 members, 98 corporate members, research organizations.

**ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE**

In 2017, the Swiss Tunnelling Society continued to promote the cause of underground construction to its constituency by hosting the following main activities:

- May - General Assembly in Solothurn
- May/June - Swiss Tunnel Congress (STC) in Lucerne
- September - DACH Meeting in Hamburg
- October - STS field trip to the Blözberg tunnel construction site
- November - BEFIPS Meeting in Paris

Additionally, the STS young members (STSym) hosted the following three events:

- March - STSym field trip to the Blözberg tunnel construction site (start event)
- May - Reception as part of STC 2017 in Lucerne
- October - Autumn workshop at ETH Zurich

**CURRENT TUNNELLING ACTIVITIES**

**New construction of Albulatunnel II:** On Thursday 17 October 2017, at the new Albulatunnel of the Rhaetian Railway (RhB), the breakthrough into the reverse drive of the cavern was achieved. With this, the excavation from Preda (main lot) met the reverse drive which has previously been excavated from a cavern. The reverse drive was commissioned separately for the excavation of the Rhaetian Railway’s most delicate zone in the massif on the Albula tunnel.

**A2 autobahn, Belchen rehabilitation tunnel:** To facilitate the repairs to the two existing Belchen tunnel tubes without traffic disruption, a third tube – a “rehabilitaion tunnel” – is currently being constructed. The breakthrough on June 21, 2017 marked the end of a 3,100m TBM drive. The largest single track overlapping in position, the TBM was subsequently refitted for operation in hydroshield mode instead of the previous dry mode. The drive was completed and the reception pit in Gretzenbach reached on December 21, 2017 – before year-end, as scheduled.

**Eppenberg tunnel:** The new Eppenberg tunnel between Schönnerweid and Grezzendenbach in the Canton of Solothurn is the main engineering structure of the work package awarded by SBB (Swiss Federal Railways) for the “integrated four-tracking” between Aarau and Olten. The summer of 2017 saw completion of the excavations in two geological areas: the “Effingen strata” and the “lower freshwater molasse” formations. While still in position, the TBM was subsequently refitted for operation in hydroshield mode instead of the previous dry mode. The natural lower terrace gravel was then extracted by the TBM, with face support provided by bentonite suspension and compressed air, and removed via steel tubes for use as aggregate in concrete production. The drive was completed and the reception pit in Grezzendenbach reached on December 21, 2017 – before year-end, as scheduled.

**FUTURE TUNNELLING ACTIVITIES**

Rail Tunnels:
- Ausbau Bahnhof Bern (RBS, L = 1,200m), Dragonato (SBB, L = 30m)
- Tunnel Cholfirst (ASTRA, L = 1,250m), Einhausung Schwamendingen und Schönachtschunnel (ASTRA, L = 1,680m), Safety Gallery Kerenzerberg (ASTRA, 5,504m), Leissigentunnel (ASTRA, 2,200m), Safety Gallery Tunnel Rofla (ASTRA, L = 1,017m), Leissigtunnel (ASTRA, 2,200m), Sicherung Schneise im Tunnel Rofla (ASTRA, 5,504m), Safety Gallery Kerenzerberg (ASTRA, 5,504m), Morschacher / Sisikoner Tunnel (Kt. SZ/UR, L = 7,680m), Vingelztunnel (Kt. BE, L = 2,300m), City Tunnel (Kt. BE, L = 900m), Porttunnel (Kt. BE, L = 1,700m), Tunnel Weidstein (Kt. BE, L = 1,300m), Tunnel Fäsenstaub (ASTRA, L = 1,460m), Tunnel de déviation des Évolettas (Kt. VS, L = 770m)

**CEVA:**

The new Cominvin-Eaux-Vives-Annemasse (CEVA) rail link, with a total length of 16km (of which about 14km is on Swiss territory), will serve key hubs in and around Geneva. By connecting the French (SNCF) and Swiss (SBB) rail systems, each of which currently terminate separately, the new link will also pave the way for a full regional network spanning the binational and bicantonal (Geneva/Vaud) connection.

In addition to several isolated engineering structures and cut-and-cover sections, the new route also includes two bored tunnels: the (2,100m) Pinchat tunnel and the (1,400m) Champel tunnel. The tunnels were excavated in soft ground, stabilized by means of pipe umbrellas and jet grouting so as to allow the subsequent use of excavators in conjunction with heavy supports. The Pinchat tunnel necessitated partial-face excavation (on the Bachet side).

**Top:** Belchen. Above: CEVA

Four to six lanes, between the Limmat and Zurich East junctions. A celebration was held on November 21, 2017 to mark the start of the tunnelling works.

**Blözberg tunnel:**

SBB (Swiss Federal Railways) has mandated by the Swiss federal government to build, by 2020, a four-meter rail corridor on the Gotthard axis that will allow additional cargo to be shifted from road to rail. The largest single project on this corridor is the new Blözberg tunnel in the Canton of Aargau.

The focus of operations in 2017 was the approx. 2.5km TBM drive. Work started on June 6, 2017 on the Schinznach Dorf side. The 12.36m-diameter tunnel boring machine advanced at rates of up to 40m per day. With the breakthrough on the Effingen side on November 29, 2017, the tunnelling works were completed exactly within the estimated six-month window.
aux-Vives–Annemasse at a total length of 14 km is on Swiss key hubs in and connecting the Swiss (SBB) rail which currently terminate link will also pave the network spanning the (Geneva/Vaud)

isolated engineering and-cover sections, the tunnel with two bored tunnels: tunnel and the tunnel. The tunnels were bored, stabilized by dillas and jet-grouting so frequent use of with heavy tunnel necessitated (on the Bachet side).

Tunnel between Gretzenbach in the is the main engineering package awarded by Railways) for the in 2017 saw completion two geological areas: and the Tower formations. While still was subsequently in tunnel mode and dry mode. The gravel was then in hydro shield mode and removed via steel gate in concrete a) was completed and Gretzenbach reached on before year-end, as

STATISTICS
1. Length or volume excavated - % mechanized / % conventional during 2017: 9,000m / 33% TBM
2. Amount of tunnelling / underground space facilities awarded in 2017: €670M.
3. Tunnels completed: Rosshäuserntunnel (BLS, L = 1,200m)
4. List of tunnels under construction

Rail Tunnels:
Ceneri-Basistunnel (ATG AG, L = 15,400m), Tunnel Cineéli (BLS, GE, L = 8,200m), Blinzberg II Tunnel (SBB, L = 2,500m), Ruckhaldtunnel (AB, L = 725m), Epfenberg tunnel (SBB, L = 3,114m), Albulatunnel (RhB, L = 5,860m), Coldenro (SBB, L = 96m). Road Tunnels:
Tunnel Eyholz Haupttunnel (Kt. VS, L = 4,200m), Tunnel Ligerz (ASTRA, L = 2,483m), Safety Gallery Tunnel Sachseln (ASTRA, L = 5,084m), Galgenbuck (ASTRA, 1,138m), Tunnel Visp 2. Röhre (Kt. VS, L = 2,600m), Safety Gallery Tunnel Bärenburg (ASTRA, L = 1,028m), Sanierungstunnel Bächer (ASTRA, L = 3,200m), Gubrist 3. Röhre (ASTRA, 3,230m), Safety Gallery Tunnel Crapisteig (ASTRA, L = 2,171m), Tunnel Roflau (Kt. VS, L = S: 555m, N: 483m), Tunnel Silvaplana (Kt. GR, L = 750m), Sudumfahren Kussnacht (Kt. SZ, L = 500m).

ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE
In 2017 the Thailand Underground and Tunnelling Group (TUTG) continued working to contribute to underground and tunnelling education through a number of technical seminars, technical visits and training sessions.

CURRENT TUNNELLING ACTIVITIES
The tunnelling activities done by TUTG are:
1. The Five Tea Talk Seminars held through 2017 were:
   • Innovations for Unpredictable Ground Conditions and Water Ingress (March 2017)
   • Tunnel Safety – How designers and Clients can improve safety on site (April 2017)
   • Specifications and Design of Steel Fibre Sprayed Concrete Linings, Segmental Linings and Vertical Shaft (May 2017)
   • Nam Kong 2 – Project Improvement (August 2017)
   • Risk Management in Tunnelling – Risk Control in Design & Construction (September 2017)
2. Technical Site Visit to Double track project on Eastern Seaboard Railway Contract 2: Wihan Daeng-Bu Yai to the railway tunnel. (January 2017)
4. Organize the 2nd Training of
   • ‘Tunnelling in Soft Ground’ (July 2017)
   • ‘Tunnelling in Rock’ (November 2017)

FUTURE TUNNELLING ACTIVITIES
The tunnelling activities program by TUTG are:
• 3rd Training on ‘Tunnelling in Soft Ground’ and ‘Tunnelling in Rock’
• Tri-monthly Tea Talk Seminar
• In-house Training for State Railway of Thailand, SR T (July 2018)
• In-house Training for Royal Irrigation Department, RID (August 2018)
• 5th Thai Geotechnical Conference (Co-organizer)

STATISTICS
1. Length or volume excavated - % mechanized / % conventional during 2017:
   • Flood Diversion Tunnel under Khlong Bang Sue 6,200m (Mechanized)
   • Double track project on Eastern Seaboard Railway Contract 2: Wihan Daeng-Bu Yai with the railway tunnel 1,200m (Conventional), Pr (US$12M)
2. Amount (USD or EU under ground awarded in 2017:
   • More than US$2.5 and underground
   • Double track project on Eastern Seaboard Railway Wihan Daeng-Bu Yai railway tunnel. (St Thailand)
   • Blue Line Extension Transit Authority
   • Flood Diversion Tunnel Khlong Bang Sue Metropolitan Administration
3. List of tunnels completed:
   • Orange Line - East Rapid Transit Authority
   • Mae Tang – Mae Nam Water Diversion Tunnel
   • Flood Diversion Tunnel Nong Bon to Chaopraya (The Bangkok Metropolitan Administration)
4. List of tunnels under construction:
   • Blue Line Extension
   • Flood Diversion Tunnel
   • Orange Line - East Rapid Transit Authority

Name: Thailand Underground and Tunnelling Group (TUTG), The Engineering Institute of Thailand
Type of structure: Non-profit organization
Number of members: 60 members

ITA MEMBER NATION ACTIVITY REPORTS 2017
and Design of Steel Concrete Linings, (Conventional), Project Cost 407MB (US$12M)

2. Amount (USD or EUR) of tunnelling / underground space facilities awarded in 2017:
   • More than US$2.5bn for tunnelling and underground projects were awarded in 2017.

3. List of tunnels completed:
   • Double track project on the Eastern Seaboard Railway Contract 2: Wihan Daeng-Bu Yai with the railway tunnel. (State Railway of Thailand)
   • Blue Line Extension, (Mass Rapid Transit Authority of Thailand)
   • Flood Diversion Tunnel under Khlong Bang Sue (The Bangkok Metropolitan Administration)

4. List of tunnels under construction
   • Orange Line - East Section (Mass Rapid Transit Authority of Thailand)
   • Mae Tang – Mae Ngud – Mae Kuang Water Diversion Tunnel (Royal Irrigation Department)
   • Flood Diversion Tunnel – Bueng Nong Bon to Chao Pha Ya River (The Bangkok Metropolitan Administration)
ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

1) "Yavuz Sultan Selim Bridge and Northern Peripheral Highway Seminar and Exhibition" was held on January 18-19, 2017 at the Sheraton Ankara Hotel & Convention Center with great success.

2) "2nd Roads, Bridges and Tunnels Fair was organized on May 24-26, 2017 at the Congresium Ankara with great participation.

3) "7th National Symposium and Exhibition on Asphalt Pavements" was held on November 29-30, 2017 at the Sheraton Ankara Hotel & Convention Center again with great success.

CURRENT TUNNELLING ACTIVITIES

Ovit Tunnel
The Ovit Highway Tunnel project is located between Kızdere, Rize Province and Spir, Erzurum Province in Turkey. The mined section of the tunnel is approximately 12.6 km long. At the western end of the tunnel an approximately 1.4 km long avalanche tunnel, with the same cross section is added. The tunnel becomes one of the longest tunnels in Turkey with the length of 14 km.

New Zigana Tunnel
The New Zigana Tunnel project in Turkey is currently under construction and when it is completed it will have a 14.3 km length. The two lane tunnel will connect the Gümüşhane and Trabzon provinces in Turkey’s north east, and will be located at an altitude of over 1,200 m above sea level. The construction of the tunnel will replace the existing route over the Zigana Pass, which reaches an altitude above sea level of 2,032 m.

Kırık Tunnel
Rize and Erzurum provinces are connected by the double tube Kırık Tunnel Project. 7,063 m excavation and support with 1,086 m final concrete lining were completed in both tunnels.

Eğribel Tunnel
A total of 10,286 m excavation and support works were completed in the 5,801 m long double tube Eğribel Tunnel.

Sabuncubeli Tunnel
The 4,070 m long double tube Sabuncubeli Tunnel is connecting the cities of İzmir and Manisa, and is expected to be completed in June 2018.

Salarha Tunnel
A total of 4,231 m excavation and support works were completed in the 2,945 m long double tube Salarha Tunnel in the Black Sea Region. The tunnel is planned to be completed in 2019.

Prinkayalar Tunnel
The 2,246 m long single tube Prinkayalar Tunnel is connecting the cities of Erzurum and Artvin, is expected to be completed in 2019.

Ayaş Railway Tunnel
Turkey's longest railway tunnel and the 3rd tunnel project to Bosphorus is the Big Istanbul Tunnel. The 3rd tunnel project to be opened in 2023 is the Big Istanbul Tunnel. The tunnel has a diameter of 16.8 m. The tunnel is expected to be completed in 2023.

In the Ayaş Railway Tunnel, 2,446 m excavation and 1,912 m concrete lining works were completed using the New Austrian Tunnelling Method.

Other Railway Tunnels
The construction works of the railway tunnel which is located at the Big Hakkâri Tunnel in the South East Region of Turkey are continuing.

In the 4.5 m diameter Gaziantep High Speed Rail Tunnel, the longest undersea railway tunnel with a length of 6 km, construction works were completed in 2019.

Maxi Tunnel
The construction works of the 4.2 m diameter Maxi Irrigation Water Tunnel are continuing.

FUTURE TUNNELLING ACTIVITIES

3 Level Big Istanbul Tunnel
The 3rd tunnel project to Bosphorus is the Big Istanbul Tunnel. The tunnel has a diameter of 16.8 m. The tunnel is expected to be completed in 2023.

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The construction of the existing route over which the railway reaches an altitude of over 32m.

In the Ayaş Railway Tunnel, the longest railway tunnel in Turkey and the sixth in the world, a total of 8,000m excavation and final concrete lining works were completed. The tunnel is constructed using the New Austrian Tunnelling Method.

Other Railway Tunnels
- Dolmabahçe–Kılıos Tunnels
- Bilecik-Bozüyük part of the Ankara–Istanbul High-Speed Railway Line

The construction works of the T26 Tunnel, which is located at the Bilecik-Bozüyük part of the Ankara–Istanbul High-Speed Railway Line, are continuing.

In the 4.5m-diameter Gerede Drinking Water Tunnel, the longest water tunnel in Turkey with its 31,592m length, total of 24,250m construction works were completed.

Mavi Tunnel
- The construction works of the 17,000m long 4.2m diameter Mavi Irrigation and Drinking Water Tunnel are continuing.

FUTURE TUNNELLING ACTIVITIES
- 3 Level Big İstanbul Tunnel
- The 3rd tunnel project to be constructed under Bosphorus is the Big İstanbul Tunnel, which is a 3-storey multi-use highway and railway undersea tunnel. The tunnel will have a diameter of 16.8m. The middle storey will be used by metro, and others will be used by cars. The tunnel length is 6.5km. The deepest point will be 110m under sea level, and 45m under the bottom of Bosphorus. The survey, project and engineering services tender of the project has been done. The project is now in the design stage.

STATISTICS
1. Length or volume excavated - % conventional method and railways tunnels excavated with 5% conventional method and 95% mechanized method.

2. Amount (USD or EUR) of tunnelling / underground space facilities awarded in 2017

3. List of tunnels completed:
- Bayram Tunnel (İzmir)
- Beşiktaş Tunnel (İzmir)
- Erkenek Tunnel (Malatya)
- Selçukgazi Tunnel (Bursa)
- Güneyce Tunnel (İzmir)
- T2 Tunnel (İzmir)
- Beştepe Tunnel (Trabzon)
- Kanuni Avenue Connection Tunnel (Trabzon)
- Bağcılar Tunnel (İzmir)
- T2 Tunnel (Trabzon)
- GCY-T3 Tunnel (Gümüşhane)
- GCY-T4 Tunnel (Gümüşhane)
- GCY-T5 Tunnel (Gümüşhane)
- Çınarök Tunnel (Giresun)
- Ovit Tunnel (İzmir)
- New Zigana Tunnel (Gümüşhane)
- Kırık Tunnel (İzmir)
- Eğitim Tunnel (İzmir)
- Sabuncu棠 Tunnel (İzmir)
- Salarha Tunnel (İzmir)
- Prinkayalar Tunnel (Erzurum)
- Ayiş Tunnel (Ankara)
- T2 Tunnel (İzmir)
- Nurdagi Tunnel (Gaziantep)
- Gerede Tunnel (Bolu)
- Mavi Tunnel (Konya)

Sampling. and when it is a 14.5km length. The Gümüşhane tunnels in Turkey’s north east, an altitude of over 32m. The construction of the existing route over which the railway reaches an altitude of over 32m.

In the Ayaş Railway Tunnel, the longest railway tunnel in Turkey and the sixth in the world, total of 8,000m excavation and final concrete lining works were completed. The tunnel is constructed using the New Austrian Tunnelling Method.

Other Railway Tunnels
- Dolmabahçe–Kılıos Tunnels
- Bilecik-Bozüyük part of the Ankara–Istanbul High-Speed Railway Line, are continuing.

The construction works of the 10,000m long double tube Nurdagi Tunnel, which is a part of the Mersin-Adana-İncirlik-Osmaniye-Gaziantep High-Speed Railway Project, are continuing.

Gerede Tunnel
- In the 4.5m diameter Gerede Drinking Water Tunnel, the longest water tunnel in Turkey with its 31,592m length, total of 24,250m construction works were completed.

Mavi Tunnel
- The construction works of the 17,000m long 4.2m diameter Mavi Irrigation and Drinking Water Tunnel are continuing.

FUTURE TUNNELLING ACTIVITIES
- 3 Level Big İstanbul Tunnel
- The 3rd tunnel project to be constructed under Bosphorus is the Big İstanbul Tunnel, which is a 3-storey multi-use highway and railway undersea tunnel. The tunnel will have a diameter of 16.8m. The middle storey will be used by metro, and others will be used by cars. The tunnel length is 6.5km. The deepest point will be 110m under sea level, and 45m under the bottom of Bosphorus. The survey, project and engineering services tender of the project has been done. The project is now in the design stage.

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- Erkenek Tunnel (Malatya)
- Selçukgazi Tunnel (Bursa)
- Güneyce Tunnel (İzmir)
- T2 Tunnel (İzmir)
- Beştepe Tunnel (Trabzon)
- Kanuni Avenue Connection Tunnel (Trabzon)
- Bağcılar Tunnel (İzmir)
- T2 Tunnel (Trabzon)
- GCY-T3 Tunnel (Gümüşhane)
- GCY-T4 Tunnel (Gümüşhane)
- GCY-T5 Tunnel (Gümüşhane)
- Çınarök Tunnel (Giresun)
- Ovit Tunnel (İzmir)
- New Zigana Tunnel (Gümüşhane)
- Kırık Tunnel (İzmir)
- Eğitim Tunnel (İzmir)
- Sabuncu棠 Tunnel (İzmir)
- Salarha Tunnel (İzmir)
- Prinkayalar Tunnel (Erzurum)
- Ayiş Tunnel (Ankara)
- T2 Tunnel (İzmir)
- Nurdagi Tunnel (Gaziantep)
- Gerede Tunnel (Bolu)
- Mavi Tunnel (Konya)
In 2017 the British Tunnelling Society continued to offer its membership technical lectures, training and development and engage and inform on the development and use of underground space. The BTS continues to work closely with University of Warwick in the delivery of an MSc in Tunnelling & Underground Space. We are a focal part of the Industry working group – Transforming Tunnel Safety, comprising BTS, Clients, Consultants and Contractors with the initiative to drive improvement in the health and safety performance of the tunnelling industry.

- 10 informal evening discussions – monthly apart from July and August.
- Various technical and social meetings and events arranged by the BTS Young Members
- Award of James Clark Medal to Joseph Gallagher for his lifetime contribution to tunnelling.
- Lunch for James Clark Medal recipients
- Harding Prize competition for under 35’s
- Annual dinner held each year in May.
- Co-badged events with numerous other organisations including ICE, IOMS, BSA, Concrete Society
- Will hold the BTS Conference & Exhibition in London in October 2018

The BTS jointly with the Institution of Civil Engineers supports a Parliamentary Group to engage with politicians and promote tunnelling and use of underground space. This has been reenergised in 2017 and it is planned for future activities through 2018.

The BTS continues to work with and support Tunnel Skills. TunnelSkills (the industry training development forum) has developed a number of tunnelling specific courses in conjunction with City & Guilds and CITB. Tunnel Entry, Loco Operators, Concrete Pump Operation and Tunnel Safety Training Scheme are some of the courses developed.

Friday 10th March 2017 was the day of the fourth annual BTSYM conference. It was an event with an attendance of 100 young tunnelling professionals. The conference started with the presentation from the keynote speaker Joeltis van Gaalen of BAM Infraconsult and continued with a very good selection of technical, practical and academic presentations. There also included a presentation from a Norwegian international speaker.

Friday 7th December marked this year’s National Tunnelling Day, the third annual event to be held. The Target 1000 Initiative to reach out and inspire young people was easily met. 2017 also saw the ITAYM grow this globally by launching the International Tunnelling day.

**ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE**

**Current Tunnelling Activities**

**Northern Line Extension**

November 2017 saw the completion of twin 3km of 5.2m diameter tunnel for the extension to the Northern Line to the future development at the iconic Battersea Power Station.

Both workshops were attended by over 20 peoples and there was great debate and discussion at each. The group is currently in the process of preparing papers from the workshops or publishing in 2018.

The 3rd in a series of three workshops will be held in February 2018 on 3D Urban Planning.

In June 2018 we will again host our annual event to recap on the work of the group for the past 12 months.

**BTS Young Members**

The young members continued to offer a wide range of activities including lectures, workshops and socials.

A key part of their work in 2017 was actively working on encouraging the younger generations to consider tunnelling as a career.

The teachers pack which has been being developed by the BTSYM for a number of years completed its hugely successful trial at the Oasis Academy Southbank.

The pack will be released for public use on the BTS website in December 2017. The pack will continue to be developed and refined going forward and the BTSYM welcomes any feedback on the pack from its members.

Friday 7th December marked this year’s National Tunnelling Day, the third annual event to be held. The Target 1000 Initiative to reach out and inspire young people was easily met. 2017 also saw the ITAYM grow this globally by launching the International Tunnelling day.

**Northern Line Extension**

Works continue on the stations at Battersea and Nine Elms and the connection to the existing network with Step Plate Junctions.

**Thames Tideway Tunnel**

2017 saw the award of the Thames Tideway contracts comprising 23km of 7.3m diameter tunnel at depths up to 66m under the River Thames connecting the previously constructed Lee Tunnel. Works have begun on the TBM and the TBM has been delivered for tunnelling due to commence in 2018.

**High Speed Two**

2017 saw the award of the civils contracts for the part rail line between London and Birmingham. These contracts comprise tunnel and bored tunnel. Construction is due to commence in 2019 following the completion of the ECI stage 1.

Phase 2 for HS2 is currently under development and this currently comprises a further 21km of twin running tunnels giving a total of 57km of approximately 10% of the construction.

**York Potash**

Project owner Sirius Minerals commenced work on the 2km twin 2km twin running tunnels giving a total of 57km of approximately 10% of the construction.

**Hinckley Point Nuclear Power Station**

Work continues on the first of two power stations in the UK. Part of the work on this project includes the bored tunnels, outfall tunnels, shafts and road tunnels at the site.
2017 was the day of the 10th ITA conference. It was an assembly of 100 young architects. The conference presentation from the keynoter, Van Gaalen of BAM, continued with a very good practical and thoughtful presentation from a Norwegian.

In 2017, the annual Target 1000 initiative saw the International ITAYM grow to 10,000 young people working and learning the International Tunnelling Association.

TUNNELLING

Construction of the completion of twin bored tunnel for the new Battersea Power Station (above) connecting the previously constructed Lee Tunnel.

High Speed Two

2017 saw the award of the seven main works civils contracts for the proposed high speed rail line between London and Birmingham. These contracts comprise 35km of twin bored tunnel.

Construction is due to commence in 2019 following the completion of the ECI stage 1.

Phase 2 for HS2 is currently under development and this currently comprises a further 21km of twin running tunnels giving a total of 58km which is approximately 10% of the total 561km length.

High Speed Two: Bank Station Capacity Upgrade

Construction work has commenced on the upgrade to Bank Station, one of the largest underground railway complexes in the world.

The works comprise new entrance, three ticket halls, six lifts, 10 platforms, two 94m travelators, 570m tunnel and platform for Northern Line.

FUTURE TUNNELLING ACTIVITIES

1. Silvertown Tunnel

Twin bored Tunnel under River Thames approximately 1.4km long and 12m diameter. The project is currently out to tender and is to be procured as a PPP delivery model. Contract award and construction are due in 2019.

2. Crossrail 2

This project will comprise 72km of twin bored tunnel; 11 underground stations. It is currently undergoing a review by Government prior to being taken forward to Hybrid Bill.

3. Lower Thames Crossing

A proposed new motorway on the M25 to include 13 miles of road. This will also comprise 3km of tunnel beneath the River Thames East of London with a tunnel diameter of 12m or greater. The project is currently in planning and due to be operational in 2027.

4. A303 Stonehenge Tunnel

This is a proposed 11km dualling of the A303 in the vicinity of the ancient monument at Stonehenge. The works will comprise 2.9km of twin tunnels. The project is currently in planning and due to start on site in 2021.

5. Bakerloo Line Extension

TfL is proposing to extend the Bakerloo line beyond Elephant & Castle to Lewisham, serving Old Kent Road and New Cross Gate, and would like to hear your views.

York Potash (above) Project owner Sirius Minerals, which has commenced work on the 37km long tunnel to transport the high-grade potash (polyhalite) to the coast at Redcar. The tunnel will be at depths of up to 300m with associated access shafts and mine shafts up to 1500m deep.

Hinkley Point Nuclear Power Station Work continues on the first new nuclear power station in the UK for many years. Part of the work on this will comprise intake and outfall tunnels: 9km in total.
UNITED STATES

Name: Underground Construction Association (UCA of SME)

Type of structure: Non-profit, open association

Number of members: 1,496 members, 31 corporate members

ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

Throughout 2017 and to date, the UCA of SME continued to promote the wise, efficient and sustainable development and use of underground space. Some of the ways that we are accomplishing this are:

- 2017 and 2018 George Fox Conferences. These one-day conferences provide concise information on emerging technologies, project updates, and future planning.
- Provided numerous student scholarships for attendance of the Rapid Excavation and Tunneling Conference (RETC).
- 2017 Cutting Edge Conference. Annual two-day conference to explore technical advancements and innovations in the industry. This year’s event featured a working site visit organized and promoted by our Young Members group.
- Our Young Members group also presented monthly webinars on various topics of interest to our developing members.
- Published four editions of our magazine, “Tunneling & Underground Construction”.
- Published the book, “History of Tunneling in the United States”, which chronicles the 200-year evolution of the societal benefits that tunneling has brought to the U.S. This is a new tool in the UCA’s tool box to educate government decision makers and the private sector to the advantages of underground space utilization.
- Completed the majority of planning for June’s North American Tunneling (NAT) Conference, UCA’s biennial technical event.
- Realized a 36% growth in membership within the past 12 months.

CURRENT TUNNELLING ACTIVITIES

There are dozens of notable tunnels currently under construction in the United States. These include:

Highway Tunnels –
- The Alaskan Way Tunnel, boasting the World’s largest EPB TBM (17.5m) has completed excavation, and will be substantially complete later this year.
- The Parallel Thimble Shoal Tunnel project in Virginia Beach, VA is underway, following a groundbreaking ceremony last September. This EPB TBM excavation will twin the existing immersed tube tunnel under the Chesapeake Bay constructed between 1960 – 1964.

Transit Tunnels –
- Ahead of the 2028 Olympics, Los Angeles is the American hot bed for transit tunnels and is currently under development. Four major subway projects are underway: Crenshaw/LAX Corridor, Regional Connector, Purple Line Extension – Phase 1 and Purple Line Extension – Phase 2. Phase 3 of the Purple Line Extension is in tender, with the winning team expected to be announced in April 2018. Combined, these projects will add 19 miles of new commuter lines and connect existing lines for shorter overall travel times.
- The Greater Seattle Area continues its “Sound Transit” expansion as the NorthHink TBM Tunnels project nears completion. East of Seattle, the Downtown Bellevue Tunnel (DTM) approaches the halfway mark in construction.
- The City of Atlanta is utilizing a novel approach to bolster its water reserves with its Raw Water Storage Program. A TBM driven tunnel, deep pump stations, adits and shafts will connect existing treatment and distribution facilities to an abandoned quarry. When the project is complete, the quarry will be flooded to create an additional 2.4 billion gallons of on-hand storage.

Wastewater –
- Sewer and drainage tunnels are the most prevalent tunnel projects currently under construction in the United States. Many municipalities continue to add more tunnels to their systems as others are just beginning:
  - In Washington, D.C., the Boundary Tunnel is nearing completion. This tunnel projects as a major part of a new Water & Wastewater Tunnel Program. The tunnel is currently under construction and will be the first major tunnel project constructed in the District of Columbia in over twenty years.
  - The Los Angeles County Metropolitan Water District’s Boundary Tunnel is nearing completion. This 4.5-mile-long tunnel has a diameter of 14.5 meters and is currently under construction.
  - Cleveland, OH also has several new wastewater tunnel projects ongoing. The Dugway Southeast Storage Tunnel, Dugway South Yard Storage Tunnel, and the Dugway South Yard Sewer Tunnel project is currently underway.
  - Hartford, CT, Akron, OH and Louisville, KY have several new wastewater tunnel projects in tender.

FUTURE TUNNELLING ACTIVITIES

Several large tunneling projects are ongoing in the United States.

- The Los Angeles County Metropolitan Water District’s Boundary Tunnel has been in planning for over twenty years, and seven miles long, and is currently under construction.
- The Ship Canal Waterway Tunnel project is currently under construction in Seattle. Seattle will also tend to 69.4 miles of tunnel at a cost of 14.04 billion dollars.
- The Hampton Roads Tunnel Expansion Project is currently under construction and is expected to be completed in 2018.
Wastewater – Sewer and drainage tunnels continue to be the most prevalent tunnels being constructed in the United States. Several municipalities continue with their programs, as others are just beginning.

- In Washington, D.C., the Blue Plains Tunnel, First Street Tunnel are complete, and the Anacostia River Tunnel project is nearing completion. The 4th and largest of 5 major projects, the Northeast Boundary Tunnel is now underway.
- St. Louis, MO currently has three wastewater tunnel projects underway, the Deer Creek Sanitary Tunnel, Jefferson Barracks Tunnel and the Maline Creek CSO Storage Tunnel.
- Cleveland, OH also has three wastewater tunnel projects ongoing – the Doan Valley Storage Tunnel, Dugway Storage Tunnel and the Dugway South Relief Tunnel.
- Hartford, CT, Akron, OH, Ft. Wayne IN and Louisville, KY have the first of their wastewater tunnel projects underway.

FUTURE TUNNELLING ACTIVITIES

Several large tunnelling projects are on the horizon in the United States.

- The Los Angeles County Effluent Outfall Tunnel has been in the planning stages for over twenty years. At 18-foot diameter and seven miles long, this project will tender in 2018.
- The Ship Canal Water Quality Project in Seattle will also tender in 2018. This 18-foot diameter x 14,000-foot-long tunnel project will include the construction of five shafts.
- The Hampton Roads (Virginia) Bridge-Tunnel Expansion Project is scheduled to tender in late 2018. This project will twin...
In 2017 the Vietnam Tunnelling Association continued working to show society the benefits of the underground environment, both through the implementation of technical events, and the dissemination of materials via technical and social media. Several activities, like Conference, Lectures and Presentations at engineering events were developed through 2017.

Vietnam

Name: Vietnam Tunnelling Association
Type of structure: Non-profit, open association
Number of members: 500 members, 5 corporate members

United States continued

the existing highway tunnel where the James River meets the Chesapeake Bay. Both bored tunnel and immersed tube options are being considered.

- Subject to available funding, the massive Bay Delta Water Conveyance Program will get started in 2018, as several design and logistical contracts are scheduled for procurement. The entire project will consist of over 36 miles of twin 40-foot diameter tunnels.

- We may see the Gateway Tunnels Project in procurement in 2018. These twin heavy rail tunnels will run under the Hudson River between New Jersey and New York to compliment the existing and aging North River Tunnels. This project originally went into procurement in 2009 but was cancelled when the State of New Jersey withdrew funding. A follow-on project will rehabilitate the existing tunnels to effectively double current rail commuter rail capacity. The project continues to face major funding hurdles.

- Wastewater tunnels will continue to make up the majority of tunnelling projects in the United States throughout 2018. St. Louis, MO, Cleveland, OH, Providence, RI and Los Angeles are just some of the U.S. cities that will continue to expand their facilities.

STATISTICS

1. Length or volume excavated - % mechanized / % conventional during 2017:

   We don’t track this statistic.

2. Amount (USD or EUR) of tunnelling / underground space facilities awarded in 2017:

   The value of major tunnel projects awarded in 2018 was nearly US$3,000,000,000.

3. List of tunnels completed

   While many U.S. tunneling projects are nearing completion, the Deep Rock Tunnel Connector/Eagle Rock Tunnel in Indianapolis is the only major project to reach final completion in 2017.

ASSOCIATION ACTIVITIES DURING 2017 AND TO DATE

In 2017 the Vietnam Tunnelling Association continued working to show society the benefits of the underground environment, both through the implementation of technical events, and the dissemination of materials via technical and social media.
MUMBAI METRO

TERRATEC is supplying more TBM's than any other manufacturer to Mumbai Metro's highly anticipated 33.5km Line 3 underground corridor, in India, with a total of seven machines working on the project.

Versatile 6.68m diameter Dual Mode machines are equipped with robust hard rock cutterheads that are mounted with 17" heavy-duty disc cutters and feature large bucket openings. Other state-of-the-art features include electric Variable Frequency Drives, active shield articulation and two component backfilling systems.
CREG TBM Successes in Soft/Mixed Ground Worldwide in Early 2018

Double 6.7m CREG Sherry TBM breakthrough on 1.4km twin tunnel of Thomson-East Coast Line T289 Project, Singapore in early January.

Breakthrough of CREG 7.56m EP3 TRM on 2.4km tunnel of Tel Aviv Red Line, Israel on 9th February.

Breakthrough of CREG 9.09m EPB TBM on 2.6km tunnel of Utrecht Metro Line 3 on 4th January.

Breakthrough of CREG 8.3m Sherry TBM on 2.9km tunnel of Nanjing Metro Line 3 on 14th January.

Breakthrough of CREG 11.900-10.990 mm Horseshoe-shaped EPB TBM on 3.35km railway tunnel in Shaanxi Province in Line January 2018.