

# Singapore



**Name:** Tunnelling & Underground Construction Society (Singapore)

**Type of Structure:** Non profit, open association

**Number of Members:** 1329 members, 120 corporate members

## ASSOCIATION ACTIVITIES DURING 2021 AND TO DATE

In 2021, TUCSS continued to promote tunnelling and underground construction through organising monthly evening seminars, training courses, conference & site visits for dissemination of tunnelling & underground related information and best practices, as well as conducting social networking events to bring together the practitioners from the different sectors of the industry. TUCSS continued to support the accreditation of tunnelling resident site supervisory staff during the year.

### Hulme Prize Award:

16th September 2021

#### Hulme Prize Paper Competition 2021

This annual competition is set up for young engineers or students (below 35) to submit best technical papers on any subject related to tunnelling and underground construction.

3 papers were shortlisted out of the 7 submitted papers by the TUCSS Committee as follows:

- Review of Investigation Methods to Determine Pile Lengths, Presented by Fu Jiajun, Land Transport Authority
- The Use of Classification Machine Learning for Cone Penetration Test Interpretation in a Singapore Context, Presented by Amelia Loo, Mott MacDonald
- Testing of a Muck Pumping System for EPB TBMs for Thomson-East Coast Line T307 Tunnelling Works, Vincent Zillianstretra, Land Transport Authority

The first prize was awarded to Mr Fu Jiajun, second prize to Mr Vincent Zillianstetra and the third prize to Ms Amelia Loo.

### Training Course & Conference:

20th to 21st April 2021

#### TUCSS Tunnel Course 2021

The two half-day course was attended by a total of 237 participants. The purpose of this course was to provide a comprehensive background to certain contemporary practices in design and construction of tunnels and underground structures.

23rd to 24th September 2021

#### Underground Singapore 2021

A total of 351 participants attended the hybrid conference. The purpose of the conference is to provide a forum to share and discuss issues relevant to the planning, design and construction of underground projects in Singapore and the region. Over 30 technical papers were accepted and presented during the 2-day conference.

### CURRENT TUNNELLING ACTIVITIES

The construction of subway, road and utility infrastructures form the bulk of current tunnelling activities in Singapore. In addition, with the limited land space available, Singapore has seen an increase in the adoption of pipe jacking as a method for the construction of underground linkways and pipelines. Some of the ongoing major tunnelling activities are as shown below:

### Circle Line 6 (CCL6)

Commenced in 2018, CCL6 comprises of a total of three stations and an extension to the existing Kim Chuan Depot and serves to connect the Central Business District with the rest of the Circle Line. Once completed, the 4km CCL6 will close the loop between the existing HarbourFront Station and Marina Bay Station and will bring the total number of Circle Line stations to 33, inclusive of 12 interchange stations. Three EPBMs have been used in CCL6 to support the bored tunnelling works, which have been now completed. In addition, CCL6 comprises of five underground linkways that will be constructed via pipe jacking, with 1.2m diameter slurry mTBMs supporting the works.

### North-South Corridor (NSC)

Commenced in 2018, NSC comprises of 21.5km of expressway, with a large portion underground and serves as Singapore's 11th expressway, connecting the northern towns in Singapore from Woodlands down to the city centre. Envisaged to be Singapore's first Integrated Transport Corridor, NSC comprises of dedicated, continuous bus lanes as well as cycling trunk routes and pedestrian paths, connected with the existing Park Connector Network. Construction of the road tunnels

Virtual Monthly Evening Seminars for members:		
21st January 2021	Challenges during Diaphragm wall construction	Mr. Michel Bock, COWI
24th February 2021	Baseline Approach to Manage Third-Party Risk in Underground Constructions	Dr. Logan Loganathan, WSP Australia Pty Limited
18th March 2021	Segmental Lining Design in Adverse Soft Ground Conditions	Dr. Benno Ring, Ring – Consultancy in Tunnelling
15th April 2021	An Automatic Back-analysis Methodology to Better Predict the Real Ground Behaviour	Dr. Cristian de Santos, SAALG Geomechanics
20th May 2021	Safety Challenges in Long Rail Tunnels	Mr. Bernd Hagenah, HNTB
17th June 2021	Precast Tunnel Segments reinforced by GFRP Reinforcements	Dr. Aniello A. Giamundo, ATP srl Italy
15th July 2021	40 km of TBM Tunnels excavated through Extremely Hard Rock and High Water Pressure - The Follo Line tunnels (Oslo, Norway)	Mr. Fernando Vara, ACCIONA
19th August 2021	Safety Practices in Tunnelling Industry	Mr. Michael Chin, Singapore Power
18th November 2021	Holistic approach for the construction monitoring of the Grand Paris Express metro network (France)	Mr. Vincent Lamour, SOCOTEC
<b>Virtual Annual Lecture:</b> 21st October 2021	Tunnelling Risk Management on the FAL Project, Perth	Mr. Eric Hudson-Smith, Perth Transport Authority

will be predominantly carried out via the cut and cover method and features extensive at-grade road and utility diversion works.

### Deep Tunnel Sewerage System (DTSS) Phase 2

To meet Singapore's long-term clean water needs, a used water conveyance system, the DTSS, is currently under construction. Some of the shafts were constructed using a vertical shaft boring machine which is a first in Singapore. The constructed link sewers will connect existing sewer lines with the deep tunnels via drop shafts, conveying used water via gravity to centralised water reclamation plants for further processing and treatment. With Phase 1 completed in 2008, DTSS Phase 2 comprises of 60km of link sewers (50km of which to be constructed via pipe jacking) and 40km of deep tunnels at depths between 35m to 55m, both underground and undercrossing the sea. A total of 19 TBMs, comprising of both EPBMs and

Slurry TBMs, are used to construct the deep tunnels with many already completed their drive.

### Changi East Airport Development

To support the future airport infrastructure with the planned Terminal 5 (T5), Changi Airport Group (CAG) has awarded contracts for the construction of bored tunnel as well as for cut and cover tunnels; TBMs have been delivered and construction works are now in progress.

## FUTURE TUNNELLING ACTIVITIES

### Cross Island Line (CRL)

The CRL comprises of more than 50km of underground lines and is envisaged to increase connectivity between the western, eastern and north-eastern parts of Singapore. Construction of the CRL will be divided into three phases, with the first phase (CRL1) comprising of a total of 12 stations, inclusive of four interchange stations and spanning a total of 29km in

length. In addition to the conventional EPBMs and slurry TBMs, CRL1 features the use of two large-diameter TBMs, one EPB and one Slurry, for the construction of single tunnel to house both tracks. Passenger service for CRL1 is slated for 2030 and studies on the subsequent CRL phases are currently ongoing. The CRL also includes the 7.3km Punggol extension which will provide better rail connectivity and greater accessibility for those living in eastern areas. The Punggol extension will be fully underground and comprises four stations, and it will also feature the use of a large-diameter EPBM.

## EDUCATION ON TUNNELLING IN THE COUNTRY

Certificate Course in Tunnel Engineering/  
Singapore Institute of Technology  
Specialist Diploma in Underground  
Construction/BCA Academy