

China



Name: China Civil Engineering Society (CCES)

Type of Structure: Non profit, open association

Number of Members: Total number: 45,407, number of corporate members: 1,355

ASSOCIATION ACTIVITIES DURING 2021 AND TO DATE

The 2021 China (Shanghai) International Tunnel Engineering Seminar was hosted by the Tunnel and Underground Works Branch of the China Society of Civil Engineering from April 18th to 19th in 2021. With the theme “Challenges and Innovations of Tunnel Engineering in Complex Urban Environment”, the two-day event included one theme forum and six sub-forums. Nearly 100 academic papers were presented. Six Chinese academicians and top experts from China, Japan, Italy, Austria, and Brazil attended the seminar, which gathered more than 600 participants through both online and offline platforms. There were more than 2 million live-stream viewers, and the event was widely reported in the media.

“The Third International Symposium on Detection and Monitoring for Tunnels and Underground Works and the Seventh Construction Management and Technology Youth Forum of the Tunnel and Underground Works Branch of CCES” was hosted by the Central South University in Changsha, China from October 15th to 17th, 2021. The theme was “Safety Risks and Intelligent Monitoring of Tunnel and Underground Engineering”. Top experts and young graduate students from China, Japan, the United States and France were invited to present papers, including 11 keynotes and 55 presentations for five sessions. The event was held both online and offline, and attracted more than 350 experts, tunnellers, and graduate students from universities, research institutions and companies.

Publication

“Modern Tunnelling Technology”, 3,000 copies in print

“Proceedings of The 3rd International Symposium on Detection and Monitoring for Tunnels and Underground Works and the 7th Construction Management and Technology Youth Forum of the Tunnel and Underground Works Branch of CCES”

“Proceedings of the 20th Waterproofing and Drainage Technology Forum of the



The Gaoligongshan Tunnel



The Shenzhen-Zhongshan Channel



Oujiang River North Estuary Tunnel

Tunnel and Underground Works Branch of CCES”

“Proceedings of the 12th National Tunnel and Underground Space Forum for Safe Operation, Energy Saving and Environmental Protection and the 3rd Traffic Tunnel Fire Prevention and Emergency Rescue Technology Forum by the Tunnel and Underground Works Branch of CCES

CURRENT TUNNELLING ACTIVITIES

In 2021, there were 743 railway tunnels (length: 1,425km), 2,132 road tunnels (length: 2,199km), and 971.93km of subway tunnels newly built and put into operation in China. Major tunnel projects still under

construction include the Gaoligongshan Mountain Tunnel of the Darui Railway, Shenzhen-Zhongshan Tunnel, Shenzhen Chunfeng Road Tunnel, etc. Major tunnel projects completed in 2021 include the Oujiang River Tunnel in Wenzhou City, etc. some are shown below:

The Gaoligongshan Tunnel, is 34,538m long and has a maximum depth of 1,155m

The unfavorable geological conditions encountered in the tunnel are characterized by “three highs” (high geotherm, high geo-stress and high earthquake intensity), and “four actives” (active neotectonic movement, active geothermal water environment, active external dynamic geological conditions, and an active bank slope superficial transformation process), which makes construction extremely difficult.

The Shenzhen-Zhongshan Channel

A cross-sea link integrating tunnels, artificial islands, bridges and underwater interconnections. The project is about 30km from the Humen Bridge in the north and about 38km from Hong Kong’s Zhuhai Macao Bridge to the south. The length of the link is about 24km. The main structures of the project include: a suspension bridge for the Lingding channel with a main span of 1,666m, a cable-stayed bridge for the Hengmen East Waterway with a main span of 580m, a 6,845m long undersea tunnel (5,035m long steel shell immersed tube), and East artificial island (930m long), a West artificial island (625m long), etc. The initial project started in December of 2016 and is planned to be completed and opened to traffic in 2024.

Oujiang River North Estuary Tunnel

On June 6th, Wenzhou’s first cross-river shield tunnel project – the Oujiang North Estuary Tunnel of Wenzhou Rail Transit S2 Line Phase I Project SG5 Section - bored through smoothly. This is the first shield tunnel with a super-large diameter composite lining in China, and also the first tunnel constructed by shield tunnelling in Wenzhou. The Jiangbei Shield receiving shaft is the deepest rectangular foundation pit in Zhejiang Province. The Oujiang North Estuary Cross-River Tunnel is 4.8km long, with the shield tunnel section 2,664m long. The underwater section has a maximum buried depth of 60m. It is designed with a single tube and two lanes and has been constructed using a TBM with a diameter of 14.93m. Oujiang River North Estuary Tunnel has been awarded “Three-first Records”, i.e. Wenzhou’s first shield tunnel,

the province's first super-deep foundation pit (52m), and the country's first municipal railway super-large diameter shield.

FUTURE TUNNELLING ACTIVITIES

In 2022, the major tunnel projects planned and constructed in China include the Shenhai Expressway Jihe Section Reconstruction and Expansion Project (41.43km), the Yongsheng Tunnel for the Dali (Lijiang)-Pan-zhihua Railway (18.085km), the Jiuliwan Tunnel on the Chongqing-Guiyang High-speed Railway (19.54km), and the Nanwashan Tunnel for the Changzhi-Handan-Liaocheng Railway (22.11km), etc. Some are shown below:

He'ao Tunnel

With a length of about 41.43km, the Shenhai Expressway Jihe Section Reconstruction and Expansion Project is located in the centre of Shenzhen City and is the east-west traffic axis of the Guangdong-Hong Kong-Macao Greater Bay Area. The completion of the project will promote the construction of the Guangdong-Hong Kong-Macao Greater Bay Area, accelerate the development of the Shenzhen-Dongguan-Huizhou metropolitan area, and speed up the integration of the Pearl River Delta which plays an important role in implementing Shenzhen's development plan of "connecting the east and the west".

The He'ao Tunnel starts from the east of the He'ao Interchange and ends at the Longkou Reservoir. Complying with the standard of expressway construction, it has a design speed of 100km per hour and is a dual carriageway with eight lanes. It has been proposed as a shield tunnel, passing under the Longgang New City, an existing water source protection zone, and existing buildings, subways, expressways, underground structures, etc. There are many sensitive factors and risks to be tackled, and the geological conditions are complex. To ensure construction safety, a single-tube double-layer shield tunnel has been proposed, which is a first for expressway construction in China. The outer diameter of the shield tunnel segments is 17.5m, and the outer diameter of the TBM 18.1m. After its completion, it will be the largest diameter shield tunnel in the world, beyond the Tuen Mun Tunnel in Hong Kong.

Qinling Mabaishan Tunnel

The new Xi'an-Shiyan High-speed Railway starts from the Xi'an hub - Xi'an East Station, and ends at the existing Shiyan East Station. With a length of 256.7km, the main line has seven stations, including

six newly built ones. The construction of the Shaanxi section of Xi Shi High-speed Railway is scheduled to commence on December 20th, 2021 and to be completed on June 30th, 2026, with a construction period of 4 and half years. The length of new bridges is about 40.9km, accounting

for 15.99% of the whole line, while the length of the 41 new tunnels is 201.6km, accounting for 78.83%. The proportion of bridges and tunnels will be 94.82%. Among these new tunnels, the longest one is the 22.9km long Mabaishan Tunnel in Qinling.

STATISTICS

By the end of 2021, there were 17,532 railway tunnels in operation in mainland China, with a total length of 21,055km. In 2021, 734 railway tunnels were newly built and put into operation, with a new mileage of 1,425km. The length of railway tunnels under construction is about 6,414km, and 15,266km in the planning stage.

By the end of 2020, the number of highway tunnels in China reached 21,316, with a length of 21,999km in total. Among them, the number of super long tunnels increased rapidly. In 2020, the number of super long highway tunnels in China was 1,394, with a year-on-year increase of 219, and the length was 6,236km, with a year-on-year increase of 19.5%.

By the end of 2021, a total of 50 cities in mainland China had put 9,192.62km of urban rail transit lines into operation, including 7,253.73km of subways, accounting for 78.9%. In 2021, Luoyang, Jiaying, Shaoxing, Wenshan Prefecture and Wuhu were classified as the five new urban rail transit operation cities.

EDUCATION ON TUNNELLING IN THE COUNTRY

Graduate courses

- "Tunnel Engineering", Central South University
- "Introduction to Underground Works, Mountain Tunnels, Metros, Underwater Tunnels, Design Principles for Underground Structures, Utilization of Underground Space", School of Civil Engineering, Southwest Jiaotong University

Post graduate courses

- "Shield Tunnel Engineering", Central South University
- "Tunnel Mechanics, Vibration Reduction of Tunnels and Underground Structures, Construction
- Methods of Tunnelling and Underground Engineering, Similarity Theory and Model Test", School of Civil Engineering, Southwest Jiaotong University
- School of civil engineering, Tongji University

Doctoral program:

Advanced underground structure, Tunnel Mechanics and engineering, advanced rock mechanics, underground structure test and testing technology, geotechnical plastic mechanics, underground structure calculation theory, special theory of underground space utilization, risk and safety of civil engineering, dynamic feedback and control of underground engineering, underground engineering construction technology, optimization method of underground structure, unsaturated soil mechanics, probability analysis of civil engineering Earthquake resistance of underground structure, deep foundation pit engineering, Soil Mechanics II, it technology and application of tunnel and underground engineering, disaster science of underground engineering, intelligent underground structure, etc.

Master Program:

Civil engineering discipline progress and research methods, underground structure test and testing technology, advanced rock mechanics, geotechnical plastic mechanics, underground structure calculation theory, Tunnel Mechanics and engineering, underground engineering construction technology, underground structure optimization method, underground structure earthquake resistance, tunnel and underground engineering IT technology and application, introduction to underground space utilization, underground engineering disaster Tunnel and underground space operation safety and disaster prevention, advanced underground concrete structure theory, intelligent underground structure, etc.