CHINA

Name of Association: China Civil Engineering Society

Type of Structure: Non-profit, open association

Number of Members: Total number100,000, number of corporate members 3000

ASSOCIATION ACTIVITIES DURING 2023 AND TO DATE

Academic events

1. From April 21st to 24th, 2023, the 2022 China Tunnel and Underground Engineering Conference (CTUC) and the 22nd annual conference of the Tunnel and Underground Engineering Branch of the China Civil Engineering Society was hosted by the Tunnel and Underground Engineering Branch of the China Civil Engineering Society and Central South University. The annual conference was successfully held in Changsha City, Hunan Province. This conference set up 12 academic forums on special topics. There was a total of 1,100 registered participants in the conference. It was broadcast live online, with 121,094 people watching. A total of 230 papers were received. Experts and scholars participated in the conference via various forums and conducted extensive exchanges on the latest developments in tunnel and underground engineering. After the conference, more than 100 people visited the manufacturing base of China Railway Construction Heavy Industry.

2. On the morning of October 14th, the "2023 China Tunnel and Underground Engineering Conference (CTUC) and the 23rd Annual Conference of the Tunnel and Underground Engineering Branch of the China Civil Engineering Society" opened in Chengdu. The conference was jointly sponsored by the China Civil Engineering Society Tunnel and Underground Engineering Branch, Southwest Jiaotong University, and Chengdu Tianyou Intelligent Tunnel Technology Co., Ltd. and was co-organized by 28 companies including China Railway 18th Bureau Group, China Railway 12th Bureau Group, China Railway 11th Bureau, Extreme Environment Geotechnical and Tunnel Engineering the National Key Laboratory of Intelligent Construction, the Key Laboratory of Transportation Tunnel Engineering of the Ministry of Education, and the School of Civil Engineering of Southwest Jiaotong University. With the theme "March into the Deep Earth - Meeting the Challenges of High-Energy Geology" the conference conducted in-depth discussion on the progress, innovative technologies and future development of tunnel and underground engineering construction in China's high-energy geological environment. It also played a positive role in promoting tunnel construction in extremely complex environments, such as the series of JZ railways and highways. More than 500 people attended the meeting, and a total of 15,700 people watched online.

3. On November 30th, 2023 - jointly sponsored by Tunnel and Underground Engineering Branch of China Civil Engineering Society and China Railway Tunnel Group Co., Ltd - the "6th Tunnel and Underground Engineering Science and Technology Innovation Forum" hosted by China Railway Tunnel Survey and Design Institute Co., Ltd., and Guangdong Province Tunnel Structure Intelligent Monitoring and Maintenance Enterprise Key Experiment, and Tunnel Construction Journal (Chinese and English) was successfully held online. Focussing on the theme "Plateau Railway Tunnel Construction Technology", the forum invited three experts to give special lectures. Duo Shengjun, the tunnel manager of the Changlin Section of the Plateau Railway of the China Railway First Survey and Design Institute Group Co., Ltd., delivered a report titled "Key Technologies for Plateau Railway Design" on behalf of the national engineering survey and design master, Li Guoliang. From the perspective of plateau railway tunnel engineering characteristics, key technologies for plateau tunnel design and challenges faced in plateau railway tunnel engineering construction were elaborated on. This forum was held by the Tencent conference, with more than 1,840 participants and received more than 1,300 likes.

4. The 21st Academic Exchange Conference of the Waterproof and Drainage Technology Forum of the Tunnel and Underground Engineering Branch of the China Civil Engineering Society was held in Fuzhou City, Fujian Province from November 1st to November 3rd, 2023. More than 120 representatives from railways, rail transit, municipal administration, highways, water conservancy and hydropower, universities and scientific research units attended the meeting. This conference selected 33 papers for publication in the 2023 supplement of "Tunnels and Rail Transit". Four guests were invited to give subject speeches, and 16 paper authors and corporate exchange speakers were invited to the exchange conference. 33 papers from this conference were published.

5. On April 21st, 2023, the 3rd Symposium for Young Tunnellers of Asia was held in Changsha City, Hunan Province. The Asian Tunnel Youth Forum is an annual international seminar held for young professionals in the Asian tunnel industry. The first and second forums were hosted by Malaysia and India respectively. The 3rd Asian Tunnel Youth Forum was hosted by the School of Civil Engineering of Central South University and the Tunnel and Underground Engineering Research Center of Central South University with the support of the Youth Working Group of the International Tunnel and Underground Space Association. It involves tunnel soil improvement, new tunnel construction technologies, new tunnel calculation methods, disaster prevention and repair and maintenance, energy conservation and emission reduction, and sustainable development. The total number of academic reports was 71, including 17 reports by overseas scholars, respectively from the United States, France, the Netherlands, Australia, Japan, Norway, Pakistan, Ireland, Malaysia and other countries and regions.

Publications

As the official journal of the Tunnel and Underground Works Branch of the China Civil Engineering Society, Modern Tunnelling Technology published six issues and one special issue throughout the year, featuring a total of 212 articles. These publications mainly focused on cutting-edge technologies, such as AI and BIM, and covered key and challenging projects. They reported on major technological innovations, scientific research outputs, and practical solutions, aiming to promote the dissemination and exchange of tunnelling technology and knowledge within the community.

2023 ITA Tunnel Awards, China won three awards

Our association encouraged Chinese tunnel and underground space companies to actively apply for the ITA Tunnel Awards. A total of 21 projects were recommended, and 12 projects were shortlisted. On November 24th, the 2023 Ninth International Tunnelling Association Awards Ceremony was held in Mumbai, India. China won three ITA Tunnel Awards.

CURRENT TUNNELLING ACTIVITIES

Shenzhen to Zhongshan Immersed Tube Tunnel

The Shenzhen-Zhongshan Channel Project is an underwater interchange set in shallow to deep silt integrating a bridge, tunnel and island. The project is 24km, including an east artificial island, a west artificial island, a 17,129m bridge, a 6,845m underwater immersed tunnel, and an airport hub interchange (underground ramp part), etc. The design speed is 100km/h and the service life is 100 years.

Shenzhen-Zhongshan Channel Project's immersed tunnel is a two-way eight-lane steel shell concrete structure. The length of a single standard pipe section is 165m, with a width of 46m, and a height of 10.6m. Its dead weight is about 80,000 tons. The floating transportation distance is about 50km which needs to cross multiple busy public waterways. The underwater docking accuracy is required to be controlled to ±5cm. The immersed tube adopts a new "steel shell-concrete" structure, which has large load-bearing capacity, good waterproof performance, and significant social, economic and ecological value. Construction started in April 2018 and will be opened to traffic in June 2024.

Shenzhen-Zhongshan Channel Project

Shenzhen-Jiangmen Railway Pearl River Estuary Tunnel Project

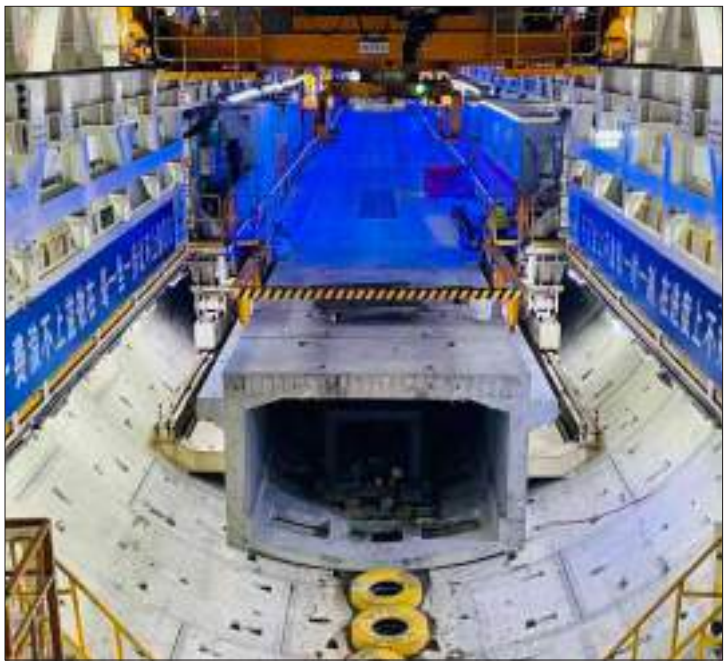
The total length of this project is 13.69km. It is a single-tube double-line tunnel structure with a design speed of 200km/h. It is constructed using a combination of TBM tunnelling (6.52km), NATM (5.52km), and open-cut methods (1.65km). The TBM diameter is 13.32m. The "Shenjiang No. 1" TBM has advanced 3.59km from Humen, Dongguan, and the "Greater Bay Area" TBM has advanced 2.93km from Guangzhou Wanqingsha. The engineering characteristics include complex geological conditions, high tunnel depth, high water pressure, and long-distance excavation by TBM. The deepest point of the tunnel is 115m underwater, with a maximum water pressure of 10.6MPa. The project started in July 2020 and will be completed in December 2025.

Guangzhou-Dongguan-Shenzhen Intercity Shield Tunnel Project

This is the largest diameter tunnel under construction for Shenzhen Rail Transit. It is located in the middle of the Pearl River Delta and is the main line on the Pearl River Delta intercity network on the east bank of the Pearl River. The section from Qianhai to Huanggang Port is an extension of the Guangzhou-Dongguan-Shenzhen Intercity. The line passes through the Qianhai Cooperation Zone and Nanshan District, Futian District, with a total length of 21.14km, and a design speed of 160km/h. Construction uses open-cut and shield tunnelling methods. The open-cut section #1 on the Qianhuang section of the Guangzhou-Dongguan-Shenzhen Intercity to Huanggang Port Station is a single, double-track tunnel with an outer diameter of 12.8m, tunnelling is by shield machine with a diameter of 13.27m. The minimum curve radius is 1300m, a maximum longitudinal slope of 29.6‰, a total length is 3.51km, and a tunnel depth is 10.7m~32.9m. The project section is located in the centre of Shenzhen City. It has complex geological conditions and a sensitive environment along the line. The proportion of composite strata exceeds 50%. Present are long-distance parallel highways, subways and other risk sources. It is one of the most complex shield tunnel projects globally, with some of the highest comprehensive risks during construction. The project started in 2021 and will be completed in 2026.

Shenzhen Qianhai Comprehensive Transportation Hub

The Qianhai comprehensive transportation hub is an unusual large-scale fully underground hub TOD project in China. The project covers three subway lines, Line 1, 5, and 11, and two intercity railways - the Guangzhou-Dongguan-Shenzhen Intercity Line and the Hong Kong-Shenzhen Western Railway. The total land area is 20 hectares, including the underground hub and superstructure properties, with a total construction area of approximately 2.159M square meters. All underground space within the project land will be utilized. From east to west are; the Metro Lines 1, 5, and 11 stations and their new spaces; the hub transfer hall and property development underground space; the Guangzhou-Dongguan-Shenzhen intercity line station; and the Hong Kong-Shenzhen Western Railway station and



Shenzhen-Jiangmen Railway Pearl River Estuary Tunnel Project

The Guangzhou-Dongguan-Shenzhen Intercity

Shenzhen Qianhai comprehensive transportation hub

port space - including transportation.

The project's underground space consists of a deep foundation pit near the sea. The underground space of the hub transfer hall and property development is a six-story basement with a total length of 830m. The depth of the standard section of the basement is about 30m. The deepest pit within the tower and core tube range is about 37m to protect the safety of subway operations, divided into eight foundation pits for excavation at intervals. The foundation pit of the adjacent Guangzhou-Dongguan-Shenzhen intercity line is 32m deep and is being constructed simultaneously. The construction of large-scale deep foundation pits near the sea and the subway is very complex in terms of safety and cross-construction. The project started in 2011 and will be completed in 2027.

Shenzhen-Daya Bay Intercity

The area from Shenzhen Airport to Daya Bay Intercity Shenzhen Airport to Pingshan is vital for the development of Shenzhen and Hong Kong, and an important factor in the Greater Bay Area intercity line network. It connects multiple districts such as Baoan, Longhua, Longgang and Pingshan and constitutes an express line that supports the expansion of urban space. It is also an express line that improves tourism transportation for Dapeng and Daya Bay. After completion, it will take just 40 minutes from Pingshan to Shenzhen Bao'an International Airport, which will strengthen the rapid connection between eastern, western and central Shenzhen. At the same time, the intercity railway will have important strategic significance for the connection of the Bay Area and the integration of the Shenzhen-Dongguan-Huizhou metropolitan area.

The Shenzhen-Daya Bay Intercity Lot 2 mainly includes the section from the No. 1 working shaft in the Baidu section to the Universiade Station. It is a twin-tube single-line tunnel. It uses two double-channel slurry/EPBMs, each excavating 5.2km. The TBMs start from the Universiade Station and pass through the Longgang Central City Water Plant, Jihe Expressway, Shuiguan Expressway, Longgang Public Golf Course, Hangzhou-Shenzhen Railway Tunnel, and reaches the No. 1 Working Shaft in the Baidu Intersection. The geological conditions are complex and changeable within a large-scale karst development with a rock surface line that fluctuates greatly. There is a large number of bead-shaped caves, making construction difficult and risky.

FUTURE TUNNELLING ACTIVITIES

There are 5,460 railway tunnels planned, with a total length of 13,313km, with 163 extra-long railway tunnels with a total length of 2,511km under construction. Among them, there are 24 extra-long railway tunnels each of more than 20km, with a total length of 643km.

The highway tunnels under construction and planned have a length of more than 100km. The Tianshan Shengli Tunnel (22.1km) is the world's longest highway tunnel, and the Guigala Tunnel of 12.94km is the world's longest highway tunnel under construction in a high-altitude area, with tunnel elevation of 4248m. The Chaohu Tunnel (16.2km) in the southern section of the G9912 Hefei Metropolitan Ring Line, is undergoing feasibility studies, and is the longest highway underwater shield tunnel in the world. The Ailao Mountain Tunnel (24.5km) in Yunnan is in planning, and is the second highway tunnel over 20km.

STATISTICS DATA

By the end of 2023, China's railway operating mileage reached 159,000km. 18,573 railway tunnels are in operation, with a total length of 23,508km. In 2023, 622 new railway tunnels will be opened for operation, with a total length of 1,292km, including 23 extra-long tunnels of more than 10km, with a total length of 320km.

In 2023, there will be 27,335 highway tunnels nationwide with a length of 29,460km, an increase of 1,740 tunnels with a length of 2,290km, including 1,927 extra-long tunnels with a total length of 8,750km, and 7,387 long tunnels with a total length of 12,900km.

As of December 31st, 2023, in 55 cities in 31 provinces (autonomous regions and municipalities), 306 urban rail transit lines have opened and are operational, with an operating mileage of 10,165.7km and 5,897 stations. Throughout 2023, 16 new urban rail transit operating lines have been added, with an additional operating mileage of 581.7km. Two new cities, Honghe and Xianyang, have urban rail transit for the first time.

EDUCATION ON TUNNELLING IN THE COUNTRY NATIONAL TUNNEL ENGINEERING EDUCATION

Serial No.	Province (city)	School
1	Anhui	Anhui University of Science and Technology
2	Anhui	Hefei University of Technology
3	Beijing	Beijing Jiaotong University
4	Beijing	Beijing industry university
5	Beijing	University of Science and Technology Beijing
6	Beijing	Tsinghua University
7	Beijing	China University of Mining and Technology (Beijing)
8	Beijing	China University of Geosciences (Beijing)
9	Beijing	China Academy of Railway Sciences Group Co., Ltd.
10	Beijing	Coal Science Research Institute
11	Chongqing	Chongqing University
12	Chongqing	Chongqing Jiaotong University
13	Gansu	Lanzhou Jiaotong University
14	Gansu	Lanzhou University of Technology
15	Guangdong	GuangZhou University
16	Hebei	Shijiazhuang Railway University
17	Henan	Zhengzhou University
18	Heilongjiang	Harbin Institute of Technology
19	Heilongjiang	Institute of Engineering Mechanics, China Earthquake Administration
20	Hubei	Chinese Academy of Sciences University
21	Hubei	Wuhan University
22	Hunan	Central south university
23	Hunan	Changsha University of Science and Technology
24	Jilin	Jilin University
25	Jiangsu	Southeast University
26	Jiangsu	He Hai University
27	Jiangsu	China University of Mining
28	Jiangsu	Nanjing University of Technology
29	Jiangsu	Army Engineering University
30	Liaoning	Dalian University of Technology
31	Liaoning	Shenyang Jianzhu University
32	Liaoning	Northeastern University
33	Liaoning	Liaoning University of Engineering and Technology
34	Shandong	Shan Dong University
35	Shandong	Shandong University of Science and Technology
36	Shaanxi	Changan University
37	Shaanxi	Xi'an University of Architecture and Technology
38	Shaanxi	Xi'an University of Science and Technology
39	Shaanxi	Xi'an University of Technology
40	Shanxi	Taiyuan University of Technology
41	Shanghai	Tongji University
42	Sichuan	Southwest Jiaotong University
43	Sichuan	Chengdu University of Technology
44	Sichuan	Sichuan University
45	Tianjin	Tianjin University
46	Zhejiang	Zhejiang University