

RAILWAY TUNNELLING

Underground Solutions Provider

CREG TBM

Make Tunnelling Safer,
Better and Faster

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Underground Solutions Provider

By constructing tunnels, railways can directly pass through mountains, shortening the railway mileage. This enables trains to operate with more reasonable gradients and curve radius, greatly improving transportation efficiency and minimizing the damage to surface vegetation and the ecological environment. Moreover, it can strengthen the transportation connections between regions and promote resource development and economic exchanges.

As an equipment manufacturer that best understands construction and a comprehensive service provider that is most proficient in manufacturing, CREG adheres to a customer-centered concept and is committed to providing customers with all-round comprehensive solutions. With the help of tunnel boring machines of different diameters, CREG can make tunnel construction under various geological conditions safer, better and faster.

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CREG has delivered 26 TBMs to facilitate railway construction in Italy. This is twin EPB TBMs at job site for Napoli-Bari Railway Project.

Cover photo:
Tunnel and bridge construction technology helps railway to extend to mountainous areas more easily.

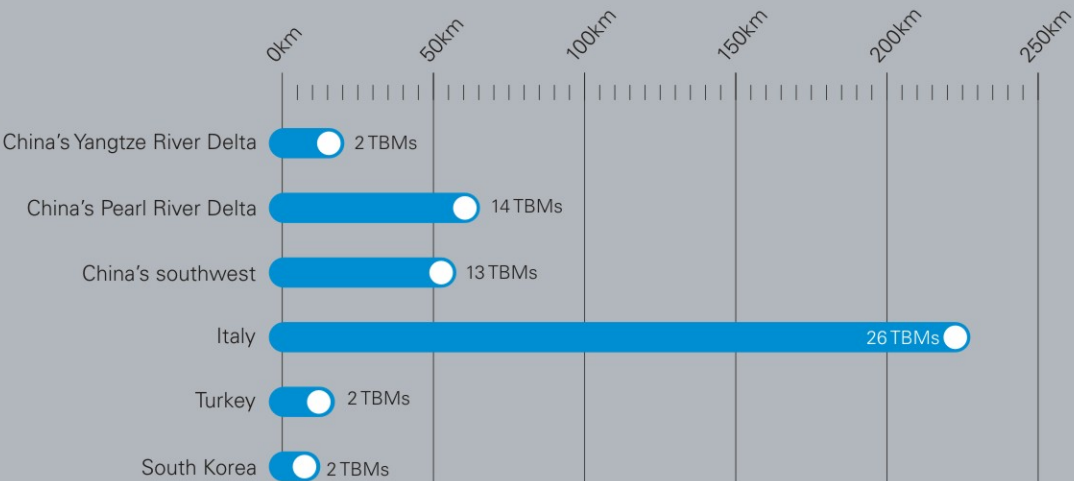
Construction of over

465

kilometers long railway tunnels
around the world using more than

87 types of CREG TBMs with
diameter ranging from

7.08 to 15.34
meters.



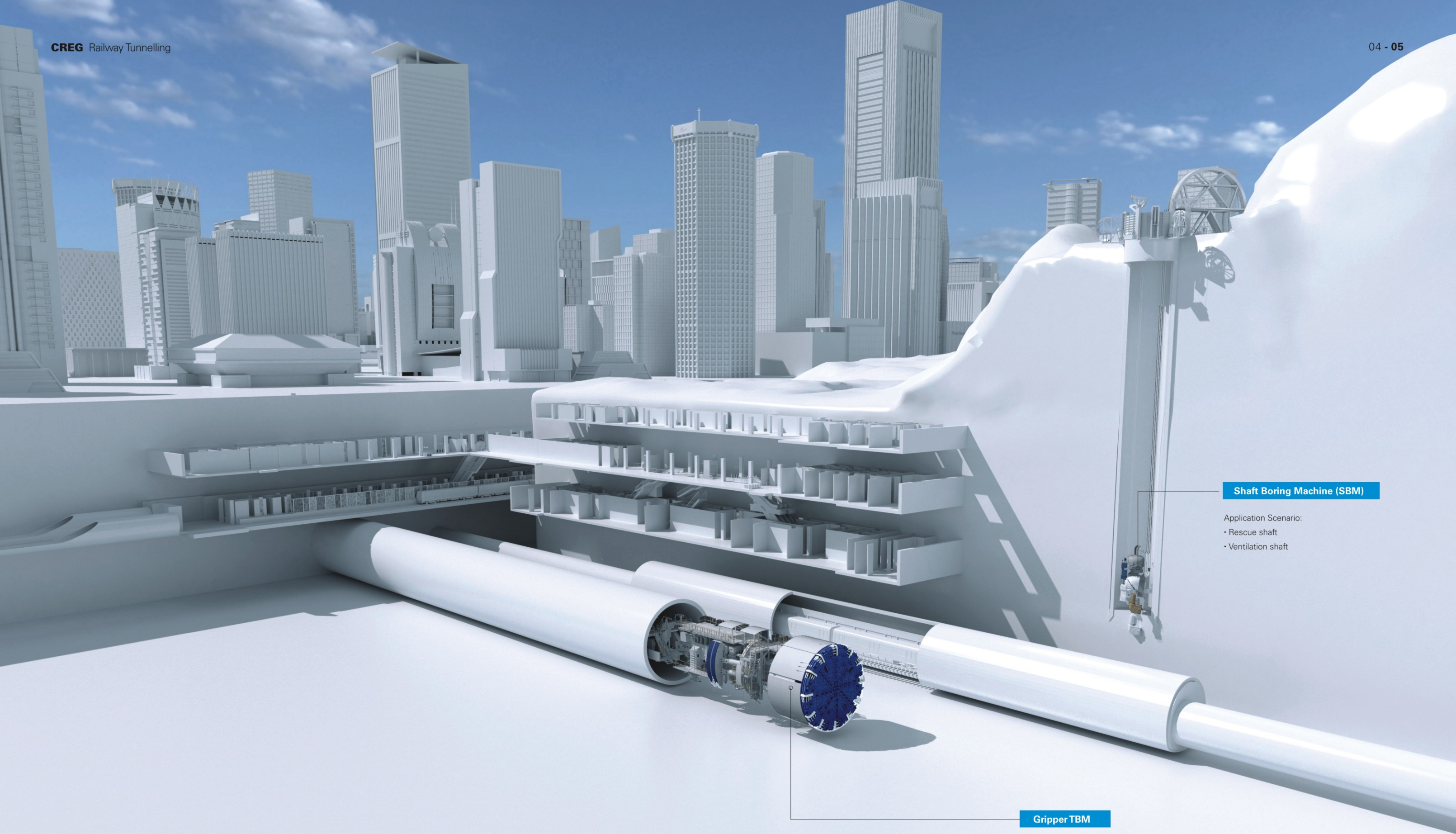
Railway Tunnel Construction

Leading technology and expertise worldwide guarantee safety and efficiency of tunnel construction

Various types of CREG TBM facilitate the construction of railway tunnel. In these projects, more than 465 kilometers of railway tunnel around the world have been constructed using the innovative tunnel boring technology of CREG. Based on solid professional knowledge and rich experience, CREG works closely with customers to develop tailor-made technical solutions to overcome all challenges and build robust tunnel structures while maximizing the safety of personnel and the environment as well as controlling budgets and schedules.

As the world's largest supplier of tunnel boring machines, CREG provides customers with products and services of the highest standards of technology and quality, combined with fast and comprehensive service. CREG pays special attention to teamwork and works hand in hand with all parties involved throughout the project.

CREG has completed more than 1,200 projects around the world in the fields of metro, road, railway, utility, hydropower and mines. CREG's tunnel boring technology is adaptable to all types of tunnels, pipelines and shafts in all geological conditions, with diameters ranging from 1 meter to 16 meters. Advanced technologies from CREG are used to build new infrastructure and help improve people's lives.



Shaft Boring Machine (SBM)

- Application Scenario:
- Rescue shaft
 - Ventilation shaft

Gripper TBM

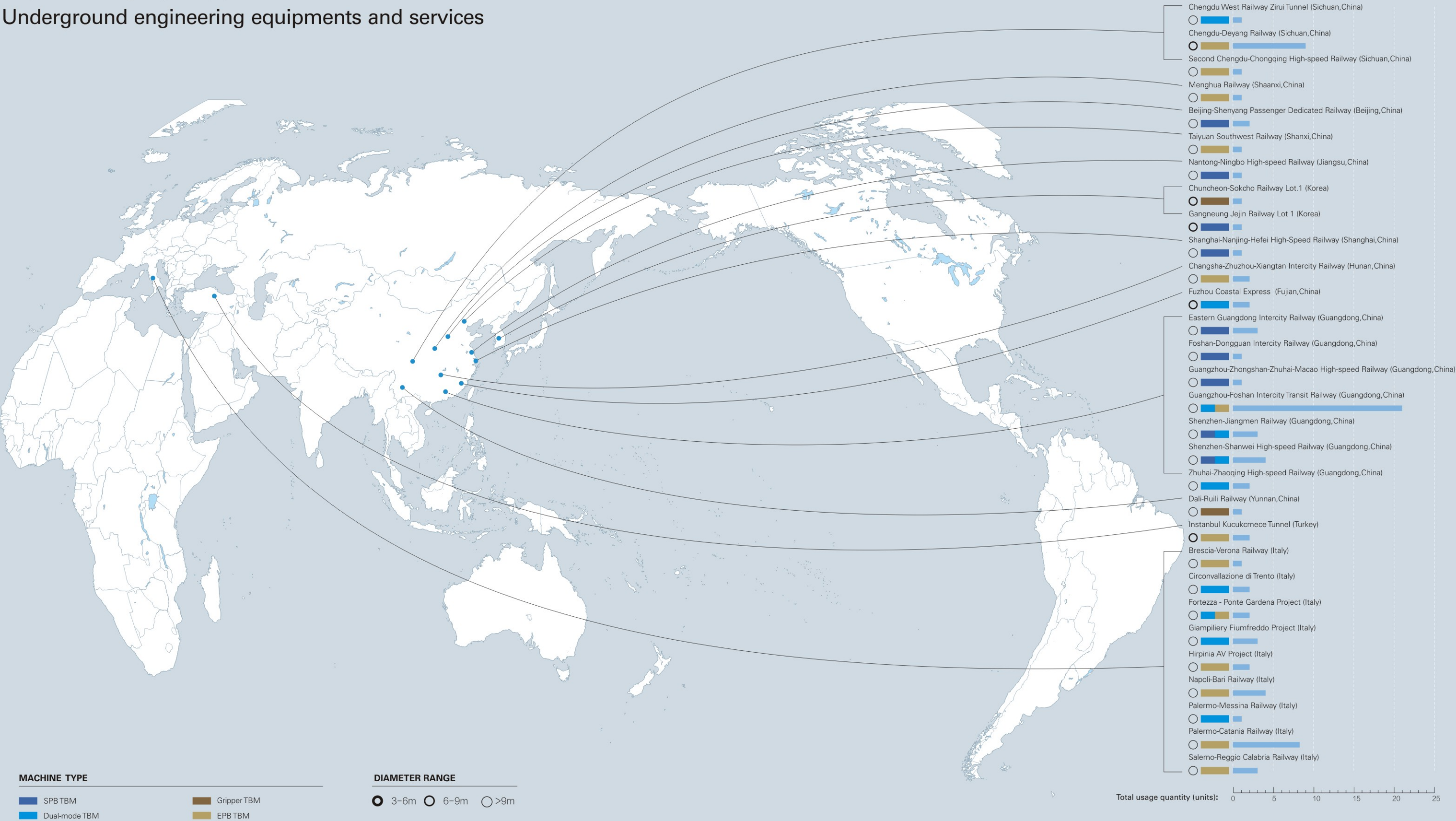
- Application Scenario:
- Railway tunnel

RAILWAY TUNNELLING

Underground Solutions Provider

GLOBAL VISION

To provide high-quality products for the world
Underground engineering equipments and services



Brescia-Verona Railway Lonato Tunnel in Italy

Contribute to the construction of the Mediterranean corridor in Europe

Lonato tunnel belongs to Milan - Verona high-speed railway line, which is a large-scale strategic infrastructure project of Italy. It is part of the European Core Corridor (Mediterranean Corridor), connecting the western and

eastern parts of Europe through Spain, France, Italy, Slovenia and Hungary. The TBM Martina (CREC-699) supplied by CREG is the first Chinese TBM exported to European Union.

Project Information

- > Tunnelling length: 2 ×4,782 m
- > Geology: Slump, glacial deposits, silty sand and pebbles
- > Contractor: Cepav Due

Project Characteristics

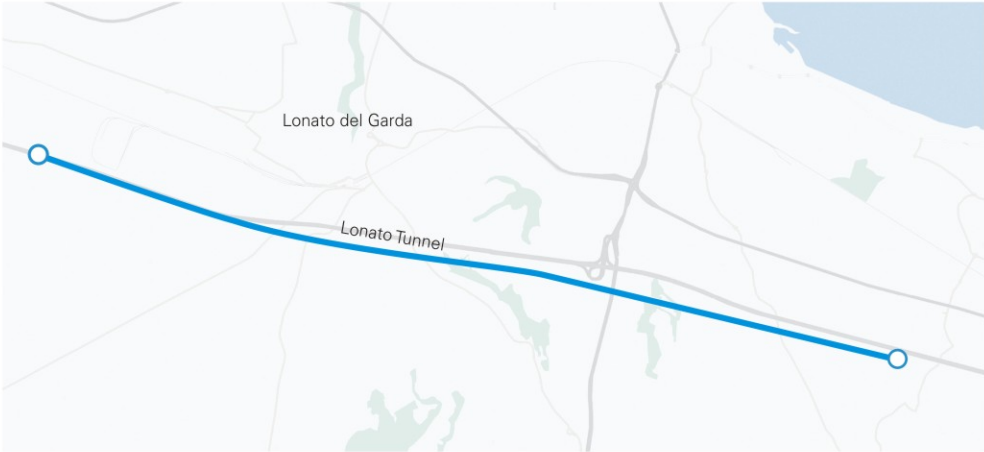
- > Existence of boulders over 1m.
- > Water pressure of 6 bar.
- > Double screw conveyor.

Project Background

The tunnel travels through glacial and fluvial sediments, as well as a hydro-geological structure composed of multiple deep and shallow aquifers. In addition, the tunnel needs to pass under the A4 Milan-Venice expressway and other important buildings and ground structures at a shallow burial depth, which is a huge challenge for the design and construction team.

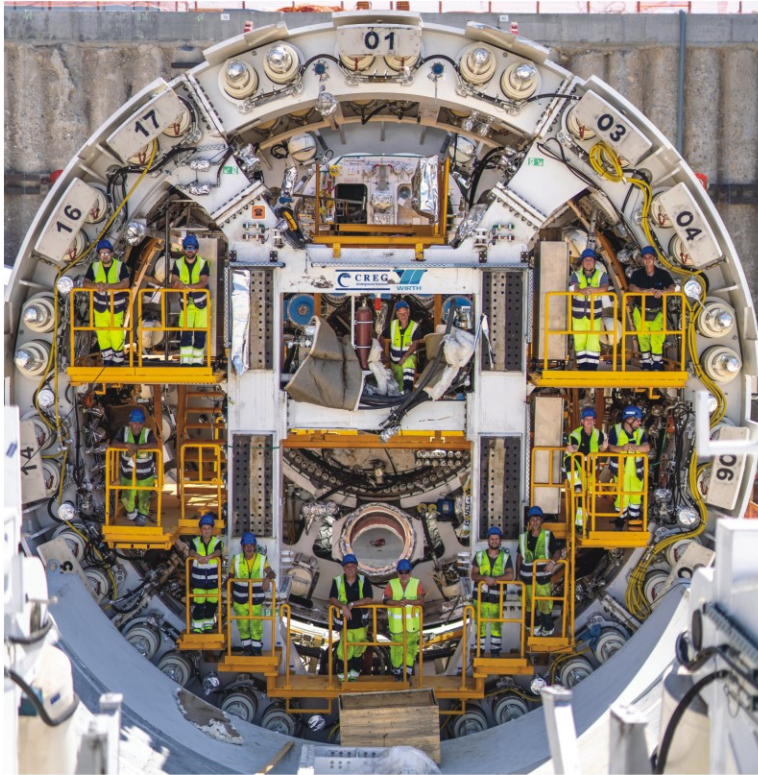
TBM Parameter

- > TBM type: EPB TBM
- > TBM S/N: CREC 699
- > Boring Dia.: 10.03 m
- > Main drive power: 3,850 kW
- > FAT date: November, 2019
- > Best performance: 38 m per day, 704 m per month



Brescia-Verona Railway
Lonato Tunnel in Italy Route

Main machine assembly is in progress.



CREG service team are working on cutterhead assembly at job site.



Giampilieri Fiumfreddo Project in Italy

Green TBMs lead technological revolution of the industry

Giampilieri Fiumfreddo Section is part of the Messina Catania High-speed Railway Line. This project features the first application of the green concept in TBM industry, where the green concept is embodied through intelligent control and low-carbon environmental protection.

Project Information

- > Tunnelling length: 18,219 m + 13,338 m+ 10,742 m
- > Geology: Phyllite, sandstone, metamorphic clastic rock, limestone
- > Contractor: Webuild

TBM Parameter

- > TBM type: Dual-mode TBM
- > TBM S/N: CREG 1193/1194/1237
- > Boring Dia.: 9.16 m
- > Main drive power: 3,850 kW
- > FAT date: August, 2023

Project Characteristics

- > Application of green TBM concept.
- > Continuous mining technology.
- > Rapid mode changing technology.

Project Background

The Messina-Catania Railway Line is part of the initiative to develop sustainable transportation promoted by the European Union to create theTEN-T European Corridor system, which will connect and improve transportation in Europe.



Giampilieri Fiumfreddo Project in Italy Route



The green TBM starts the 10-km long travel through mountains.

Green TBM features higher automation and intelligence.



Palermo-Messina Railway Cefalù Tunnel in Italy

Dual-mode TBM explores the Sicily Island

Located in Sicily, Italy, the Palermo-Messina Railway Cefalù Tunnel Project is designed as a single line with two bores. The geology consists of sandy gravel, clay limestones and rock fracture zone, etc. It will also pass through many historical and cultural monuments. All these impose

extremely high requirements on the overall performance of TBM. This TBM is the first large-diameter dual-mode TBM exported from China, and it is also the first time that China's dual-mode TBM has been used in an overseas railway tunnel projects.

Project Information

- > Tunnel length: 2× 6,700 m
- > Geology: Clay, clay limestone, sandstone
- > Contractor: TOTO Costruzioni Generali

Project Characteristics

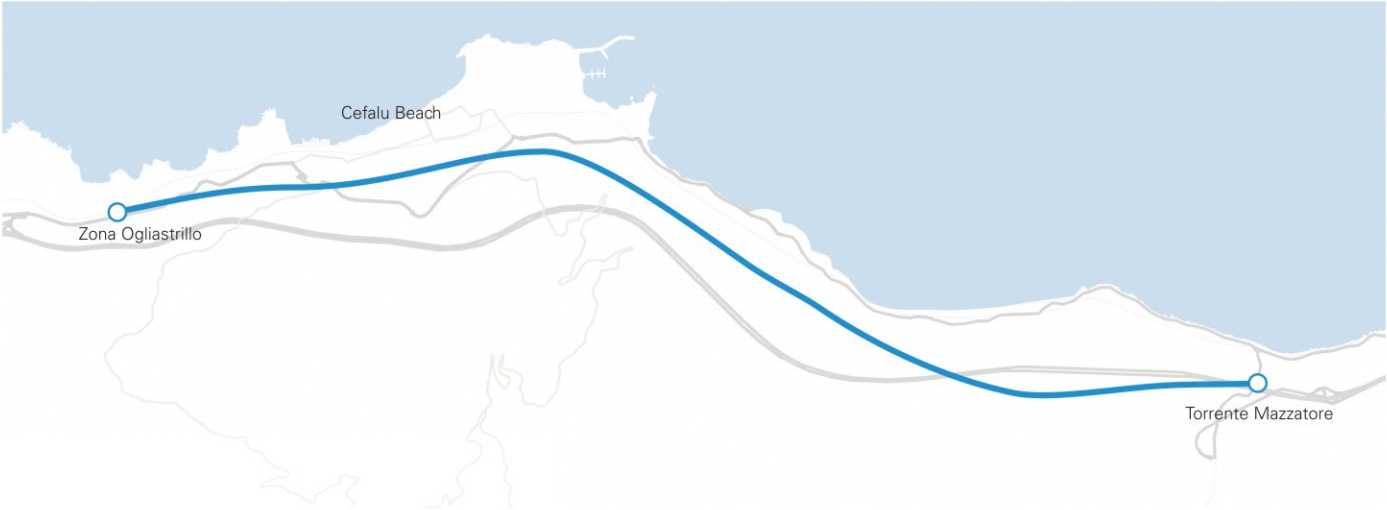
- > Existence of fracture zone along tunnel alignment.
- > Tunnelling beneath historical and cultural monuments.

TBM Parameter

- > TBM type: Dual-mode TBM
- > TBM S/N: CREC 749
- > Boring Dia.: 9.98 m
- > Main drive power: 3850 kW
- > FAT date: February, 2021
- > Best performance: 411.4 m per month

Project Background

The 6,700 metre Cefalù tunnel is the longest of the three tunnels planned to double the Cefalù/Ogliastrello-Castelbuono railway line on the Palermo-Messina line. The new double-track line is almost entirely underground and has a total length of 13.4 kilometres. Once completed, it will provide a faster and more efficient connection between Cefalù and Punta Raisi Airport.



Palermo-Messina Railway Cefalù Tunnel in Italy Route



CREC after-sales specialist works closely with the client.



CREC representatives at the TBM launching ceremony.

Guifengshan Tunnel of Zhuhai–Zhaoqing High-speed Railway

Enabling Rapid Connectivity: Pearl River East–West & Southwest Regions

Within the project scope, 18 new tunnels are planned, with a total length of 28.09 km, accounting for 28.18% of the line. The Guifengshan Tunnel is the longest tunnel along the line. It starts in Xinhui District, Jiangmen City, Guangdong Province, passes beneath Guifeng Mountain, crosses Pengjiang District of Jiangmen City, and finally breaks through after passing under Longzhou Mountain, with a total length of 15.147km. It is a single-tube tunnel

for bidirectional traffic. CREG provides two super-large-diameter (φ14.29 m) multi-mode TBMs (slurry/single shield modes, EPB/single shield modes) for the construction of the tunnel section through the urban area. The two TBMs launched from opposite ends and disassembled within the tunnel upon completion.

Project Information

- › Tunnelling length: 4,780 m
- › Geology: Granite, schist, slate, limestone, sandstone
- › Contractor: China Tunnel Construction Co.,Ltd. Guangdong

TBM Parameter

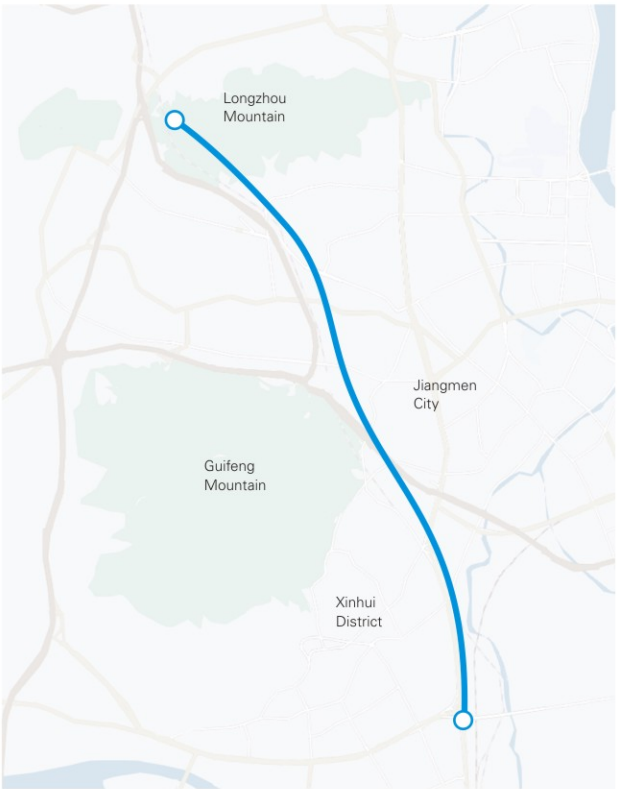
- › TBM type: Multi-mode TBM (slurry/single shield modes)
- › TBM S/N: CREC 1192
- › Boring Dia.: 14.29 m
- › Main drive power: 70,000 kW
- › FAT date: August, 2023
- › Best performance: 20 m per day, 306 m per month

Project Background

The project spans approximately 184.5km, connecting Zhuhai, Jiangmen, Foshan and Zhaoqing. The main line will link to the planned Pearl River Delta Hub Airport, enabling rapid connections between the eastern and western banks of the Pearl River and the southwestern regions. Upon completion, travel time from Zhuhai to Zhaoqing East will be as short as 36 minutes, and major cities across the Pearl River Delta along the route will all be reachable within one hour.

Project Characteristics

- › Complex geological conditions (uneven ground, fracture and fissure development and structural influence zones)
- › Continuous downhill slope with long distance, full face, hard-rock and water-bearing strata



Guifengshan Tunnel Route



On-site assembly of the TBM

Chongtai (Chongming-Taicang) Yangtze River Tunnel of Shanghai-Chongqing-Chengdu High-speed Railway

11.325km-Long Single-heading Excavation

The total length of the Chongtai Yangtze River Tunnel is 13,201m. It mainly passes through silt, silty clay, muddy soil and sand layers. The horizontal alignment includes three curve sections, and the vertical alignment includes five curve sections, with radii of 4,000m, 8,000m and 10,000m. A “V-shaped” longitudinal profile is adopted,

with a maximum gradient of 25%. At its lowest point, the tunnel overburden is approximately 74.5m. The max. water and earth pressure reaches 9.6 bar. This TBM is recognized within the industry as a “four-super TBM” and achieves an intelligent tunnelling mode of “manned supervision with unmanned operation.”

Project Information

- › Tunnelling length: 13,200 m
- › Geology: Silty clay, fine sand, coarse sand, medium sand and low-gas strata
- › Contractor: China Railway Tunnel Group Co., Ltd.

Project Characteristics

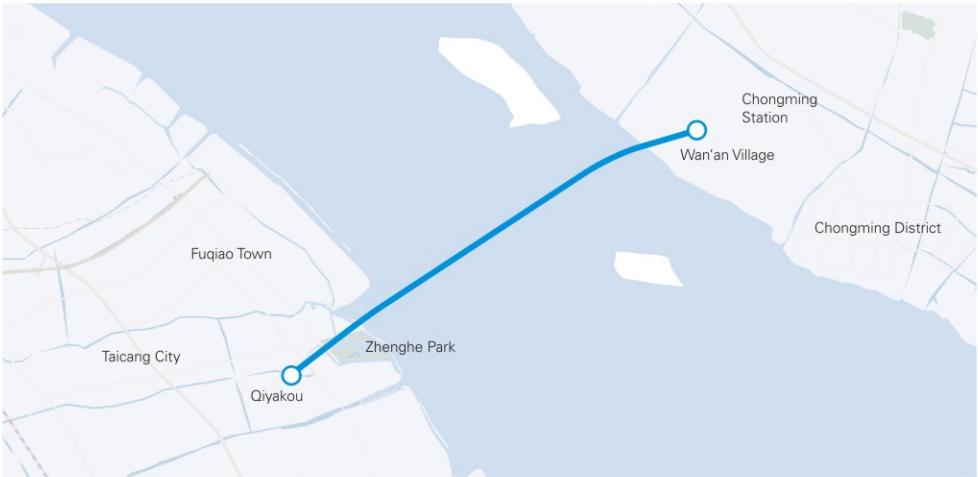
- › High water pressure sealing and muck discharge with the slurry circulation system
- › Challenges in the reliability of super-long-distance construction equipment
- › Construction in low-gas strata

Project Background

The commencement of construction on the Shanghai–Nanjing section is of great significance for supporting the national strategy of the Yangtze River Economic Belt, optimizing the spatial layout of the Yangtze River Delta, and accelerating the integration of Shanghai, Jiangsu and Anhui.

TBM Parameter

- › TBM type: Mega Sized Slurry TBM
- › TBM S/N: CREC 1398
- › Boring Dia.: 15.4 m
- › Main drive power: 4900kW
- › FAT date: January, 2024
- › Best performance: 30 m per day, 718 m per month



Chongtai Yangtze River Tunnel Route



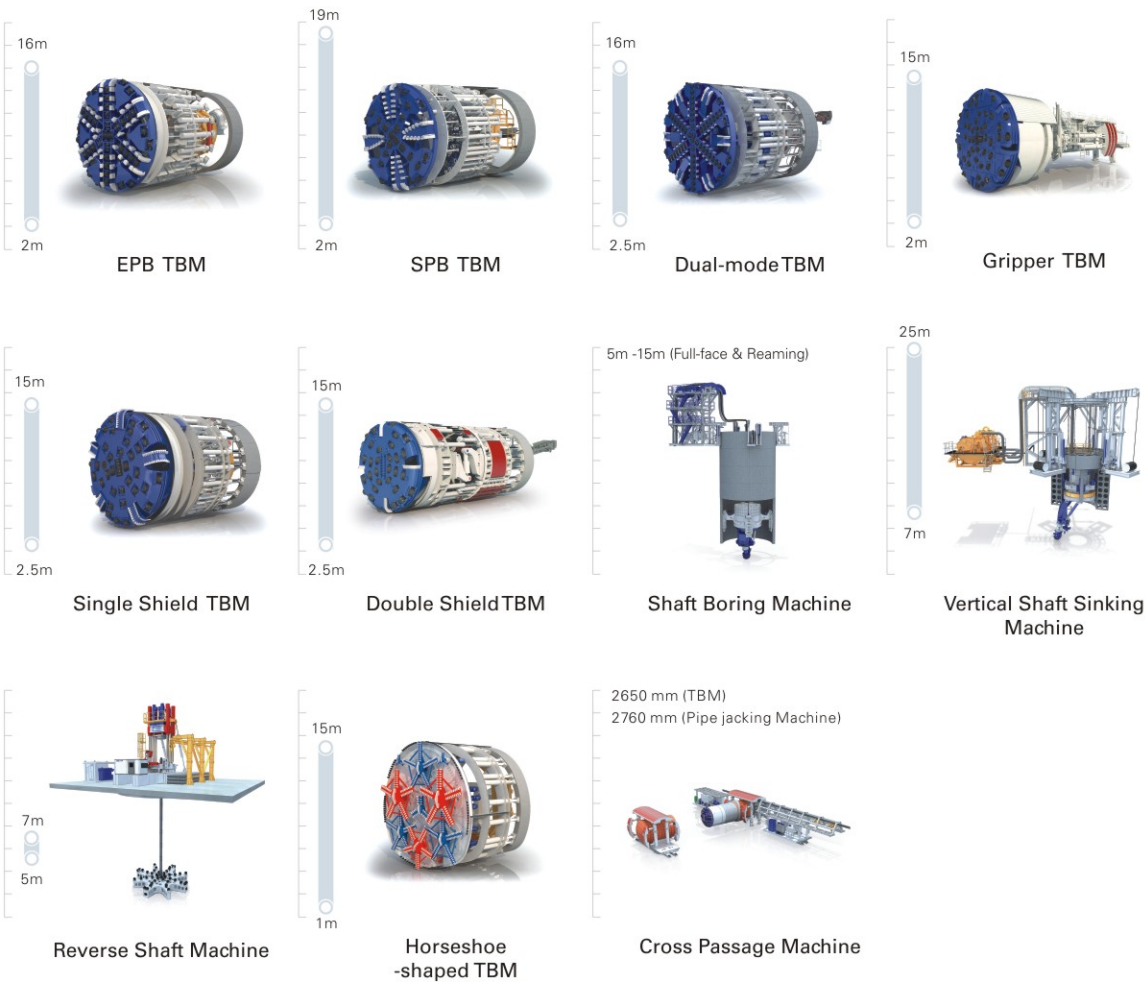
TBM Factory Acceptance Test

Product portfolio for Railway Tunnelling

Tunneling technology suitable for various geological conditions and diameters

CREG is the only underground solutions provider that offers a comprehensive range of tunneling technologies suitable for various diameters and geological conditions. Furthermore, each CREG TBM or machine is specifically customised according to the geological, hydrological and other parameters of the project. Consequently, our products are recognized for their durability, reliability and performance. We are dedicated to providing exceptional customer service, and we constantly strive to exceed customer expectations.

Product Portfolio



CREC-978 achieved breakthrough on the Hirpinia AV project in Italy.

For more information of CREG, please refer to contacts at back cover.



CREG headquarters

CREG

Underground Solutions Provider

China Railway Engineering Equipment Group Co., Ltd. (referred to as "CREG") is a worldwide underground solutions provider for a full spectrum of mechanized tunnelling technology and services. The company's headquarters is located in Zhengzhou, the capital city of Henan province. We draw together more than 4,500 employees including over 700 designers to design and manufacture TBMs and associated equipment. As the largest TBM supplier in the world, CREG boasts outstanding

productivity, performance, safety and geological adaptability, impressive R&D competence, a number of invention patents, as well as excellent after-sales service and support.

CREG has 16 production bases with an annual production of more than 300 TBMs. We have supplied TBMs ranging from ϕ 2m to ϕ 18m used in all kinds of ground conditions, including hard rock, soft soil and complex geology. Our

products consist of Single/Double Shield Open-type TBM, Gripper TBM, Earth Pressure Balance TBM, Rectangular TBM, Slurry TBM, Horseshoe-shaped EPB TBM, U-shaped Open-type TBM, Pipe Jacking Machine, Shaft Boring Machine, Reamer TBM and Inclined Shaft TBM. CREG is committed to every client as an efficient and reliable partner in the tunnel construction field. Until now, CREG has exported more than 140 TBMs to 34 countries and regions including Doha, Singapore, France, Italy, Australia, Lebanon, Poland, Denmark, South Korea and Austria etc.

With our extensive research and practical experience, CREG offers a series of auxiliary mechanized tunnelling equipment and service packages. In addition to various types of TBMs, CREG also designs and manufactures Shaft Boring Machines, Cutters, Rolling Stock, Roadheaders, Three-boom Drill Jumbos, and Wet Shotcrete Machines etc. We provide a full range of tunnelling equipment and all-around solutions.

Overseas Business and R&D institutions

- CREG TBM Germany GmbH
- China Railway Engineering Equipment Group Co., Ltd. Singapore Branch
- CREG Co., Ltd. South Korea Branch
- CREG Co., Ltd. Italy Branch
- カレグ・テクノロジー日本株式会社

Full Range Services

CREG also provides high value-added customized services, including design, consultancy, tunnelling service, maintenance, remanufacturing, mechanical & electrical installation, technical service, spare parts, etc. CREG establishes remote support system for delivered TBMs to facilitate CREG rendering quick troubleshooting and real-time monitoring during tunnelling.



TBM assembly in progress for the Napoli-Bari Project in Italy.



Trend

Infrastructure investment at current trends and need



Sources: Global Infrastructure Hub (2021),The Future of Rail 2019

The ϕ 14.29 m dual mode TBM has completed half of the 4.78 km long Guifeng Mountain tunnel of Zhuhai-Zhaoqing High-speed Railway, achieving a best monthly advance rate of 306 meters.

