

WUHAN TO GUANGZHOU THE WORLD'S FASTEST RAIL LINK

English



Project Report

MODERN RAILWAY INFRASTRUCTURE FOR CHINA'S WUHAN – GUANGZHOU LINE

The world's fastest rail link

Since December 2009, China's first large-scale high-speed line has connected the cities of Wuhan in Hubei province and Guangzhou in Canton province – both of which have populations of over a million people. With a total length of 968 km, this modern line is the heart of the new high-speed Beijing–Shenzen (Hong Kong) section, one of the country's four north-south corridors. With a maximum speed of around 320 km/h it was the world's fastest rail connection at that time, reducing the journey time from the previous ten hours to a mere three before speeds were reduced nationally in 2011.

High-speed programme for Chinese Railways

The line is part of the Chinese government's high-speed programme. This ambitious 2004 development plan for its rail network involves constructing around 18 000 km of railway line by 2020. 5 000 km of this total is already under construction, and will be commissioned within the next few years.

Innovative technology for complex construction work

Construction of the new fast line started in December 2005 – partly under difficult geological and geo-technical conditions.

A total of 231 tunnels with a total length of 165 km, about 472 km of bridges and elevated tracks, and 18 new stations were constructed. The superstructure of the section was conceived as a fixed track based on the Rheda 2000® system – the state-of-the-art technology for high loads at extreme speeds.



Responsibility for the overhead contact line system

In Summer 2007 the Chinese Ministry of Railways commissioned Rail Power Systems Germany as the foreign partner for the overhead contact line. Rail Power Systems's experienced railway infrastructure experts developed the basic design, supplied 80% of the catenary components and managed the execution planning with the Chinese design institutes. Rail Power Systems trained the Chinese construction units, and with up to 20 employees on site they were responsible for the installation and inspection of the overhead contact line. The company simultaneously initiated local production of overhead contact line components through a Chinese Joint Venture. Rail Power Systems's contractual partners were the general contractor China CREC Railway Electrification Bureau (Group) Co. Ltd., China's biggest electrification company, and the owner of the line, Wuhan Guangzhou Railway Passenger Transportation Co. Ltd.

Project details

- Responsibility for the line's overhead contact line system
- Development of basic design, design speed: 350 km/h
- Supervision of execution planning with the Chinese design institutes
- Provision of 80% of the catenary components (aluminium booms, tensioning equipment, clips, suspenders etc.)
- Establishing the Joint Venture in Baoji (ensuring supply of 20% localised materials)
- Training of construction teams for installation
- Supervision of assembly using Rail Power Systems supervisors
- Inspection of the overhead contact line, including assessment of test runs
- Training of local maintenance crews

Innovative technology for high-performance usage

The new overhead contact line system developed by Rail Power Systems raises the international standard for high-speed overhead contact line systems. It is the first time that the system has ever been used in this form. Development of the overhead contact line system was based on the experiences of railway-infrastructure specialists gained during the construction of the overhead contact line systems Re330 (Nuremberg–Ingolstadt line) and EAC350 (Madrid–Lérida line). A special challenge was posed by the enormous tension forces at play in the contact wire and supporting cable (30 kN/21 kN), necessitating the use of high-strength contact wires (\varnothing 150 mm²), and the short distances between pole and track (distance center of track to pole front edge: 3 m).

The preference: an experienced railway infrastructure partner

A demanding schedule was set for this ambitious high-speed project, which involved extensive development work and the use of a completely new overhead contact line system. The Chinese clients were relying on Rail Power Systems's sound experience and its great expertise in the field of railway infrastructure. For example, the company used its own simulation programs for the testing and optimisation of the dynamic properties of the overhead-cable concept at high speed. Top priority was given to Rail Power Systems's high quality and safety standards and, based on the company's assessments, the high forces in the overhead contact line called for modifications and intensive testing of all components.

Technical ratings for the overhead contact line

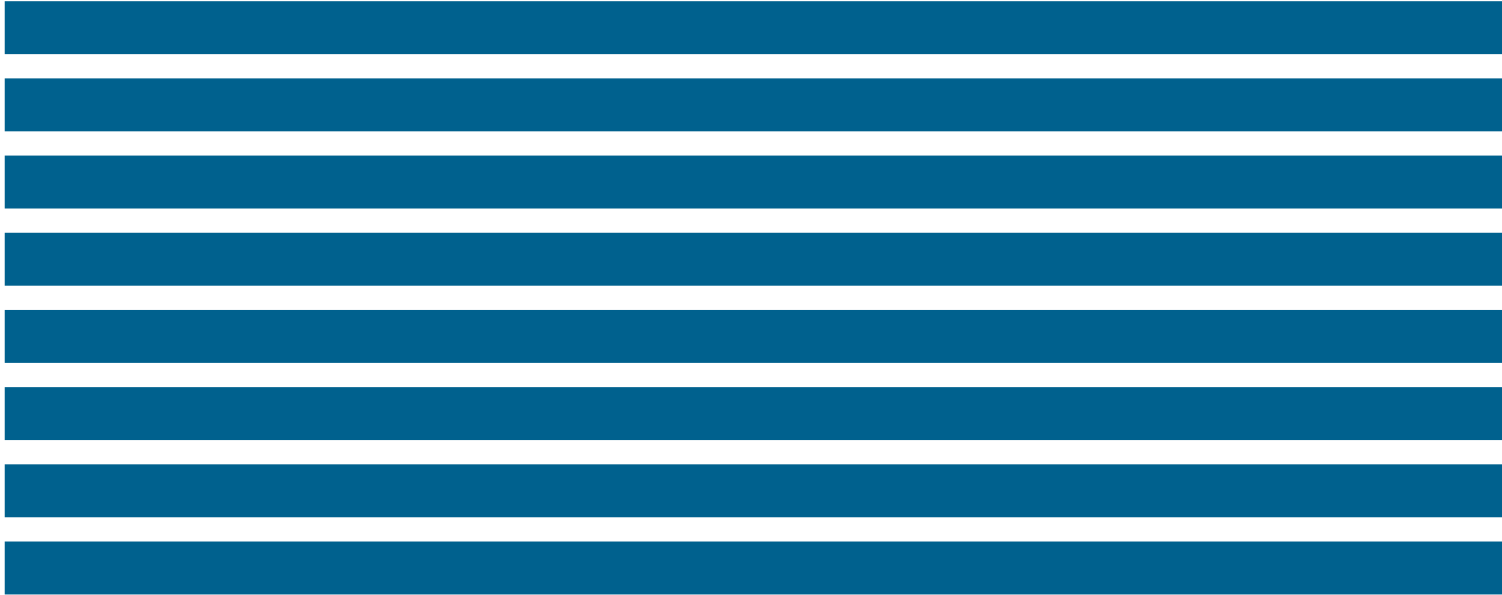
- Nominal voltage/traction-current system:
2 x 25 kV/AC/50 Hz
- Design speed: 350 km/h
- Simple catenary system with Y-shaped stitch wire
- Use of 150 mm² magnesium alloy contact wires with a tension force of 30 kN, use of bronze supporting cable with a tension force of 21 kN
- 5-field overlap areas
- 4-field overlap areas near phase separation points (in accordance with Chinese design)
- Aluminium technology for cantilevers
- Maximum tension lengths: 1 200 m
- Distance between poles: approx. 50 m
- Tangential wiring at turnouts (in accordance with Chinese design)

The measurement equipment for the test trips using the specially equipped CRH2-061 trainset was also supplied by Rail Power Systems, and was based on Deutsche Bahn's technology, guaranteeing tried-and-tested German standards for the quality of the overhead contact line. Rail Power Systems also applied its own risk management principles, ensuring the safety of all involved in the project through the use of its ZERO HARM programme. This was no small task, as around 4 500 Chinese employees were deployed on the line in addition to the Rail Power Systems assembly supervisors.

Project success: commissioning ahead of schedule and satisfied clients

Rail Power Systems, for over 20 years a valued partner of Chinese Railways, has proved its worth in over 15 major projects involving a total track length of around 7 000 km. The Wuhan–Guangzhou rail project was also completed to the client's total satisfaction. The railway infrastructure professionals are proud to have set new standards with their realisation of the world's fastest railway line. In addition, the project was completed one month ahead of schedule.





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