

Project report GRP 1000

# Slab Track „Made in China“ Olympic High Speed Line Beijing - Tianjin





## “Ready for the Olympics” – Timely completion of track section thanks to innovative GRP track surveying technology

Due to great economic growth and social development, the People's Republic of China is rapidly expanding its railway network. The great speed of growth demands quick expansion: The long-term plan of the MOR (Ministry of Railways) is to expand the network from currently 75,000 to 100,000 km by the year 2020. In order to increase capacity, both passenger and freight lines are being implemented, with freight and passenger transports separated. The plan is for around 50% of the total network to be double-tracked and electrified and for the network to conform to modern standards in terms of quality and comfort.

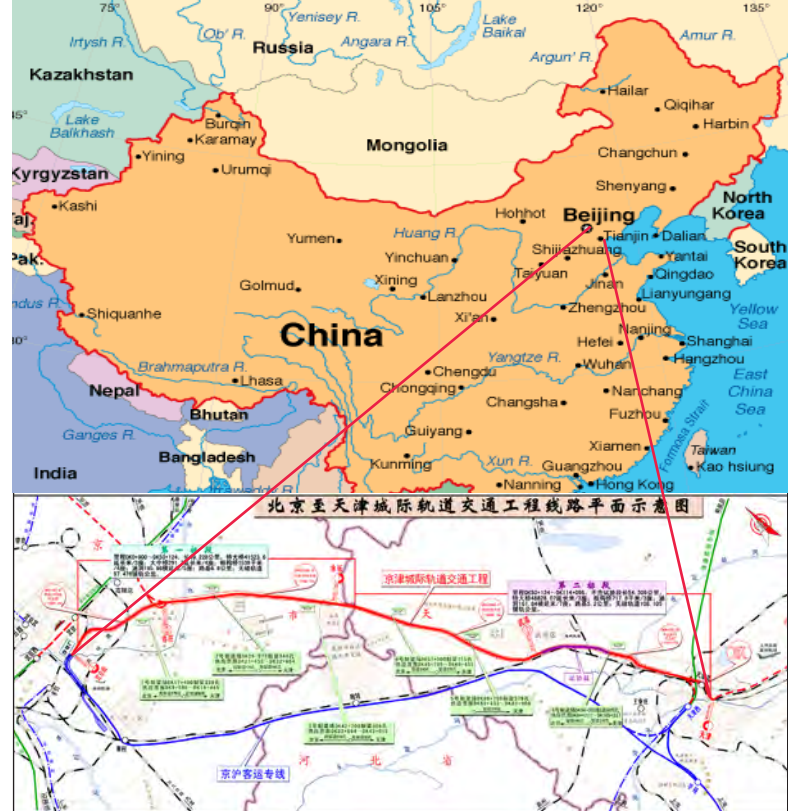
The construction plan also features high-speed lines – including the 114km section between Beijing and Tianjin linking a venue of the Olympic sailing competition with the Olympic metropolis Beijing. After some three and half years of construction and a test phase in July 2008, this section will go into operation on schedule.

The section is a Slab Track system and is for the most part supported on bridges due to the poor ground. This new high-speed line is the first in China to allow travel speeds of up to 350 kilometres an hour and train services with a frequency of three minutes. Travel time on the section, that comprises three stops, is approx. 30 minutes. Building costs of the new section will be US\$1.73 billion.

For the first time, Chinese building contractors have used modern Swiss surveying technology for track building. The surveying task involved high-precision positioning of 24 high-speed turnouts and complete geometric acceptance surveys of the high-speed section between Beijing and Tianjin.



Precise and fast turnout positioning with the aid of the precise and robust measuring system GRP 1000.



Thanks to the new high-speed line, the travel time from Beijing to Tianjin is only 30 minutes.

The following requirements had to be met:

- highest level of track position quality track position accurate to the millimetre for perfect driving dynamics for safe and comfortable operation
- high-performance surveying with maximum accuracy for fast construction
- comprehensive documentation and compliance check of relevant track geometry parameters

In terms of surveying, the quality of the tracks and turnouts hinges considerably on the accuracy of the measuring system and its correct operation. Other key factors include monitoring a wide range of tasks in the building process – e.g. acceptance inspection of delivered points and geometrical positioning in the track ahead of expert track slab concreting.

Other challenges for successful execution are expertise in surveying processes in the course of construction, language barriers, and cultural characteristics.

The technology manufacturer's tasks – in addition to simply providing the track measuring system – include:

- direct support on site
- customer training for use of the measuring system in the demanding Slab Track construction setting.



## Solution

As many as eight GRP 1000 Slab Track measuring systems were used on the section between Beijing and Tianjin. The system consists of a track surveying trolley, prism column, special GRP Slab Track software module and external, radio-controlled precision tachymeter. The GRP 1000 allows precise track measurement during automated measuring processes. The system delivers 3D track coordinates in real time, performs gauge and cant measurements, and displays the current track deviation relative to the design position. The GRP 1000 system accomplishes fast track positioning accurate to the millimetre before concreting work or track geometry acceptance measurement, with an output of up to 700m an hour. The Amberg GRP 1000 also offers extensive options for final track documentation.

Timely completion of construction work in the run-up to the Olympic Games is remarkable proof of the power and reliability of the GRP 1000 system, particularly in view of the special demands of a major Chinese building site.



New high-speed line section Beijing-Tianjin, China, ready for the Olympic Games in August 2008.

## Advantages

The GRP 1000 allows fast, efficient track surveying. Thanks to a well-thought out operating concept that caters for the special requirements during construction, tracks can be built with millimetre accuracy and comprehensively documented for quality assurance purposes. The real-time results returned by the GRP 1000 contribute significantly to fast execution of construction work. Precise measuring with GRP 1000 provides a basis for immediate release of subsequent processes (e.g. track slab concreting work). This helps prevent incorrect positioning of points. (It is not possible to correct the position of points once they have been concreted without expensive and time-consuming dismantling.) Final track acceptance using the GRP software serves the purpose of quality control and as the building contractor's documentation for the client. The results of the analyses with the special Slab Track software with regard to deviations of position and relevant track geometry criteria are an important addition to acceptance of dynamic behaviour using track surveying vehicles.



Positioning completed and ready for concreting. Installation of BWG high-speed turnouts with lead curve radii of up to 10'000 metres.



Automatic correction data in real time - low error rate, high performance and excellent track quality.

# GRP System FX

## The «all in one» railway surveying solution

### GRP System FX

The concept of the modular GRP System FX enables the GRP 1000 to be used as the basis for system expansions.

### Upgrade options

Modular extensions upgrade the GRP 1000 to:



#### GRP 5000 –

The mobile scanner solution for infrastructure analyses

#### GRP 3000 –

The versatile system for railway surveying

### Efficiency due to modularity

The modular design of the GRP 1000 from Amberg Technologies enables the system to be easily transported direct to the work site. Speed of deployment and the flexible measuring technique enable measurements to be efficiently integrated into railway network operations. There is no requirement for costly support infrastructure.

Further information about the GRP System FX from Amberg Technologies are available from your local distributor or by e-mail: [rail@amberg.ch](mailto:rail@amberg.ch)

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