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Line 4 links Shenzhen's central business district to the Hong Kong Special Administrative Region via Huanggang, a border checkpoint to the south. It will also link north to an interchange with a new high-speed train station, Lunghua.

The schedule so far…

December 2004
Line 1 (linking Lo Wu on the Hong Kong border with the Window on the World theme park) and four Line 4 stations open for business.

July 2005
Line 4 contracts awarded to Arup.

Feb 2006
Completed specifications and design delivered to MTR.

End 2009
Line 4 extensions open for business.

The birth of a boomtown

From fishing village to commercial hub, Shenzhen has been the focus of massive infrastructure development for 20 years. A six-line underground system is set to complete the picture in 2012.

Words: Tim Edwards

Shenzhen Line 4
Shenzhen, China

Back in the 1970s, the residents of economic powerhouse Hong Kong could have been forgiven for being unaware of Shenzhen, a Chinese fishing village 35km north of Hong Kong. But in 1980 all that was set to change, as the late Chinese leader, Deng Xiaoping, designated Shenzhen one of four Special Economic Zones (SEZs).

Shenzhen is one of two SEZs located in the Pearl River Delta. This location gave the city an advantage in developing private enterprise, manufacturing capabilities and foreign trade. Additionally, Shenzhen has been quick to make the most of its proximity to Hong Kong, becoming the manufacturing powerhouse of China. While Shenzhen offers a competitive market for companies to source or manufacture goods, Hong Kong, the source of approximately 70% of cumulative foreign direct investment in the region since 1979, provides logistic, financial, legal, design and marketing services that allow companies to export their products to rest of the world.

Today, the city of Shenzhen has a population of 10M and is home to mainland China's second stock exchange (the other is in Shanghai). In 2005 it was the world's fourth largest port (measured by container traffic).

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To serve this boomtown, extensive infrastructure development is under way, including plans for an underground metro system with six lines fully operational by 2012. When completed, the 21km-long project will have 14 stations and run between the Huanggang border checkpoint and Longhua.

The scale of the task on the metro system alone is massive and for Arup, the designated engineers, the task has required considerable resources. The concessionaires, MTR Corporation, divided the design into four contracts: underground stations and tunnels; design of the elevated section; depot design; and systems design. Arup is delivering the elevated section, depot and systems design amongst the communications systems for the Shenzhen Line 4 project, including the operational networks, radio, CCTV and office automation.

In large projects involving many different contractors, effective control is an issue. It is common for contractors to turn up on site without some piece of essential hardware, thinking that another contractor was supposed to bring it. To avoid this on Line 4, the team is using a management system called DOORS, a powerful tool which allows all concerned not only to predict the future, but also change it if they need to. It gives client and contractor complete control.

What is DOORS?

DOORS (Dynamic Object Oriented Requirements System) is widely used, particularly in the avionics industry. It's a requirements tool that can be adapted for individual projects. Think of it like a database. It's not the system itself that's exceptional, but how Arup uses it.

So how does Arup use it?

For this project, DOORS works like a very clearly identified management tree. In any given circumstance the system will cross-reference inputted data to come up with a solution. This kind of planning means that later, when it's time to work with contractors on the ground, the system identifies who's doing what.

What are the benefits?

DOORS removes risk from the project. It smoothes delivery and the impact of changes ensures cross-requirement compatibility. Clients benefit from seeing a visible audit trail throughout the design phase and are able to determine the cost or time implications of changes immediately.

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