MTR Corporation Limited

Project:
Hung Hom Station & Approach Tunnels

Location:
Hung Hom, Hong Kong

Type:
Civil Infrastructure

Scheduled Time of Completion:
2018

Railway Model Aids Designers and Tenderers

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Kevin Yip,
Design Management Engineer,
MTR Corporation Limited

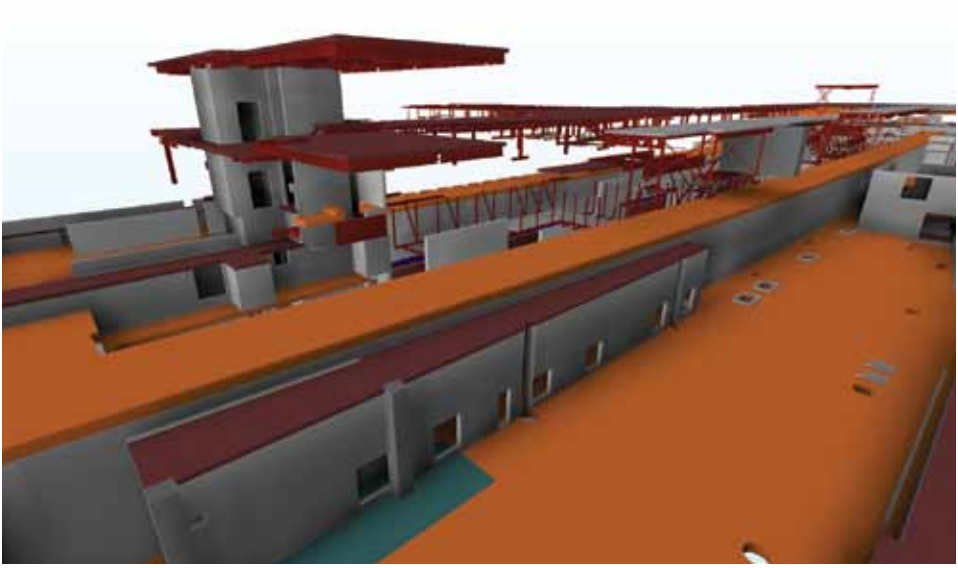
Image courtesy of MTR Corporation Limited

The Shatin to Central Link (SCL) comprises two railway corridors – East West Corridor and North South Corridor. The two rail corridors meet at Hung Hom, where works include new platforms beneath the existing station and railway facilities, together with approach tunnels and open trough structures. The Hung Hom section is one of the most challenging parts of the SCL project, and BIM is being extensively deployed to conveying information to tenderers.

This may be the first time that BIM has been so extensively used at the tendering stage for civil works of this nature.

BIM Partners Involved:

- Aedas Limited
- Parsons Brinckerhoff
- Atkins
- Sweett Limited
- InteliBuild
- Leighton Contractor (Asia) Limited
- Gammon Kaden Joint Venture



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Modeling the existing station

"The Corporation has included BIM as a requirement in the Shatin to Central Link during its tendering," says Ir Kevin Yip, Design Management Engineer, MTR Corporation.

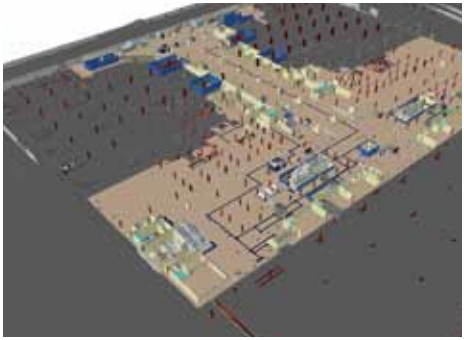
The works are complex partly as they are adding new facilities to a busy network in a congested area. Existing lines will still need to be in operation, even as new platforms are built under the Hung Hom podium. The concourse will be shared by the existing and new platforms.

"Hung Hom station is very old, and has a lot of renovations and new structures, along with the West Rail Line," says Ir Yip. "So we thought it is appropriate and useful to create a BIM model with renovation details, so contractors can understand the reasoning behind our designs."

The BIM model of the existing station was built from information extracted from a wide range of materials, spanning computer designs for recent renovations to hard copy prints that have been gathering dust. "The model really helped in the design stage, to understand the constraints," says Ir Yip. It then became part of the larger model, built to include the two new projects.

Retained, Modified or Demolished

The project team started the designs in 2D. BIM then used to check clashes, such as with utilities and services, and during the construction sequence. The BIM model had successfully found many clashes for building services, which wouldn't otherwise be solved during the



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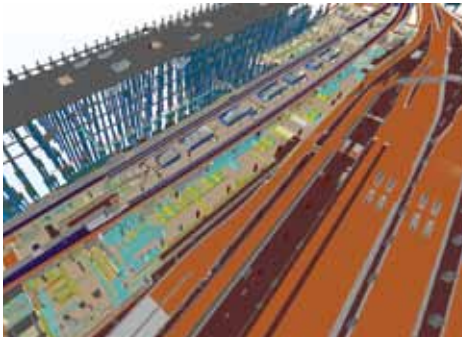
construction stage of a project. These included several critical issues.

"We have also found that some renovations of the existing station would affect the design intent of the new platforms," says Ir Yip. "We could quickly review and revise the design. As there was no need to wait till the construction stage, we saved time, money, and resources."

The BIM model includes a huge amount of information from some 10,000 drawings, for systems designed by over 250 engineers. It includes railway tunnels, architectural elements, new highways structures, major pipes, gas mains, and fibre optic cable troughs.

It's possible to select a specific area, and cut sections wherever required. Using traditional methods, Ir Yip says this would entail several levels of drawings, and different kinds of utilities: "To look at one corner of congestion, we might need to take 50 pages of drawings, and ask a draftsman to put the information on one page." But with the BIM model, the team can see the coordinated detail on a computer screen.



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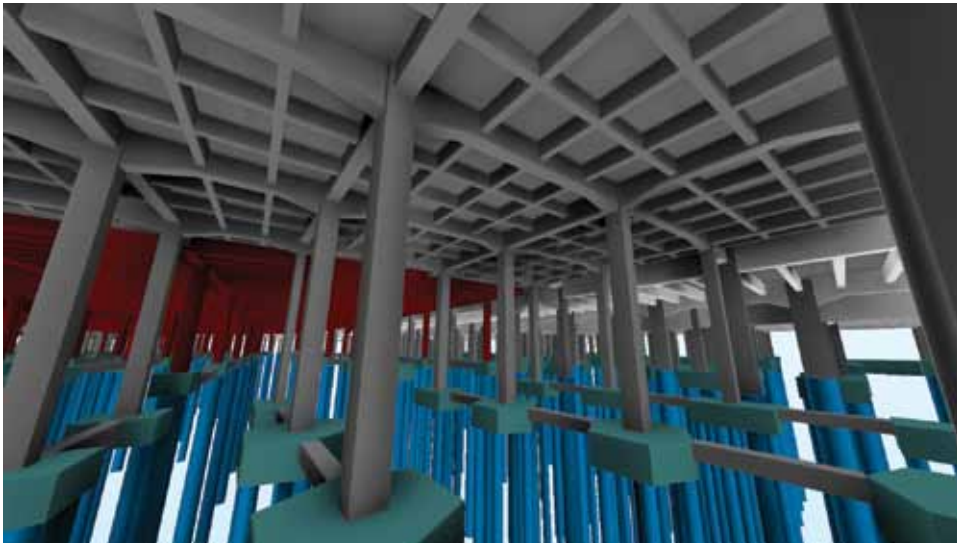
In addition, the model was used to check which building services would be retained, modified or demolished; verify delivery routes and operation headroom, and ensure adequate working space.

1000 drawings or 3 minutes video

To construct the new platforms, two diaphragm walls are built in the ground, and then excavating between them. "Normally, these walls are constructed in open space, where you can use huge plant, and cast the walls underground,"



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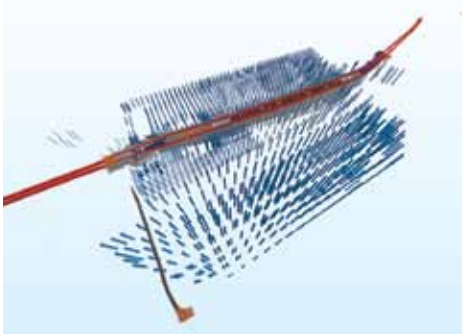

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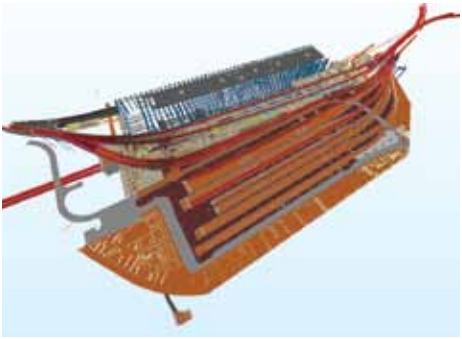

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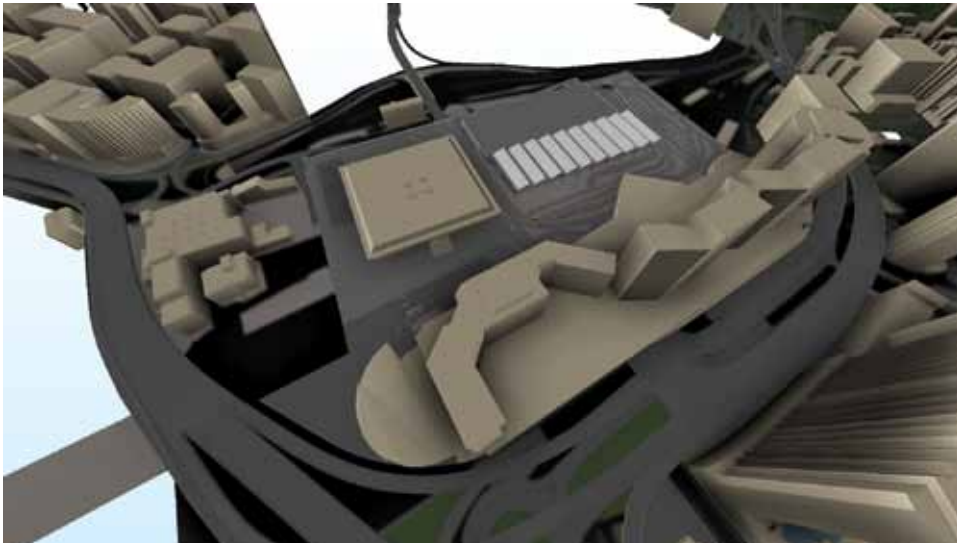
says Ir Yip. "But here, it will be very difficult to construct them under the podium with about 5 to 6 meters of headroom." Other space constraints include a nearby overpass, with no room underneath for the kinds of crane that might be normally employed.

To explain the issues to contractors interested in tendering for the diaphragm wall construction, the project team built a 4D model – featuring a video of the construction sequence in particular locations.

"This gave contractors a very quick understanding of the construction constraints, and helped them understand the kind of construction method we had chosen," says Ir Yip. "If we had done this the traditional way, it might have required 1000 drawings, and contractors would need 1 or 2 weeks to understand them, before meeting us for discussions. Instead, we could show them a three-minute video from the BIM model, so it saved us a lot of time."

Given that traditional tendering might allow only one or two months for preparing tenders, during which potential contractors have a lot of



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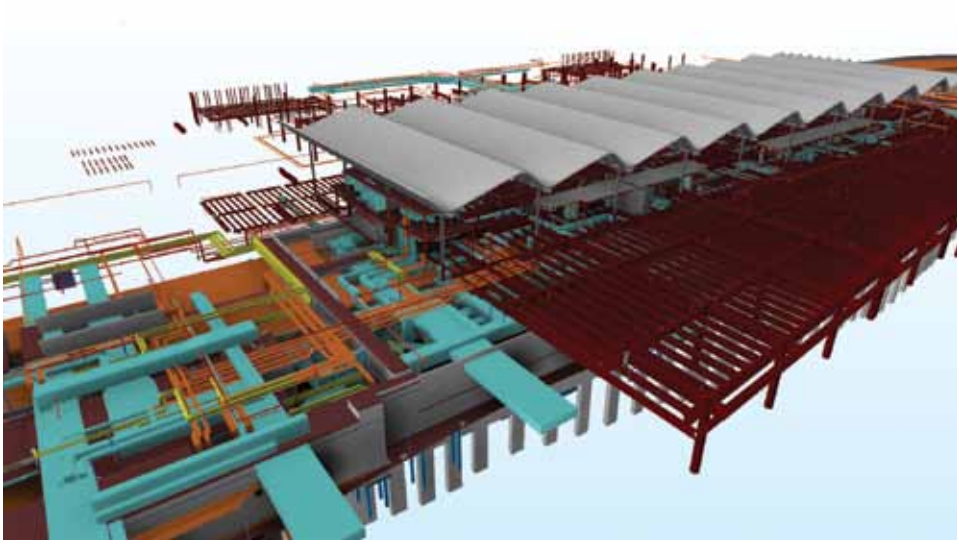

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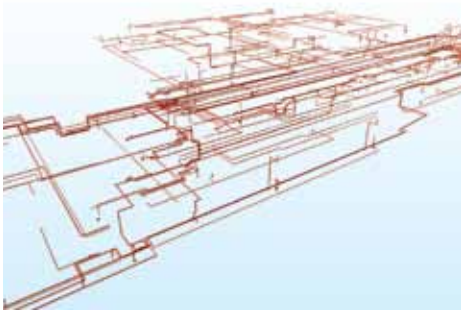
information to digest, use of BIM models in this way can both save time and ensure there is a clear understanding of the project.

From design intent to as-built model

As construction proceeds, the existing concourse area will need to transform into a new station concourse. All building services and system contractors who will work on the concourse modification works will design the system and building services, and should find the BIM model very helpful.



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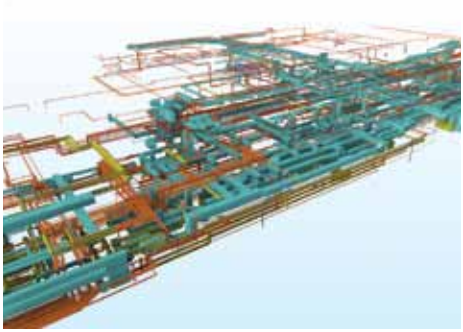
Already, the main project contractors are developing BIM modeling. Contractors can then make use of the BIM model, and construction engineers can update it. Eventually, operators will be able to use the as-built BIM model.

"If all construction projects are using BIM models," says Jacob Tam, Construction Engineer – Civil, MTR Corporation. "It can save a lot of time – as we can create a building in the computer and, ideally, build the same structure on site."



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About MTR Corporation Limited

Carrying an average of 5.1 million passengers every weekday across all of our services, the MTR is regarded as one of the world's leading railways for safety, reliability, customer service and cost efficiency.

The MTR Corporation was established in 1975 as the Mass Transit Railway Corporation with a mission to construct and operate, under prudent commercial principles, an urban metro system to help meet Hong Kong's public transport requirements. The sole shareholder was the Hong Kong Government.

The Company was re-established as the MTR Corporation Limited in June 2000 after the Hong Kong Special Administrative Region Government sold 23% of its issued share capital to private investors in an Initial Public Offering. MTR Corporation shares were listed on the Stock Exchange of Hong Kong on 5 October 2000.

The Corporation marked another major milestone on 2 December 2007 when the operations of the other Government-owned rail operator, the Kowloon-Canton Railway Corporation, were merged into the MTR, heralding a new era in Hong Kong railway development.

Other than bringing more efficient and competitively-priced services to local rail passengers, the merger brought new growth opportunities to the MTR Corporation's businesses in and outside of Hong Kong.

The merged rail network comprises nine railway lines serving Hong Kong Island, Kowloon and the New Territories. In addition, a Light Rail network serves the local communities of Tuen Mun and Yuen Long in the New Territories while a fleet of buses provide convenient feeder services.

The Corporation also operates the Airport Express, a dedicated high-speed link providing the fastest connections to Hong Kong International Airport and the city's major exhibition and conference centre, AsiaWorld-Expo.

From Hong Kong, passengers can travel with ease to Guangdong Province, Beijing and Shanghai in the Mainland of China using the MTR's intercity railway services.