

MTR Corporation Limited

Project:

Re-provisioning of Harbour Road Sports Centre and Wan Chai Swimming Pool

Location:

Harbour Road, Wan Chai, Hong Kong

Type:

Government owned public service building

Scheduled Time of Completion:

2017

“There’s a framework for using BIM in all future railway projects. With it, contractors can more easily visualise problems, such as in congested areas. As well as helping discover any genuine problems with constructability, BIM delivers benefits for projects as a whole.”

Vincent Chu,
Design Manager,
MTR Corporation Limited

BIM Partners Involved:

Architect:

TFP Farrells (Sub-consultant)

MEP Engineer:

Arup

Structural Engineer:

Arup

Quantity Surveyor:

Langdon & Seah

Civil Engineer:

Arup (Lead Consultant)

Building Sustainability Consultant:

Arup

Total Architecture Solution for Re-provisioned Sports Facilities

MTR Corporation uses BIM to design outstanding sports centre and swimming pool that can be built swiftly and efficiently



Image courtesy of MTR Corporation Limited

MTR Corporation is building a new railway line, the Shatin to Central Link. Construction will entail demolition of the existing Harbour Road Sports Centre and neighbouring Wan Chai Swimming Pool, as they are within the footprint of the planned Exhibition Station. However, like a phoenix rising from the ashes, a new combined swimming pool plus sports centre will be re-provided on the adjacent site.

The new facilities are now being constructed by MTR Corporation and will be handed over to and managed by the Leisure and Cultural Services Department, and maintained by government works departments. Though a relatively small project compared to the overall project of the Shatin to Central Link, which fully implements BIM, the facility presents several challenges.

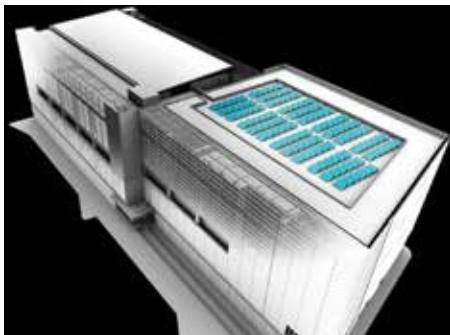


Image courtesy of MTR Corporation Limited

One key challenge is a tight timeframe. “From a civil construction perspective, the facility is on a critical path,” says Ir Vincent Chu, Design Manager-SCL, MTR Corporation. “Since the planned Exhibition Station is located underneath the existing sports centre and swimming pool, the re-provisioning works must be completed before the construction of the station.” Other challenges include restricted building height, a goal of making this the first BEAM Plus Gold certified pool and sports facilities in Hong Kong, and involving facility management and maintenance parties from early in the design stage, which will optimise various aspects such as lighting and air flow.

Better coordination in the design stage saves costs and time

Usually, MTR projects deploy BIM in the construction stage and beyond. However, the pool and sports facility project team implemented BIM in the design stage. “Using the BIM model, we can understand what we will build, and resolve clashes between disciplines,” says Ir Gary Ho, Senior Design Management Engineer - E&M, MTR Corporation. “With better spatial coordination, it will be easy for contractor to build the

facility. Also, with a BIM model for government departments to visualise, it will help with getting agreement about the design.”

Coordination during the design stage will significantly reduce abortive works – in turn substantially reducing costs for materials and labour, whilst saving time. This is especially important as the restricted building height limits space.

“The most challenging area is the swimming pool filtration plant room,” says Ir Ho.

“There will be highly sophisticated filtration equipment connected by pipework. We used the BIM model to accurately locate the

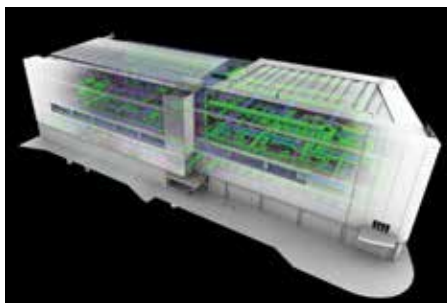


Image courtesy of MTR Corporation Limited

equipment, so to ensure it could be installed. We also designed the pipe route, while ensuring there is space for maintenance and access.”

With high level and low level piping, along with pipes side by side with equipment, Ir Ho believes that using 2D drawings for the design would have resulted in considerable abortive work during the design stage. But with BIM, the team found the design coordination was much effective.

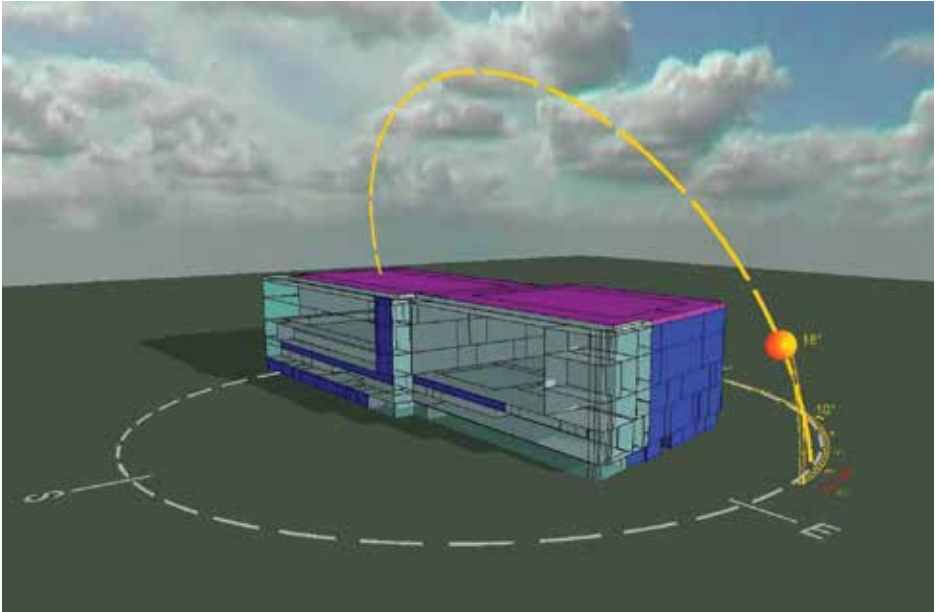


Image courtesy of MTR Corporation Limited

Aiming for BEAM Plus Gold rating

Achieving the BEAM Plus Gold rating requires careful planning and detailed considerations in the design strategy. BIM helped, through pursuing an integrated design process that combined energy efficiency and green features.

“We cross-linked the Revit BIM model with other computer simulations,” says Ir Ho. “For instance, we used Hong Kong Observatory data on the sun path to find the optimum arrangement of solar panels on the rooftop, while minimising sunlight reflection disturbance to nearby residents.”

Also by using sun paths, the design team determined the best places for positioning greenery.

Plus, information embedded in the BIM model was widely used to facilitate calculations required for BEAM Plus Gold rating, such as floor and room areas. The team found that statistical information could be easily extracted from the model.

BIM model helps in gaining supports

Using the BIM model, the project team readily involved the Leisure and Cultural Services Department and government works departments in the design process. During meetings, the BIM model could show vivid 3D visualisation images, illustrating aspects such as delivery and maintenance routes and access to services.

“We had a video showing animated figures walking around, showing that there were arrangements for maintenance access,” says

Ir Ho. This included a catwalk system over the swimming pool, providing convenient access to the lighting system close to the ceiling.

The BIM model enabled the team to show stakeholders how the new facilities will look like. Shading effects and the extent to which the facility will block sea views of nearby buildings were also simulated, which helps in gaining support from the stakeholders.

Modelling lighting and air flows

Other important aspects of the design that were enhanced through using the BIM model included lighting and air flow. For the sports centre, the project team optimised illuminance levels with reference to different games and activities.

“We could also check where columns or recesses might affect lighting, and ensure



Image courtesy of MTR Corporation Limited

there will be the lux levels required by law,” says Ir Ho.

The lighting design was also especially important for the swimming pool. “We avoided any glare that would affect the views of lifeguards,” says Ir Ho.

Also for the pool, it was important to ensure there would be air flows to prevent

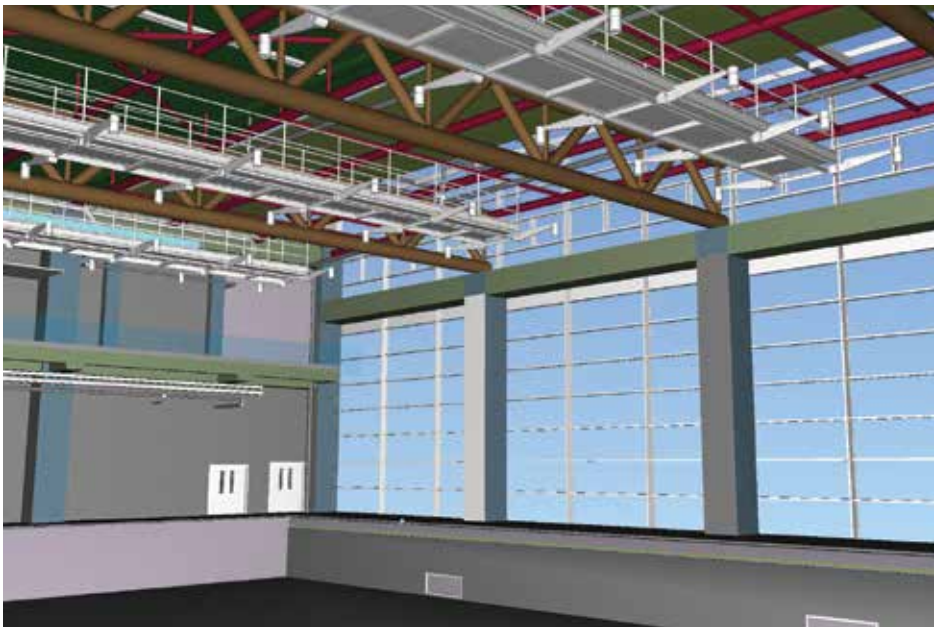


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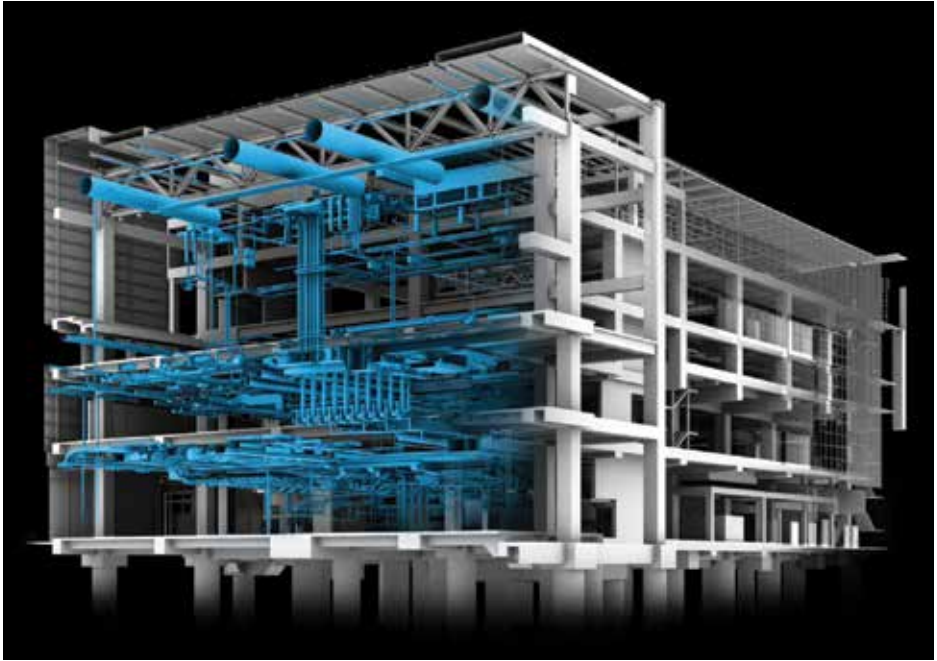


Image courtesy of MTR Corporation Limited

vapour condensation problems, which could even threaten serious damage. The design team addressed this issue by exporting the information from BIM model to carry out Computer Fluid Dynamics simulations and analyses of air flow and temperature, to understand the vapour condensation inside the indoor swimming pool in summer and winter scenarios. "We made an animated simulation, showing the movement of air around the pool," says Ir Ho. "Users could view this, and see how our pool design is better than others."

Delivering benefits for projects as a whole

Using BIM, the project team could further deploy a new procurement model, in which resources are expended upfront, in the design stage, which is expected to achieve significant cost and time savings. As it

combines architecture, civil plus electrical and mechanical engineering, they refer to this as a "total architecture" solution.

Ir Chu says the major benefit for this project could be in saving time, as it is crucial the re-provisioning of the sports centre and swimming pool would not affect the new railway construction.

"MTR aims to use BIM during both design and construction phases of projects," adds Ir Chu. "There's a framework for using BIM in all future railway projects. With it, the project team can more easily visualise problems, such as in congested areas. As well as helping discover any genuine problems with constructability, BIM delivers benefits for projects as a whole."



Image courtesy of MTR Corporation Limited

About MTR Corporation Limited

Carrying an average of 5 million passengers every weekday across all of our services, MTR is regarded as one of the world's leading railways for safety, reliability, customer service and cost efficiency.

MTR Corporation was established in 1975 with the former name "Mass Transit Railway Corporation" with a mission to construct and operate, under prudent commercial principles, an urban metro system to 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 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 MTR Corporation, 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 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 North West 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.