

COMPANY
CLP Power Hong Kong Limited

PROJECT
BIM Life Vitality • Power of Kai Tak
Cable Tunnel

LOCATION
Kai Tak

TYPE
Underground Cable Tunnel

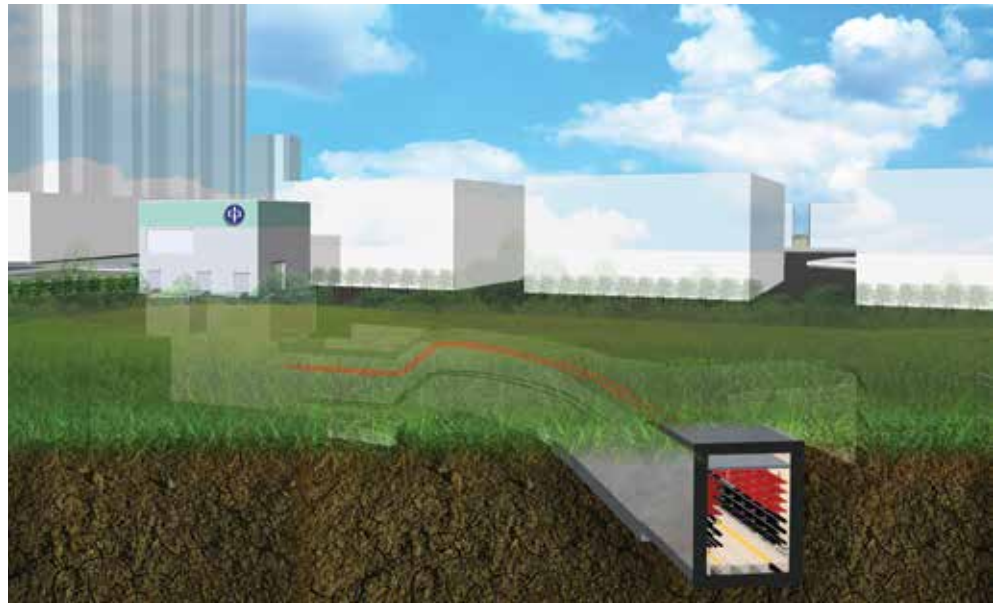
SCHEDULED TIME OF COMPLETION
2017

Unique Cable Tunnel Design Helps Power Kai Tak

“Using BIM, we found the construction could be managed more easily compared with that of using traditional 2D site plans only - engineers could visualise the project in 3D model during the planning and design stage, making the design easier and better.”

—Ir Anthony Ip
Senior Project Engineer,
CLP Power Hong Kong Limited

BIM PARTNERS
Atkins China Limited
Beria Consultants Limited
Hip Hing Construction Company Limited
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Visualisation of Underground Kai Tak Cable Tunnel helps the stakeholders to understand the surrounding development and build environment
Image courtesy of CLP Power Hong Kong Limited

The Government of Hong Kong is set to redevelop the former airport area at Kai Tak, in eastern Kowloon, and CLP Power is preparing to supply electricity to the area, through building the Kai Tak Cable Tunnel which will connect to five new substations in the area. “In future, this cable tunnel will minimise the need for future road opening works during the power supply connection,” says Ir Anthony Ip Wai-leung, Senior Project Engineer, CLP Power. “Plus, it’s an innovative way of leaving a strip of land around a kilometre long for other community development.”

While the cable tunnel made the construction of other developments above ground easier, its route planning involved making many adjustments to ensure the tunnel would not affect other utilities or future road work. Furthermore, an innovative design was developed, to minimise impacts on the environment and the local community – with higher headroom, multiple cable racks on opposite walls, an underground cable chamber and a mobile working platform.

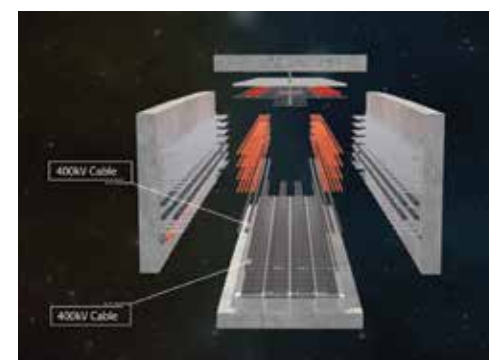
For previous tunnels, designs employed 2D drawings, which required experienced engineers to check for issues such as cable and building services clashing and air quality, with investigations and design

revisions taking considerable time and efforts. This new tunnel would be even more complex, affecting multi-disciplinary project stakeholders in various project phases, with many challenges anticipated during collaboration between them. To help tackle the challenges, the project team decided to use BIM.

Route planning and ensuring safety

When planning the tunnel route, the project team checked old drawings, and created a relatively simple BIM model.

Then, with the route established, the team



BIM enhances the multidiscipline design collaboration. The tunnel configuration is optimized for installation of high voltage cables.
Image courtesy of CLP Power Hong Kong Limited



BIM Life Vitality for Delivery of CLP Kai Tak Cable Tunnel Project through Design, Planning, Safety, Construction Management, Facility Management and Big Data aspects
Image courtesy of CLP Power Hong Kong Limited

members began more detailed work, emphasising safety.

For example, they reviewed the ventilation of the tunnel, aiming to ensure provision of sufficient air supply for engineers and frontline workers during inspection and maintenance work. “We used BIM together with computational fluid dynamics (CFD) technique, and performed some reviews,” says Ir Ip. “We found some areas in the tunnel were with poor ventilation originally in some localized corner

areas, and therefore made further improvements to the design.”

Visualising in 3D helps evaluate scenarios

The cable tunnel will be seven metres high and five metres wide, and though relatively large there were still severe space constraints. These included the need for sufficient headroom during operational stages. “Using BIM, we found the construction could be managed more easily compared with that of using

traditional 2D site plans only - engineers could visualise the project in 3D model during the planning and design stage, making the design easier and better,” says Ir Ip. “We held regular design meetings between the BIM team and engineers, to review the design on screen together.”

In addition, BIM was adopted to build virtual digital images for evaluating different scenarios, such as the lighting layout inside the tunnel. The team simulated the effects of different arrangement of lights inside the tunnel, ensuring sufficient illumination and no lights being blocked by cable racks.

The BIM model helped the project team to plan escape routes in the cable tunnel. “This showed the beauty of the BIM process,” says Ir Ip. “We could visualise how long it would take from the furthest point in the tunnel to an exit, as well as the obstructions of the routes, so that we could plan ahead and inform the team about the escape routes for any unexpected events and emergencies.

The Kai Tai Cable Tunnel can accommodate up to 50 cable circuits including four 400kV, six 132kV and forty 11kV cable circuits, and the cables are heavy, each perhaps with the diameter



BIM Model provided an accurate sense of presence inside the tunnel that is yet to be built. Improvement to the design can be identified easily prior to the construction.
Image courtesy of CLP Power Hong Kong Limited



Accurate information of the building facility can be retrieved quickly in the BIM model for the facility management team.
Image courtesy of CLP Power Hong Kong Limited

as large as an arm. With the BIM virtual 3D models, the engineers and designers optimised the cable alignment, enhancing cost effectiveness and minimising spatial conflicts. “When turning a corner, we had to make sure there would be enough radius for the thick cables,” says Ir Ip. “As the cables are quite heavy, we also used BIM to help us install them in a safer way.”

Future and BIM - with Big Data

By employing the BIM model, the project team has optimized the tunnel design in cost, construction programme, quality and operational efficiency as well.

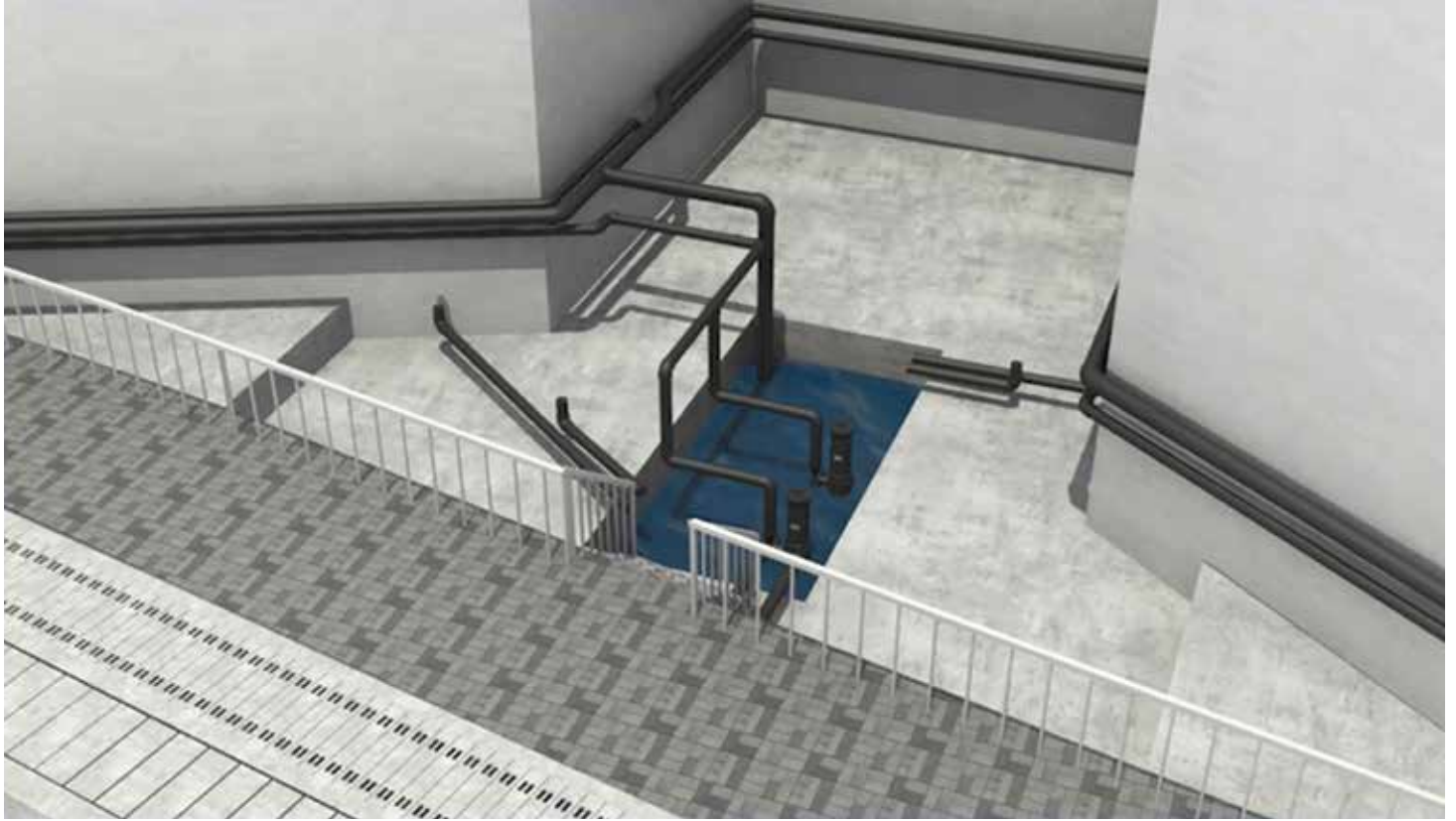
“Now, we are planning for using BIM for long term facility management – so our maintenance colleagues can open BIM files, tap the cursor, and see information on screen,” says Ir Ip. “For instance, for a ventilation fan, they can see the installation and inspection time, as well as the information on maintenance.” Moreover, QR code labels on the facility and equipment can make the information retrieval more convenient by using a smartphone.

“We are planning to apply BIM to facility management more widely at both our existing and new substations in the future,” says Ir Ip.

CLP Power also hopes to utilise Big Data for future continuous improvements on the design and management of power

facilities, based on previous experience that BIM can have many applications, not only for civil construction, but also for electrical plant installation and overhead line towers.

“CLP Power has been serving Hong Kong for 116 years and supplies highly reliable electricity to over 80% of Hong Kong’s population. We plan to transform the information of our existing power facilities into BIM models so as to facilitate the operation and maintenance,” says Ir Ip. “Our senior management is supportive to the initiative.”



BIM model is an effective communication tool to convey design intentions to the project stakeholders. Arrangement of working platform and drainage sump is clearly shown.
Image courtesy of CLP Power Hong Kong Limited

About CLP Power Hong Kong Limited

CLP Power Hong Kong Limited (“CLP Power”) is a Hong Kong utility subsidiary wholly owned by CLP Holdings Limited, a company listed on the Hong Kong Stock Exchange and one of the largest investor owned power businesses in Asia. CLP Power operates a vertically integrated electricity supply business in Hong Kong, and provides a highly reliable supply of electricity and excellent customer services to 6 million people in its supply area.