

COMPANY

Bureau of Public Works of Shenzhen Municipality
Architectural Services Department,
HKSAR Government
China State Construction Engineering
(Hong Kong) Limited

PROJECT

North Lantau Hospital – Hong Kong Infection Control Center (HKICC)

LOCATION

Reserved Land next to AsiaWorld-Expo (AWE)

TYPE

Government Project

SCHEDULED TIME OF COMPLETION

Jan 2021

“In the post-pandemic era, faced with various changes and uncertainties, we should always maintain an adaptive and creative mindset. We should quickly introduce innovative methods to build the necessary infrastructures. By this we can fulfill the mission bestowed by this era, and also breathe new vitality into the traditional construction industry.”

– Zhang Yi

CSHK Assistant President /
CSIM General Manager /
HKICC Project On-site Commander,
China State Construction
Engineering (Hong Kong) Limited

BIM PARTNERS

China State Construction International
Medical Industry Development
Company Limited

China State Construction Science and
Technology Limited

China State Construction Hailong
Technology Company Limited

Transcendence Company Limited

AUTODESK PRODUCTS USED

Autodesk® 3ds Max®

Autodesk® AutoCAD®

Autodesk® BIM 360® Design

Autodesk Construction Cloud®

Autodesk® Fabrication

Autodesk® FormIt®

Autodesk® Navisworks®

Autodesk® ReCap® Pro

Autodesk® Revit®

Autodesk® Revit® Live

Together, We Build to Fight the Virus!



MiC production factory in China Zhuhai
Image Courtesy of Bureau of Public Works of Shenzhen Municipality and Architectural Services Department, HKSAR Government and China State Construction Engineering (Hong Kong) Limited

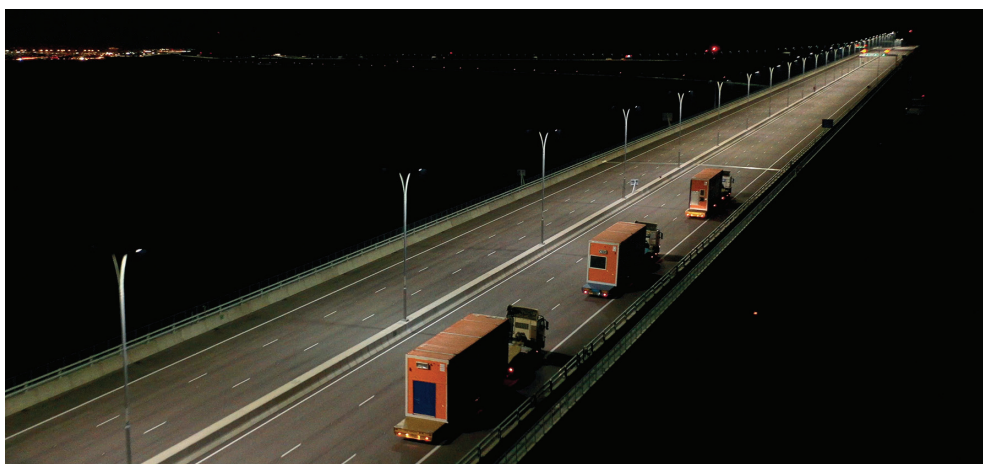
Background

In 2020, COVID-19 pandemic rampaged the world, requiring many additional temporary healthcare facilities to be built in a short time to cope with the overwhelming needs. The HK Special Administrative Region Government then requested support from the Central Government of the People's Republic of China, to build a new negative pressure isolation hospital to enhance our public hospital capacity to fight the pandemic upsurge. The target was to build more

than 800 beds' hospital that must comply with HK's building regulations, and to be completed in 4 months. We took this momentous task with honor and achieved this challenging mission by using the modular hospital concept with the help of Building Information Modeling (BIM) and related creative construction technologies.

Project Scale and Complexity

The whole project took 120 days, from September 2020 to January 2021. It was officially named North Lantau Hospital –



MiC delivery through the Hong Kong-Zhuhai-Macau Bridge
Image Courtesy of Bureau of Public Works of Shenzhen Municipality and Architectural Services Department, HKSAR Government and China State Construction Engineering (Hong Kong) Limited



Point-cloud model generated by laser scan process
Image Courtesy of Bureau of Public Works of Shenzhen Municipality and Architectural Services Department
HKSAR Government and China State Construction Engineering (Hong Kong) Limited

HK Infection Control Center (HKICC) and had started operation since mid-February 2021. The HKICC was built on the reserved land next to the AsiaWorld-Expo (AWE), with pre-existing underground services such as high-tension power cables, which increased the complexity of the site formation works. It covered a site area of 22,000 m², with construction floor area of 44,000 m². Planning had considered existing noise and vibration factors from the northwest side from the railway track and the airport northern runway.

Designed with modular hospital concept, the HKICC was comprised of six 2-storey Ward Blocks, one 2-storey Medical Block, 1 Energy Centre, VIE Tank, DG Stores, and Plant room for Medical Gas. The six ward blocks were equipped with 136 six-beds negative pressure isolation rooms, providing a total of 816 beds. The negative pressure isolation room was designed in accordance with the international healthcare standards. Each room consisted of 3 MiC modules with their M&E parts and interiors pre-manufactured at the MiC factory in Zhuhai, China, enhancing the construction efficiency. The Medical Block accommodated laboratories, pharmacy, storage and medical staff facilities. The laboratory was designed for performing routine and Nucleic Acid Extraction (PCR) tests.

BIM Works and Related Collaboration Mode

To complete the HKICC within such a short time, the design teams worked closely with BIM teams in HK and Shenzhen (SZ) via the Autodesk BIM 360 platform. The whole team utilized the “Live Model Coordination” function of the BIM 360 to develop the BIM model synchronously. It was not only facilitated the different party’s design review need but also ensured the BIM model

reflecting the latest design information for coordination.

VR and Laser Scan Technology

The combination of VR (Virtual Reality) technology and MiC method was another innovative and successful trial for the project. With VR set, designers could readily visualize the outcome and review the interior design of the MiC unit. This greatly facilitated the design coordination of the MiC ward and helped to confirm the details of the MiC ward for early and accurate mass production.

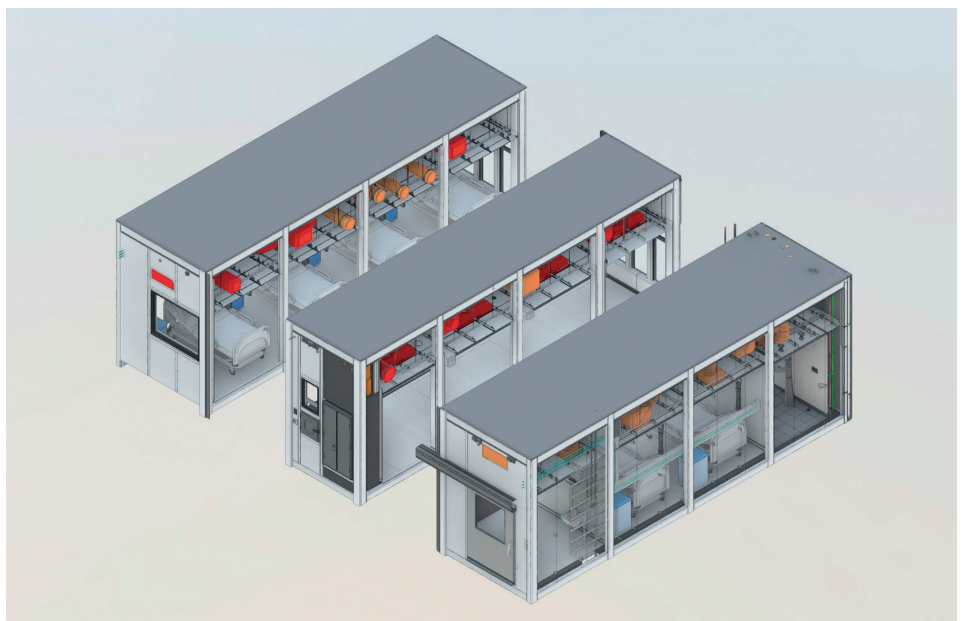
With the help of the laser scan technology, the team could scan the MiC units in both factory pre-fabrication stage and the on-site installation stage. The point-cloud model generated by the laser scan process could be used to compared with the BIM model by using the Autodesk Navisworks Manage for quality checking.

AR Technology for Construction Coordination and Facility Management

AR (Augmented Reality) technology can layer certain groups of details and BIM elements of building onto the real site. Models were grouped by different trades such as architectural fittings, structural elements, MVAC, fire services, electrical fittings, pumping & drainage systems and MiMEP units for easy checking. Project management teams could make use of the AR technology to train the site staffs and workers regarding the overall design concept, system locations, and installation progress with displaying detail BIM models in real condition.



Laser scan process in the construction stage
Image Courtesy of Bureau of Public Works of Shenzhen Municipality and Architectural Services Department, HKSAR Government and China State Construction Engineering (Hong Kong) Limited



BIM Model of the MiC
Image Courtesy of Bureau of Public Works of Shenzhen Municipality and Architectural Services Department
HKSAR Government and China State Construction Engineering (Hong Kong) Limited



4D Simulation
Image Courtesy of Bureau of Public Works of Shenzhen Municipality and Architectural Services Department, HKSAR Government and China State Construction Engineering (Hong Kong) Limited



VR application and design review process
Image Courtesy of Bureau of Public Works of Shenzhen Municipality and Architectural Services Department, HKSAR Government and China State Construction Engineering (Hong Kong) Limited



BIM and Smart Site Control Center of the project
Image Courtesy of Bureau of Public Works of Shenzhen Municipality and Architectural Services Department, HKSAR Government and China State Construction Engineering (Hong Kong) Limited

Engineers could also check and compare the on-site installation with the design models.

Using the AR technology, the installation and system discrepancy could be easily identified as the visualized screen could be switched from real world to BIM model or even mixed. By clicking the display model, detail information would be shown on the AR device. This greatly benefited the facility management (FM) works especially the building services system. FM staff could easily locate the water pipe or air duct by using the



AR technology and application in construction stage
Image Courtesy of Bureau of Public Works of Shenzhen Municipality and Architectural Services Department, HKSAR Government and China State Construction Engineering (Hong Kong) Limited

AR device without opening the false ceiling. This project successfully adopted AR technology together with BIM models, which provided convenience for construction coordination, building operation and maintenance.

Smart Construction and DWSS (Digital Works Supervision System)

Our project team set up a smart-site control system which integrated by Autodesk Forge. This system included installation progress system, workers' distribution statistics with the help of smart-helmet system, real-time CCTV monitoring, quality security system, MiC production logistic system as well



Hong Kong Infection Control Center (HKICC)
Image Courtesy of Bureau of Public Works of Shenzhen Municipality and Architectural Services Department, HKSAR Government and China State Construction Engineering (Hong Kong) Limited

as related design BIM models and other information modules, that provided the convenience for the project management staff to supervise the project quality and progress.

Conclusion

With undivided attention to details and determination to achieve one common goal of site safety and works completion on time, the HKICC was completed in 120 days in January 2021 to users' satisfaction. It has been a miraculous project only made possible through innovative concept and construction technology, early users' engagement and seamless inter-department cooperation. As the HK's and the world's first all-MiC negative pressure isolation hospital, HKICC not only set a benchmark for subsequent projects in terms of design and construction speed, but also greatly promoted the development of construction industry. We have witnessed how the HKICC has transformed the way we built to fight the virus!



Image Courtesy of Bureau of Public Works of Shenzhen Municipality and Architectural Services Department, HKSAR Government and China State Construction Engineering (Hong Kong) Limited

Project Team photo upon HKICC completion date

About Bureau of Public Works of Shenzhen Municipality

Public Works of Shenzhen Municipality is the administrative department of Shenzhen government, which is responsible for the construction and management of the government investment projects except water and transportation projects. Engineering Design Management Center (EDMC) is responsible for the whole process management of the design for government investment projects.

About Architectural Services Department, HKSAR Government

The Architectural Services Department (ArchSD) serves and cares for our community by enriching the living environment through quality professional services. ArchSD ensures the quality, cost effectiveness and sustainable development and upkeep of community facilities; provides quality professional advisory services on community facilities and related matters; and promotes best practices in the building industry. ArchSD is also committed to collaborating with the industry partners, user departments and stakeholders in developing and maintaining the public facilities for providing a better service to the general public.

About China State Construction Engineering (Hong Kong) Limited

China State Construction Engineering (Hong Kong) Limited started its construction business in Hong Kong in 1979. The Company engages in building construction and civil engineering works. China State Hong Kong plays an active role in the construction industry by means of its sound quality management and has professional expertise capable of undertaking high quality and technically advanced projects. It has undertaken over 800 construction projects in Hong Kong and Macau over the past 40 years and has acquired substantial experience and capabilities in doing so.