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BIM Awards 2020

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房地產及建設系

HKUSPACE
香港大學專業進修學院
HKU School of Professional and Continuing Education

Acknowledgement

Sincere thanks to all the winners - AECOM Asia Company Limited, AJC Joint Venture, Architectural Services Department, HKSAR Government, ATAL-Degremont-China Harbour Joint Venture, Black & Veatch Hong Kong Limited, China State Construction Engineering (Hong Kong) Limited, CLP Power Hong Kong Limited, Drainage Services Department, HKSAR Government, Gammon Engineering & Construction Company Limited, Hip Hing Engineering Company Limited, Home Affairs Bureau, HKSAR Government, Hong Kong Science and Technology Parks Corporation, Independent Checking Unit, Office of the Permanent Secretary for Transport and Housing (Housing), HKSAR Government, Kai Tak Sports Park Limited, Kerry Properties Limited, Leigh & Orange Limited, MTECH Engineering Company Limited, Nan Fung Development Limited, The Hong Kong University of Science and Technology - Campus Development Office, Vircon Limited, Water Supplies Department, HKSAR Government, Wheelock Properties (Hong Kong) Limited, WSP (Asia) Limited, Yee Fai Construction Company Limited, Chung Cheuk Hang, Ho Koon Kau, Kong Cheuk Kin, Lai Chi Ching, Ir. Lee Ming Kiu, Leung Ka Ho, Poon Kwok Ho, Wan Cheuk Lam and Wong Kok Yiu in providing such valuable information and pictures of their projects. Besides, we are extremely grateful for the contributions of the advisor - Dr. Calvin Kam and the AIAB committee and members, Dr. Jack Cheng, Kelvin Tam, Ho Han Hsi, Simon Ng and Ir Dr George Wong who are profiled in this booklet.

Disclaimer

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Time to MAKE a Better World

2020 has been filled with unprecedented changes, but as time goes, we are embracing the "new normal" which marks an opportune time for us to become more determined than ever to create a better future through the things we make and how we make them better. Today, we are witnessing one of the most significant design and construction opportunities in history. Every day, more than 200,000 people move into cities, and by 2050 almost 70% of the world's population will live in one. All of which places incredible pressure on every aspect of urban infrastructure.

The insatiable demand for new construction – coupled with a shrinking skilled workforce, limited natural resources and an increasing desire for sustainability – requires the entire AEC industry to radically rethink almost everything. From the way we work to the way we create and, ultimately, the way we make things.

The annual BIM Awards is designed to celebrate the success of the industry talents in rethinking their approach to projects. They are outstanding achievements and examples of excellence in the building and construction field. We are proud to witness how these real-world industry players are making innovative use of technologies like BIM to build a smarter, more connected and more resilient city, today and tomorrow.

At Autodesk, we see ourselves as more than an innovative partner. We are dedicated to transforming towards more collaborative, digitized and automated ways of working. As we look toward to the future, Autodesk will continue our commitment to opening doors for companies to take advantage of latest technologies such as machine-learning, AR/VR, predictive analytics, IoT, simulation, and generative design. Our goal is to provide AEC players with the foundation to meet future needs, with fewer skilled workers and limited natural resources, and in a way that generates less waste, has less negative impact, and leads to sustainable communities. Together we can become more productive, efficient, and ultimately do far more with much less.

Better things, better work, a better world. The winners of this year's Autodesk BIM Awards have earned a well-deserved place at the forefront of our industry. They are game changers who have demonstrated the power of BIM with imagination, passion and dedication. On behalf of the Autodesk Asia Pacific team, I salute each and every one of them for their extraordinary drive and exemplary execution. I also extend our thanks for sharing their inspiring experience and insights. Together, we can make anything.

Haresh Khoobchandani
Vice President of Sales, Asia Pacific, Autodesk

Fully Ripe for Digital Transformation to Build a Better World

Digitalization is changing the way we live, work, learn and create. Organizations everywhere are accelerating digital transformations by bringing in new technologies, including AI and machine learning, Big Data, robotics, 5G and Internet of Things (IoT) to increase innovation, unleash new possibilities and manage cost efficiency for better quality of life.

The Architecture, Engineering and Construction (AEC) industry is no exception. According to IDC's "Digital Transformation: The Future of Connected Construction" report, 72% of construction companies worldwide agree that digital transformation is a key priority for driving much needed change in their processes, business models and ecosystems. In Mainland China, 64% of construction organisations have embarked on their digital transformation journeys to unlock the boundless scope of possibilities.

In recent years, we have seen many successful Connected BIM adoptions in Mainland China, and to further accelerate the development and make it fully ripe for digital transformation, construction firms are increasing the pace and raising the bar with innovations, such as using 3D printing to create new construction materials and leveraging prefabricated structures to improve project efficiency. Notable successes include the Phoenix Media Centre's Shanghai Tower, as well as the 1,000-bed Huoshenshan (Fire God Mountain) Hospital, which was designed in 60 hours, and constructed in just 10 days using the Modular Integrated Construction (MiC) model to address the demand in the shortest possible time.

Foreseeing the fast-evolving and complex needs in the new normal, we are committed to creating a connected and sustainable environment for our future, by embracing the power of Connected BIM as it enables faster approval lifecycles, real-time data harvesting and analysis, more dynamic project management processes, as well as informed decisions and enhanced operations. All the exemplary projects, especially those that are crucial to the wellness of the overall community when time is essence, are truly the best testimonials of Connected BIM and its benefits to the industry, and to the broader society.

Digital transformation is clearly empowering the AEC industry to design better and innovate faster. Autodesk is committed to driving this exciting journey further with innovations in design automation, machine-learning, integrated cross industry technologies and predictive analytics, as well as a robust integration partner program. The industry is facing the biggest design and construction opportunity in history. That, in turn, brings with it a tremendous responsibility. By combining advanced technology and processes, we can ensure that the things we make are smarter, more connected and more resilient.

Seeing is believing. The exceptional winning projects this year highlight the smart use of BIM to transform our future into a better world. We hope these success stories will encourage new talent to explore the opportunities offered by BIM technology and stay on the cutting-edge of innovation. On behalf of the Autodesk Greater China team, I would like to congratulate all the awardees, and extend our appreciation for offering both insight and inspiration. Together, we are building a better world with more collaborative, digitized and automated ways of making.

Richard Li
Managing Director, Greater China Region, Autodesk

Reimagining Innovation to Make Hong Kong a Smart City

With advanced buildings, a robust infrastructure and a vibrant construction industry, Hong Kong has been at the forefront of the BIM evolution for over a decade. Over the years, we are pleased to see blooming adoption of BIM that led us here to celebrate another year of success in this exciting journey. This year, we are glad to see a dynamic spectrum of winning projects with smart BIM deployment, and what's more, how the teams are creating a better world with their innovative minds and solid foundation that never fail to impress.

Today, the speed of digital transformation is constantly creating "new normals" that offer previously unimagined opportunities. The Architecture, Engineering and Construction (AEC) industry responds quickly to innovations at every phase of the project lifecycle – from conceptualization and construction to operations and maintenance. The integration of BIM with latest technologies and processes is unlocking potentials that enable us to create a better world with more effective collaboration, risk management, enhanced quality and cost efficiency.

Data is the new oil. With tremendous amount of data available for analysis, we are benefiting from the advent of machine learning and artificial intelligence (AI) as we integrate AI with BIM 360 to reduce safety risk and improve progress tracking. The seamless integration enables us to make insight-based decisions for better risk management, schedule management, subcontractor management, and many more. The transformation is pushing the boundaries and empowering the industry to stay ahead of constant changes by improving processes to ensure better outcomes – Generative Design, and Risk Evaluation and Mitigation are examples of how we getting more ready than ever to explore possibilities in the new normal that is full of unpredictable, time-critical challenges.

Led by pioneers like Autodesk, the industry is striving to raise the bar further by integrating BIM with different systems throughout the building lifecycle. We are glad to see successful integration of BIM with Facility Maintenance (FM) systems, which significantly improves efficiency, and saves time and resources with visualized space and building information that is crucial for building management. With BIM, we are able to more efficiently plan, design, construct, and manage buildings and infrastructure.

The future of making is here. As an industry leader, Autodesk is helping AEC talent to embrace new technologies that make it possible to remove repetitive tasks and focus on adding value. By combining human imagination and leveraging the technology at our fingertips, we can make work better and more meaningful, as we design and construct more sustainable communities. We can't wait to see the benefits that further advances in BIM will bring, and the impact they will have on Hong Kong's transformation into a smart city. Indeed, this year's winners are all excellent examples of how to use BIM to reimagine the THINGS we make, how we MAKE them, and how we WORK in smarter and more innovative ways.

In the meantime, I invite you to join us in congratulating the winners of the Autodesk BIM Awards 2020 on their impressive achievements.

Dr Wendy Lee
Regional Manager, HK & Macau, Autodesk

Autodesk Hong Kong BIM Awards 2020

Congratulations to all the winners!

Award Winners

CLP 中電

渠務署 Drainage Services Department

AECOM

ATAL HEC

Gammon

協興 HIP HING 新創建集團成員 Member of NWS Holdings

建築署 Architectural Services Department

協興 HIP HING 新創建集團成員 Member of NWS Holdings

HKSTP 香港科技園

Leigh & Orange

協興 HIP HING 新創建集團成員 Member of NWS Holdings

啟德體育園有限公司 KAI TAK SPORTS PARK LIMITED

民政事務局 Home Affairs Bureau

Industry Influencer Awards

Independent Checking Unit,
Office of the Permanent Secretary for
Transport and Housing (Housing),
HKSAR Government

香港科技大學 THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

Honorable Mentions

渠務署 Drainage Services Department

AECOM

中國建築 CHINA STATE CONSTRUCTION

渠務署 Drainage Services Department

BLACK & VEATCH

雲建 VIRCON

嘉里建設 KERRY PROPERTIES

南豐集團 NAN FUNG GROUP

水務署 Water Supplies Department

水務署 Water Supplies Department

acciona AJC JOINT VENTURE

BLACK & VEATCH

WSP

WHEELOCK PROPERTIES 會德豐地產

怡輝建築有限公司 Yee Fai Construction Co. Ltd.

Young BIMers of the Year

Ir. Lee Ming Kiu, Owen

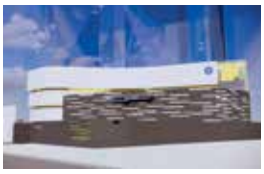
Wan Cheuk Lam, Nelson

Outstanding Students

Chung Cheuk Hang, Ho Koon Kau, Kong Cheuk Kin, Leung Ka Ho
The Chinese University of Hong Kong

Lai Chi Ching, Angel, Poon Kwok Ho, Parson, Wong Kok Yiu, Peter
The Hong Kong University of Science and Technology

Award Winners



ORGANIZATION
CLP Power Hong Kong Limited

PROJECT
Shing Kai Road 132kV Substation

ORGANIZATION
Drainage Services Department, HKSAR Government
AECOM Asia Company Limited
ATAL-Degremont-China Harbour Joint Venture

PROJECT
Design, Build and Operate San Wai Sewage Treatment Works – Phase 1

ORGANIZATION
Gammon Engineering & Construction Company Limited

PROJECT
Global Switch Hong Kong - Design and Built Data Centre at TKO

ORGANIZATION
Hip Hing Engineering Company Limited
Architectural Services Department, HKSAR Government

PROJECT
Provision of Temporary Facilities at Existing Open Playground of Junior Police Call Permanent Activity Centre and Integrated Youth Training Camp at Pat Heung

ORGANIZATION
Hip Hing Engineering Company Limited
Hong Kong Science and Technology Parks Corporation
Leigh & Orange Limited

PROJECT
InnoCell

ORGANIZATION
Hip Hing Engineering Company Limited
Kai Tak Sports Park Limited
Home Affairs Bureau, HKSAR Government

PROJECT
Kai Tak Sports Park

Industry Influencer Awards

ORGANIZATION
Independent Checking Unit, Office of the Permanent Secretary for Transport and Housing (Housing), HKSAR Government

PROJECT
Development of the Technology to Use Building Information Modelling for Statutory and Building Control Submission

ORGANIZATION
The Hong Kong University of Science and Technology
- Campus Development Office

PROJECT
Shaping a Digital Future - BIM, Space and Asset

COMPANY
CLP Power Hong Kong Limited

PROJECT
Shing Kai Road 132kV Substation

LOCATION
Shing Kai Road, New Kowloon Inland

TYPE
Design and Construction of Shing Kai Road Substation

SCHEDULED TIME OF COMPLETION
2022 Q2

Innovative Smart Shing Kai Road Substation

"Innovative Smart Substation."

—Arras Yeung

Civil Design Manager,
CLP Power Hong Kong Limited

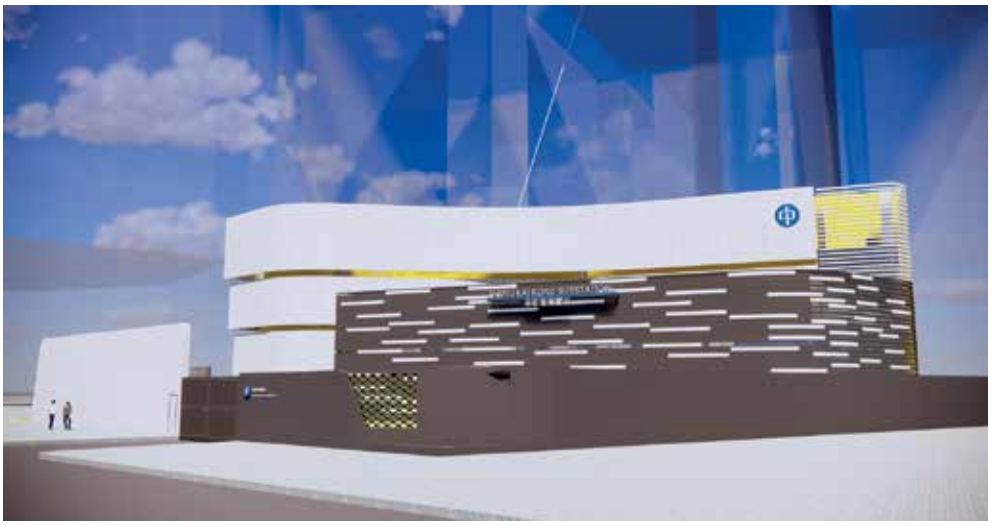
AUTODESK PRODUCTS USED

3DS Max

A360

Navisworks Freedom

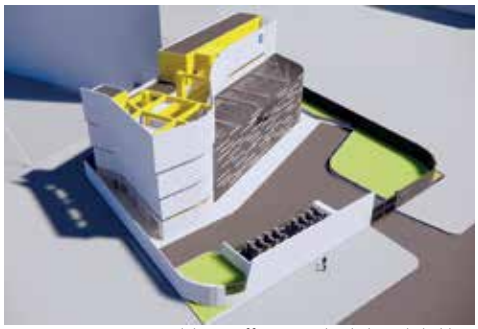
Revit



BIM model is an effective tool to help stakeholders understand the building design and surrounding development.
Image Courtesy of CLP Power Hong Kong Limited

Shing Kai Road Substation (SKR) is a 132/11kV transmission substation for supplying electricity to the Kai Tak Redevelopment area. Kai Tak, a former airport site at the central metropolitan area of Hong Kong is to be redeveloped into an urban oasis for the healthy livings of people. Echoing the healthy development strategy of Kai Tak, SKR is developed with a green and people-friendly approach.

Green practices for the substation have been developed with a systematic and innovative approach. The development of this substation addresses various aspects of environmental protection throughout the entire project life cycle in Feasibility, Planning, Construction and Asset Management.



BIM model is an effective tool to help stakeholders understand the building design and surrounding development.
Image Courtesy of CLP Power Hong Kong Limited

Feasibility, Inception Study and Planning Stage

The 3D BIM model of SKR and its surrounding conditions is presented to the senior management, project management, planning engineer, architect, structural engineer, building services engineer, HV Plant engineer, safety specialists, operation and maintenance team. The short-term and long-term operational requirements of the substation are addressed. The design of the substation addresses various comments from different project stakeholders. The budget and the project programme are adjusted accordingly.

Design Stage

BIM is applied to enhance the design of the substation in meeting various requirements such as the buildability, functional requirements, provisions for operational safety, people-friendly and environmentally friendly features. Designers from different disciplines work collaboratively to produce a well-coordinated design of the substation under the BIM environment. The 3D BIM model contains adequate details that can enhance the accuracy of the cost estimation of SKR. The 3D BIM model of SKR is prepared for communication with the external parties,

such as potential contractors, local community and other concern groups.

Construction Stage

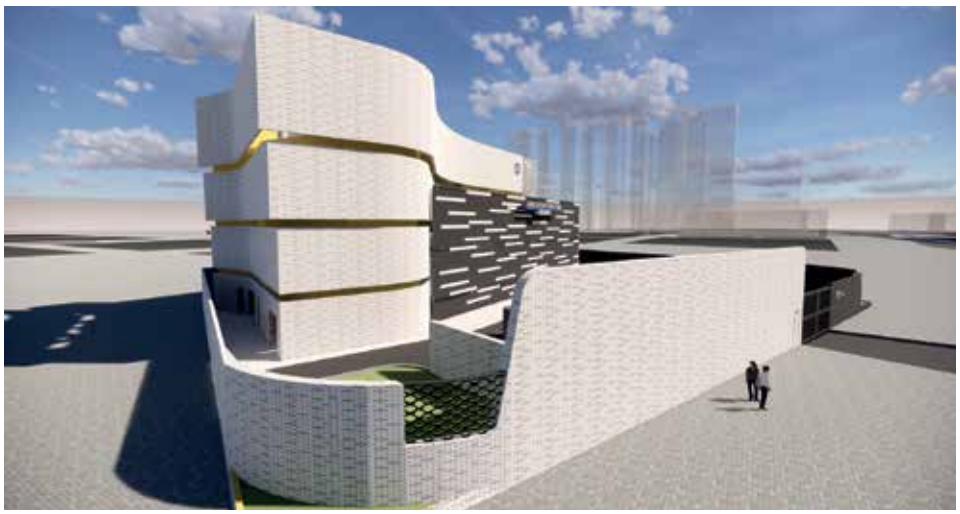
The main contractor applies BIM to enhance the management of the site construction works, improve the site coordination and reduce the construction site wastage. The BIM is used to prepare the 3D models and 4D animations of high-risk work processes and site environments for presentation during the routine coordination with the supervisory level and front-line staff in order to raise their awareness in safety and site work. Upon the completion of work, the contractor will provide the as-fitted BIM of SKR to CLP Power (project owner) for recording purpose.

Asset Management

CLP Power uses BIM technologies to improve the asset management of SKR. The short-term and long-term requirements of SKR are reviewed during the project inception stage with the BIM model. The design of SKR is optimised to address the operational requirement through the collaboration of the project stakeholders through the BIM process. The predicted energy performance of the building such as the photovoltaic installation is prepared for continuous improvement purposes. With the BIM technology, the engineer can produce the complicated additional and alternation work plan of future works inside SKR efficiently. The engineer can also convey the message about the work plan and process to others easily under the BIM environment.

BIM enhances the multidisciplinary design collaboration and effectiveness of photovoltaics operations.
Image Courtesy of CLP Power Hong Kong Limited

BIM enhances the multidisciplinary design collaboration and optimisation for high voltage plant equipment installation.
Image Courtesy of CLP Power Hong Kong Limited



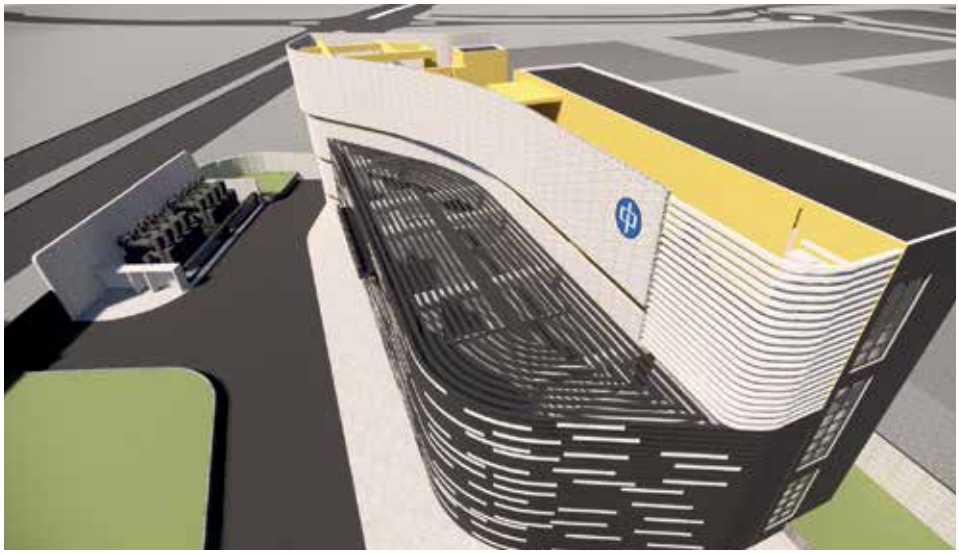
BIM model provides an accurate sense of presence of building structure that is yet to be built. Improvement to the design can be identified easily prior to the construction.
Image Courtesy of CLP Power Hong Kong Limited

Although SKR is located on a small site, the substation comprises two low rise building blocks which reduce the speed of the building induced wind to the nearby pedestrians. Light fittings in the external area is carefully located to avoid obtrusive to people outside the substation. Soft landscape with a variety of plant species covering 35% of the site adds visual interest to the surrounding area. The vertical green wall provides a comfortable visual feature at the perimeter level. The metal mesh opening on the fence wall provides an open and permeable visual linkage which helps enhance the streetscape of the surrounding area. The curved façade of the substation covering the heavy plant equipment makes it out stand from traditional power buildings and perfectly blends into this energetic hub. The positive emotion of passersby will be refreshed by birds and butterflies that are attracted by the delightful, bright and colourful flowers of plants inside the substation.

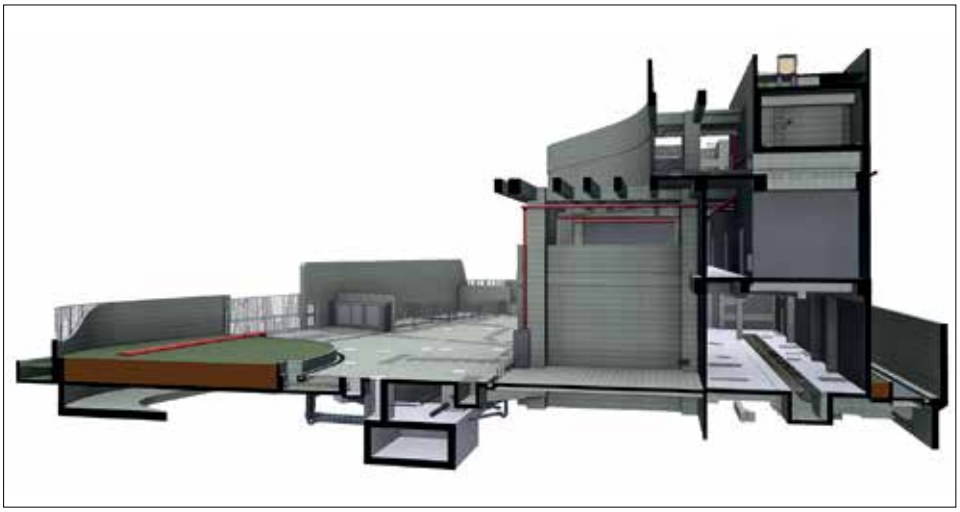
The substation aims to achieve environmental friendly BEAM Plus standard with Platinum Rating through the incorporation of various sustainable design elements. Modern and advanced technologies are applied to enhance the project so that SKR will be more friendly to people within and outside the substation during the entire project lifecycle.

The layout of SKR is planned to cater the future extension of the electrical plant facilities with the long-term developments of Kai Tak area.

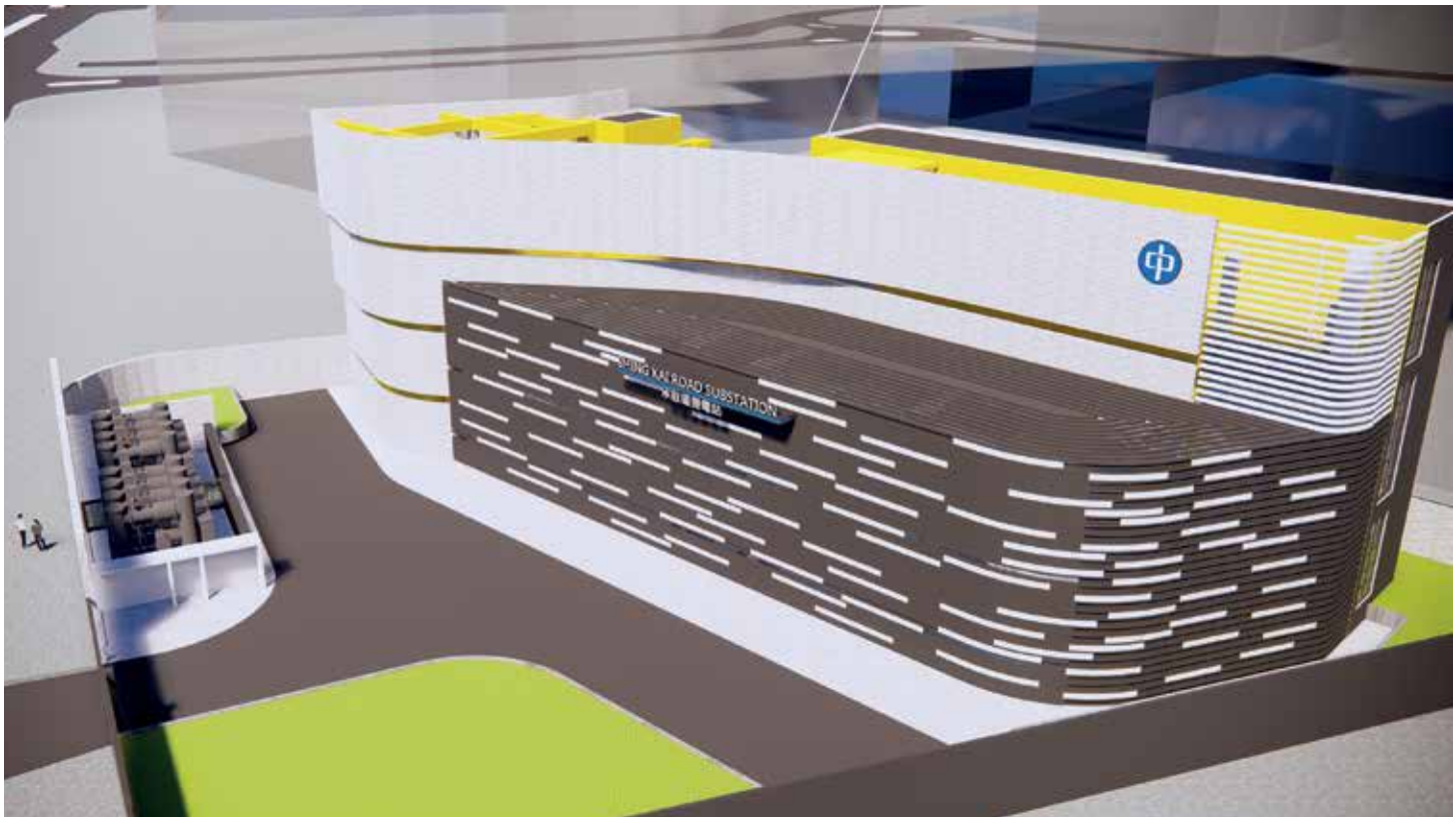
Appropriate facilities are provided inside SKR for the future routine maintenance activities. Lifting facilities like I-shape steel beam and haulage lug for servicing the heavy plant equipment are provided as resilient measures for the emergency operations of the substation.



BIM enhances the multidisciplinary design collaboration and optimisation for high voltage plant equipment installation.
Image Courtesy of CLP Power Hong Kong Limited



BIM model is an effective communication tool to convey design intentions to the project stakeholders and enhance the multidisciplinary design collaboration.
Image Courtesy of CLP Power Hong Kong Limited



BIM model is an effective tool to help stakeholders understand the building design and surrounding development.
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.

COMPANY
Drainage Services Department, HKSAR Government
AECOM Asia Company Limited
ATAL-Degremont-China Harbour Joint Venture

PROJECT
Design, Build and Operate San Wai Sewage Treatment Works – Phase 1

LOCATION
Yuen Long, New Territories

TYPE
Sewerage and Sewage Treatment

SCHEDULED TIME OF COMPLETION
2020 (Construction); 2035 (Operation)

Applying BIM in different stages of sewage treatment project delivered by Design, Build and Operate Contract

"Design-Build-and-Operate contract arrangement gives us the opportunity to readily practice Lifecycle BIM for San Wai Sewage Treatment Works, partnering with the Contractor to manage and use the BIM beyond planning and design to operation. We hope to realize the full potential of BIM, not only to provide accurate, timely, and relevant information for design and construction, but also keep the BIM "alive" by continue creating, maintaining and utilizing building information to improve the effectiveness of the facility operations."

—Ir. Lawrence Lee
Chief Engineer/Harbour Area Treatment Scheme,
Drainage Services Department,
HKSAR Government

BIM PARTNER
Ove Arup & Partners Hong Kong Limited

AUTODESK PRODUCTS USED
AutoCAD MEP
Autodesk Civil 3D
Autodesk Navisworks Manage
Autodesk ReCap™ Pro
Autodesk Revit

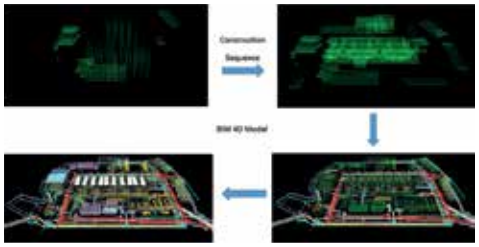
Site View of San Wai Sewage Treatment Works
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited and ATAL-Degremont-China Harbour Joint Venture

San Wai Sewage Treatment Works – Phase 1

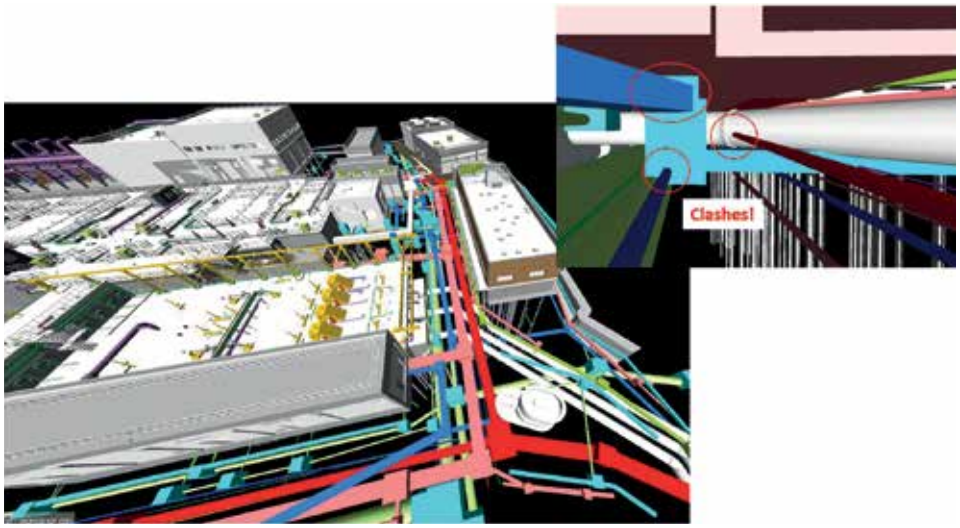
The key aims of the San Wai Sewage Treatment Works (SWSTW) upgrading project were to replace the existing SWSTW (since 1993), reduce pollution loads to the northwestern waters of Hong Kong while increasing the capacity to manage the population growth in the Northwest New Territories and reduce odour emissions.

The new SWSTW is located adjacent to the existing SWSTW, and adopting the Chemically Enhanced Primary Treatment (CEPT) process with ultraviolet disinfection (UV) facilities in order to meet the tighter effluent discharge standard. A Design-Build-and-Operate (DBO) contract arrangement is used for the project to allow Contractors the flexibility in planning the works schedule in the design and construction stages, and to achieve reasonable construction and operation costs for the SWSTW.

The improvements to the sewage treatment level, from the existing preliminary treatment to CEPT plus UV, have a direct positive impact to the environment. Given the project site is sitting in rural context, abutting cargo depot, away from high density developments and public facilities, the overall design concept of the appearance of the new SWSTW are in line with green concern from the public and matching the rural setting of the context. Meanwhile, SWSTW is one of the DSD selected pilot projects in 2013 for using BIM. With the support from management to promote wider use of BIM, the project team attempted to fulfill the potential and bring the BIM technology to public. SWSTW has been using BIM with VR, AR and animated demonstration for the project communication, which changed the way people experience meetings and consultation sessions.



Simulating Construction Sequence in BIM Model
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited and ATAL-Degremont-China Harbour Joint Venture



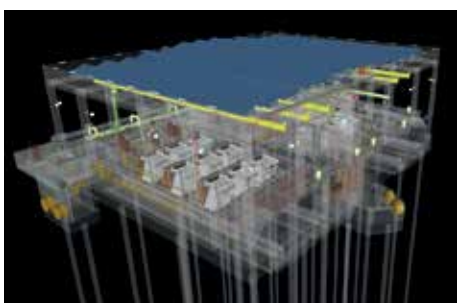
Using Clash Analysis for planning and laying of the underground utilities and pipeworks
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited and ATAL-Degremont-China Harbour Joint Venture

The use of BIM in various stages

At the early design and construction stages, Navisworks Timeliner added a time dimension of BIM to the established model to simulate the whole construction stage. This is very useful as it could foresee construction problems and eliminate them in the planning and design stages. The Project Planning Programme "Primavera P6" file was converted and imported into Navisworks Timeliner for interaction with the model and could simulate construction stage on any specific date. This enabled the project team to have a clearer visualization of the construction processes, identifying conflicts and resolve in advance. It also improved the effectiveness of communication between the concerned parties in particular with the construction sequence and site logistics arrangement.

Different LOD of BIM was developed at different stages of the project for early commencement of construction before fully completion of design. LOD 200 was adopted in the early stage with the key elements of the plant graphically represented as a generic system in a 3D model of conservative approximate in quantity, size, shape, location, loading and orientation. Based on the LOD 200 model, the detailed foundation design was completed, making it possible for the piling works to commence in the early stage. The BIM model was then progressively developed to LOD 300 with part of the model to LOD 400, which incorporated true/exact design data with systems/equipment models provided from the suppliers, and reflected specific interfaces between systems. By then, the civil requirement design could be carried out based on the exact systems/equipment. With the model being developed at different LOD in different stages of the project, the time and space constraints were progressively overcome.

Point Cloud 3D Scanning Imposing BIM for Site Verification and Measurements
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited and ATAL-Degremont-China Harbour Joint Venture



The New Inclined UV Disinfection System
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited and ATAL-Degremont-China Harbour Joint Venture

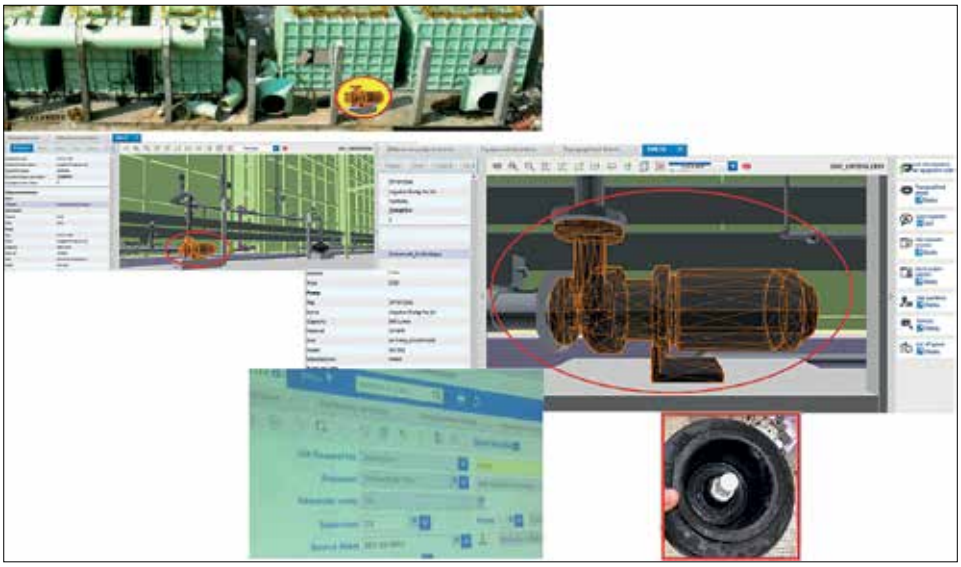
Helping to solve complex arrangement problems and to implement innovative ideas

Constrained by the limited land available, the new SWSTW has only one internal circular road, unlike other plants which have multiple internal circular roads. As the project is highly complex with numerous equipments and facilities, the sole circular road in the plant become the route for the vast majority of the underground utilities and pipeworks between buildings and facilities including process pipes, odour pipes, foul and storm drain pipes, electrical services, fire services, water services, signals, telecommunication connections, etc. The team had to coordinate with many stakeholders, including government departments, public services providers and internal teams covering different trades. It was by means of the NavisWork's clash analysis that clashes between utilities and pipeworks were identified and resolved in the early design stage. Also with the aid of BIM, coordination meetings were held effectively as the problems could be clearly visualized and fixed or revised one by one systematically. The avoidance of clashes on site had been very successful and this was instrumental in the timely completion of the construction.

SWSTW Project uses the DBO contract to elicit new and innovative ideas, the Contractors introduced various advance sewage treatment technology to the Project, viz. a new inclined UV disinfection system and a step type fine screen system. BIM helped us to quickly deal with the new proposal with identifying effect of the possible design changes, the future operation and maintenance needs in term of spatial requirement. Moreover, the final completion process was rehearsed before the actual construction and operation, which helped to improve the safety, planning and overall cost effectiveness of the project.

The project team had also explored other ways to use BIM to reduce time-consuming works. It is believed that the less time spent on construction site is the most effective way to avoid accident. Traditional site checking and surveying works require interfacing with ongoing works for inspection which is difficult and time-consuming, workers also need to be climbing up and down to conduct measurements. It was sometimes not frequent enough that some works needed to be rectified after a period of time when deviations were found during hold point checking. The team initiated an efficient way of monitoring and recording the site work by combining the Point Cloud 3D Laser Scanning and BIM

IoT Smart Safety Helmet Integrated with BIM
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited and ATAL-Degremont-China Harbour Joint Venture



BIM Viewer on Computerised Maintenance Management System
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited and ATAL-Degremont-China Harbour Joint Venture

model. Point Cloud 3D laser scanning was conducted for buildings, equipment and utility facilities, with highly accurate measurements, and by superimposing on the BIM model could accurately reveal any deviation, conduct measurements, make plan for installation works and adjust the site work/design immediately. This new method had improved the performance of works in many ways over the traditional methods.

To further enhance safety, the project team had integrated smart safety helmets with IoT technology with BIM to improve the safety management on site. Not only the helmets could detect sudden fall or unusual body temperature and heart rate of workers, the feedback from helmets would also present the location of the workers on the BIM model, which could be used with alarming system to avoid unauthorized entry to those dangerous and restricted areas.

Keep the BIM "alive"

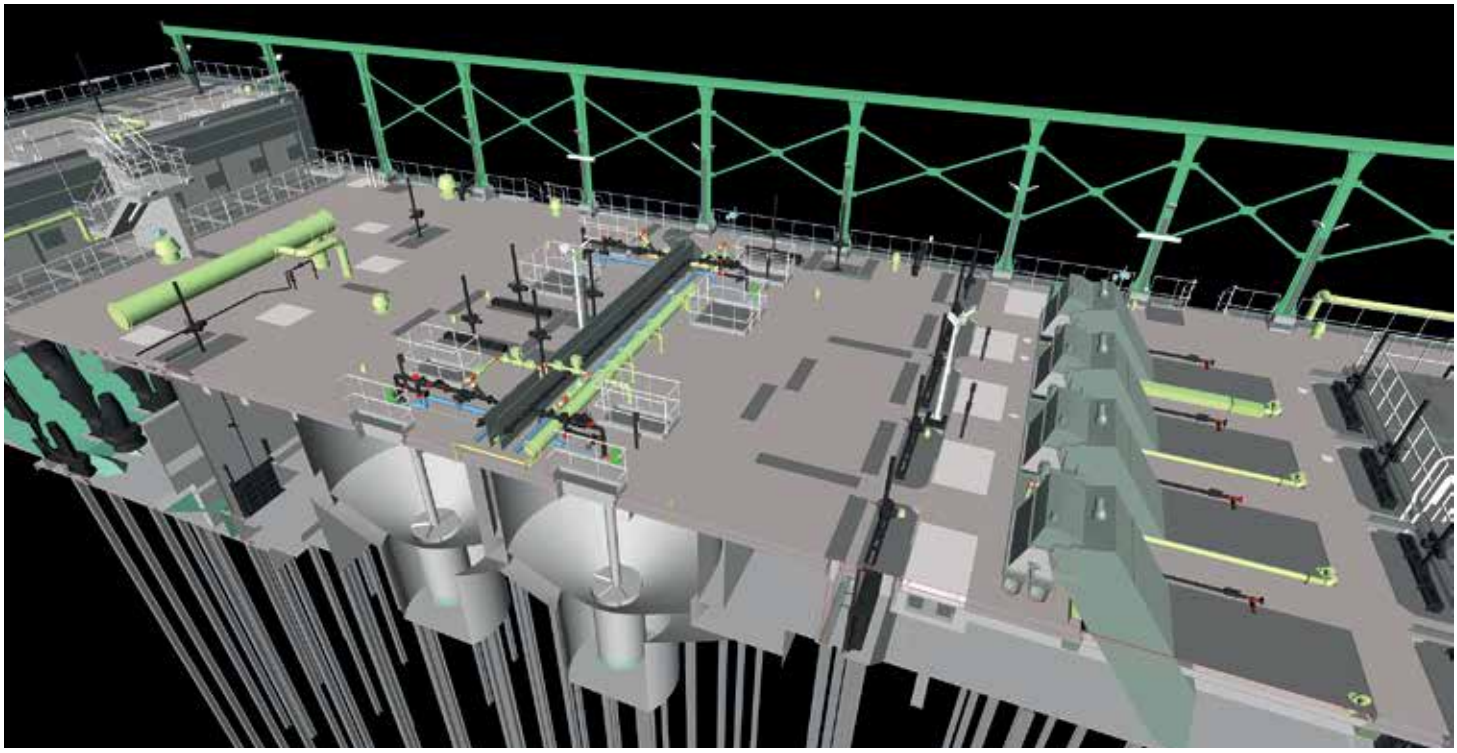
Approaching the completion of the project and getting ready for the LOD 500 model, the team had also planned for the use of BIM for asset management. Integrating BIM with Asset Management platform had been proposed since the early stage of the project, the new Computerised Maintenance Management System (CMMS) - BIM for the project features a fully integrated BIM viewer to assist the plant operation. It would allow the operation team to view the model objects and technical details in the BIM, the ongoing and planned works orders, spare parts and maintenance history. The CMMS-BIM would also integrate with the Supervisory Control And Data Acquisition (SCADA) and the Smart Optimisation Systems to form a comprehensive operation control and management system to facilitate a safe and smooth operation of SWSTW. All these combination use of BIM would see the model applicable during the whole life cycle of the project.

While the SWSTW project works has been benefiting from BIM on its design and construction stages, the team is looking forward to gain further benefit and success from the BIM applications during the operation stage. DSD is stimulated by the success of BIM in this project and will continue to work internally and externally with the industry to develop BIM applications for drainage and sewerage works.

渠務署
Drainage Services Department

AECOM

ATAL CHEC



Step Type of Fine Screen and Grit Removal System Layout
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited and ATAL-Degremont-China Harbour Joint Venture

About Drainage Services Department, HKSAR Government

Established in 1989 to provide world-class wastewater and stormwater drainage services enabling the sustainable development of Hong Kong, Drainage Services Department (DSD) has strived to upgrade sewage treatment and flood protection levels in Hong Kong, and committed to introduce new technologies for projects implementation and operation of facilities. DSD will continue to promote BIM technology, with resources being deployed on development, so as to upgrade the accuracy of project design and shorten works period.

About AECOM Asia Company Limited

AECOM is the world's premier infrastructure consulting firm, delivering professional services throughout the project lifecycle – from planning, design and engineering to program and construction management. AECOM, partnering with clients to solve their most complex challenges and build legacies for generations to come.

About Atal-Degremont-China Harbour Joint Venture

Formed by ATAL Engineering Limited, Suez International (formerly known as Degremont) and China Harbour Engineering Company Limited. The team aims to provide a higher quality results by adopting BIM technology throughout the project cycle from design to construction and up to end of operation.

COMPANY
Gammon Engineering & Construction Company Limited

PROJECT
Global Switch Hong Kong - Design and Built Data Centre at TKO

LOCATION
18 Chun Yat Street, Tseung Kwan O

TYPE
Design and Construction

SCHEDULED TIME OF COMPLETION
2020

A Real Project Example – BIM for Design for Manufacturing and Assembly (DfMA)

"With the recent development of Building Information Modelling (BIM), we successfully integrated our Design for Manufacturing Assembly (DfMA) with the aid of BIM. The project showcases different real job examples of how DfMA could be implemented, achieving a much higher safety and quality standard. Gammon believes continuous development together with the support of Autodesk could further facilitate the construction industry evolving from traditional methodology to a more innovative approach throughout the whole project cycle."

—Victor, Tse Wing Fung
Senior Project Manager,
Gammon Engineering & Construction Company Limited

BIM PARTNERS

Global Switch
DCMS
Meinhardt
Aurecon
Integrated Design Limited

AUTODESK PRODUCTS USED

3ds Max
AutoCAD
BIM 360 Glue
CFD
Dynamo for Revit
Fabrication CAMduct
Navisworks Manage
Navisworks Simulate
ReCap™ Pro
Revit

A real data center project highly adopted with BIM.
Image Courtesy of Global Switch

Global Switch Hong Kong Data Centre

Global Switch Hong Kong is a design and build project with a scope that includes substructure, superstructure, electrical and mechanical, façade, fit-out and maintenance works. It is currently the largest data centre in Hong Kong. As the main contractor, Gammon is responsible for all works, which are being delivered with the support of in-house expertise. The project makes full use of BIM for coordination and manufacturing, as well as handover throughout the different stages of the project's life cycle.

As Hong Kong's largest carrier and cloud-neutral data centre, the facility has 70,000m2 of world-class infrastructure services. Located adjacent to the Tseung Kwan O cable landing station and close to both other major submarine cable landing stations and the Hong Kong Stock Exchange hosting facility, it provides a full range of colocation, cloud and managed services.

Digital asset data storage in BIM.
Image Courtesy of Global Switch

BIM rendering of building outlook.
Image Courtesy of Global Switch

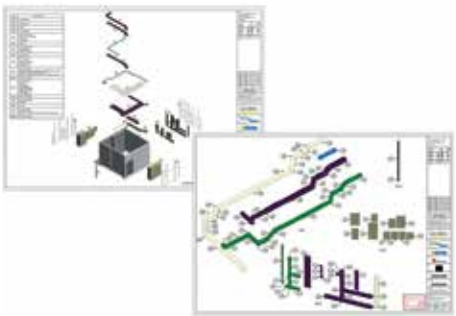
Global Switch is a leading example of an environmentally sustainable data centre, incorporating innovative design initiatives aimed at achieving long-term energy efficiency. This is reflected in its achievement of a Leadership in Energy and Environmental Design (LEED) Platinum Rating. It is also targeting the Hong Kong Green Building Council's BEAM Plus New Build Gold rating. The project was highly demanding in terms of accuracy and quality of BIM in order to align with global standards, with similar data centres operating around the world including

in London, Amsterdam, Sydney and Singapore. Accuracy was extremely stringent in terms of geometry location. In fact, the facilities management team required over 20,000 asset entries in the digital model. The contract greatly encouraged new BIM technologies so that stakeholders can enjoy the values and benefits the latest BIM has to offer. The successful adoption of DfMA is what we would like to showcase.

BIM for MiC / DfMA

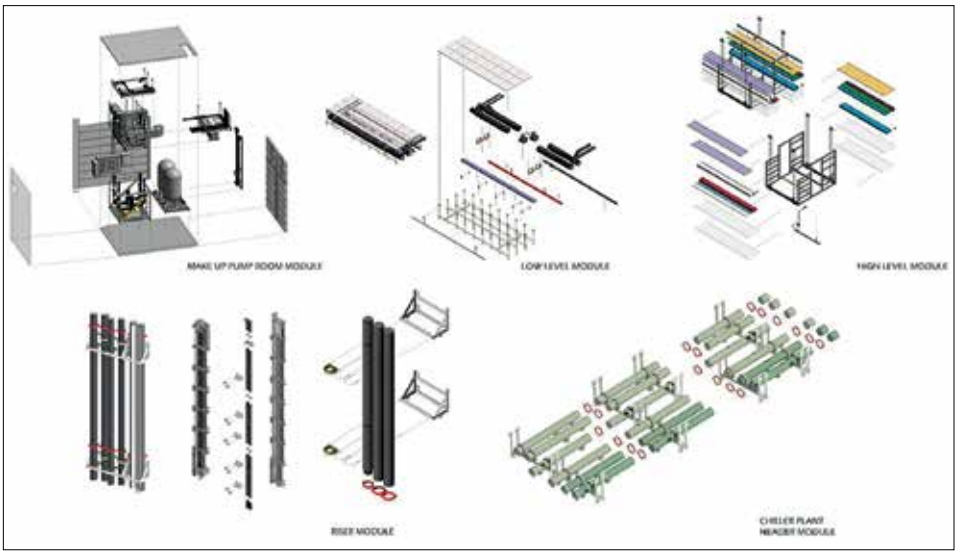
Not simply a slogan, BIM was fully utilized at Global Switch Hong Kong from the beginning. This included design coordination, construction and as-built

Modularized plant room facilitate to achieve just in time installation.
Image Courtesy of Global Switch

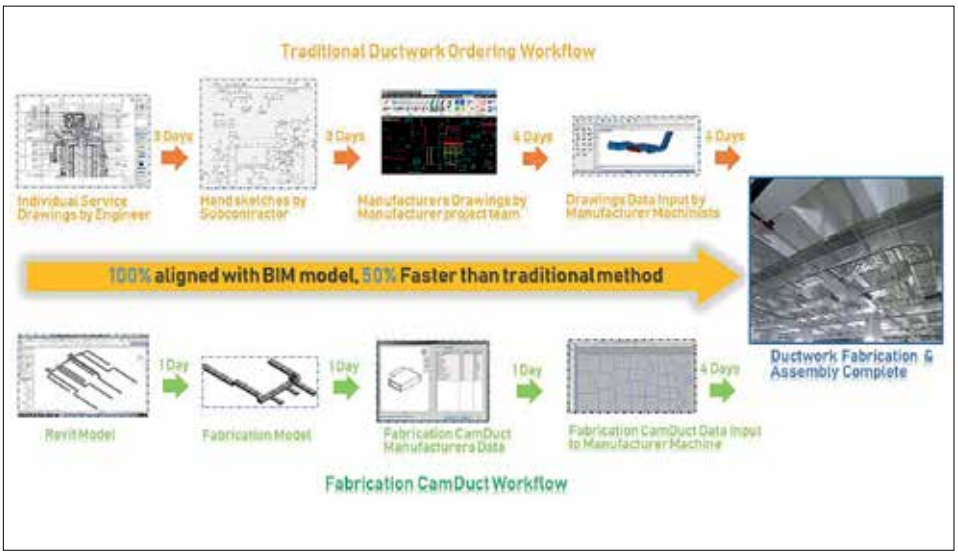


DfMA plant room designed by BIM for manufacture.
Image Courtesy of Global Switch

Automatic CNC cutting.
Image Courtesy of Gammon Engineering & Construction Company Limited



Modularization & DfMA were highly adopted in the project.
Image Courtesy of Global Switch



Time & cost being trimmed by adopting DfMA in ductwork.
Image Courtesy of Gammon Engineering & Construction Company Limited

handover, all of which is testament to Gammon's strong culture in the use of BIM and MiC /DfMA.

In addition to standard BIM operations, the BIM team also took the initiative to step out of its traditional support role. Joining the project team from the design phase to share some of their duties, the role of the BIM team evolved to become multi-functional.

Modular units were built at a remote factory and transported to the construction site. Logistics from the factory and hoisting operations on site were also demonstrated using 4D BIM methodology, ensuring modules could be completed in one go to eliminate many potential safety risks such as working at height and fire hazards; hot works moved offsite to a controlled environment with production at factory standard.

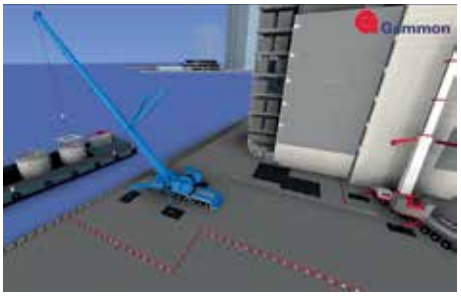
By implementing BIM technologies in a MiC / DfMA approach, the project was successful in delivering many modular applications such as integrated high-level corridor modules, integrated low-level corridor modules, riser modules, modular plant rooms... etc.

Ductwork Fabrication

Traditional ductwork fabrication requires on-site measurement by engineers and subcontractors. This information is consolidated to become fabrication drawings, which are sent to the manufacturer for production. However, this process was time consuming and prone to human errors.

To address this, Autodesk Fabrication CAMduct was adopted at Global Switch Hong Kong to develop ductwork DfMA. As there are currently no manufacturers

From Autodesk CAMduct to CNC Machine.
Image Courtesy of Gammon Engineering & Construction Company Limited



Simulation for large scale operation of the installation of heaviest MiC thermal tank in Hong Kong.
Image Courtesy of Global Switch

Hoisting operation of the heaviest MiC thermal tank in Hong Kong.
Image Courtesy of Global Switch

supporting this type of DfMA, all ductwork and fittings had to be manually created in Revit. The created custom database then became the basis, containing all fabrication parts required for CAMduct. The ductwork DfMA with Autodesk Fabrication CAMduct allowed the factory to directly fabricate ductwork using laser cutting. Overall, the workflow duration was shortened by 50% compared with traditional methods. This methodology was applied to over 70% of the ductwork throughout the project life cycle.

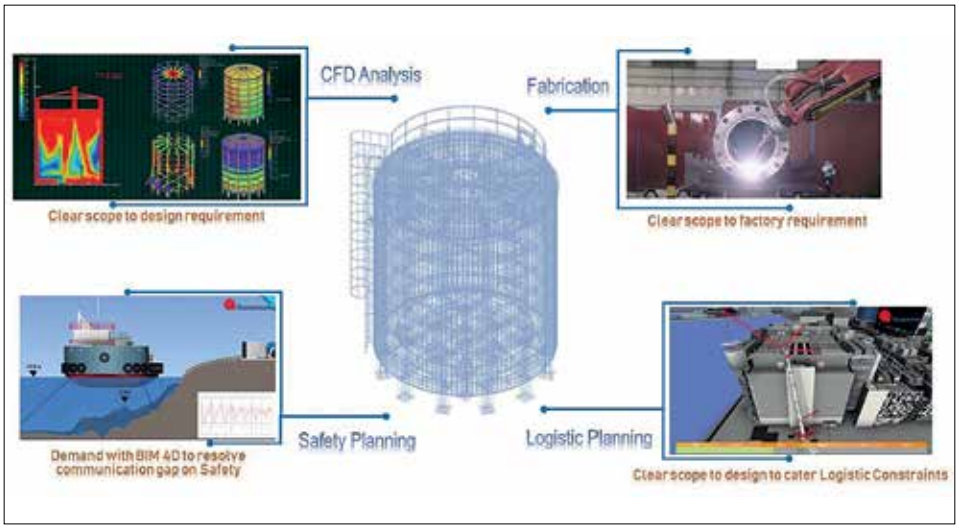
Design Coordination and Fabrication of the Heaviest MiC Thermal Tanks in Hong Kong

One of the most impressive MiC achievements in Hong Kong was the design and fabrication of the region's heaviest MiC thermal tanks at Global Switch. Starting from scratch, the conceptual model was built-up as a base, with the design process streamlined through BIM to review feasibility such as spatial requirements, structural integrity, temperature profiles and water flow pattern with CFD. Upon approval of the design by the client, the project team was able to approach the specialist manufacturer much earlier than normally possible.

Logistics and hoisting method statements were also coordinated with the use of BIM. Together with the client's representative, manufacturer, logistic contractors, in-house safety and trade engineers, the methodology was clearly communicated and reviewed together using 3D simulation.

This successful experience makes the project a benchmark for DfMA in the future and showcases Gammon's capabilities as a digital contractor.

The MiC thermal tank weighted 50 ton each being just-in-time installed to the site.
Image Courtesy of Global Switch



BIM adopted through out the Design, Pre-fabrication, Hoisting. Installation & Operating.
Image Courtesy of Global Switch

Global Switch Hong Kong - Design & Built Data Center
Image Courtesy of Global Switch

About Gammon Engineering & Construction Company Limited

Gammon has a reputation for delivering high-quality projects throughout China and Southeast Asia. Our integrated business focuses on civil, building, foundations, electrical and mechanical, facades and interiors works and design, and our construction services division provides considerable plant and steel fabrication and concrete production capabilities. We have a strong building and information modelling department and a digital entity dedicated to furthering the commercial opportunities of our innovations.

We focus on our customers' needs and how we can best use our abilities and resources to add value for them through innovative and sustainable solutions. We pride ourselves on the imagination, skill and high standards we apply to all of our projects.

Let BIM Race Against Pandemic Pace

COMPANY
Hip Hing Engineering Company Limited
Architectural Services Department, HKSAR Government

PROJECT
Provision of Temporary Facilities at Existing Open Playground of Junior Police Call Permanent Activity Centre and Integrated Youth Training Camp at Pat Heung

LOCATION
123 Fan Kam Road

TYPE
Construction

SCHEDULED TIME OF COMPLETION
70 Days

"Amid the challenges of the COVID-19, we had been racing against time to construct the quarantine facility. BIM had been proven as an extraordinary catalyst to push boundaries. Its implementation enabled us to achieve early completion of 120 new quarantine units within 63 days. This was earlier than scheduled with site formation and building works being 7 days and 8 days ahead of schedule respectively. Heartfelt thanks go to all parties for their seamless collaboration and steadfast dedication to fighting the pandemic."

— Derek So
Executive Director,
Hip Hing Engineering Company Limited

BIM PARTNERS
WSP Hong Kong Limited
Leigh & Orange Architects

AUTODESK PRODUCTS USED
Autodesk A360
AutoCAD
Civil 3D
Dynamo Studio or Dynamo for Revit
Inventor
Navisworks Manage
Revit
Revit Live

Site Photo of Pat Heung Quarantine Centre
Image Courtesy of Hip Hing Engineering Company Limited and Architectural Services Department, HKSAR Government

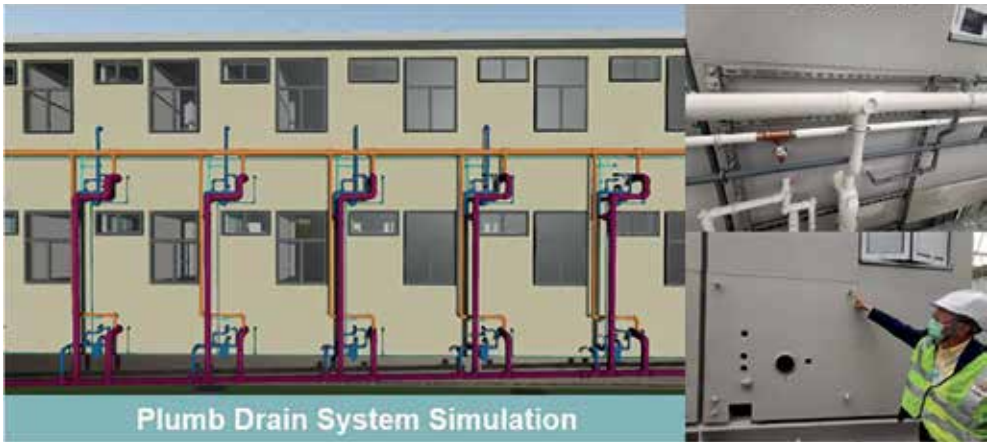
Temporary Quarantine Facilities at Pat Heung

The pandemic COVID-19 has hit hard the city. To contain its outbreak, the HKSAR Government acted swiftly and decided to build 120 units of temporary quarantine facilities at existing open playground of Junior Police Call Permanent Activity Centre and Integrated Youth Training Camp at Pat Heung. Hip Hing Engineering Co. Ltd. was responsible to complete the foundation work, design and construction of this significant project.

Time Limitation

To help the community fight the pandemic, the project has an aggressive schedule for completion within 70 days. The scope of works include design, fabrication and construction.

To push the boundary and accelerate the programme, prefabrication technology is essential. It is for this reason the game changing construction method - Modular Integrated Construction (MiC) technology - was thoroughly applied. Racing against



BIM simulation of Plumb Drain System Simulation assembled by DfMA
Image Courtesy of Hip Hing Engineering Company Limited and Architectural Services Department, HKSAR Government

BIM model of typical unit container
Image Courtesy of Hip Hing Engineering Company Limited and Architectural Services Department, HKSAR Government

time, all 120 modules were fabricated offsite in MiC factory in Mainland China within 30 days, which were installed in Hong Kong on 7 working days within 20 days' time. Thanks to the adoption of BIM, coordination between different stakeholders had been much effective, while it helps facilitate the accuracy and precision of fabrication with its ability to generate 3D fabrication drawings; moreover, all designs had been completed in a fast speed and error-free. On the other hand, Design for Manufacture and Assembly (DfMA) method had also been adopted in MEP system. As a result, the project was completed in 63 days (14% Ahead of schedule). This was earlier than scheduled with site formation and building works being 7 days and 8 days ahead of schedule respectively.

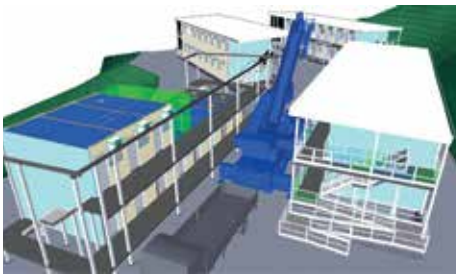
Congested Construction Site and Limited Road Accessibility

The congested construction site is another critical concern. The overall existing open playground site dimension for 120 quarantine facilities is around 5800 m2. In order to place all MiC individual units and fulfill statutory requirements such as occupants' Means of Escape and 6m width EVA separation in between the 6 blocks, Autodesk's Revit model was adopted to fit different site layout options in the existing site reference, so as to confirm the most suitable overall design. Besides, fitting in with the framing plan generated from Autodesk's Revit model, Autodesk's Civil 3D vehicle path simulation tools were adopted to facilitate the site planning works at the early stage and to simulate the path of the fire truck, for the review and approval of Fire Services Department (FSD).

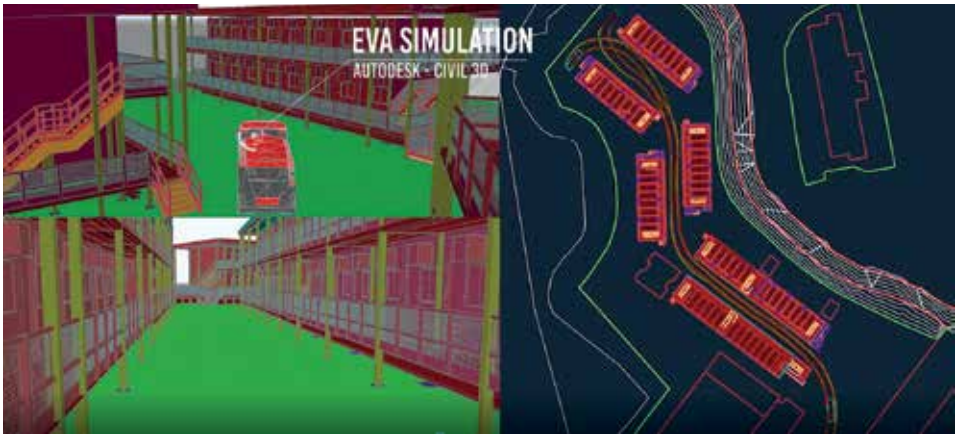
Apart from layout plan design, allocation of works is also complicated in a congested construction site. Autodesk's Navisworks had been adopted to generate the 4D simulation in view to visualize and check schedule of site activities. Since all temporary works and machines were envisioned together with the design structure and existing site conditions, vehicles flow can be carefully planned and tracked efficiently. Thus, potential issues of inadequate resources and over-deployed idling allocation in such limited site area can be resolved in advance. Project team can be given a full picture of the pros and cons of each construction method, so that the most optimum decision can be made. In fact, in collaboration with real time GPS shipment tracking, Autodesk's Navisworks can rapidly reflect the change of module quantities and its impact to the Site, and helped adjust the ad hoc issues.

Minimal Physical Meet-up: Online E-Meetings and Common BIM environment

During the most severe period of COVID-19 outbreak, strict border controls between Mainland China and Hong Kong were in place, while local meetings between client, consultants and contractor were restricted to a certain degree. Despite the lack of face-to-face meeting and on-site supervision, Autodesk's A360 had been proven to secure mutual communication and understanding. It was used for an integrated cloud system which enables all stakeholders to get the exact and adequate details of the design in the simulated world. The update of the design is real-time, which helps avoid the confusion due to different versions of hard copy. Furthermore, the accessibility is considerably user-friendly as the 3D coordination model can be viewed in tablet or mobile devices, which allows the site workers to check whether the construction is consistent with the



4D construction simulation
Image Courtesy of Hip Hing Engineering Company Limited and Architectural Services Department, HKSAR Government



EVA Road Swept Path Simulation
Image Courtesy of Hip Hing Engineering Company Limited and Architectural Services Department, HKSAR Government

QR code scanning and QA/QC inspection
Image Courtesy of Hip Hing Engineering Company Limited and Architectural Services Department, HKSAR Government

Daily construction progress record by drone
Image Courtesy of Hip Hing Engineering Company Limited and Architectural Services Department, HKSAR Government

All of the application applied in this project are inter-communicated with each other.
Image Courtesy of Hip Hing Engineering Company Limited and Architectural Services Department, HKSAR Government

design through electronic devices instead of paper.

Add-on Tools Application: Surveillance System

The record from the drone can be compared directly with the design model and programmed simulation by locating the view of the simulation on the same location as the drone. Thus, all responsible parties can review and control the construction process every day without reaching the site.

BIM model rendering for interior design
Image Courtesy of Hip Hing Engineering Company Limited and Architectural Services Department, HKSAR Government

Revitalize QA/QC Inspection Workflow

Inspection workflow of MiC units was divided into three parts: Firstly, self-inspection with photos, videos endorsed by Sub-Contractor representatives in Mainland China was submitted. Secondly, online livestream inspection was carried out between Hong Kong and Mainland China with video records, lastly, on-site random check by QA/QC team was conducted upon delivery. In order to trace the inspection record easily, a unique QR code was designated to every single module to record all inspection and photo records, including the inspection videos and endorsed documents. After the MiC units had been transported to Hong Kong, an on-site audit check was held to check the reliability of the information.

Program Compatibility

With the progressive development of BIM, more BIM related software have been developed. The project utilizes Revit, Dynamo, Autodesk Civil 3D, Autodesk Navisworks, Autodesk Inventor and Autodesk AutoCAD, which are all compatible with each other. It means that the models generated by any of these software can be directly federated into one package without losing important data, which is crucial for the project's operation with tight time frame.

Image of BIM model rendering and site photo.
Image Courtesy of Hip Hing Engineering Company Limited and Architectural Services Department, HKSAR Government

協興 HIP HING
新創建集團成員
Member of NWS Holdings

建築署
Architectural Services Department

Design and Build BIM Model: Pat Heung Quarantine Centre
Image Courtesy of Hip Hing Engineering Company Limited and Architectural Services Department, HKSAR Government

About Hip Hing Engineering Company Limited

Founded in 1964, Hip Hing Engineering Co., Ltd. undertakes the design and construction of building and civil engineering works for public sector clients, and it is one of the members of Hip Hing Construction Group ("Hip Hing"). Over the past decades, Hip Hing has grown to become one of the leading contractors in Hong Kong, and has been trusted by our clients to construct many of the landmark buildings which define Hong Kong. Our experience and expertise in the design, procurement, engineering and construction disciplines enables us to provide comprehensive project delivery services. We have also been embracing advancing technologies to take our services to the next level, so as to meet our clients' needs.

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 upkeeping 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. It is believed that through collective wisdom, experience and talent, ArchSD will be able to bring about continuous improvement on the public works and the quality living environment for the public.

COMPANY
Hip Hing Engineering Company Limited
Hong Kong Science and Technology Parks Corporation
Leigh & Orange Limited

PROJECT
InnoCell

LOCATION
TPTL 245, Pak Shek Kok, Tai Po, New Territories (Science Park)

TYPE
Building Project

SCHEDULED TIME OF COMPLETION
Dec 2020

Let Innovations Permeate Every Cell

"Echoing "Construction 2.0", the future of construction industry must be entangled with innovation, technology and more extensive BIM uses. As a pilot practitioner of Modular Integrated Construction (MiC), InnoCell resembles a breakthrough of construction method in Hong Kong."

—Michele Lui
Deputy Project Manager,
Hip Hing Engineering Company Limited

—Simon Wong
Chief Project Development Officer,
Hong Kong Science and Technology Parks Corporation

—Ivy Lee
Managing Director,
Leigh & Orange Limited

BIM PARTNERS
WSP Hong Kong Limited
Ove Arup & Partners (HK) Limited

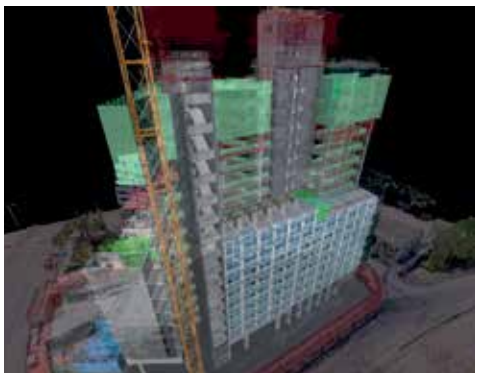
AUTODESK PRODUCTS USED
AEC Collection
Civil 3D®
Dynamo for Revit®
InfraWorks®
Inventor®
ReCap™ Pro
Vehicle Tracking

Rendered Image of InnoCell
Image Courtesy of Hip Hing Engineering Company Limited and Hong Kong Science and Technology Parks Corporation and Leigh & Orange Limited

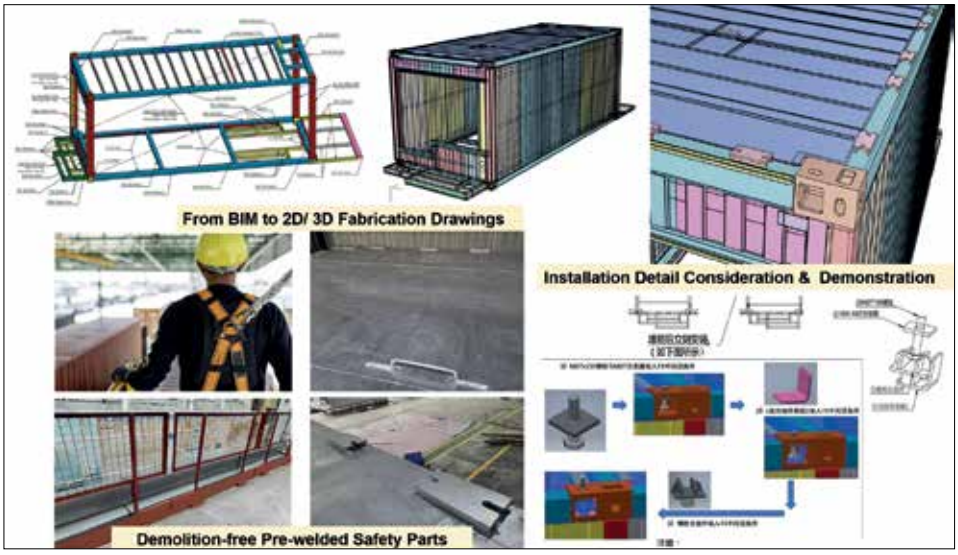
InnoCell is the first hybrid Modular Integrated Construction (MiC) permanent building in Hong Kong. After completion, it will provide residential units integrating with co-recreational and working space for technology talents. The construction involves an assembly of 418 MiC modules, that constitutes over 70% construction-floor-area on accommodation stories. By leveraging Building Information Modelling (BIM) technology in MiC project, we are committed to resolving inter-disciplinary problems 2 stories prior to site construction, maximize reusability of construction materials, and eventually push forward the conventional construction programme by 6 months. Safety is our top priority, that the team had devoted every effort to enhance safety awareness through disruptive technologies, leading to an achievement of 600,000 man-hours accident free in construction phase.

BIM Project and Information Management

To bring safety, quality and productivity to the next level, L&O and major design consultants have been collaborating in BIM environment since design stage. Upholding BIM as the single source of information, all coordination footpaths and spatial geometries were well recorded in the BIM model towards construction stage. Hip Hing could thus leverage the BIM model for more advanced developments, including 3D printing and incorporation with other technologies (e.g. IoT, GIS and VR). Furthermore, to ensure the inputs of BIM align with the objectives of facility management, HKSTP issued a BIM-AM Standards at initial stage, which defined the standardization and information required for operation. Early involvement of an asset management team and integration of BIM workflows provided soft-landings for desired operational outcomes.



3D Drone Scanning Result Incorporated with 4D Simulation
Image Courtesy of Hip Hing Engineering Company Limited and Hong Kong Science and Technology Parks Corporation and Leigh & Orange Limited



Design for Demolition-Free Pre-Welded Safety Parts in Permanent Module Frame
Image Courtesy of Hip Hing Engineering Company Limited and Hong Kong Science and Technology Parks Corporation and Leigh & Orange Limited

Construction and Cost Planning

During the construction stage, a key challenge was to avoid on-site disturbance such as modules installation. In order to obtain a clear overview of future activities, we adopted 3D drone scanning and compared the scanned point cloud data with virtual 4D construction program simulations. Since the modules are prefabricated, with furniture and fittings manufactured off-site in an MiC factory in Jiangmen China, a prudent quantity surveying management became more essential. To enhance the accuracy and traceability of quantity estimation, Revit-extracted 5D quantity takeoff (QTO) schedules were requested as a reference of monthly Bill of Quantity (BQ) applications. In the long run, we target the as-built model QTO to be served as a benchmark for future MiC projects.

Design for Manufacture and Assembly (DfMA)

Early buildability study of MiC modules is crucial prior to mass production. By maximizing construction efficiency, BIM modeling proprietary was distributed according to stakeholders' expertise. Besides, installation issues such as rigging and temporary works had already been addressed in module frame design. The module connection procedures were explicitly animated, and the corner-sides of four coherent modules were 3D-printed into components for genuine practice. Thanks to such practicing opportunity, we identified that the gesture of fastening bolts would be constrained by the adjacent steel members, and the problem was eventually resolved by using hydraulic wrench. Other than that, the BIM models were also leveraged for mock-up renderings and demarcation between pre/ pro module installation works.

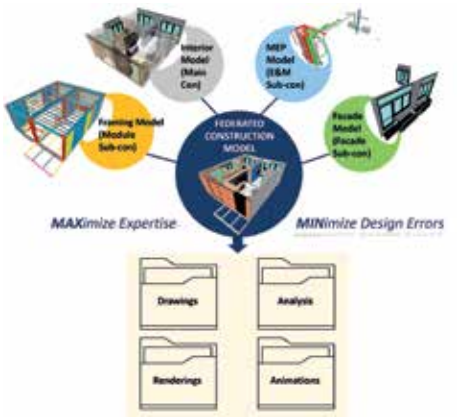
MiC + Internet of Things (IoT)

Our team implemented a robust inspection tool in order to record all inspection and defect follow-up activities in MiC module factory. It allowed the team to take and upload inspection photos, mark comments, and digital sign for approvals in an all-in-one approach via a handy smartphone. The system automatically presented a neat dashboard showing the percentage of completion and sending alerts for overdue items. To further digitalize the inspection process, each module element in BIM incorporated a link to directly access the inspection summary webpage under the application. BIM and cloud inspection platform were merged to pursue IoT, that allowed big data transfer and analysis among project team members despite geographical barriers. This advantage made a profound positive impact to the project amid the pandemic.

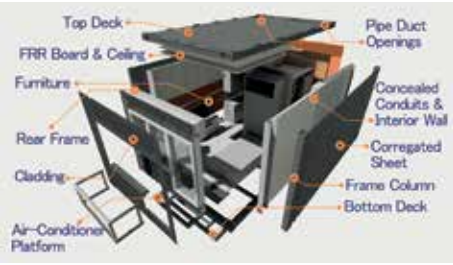
MiC + Geographic Information System (GIS)

Module logistic plays a critical role to determine the success of this project. In order to minimize the impact to the surrounding traffic and keeping the module intact at the same time, the driving path of module-loading vehicle must be well-planned in advance. Before the commencement of construction, Hip Hing had already leveraged InfraWorks® to acquire basic GIS data around the site. It provided a preliminary background and understanding of the relationship among site gantries and adjacent facilities, it also facilitated the investigation for a temporary shelter for standby vehicles in the future. Prior to the first batch of module delivery, a thorough 3D laser scanning had been conducted to acquire the most updated and highest level of accuracy of the site layout, the collected data was imported into the Vehicle Tracking add-in under Civil 3D®, for all-rounded vehicle path simulations. It helped unveil some critical points that would have been overlooked in traditional practices. For instance, we identified that one gantry should be widened to offer wider turning radius for vehicles. With the flexible use of technology, we achieved maximum 15 MiC module installations per day. Eventually 418 MiC modules were completely installed in 71 days, with no MiC modules withdrawn due to design errors or severe damages.

Demonstration of MiC Module Connection Using 3D Printed Components
Image Courtesy of Hip Hing Engineering Company Limited and Hong Kong Science and Technology Parks Corporation and Leigh & Orange Limited

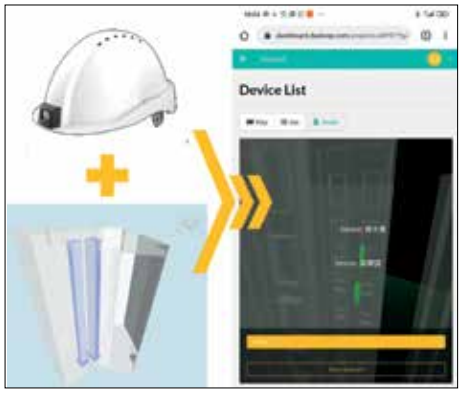


BIM Collaboration Strategy of MiC Modules Design
Image Courtesy of Hip Hing Engineering Company Limited and Hong Kong Science and Technology Parks Corporation and Leigh & Orange Limited



Exploded View of Co-Living Module Unit for Clear Indication
Image Courtesy of Hip Hing Engineering Company Limited and Hong Kong Science and Technology Parks Corporation and Leigh & Orange Limited

VR Training of Lifting an MiC Module
Image Courtesy of Hip Hing Engineering Company Limited and Hong Kong Science and Technology Parks Corporation and Leigh & Orange Limited



Operational Procedure of Smart Helmet System
Image Courtesy of Hip Hing Engineering Company Limited and Hong Kong Science and Technology Parks Corporation and Leigh & Orange Limited

Incorporate Innovations into Safety Precautions

Safety always weighs the highest priority in our project. We have proactively kept abreast with the market and realized innovative ideas to take safety performance to the next level. Conventional safety trainings might not be engaging workers to the fullest. Therefore, we incorporated VR technology to enhance the visuals and maximize the impact of training. Participants were directed to perform different characters in module lifting scenarios, and were encouraged to raise

BIM-Rendered Co-Living Unit for Pre-Mockup Visualization
Image Courtesy of Hip Hing Engineering Company Limited and Hong Kong Science and Technology Parks Corporation and Leigh & Orange Limited

out all precautious measures as the lifting animation proceeds. Over 90% of workers appreciated this immersive interaction, which let them experience the site environment in first person perspective.

A technology start-up company was also engaged to provide smart helmets for lift shaft workers. The helmets are equipped with smart systems to report workers' positions and health status to the portal in real time. If the portal receives triggering alert, it will automatically send messages to the concerned parties immediately. The role of BIM was to provide an explicit building layout to the system, for indicating the position of workers and their status. This high-esteem technology also leveraged remarkable use of IoT.

The implementation of the MiC has brought tangible benefits to the projects, combined with BIM and other technology. Those have helped expedited the construction programme with higher assurance of construction safety and quality. InnoCell shall serve as a valuable example for the operation of future MiC projects.

Swept Path Simulation of Module-Loading Vehicle Along the Site
Image Courtesy of Hip Hing Engineering Company Limited and Hong Kong Science and Technology Parks Corporation and Leigh & Orange Limited

BIM Model of InnoCell
Image Courtesy of Hip Hing Engineering Company Limited and Hong Kong Science and Technology Parks Corporation and Leigh & Orange Limited

About Hip Hing Engineering Company Limited

Founded in 1964, Hip Hing Engineering Co., Ltd. undertakes the design and construction of building and civil engineering works for public sector clients, and it is one of the members of Hip Hing Construction Group ("Hip Hing"). Over the past decades, Hip Hing has grown to become one of the leading contractors in Hong Kong, and has been trusted by our clients to construct many of the landmark buildings which define Hong Kong. Our experience and expertise in the design, procurement, engineering and construction disciplines enables us to provide comprehensive project delivery services. We have also been embracing advancing technologies to take our services to the next level, so as to meet our clients' needs.

About Hong Kong Science and Technology Parks Corporation

Hong Kong Science and Technology Parks Corporation (HKSTP) fosters a culture of promoting innovation and a vision to adopt new technologies, so as to strengthen the industry's sustainable development and build a future with abundant innovation opportunities for the younger generation. HKSTP upholds supporting infrastructure and works as a connector bridging investor, industry and public stakeholders. InnoCell is an extension of that mission.

About Leigh & Orange Limited

Founded in Hong Kong in 1874, Leigh & Orange (L&O) is a well-established international architectural design practice which operates throughout China, Hong Kong and the Middle East, and has continued to thrive as a significant force in the markets it serves by focusing on quality. With an unsurpassed depth of experience in a wide variety of building types, the firm prides itself on balancing knowledge and innovation, attuned to each client's specific needs.

COMPANY
Hip Hing Engineering Company Limited
Kai Tak Sports Park Limited
Home Affairs Bureau, HKSAR Government

PROJECT
Kai Tak Sports Park

LOCATION
38 and 39 Shing Kai Road, Kai Tak, Kowloon, Hong Kong

TYPE
Design, Build and Operation
AECO (Architecture, Engineering, Construction, Operation)

SCHEDULED TIME OF COMPLETION
2023

Kai Tak Sports Park For the People of Hong Kong

"Offering a world class destination for all interests, Kai Tak Sports Park is an exciting project with unprecedented scale of 28 hectares and multi-faceted collaboration among 63 companies from 8 different regions. Creating synergy is ultimately the key factor to secure safe and smooth operation. By unlocking the full capability of BIM, management of design, construction, quality control and data has been more effective and productive for all stakeholders. We believe the current BIM applications shall inspire us for the next game changers."

—Kenneth Ma

Director & General Manager (Business Development), Hip Hing Engineering Company Limited

Director (Design & Build), Kai Tak Sports Park Limited

BIM PARTNERS

Leigh & Orange Limited
Populous Limited
Simon Kwan & Associates Limited
Ove Arup & Partners Limited
WSP (Asia) Limited
ADI Limited
isBIM Limited
ASM Global
STRI Limited
Lagardère Sports and Entertainment
Rider Levett Bucknall Limited

AUTODESK PRODUCTS USED

3ds Max
AutoCAD
BIM 360 Design
BIM 360 Docs
BIM 360 Ops
Civil 3D
Dynamo Studio or Dynamo for Revit
Fabrication CAMduct
Navisworks Manage
ReCap Pro
Revit

Main Stadium and Event Village
Image Courtesy of Kai Tak Sports Park Limited

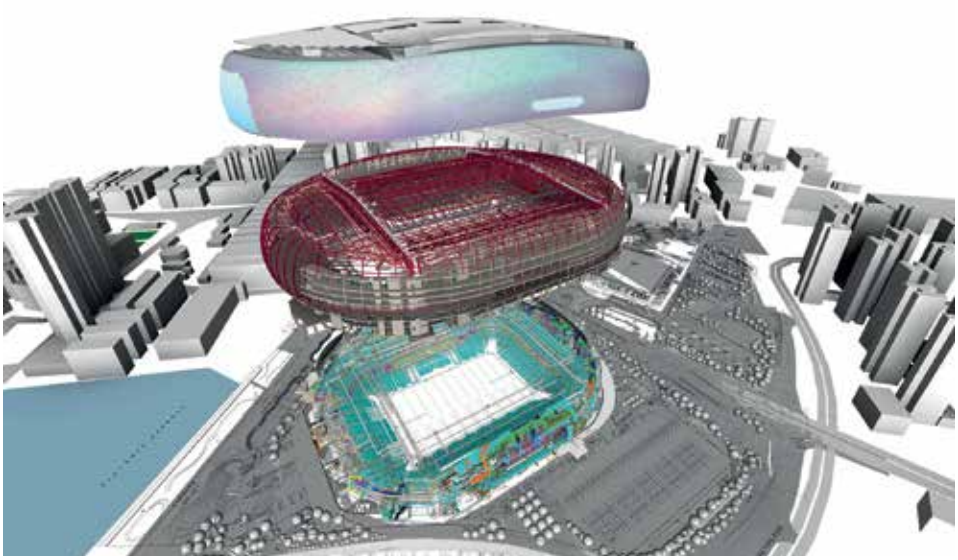
Hip Hing has been committed to staying at the forefront and adopting innovation and advanced technologies. BIM is an exemplary example. Since its first application in the Hong Kong Convention and Exhibition Centre (HKCEC) – Atrium Link Extension project, Hip Hing's BIM team has evolved into a strong force to provide innovative solutions to deliver quality projects in the local city. To meet the needs of rapid business growth, Hip Hing's BIM team has expanded 50% in 2019-2020, a Mainland China office has also been established to empower its in-house BIM development.

As a significant player to secure the smooth operation of the projects, Hip Hing has a set of sophisticated and comprehensive policies and procedures. In consideration of BIM's benefits, BIM adoption is mandatory for all projects including ELS system and underground services in Hip Hing. With solid track records, it is proven that BIM helps the project teams leverage resources and create values for the clients and all stakeholders.

Virtual Design Construction (VDC)

BIM features Virtual Design Construction

Indoor Sports Centre Main Arena
Image Courtesy of Kai Tak Sports Park Limited



Main Stadium BIM Model Explosion
Image Courtesy of Kai Tak Sports Park Limited and Hip Hing Engineering Company Limited

(VDC), which is an optimum platform to manage large-scale project in many different ways, by eliminating risks and minimizing reworks. Collaboration between teams is effectively enhanced for all project stages from design to operation, design discrepancies and information silos are thus eliminated. Moreover, all systems are vividly transformed into detailed models prior to operation, hidden issues and potential design conflicts can be identified and addressed.

Upholding the vision to boost productivity, enable traceability and enhance sustainability, Hip Hing is dedicated to implementing innovative construction methods and Research & Development on BIM. It includes Varadise (CDE platform) for Digitalization of Site Management, MiC approach for construction, Unreal for visualization of Design and Build projects, Hololens for site operation and management. The essence of the initiatives is to encourage engineers to carry out inspection, anywhere and anytime.

KTSP – A World Class Sports Park

Kai Tak Sports Park (KTSP) is an appealing project covering 28-hectare. Its unique pearl shell design resonates Hong Kong's reputation as "Pearl of the Orient". The main stadium of KTSP will serve to hold a wide range of sports, entertainment and community events. It has a capacity of up to 50,000-seat, and possesses features such as a soundproof retractable roof and a flexible pitch system, creating an adaptable venue capable of hosting events of various scales; and an indoor sports centre with a 10,000-seat main arena, a 500-seat ancillary sports hall, a 5,000-seat public sports ground and commercial facilities, all surrounded by extensive public open space.

In short-term, all designs are expected to be completed within two years through a single-source online platform. The mid-term goal is to complete the construction in the 5th year integrating the process of "Design, Build and Operate", and the ultimate goal is to create a new home for sports development that can be sustainable for the next 20 years and beyond.

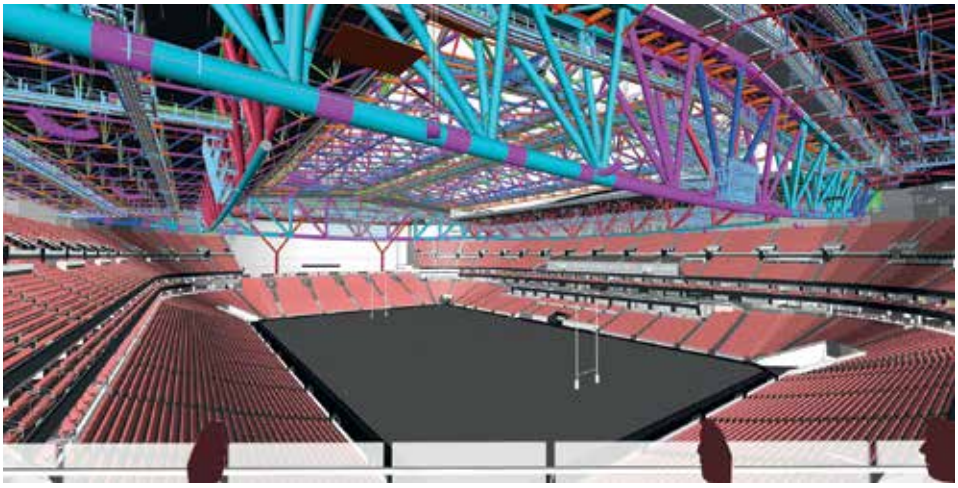
Project Challenges

Collaboration among project stakeholders is one of the major challenges of managing such a large-scale project. In the KTSP project with more than 60 companies in multi-disciplines all around the world, Autodesk's BIM360 Design provides a favorable platform as a common data environment. It enables sharing of work, reinforces collaboration and leverage data management among teams beyond physical location and time zones. Riding on the benefits of BIM 360 collaboration, the design team was able to share models through portable devices, thus strengthening communication & allowing access to the project status interactively for project team members who even don't possess BIM techniques.

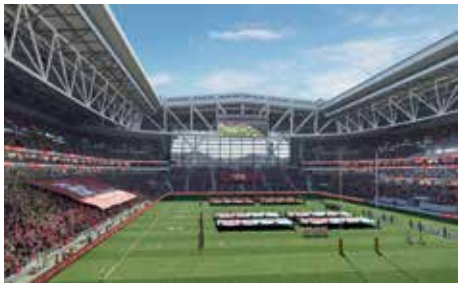
Value of BIM to KTSP

Coordination, review and approval of over 50,000 2D design drawings can be completed at the single-source Autodesk's BIM360 platform. Take KTSP, a project scale of 28 hectares and 470,000m2 of CFA as an example, DDA (Internal Design and Development Process) of such a project usually takes 2 to 3 years. BIM360 enables project team to bring forward the multi-disciplinary design coordination and systems integration, this ensures constructability concerns are taken into account.

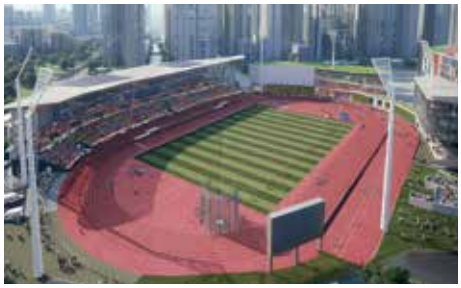
Main Stadium Façade
Image Courtesy of Kai Tak Sports Park Limited



Main Stadium BIM Model
Image Courtesy of Kai Tak Sports Park Limited and Hip Hing Engineering Company Limited



Main Stadium Seating Bowl
Image Courtesy of Kai Tak Sports Park Limited



Public Sports Ground External Overview
Image Courtesy of Kai Tak Sports Park Limited

Dining Cove
Image Courtesy of Kai Tak Sports Park Limited

Adopting Integrated Project Delivery approach has reduced design variations so as to shorten the project delivery process. As a result, the DDA stage of the KTSP project is effectively cut down to only 6 months; 70% construction reworks (design change and management) can be reduced comparing with traditional 2D Design and delivery approach.

Originally the Main Stadium Façade consists of 42,500 panels, however, with the adoption of the Design for Manufacture and Assembly (DfMA) for façade design, the amount of panels is greatly reduced to around 27,500, of 1,700 variations of exterior decorative surface. Taking this advantages of DfMA, the overall production time and cost are minimised.

The Main Stadium of KTSP presents

Main Stadium Gantry Details
Image Courtesy of Kai Tak Sports Park Limited
and Hip Hing Engineering Company Limited

challenges as it requires over 25,000 steel structural components, weighing more than 15,000 tonnes in total. Precision for installation is one of the critical factors. Autodesk's Navisworks enables integration of multiple formats of 3D models. Coupled with 3D scanning, discrepancies between the manufactured products and the BIM models can be quickly identified and solved, ensuring that a precisely-made product is delivered for installation. In addition, as the status of each component could be tracked in all stages, it minimizes the risk of improper installation while enhances overall workflow and final product quality.

Innovative BIM Use

Virtual-reality (VR) via BIM CAVE technology facilitates communication between the client and design team with strong visual to walk-through the model prior to the confirmation of design, this helps reach consents and reinforce collaboration.

By drone and photogrammetry application with Autodesk's ReCap and Navisworks and BIM360, monthly update of site analysis is achieved, the project team can carry out inspection online, enhancing safety by virtual site visit and reducing the time of site inspection and recording.

Sustainable Development

In addition to design and construction, the BIM model plays an essential role in supporting smart initiatives to realize the vision of sustainable development of Kai Tak Sports Park. By integrating different systems and technologies, BIM has created more flexible, productive and effective building management and ultimately will help shape a smart, and sustainable city.

Sports Avenue
Image Courtesy of Kai Tak Sports Park Limited

協興 HIP HING
新創建集團成員
Member of NWS Holdings

啟德體育園有限公司
KAI TAK SPORTS PARK LIMITED

民政事務局
Home Affairs Bureau

Kai Tak Sports Park Overview
Image Courtesy of Kai Tak Sports Park Limited

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About Kai Tak Sports Park Limited

Kai Tak Sports Park Limited (KTSPL) is the contracted party for the design, build, and operation of Kai Tak Sports Park. The KTSPL project team comprises of recognised local and global industry leaders with extensive experience in the design, construction and operation of large scale projects as well as the management of major sports venues. Key members include Hip Hing Engineering (contractor), Populous (lead architect), ASM Global (future operator) and Lagardère Sports (event and commercial sales consultant). KTSPL is a subsidiary of New World Development Company Limited (NWD) and NWS Holdings Limited (NWS).

About Home Affairs Bureau, HKSAR Government

The Home Affairs Bureau (HAB) has set up a dedicated project team for the Kai Tak Sports Park. The team is responsible to oversee the construction contract, programme, expenditure, resources and quality standards of the project. Comprising of architects, landscape architects, building services engineers, civil engineers, structural engineers, quantity surveyors and leisure services managers, the project team led by the Project Director makes use of BIM and project document management system to examine and monitor the planning, design, construction and cost information of the project. Upon completion of construction, an HAB operation team will be set up to monitor the operation planning and the asset and facilities management of the Sports Park.

COMPANY
Independent Checking Unit, Office of the Permanent Secretary for Transport and Housing (Housing), HKSAR Government

PROJECT
Development of the Technology to Use Building Information Modelling for Statutory and Building Control Submission

LOCATION
Hong Kong

TYPE
BIM Standard, Guideline, Templates, Objects Library and Plug-in Software

SCHEDULED TIME OF COMPLETION
30 September 2020

Development of the Technology to Use Building Information Modelling for Statutory and Building Control Submission

About Independent Checking Unit, Office of the Permanent Secretary for Transport and Housing (Housing), HKSAR Government

The Independent Checking Unit (ICU) works directly under the Office of the Permanent Secretary for Transport and Housing (Housing). Under the delegated authority from the Building Authority (i.e. the Director of Buildings), the ICU exercises statutory building control to properties developed by the Hong Kong Housing Authority (HA) that have been sold or divested, in accordance with the Buildings Ordinance (BO) and the policies and guidelines of the Building Authority (BA). The ICU also exercises administrative building control to the HA's new development works and existing buildings in line with the BO and the BA's policies and guidelines.

ICU exercises building control to properties developed by the HA including new development works, alterations and additions works, minor works and site monitoring. All the submissions of plans under administrative building control can be made through the Housing Electronic Plan Submission System (HePlan).

BIM PARTNER

Building Information Technology Limited

AUTODESK PRODUCT USED

Autodesk Revit

Project Description

ICU initiated this Project with funding support by TechConnect (Block Vote) of Innovation and Technology Bureau (ITB) which aimed to develop BIM standard and guideline, model templates, BIM objects and families so as to minimize manual-editing works during generation of 2D plans and schedules from BIM 3D model, and a plug-in software for automatic detection of manual-editing works on 2D plans to check the linkage and consistency between BIM 3D model and 2D plans generated. It serves to provide tools for the construction industry to facilitate production of 2D plans with minimum manual editing works using BIM technology for statutory and building control submission, including General Building Plan, Superstructure Plan and Foundation Plan. It echoed the government policy on promoting the use of BIM in construction industry.

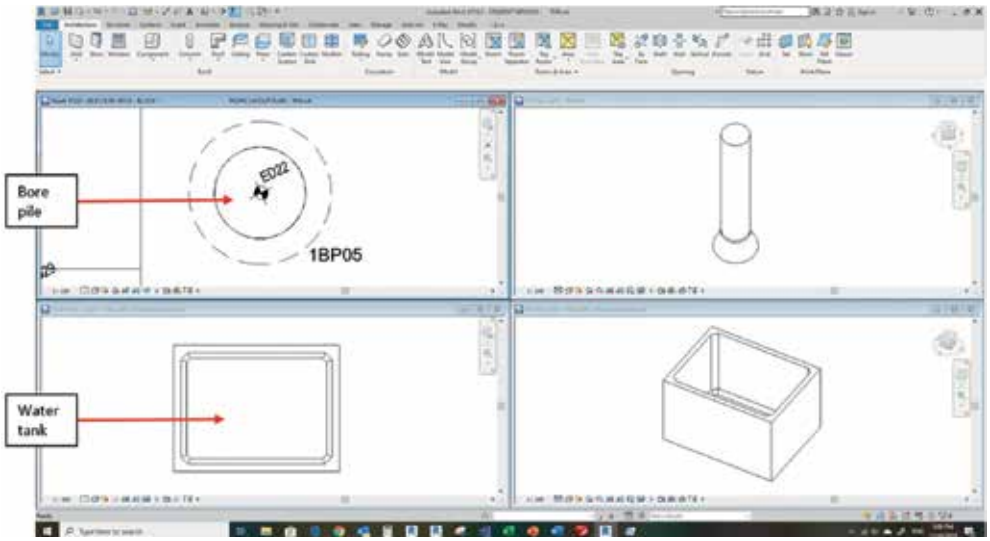
Project Challenges

In traditional construction industry, the site works rely on the 2D construction drawings including plans, elevations and sections which are produced separately without linkage to each other. When design changes, all drawings have to be updated manually which is time consuming and vulnerable to unnecessary human errors. Moreover, as the concept of direct drawing generation for statutory and building control submission is relatively new to Hong Kong and most of the building professionals do not know how to prepare 2D drawings for statutory and building control submission by using BIM. Besides, as there are always software constraints, 100% direct 2D drawing generation is normally infeasible. To mitigate the constraints, most of the BIM softwares provide 2D manual-editing tools including 2D line and annotation editing tools etc., so that users can produce 2D drawings within BIM softwares when such drawings cannot be generated directly from 3D models. For building professionals who are not familiar with BIM, it is very likely that 2D manual-editing tools will be abused. In such case, it loses the spirit of using BIM as 2D drawings produced by BIM are not directly linked from 3D model. In order to further promote the use of BIM in the construction industry of Hong Kong, this gap of linkage between 2D drawings and 3D models and minimizing the use of manual-editing works for statutory and building control submission need to be bridged over.

Solutions for challenges

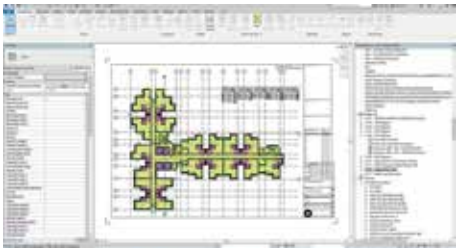
The above challenge is resolved by development of:

1) BIM Standard and Guideline



BIM Objects
Image Courtesy of Independent Checking Unit, Office of the Permanent Secretary for Transport and Housing (Housing), HKSAR Government

BIM Standard & Guideline
Image Courtesy of Independent Checking Unit, Office of the Permanent Secretary for Transport and Housing (Housing), HKSAR Government



BIM Template – GBP
Image Courtesy of Independent Checking Unit, Office of the Permanent Secretary for Transport and Housing (Housing), HKSAR Government

2) BIM Template and Object Library
3) Plugin for automatic detection of manual-editing works

The standard quantifies the definition of "proper 3D modelling". The guideline illustrates the methodology on how to achieve the standard. The Template and Library provide the commonly used BIM setting for statutory and building control submission. And as manual-editing works can be minimized but not fully eliminated, a plugin is developed for automatic detection of manual-editing works.

Testing is carried out. Number of manual editing works of a project using traditional approach is recorded. Same project is reproduced using the method proposed in this project. Significant reduction in the nos. of manual editing works items (which could be reduced from 200 to 20 approximately) has been recorded in testing stage for different types of plans including General Building Plan, Superstructural Plan and Foundation Plan for a test project.

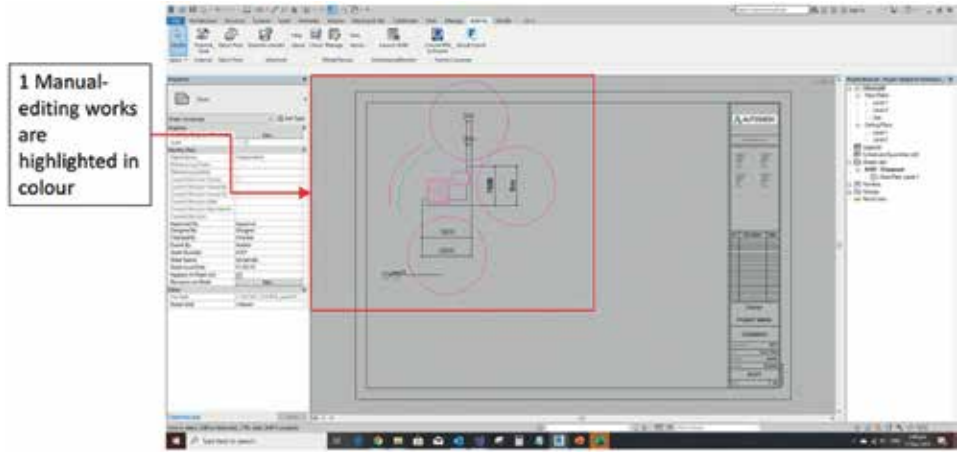
The deliverables developed in this Project could be used by HA and other works departments such as Buildings Department, Architectural Services Department and over 2700 registered consultant firms and professionals (Authorized Persons, Registered Structural Engineers, Registered Geotechnical Engineers) in Hong Kong. This would facilitate the applications of BIM technology in these departments and the whole construction industry in Hong Kong.

How does BIM benefit the project?

With the recent adoption of BIM technology, all design data are stored in a consolidated manner and all relevant presentation by means of 3D model and 2D drawings could be generated from a single source of data. When design changes with the source data amended, all related 3D model and 2D drawings will be updated automatically. This enhances efficiency and prevent unnecessary human errors.

Better with BIM

If Professionals in Hong Kong can adopt the BIM standard, guideline and template of this Project, they would be able to produce 2D drawings directly from BIM with minimum manual editing works for statutory and building control submission. The costs and time for 2D drawings production could be significantly reduced while the saving on resources could be redeployed to further develop the applications of BIM.



Plug-in for Automatic Detection of Manual-Editing Works
Image Courtesy of Independent Checking Unit, Office of the Permanent Secretary for Transport and Housing (Housing), HKSAR Government

COMPANY
The Hong Kong University of Science and Technology - Campus Development Office

PROJECT
Shaping a Digital Future - BIM, Space and Asset

LOCATION
The Hong Kong University of Science and Technology

TYPE
Asset Management

SCHEDULED TIME OF COMPLETION
2021 (First digital phase)

Shaping a Digital Future - BIM, Space and Asset

香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

About The Hong Kong University of Science and Technology

Established in 1991, the Hong Kong University of Science and Technology (HKUST) is a world-class international research university with 57 hectares site area. There are about 70 buildings with rapid facility growth and enhancement demands over the three decades.

Our campus has a clearly defined geographical area, which is a prototype and living lab of smart cities. Our community is very diverse, with many different stakeholders.

At HKUST, we are committed to inspire the students to be well-rounded, innovative and entrepreneurial. CDO brings together the graduate students and professionals who exchange innovative and expert views on emerging technologies. With their imaginative perspectives, the BIM workflow and process are transformed with the emerging technologies of cloud computing, web applications, data analysis, etc.

BIM PARTNER

Undergraduates

AUTODESK PRODUCTS USED

AutoCAD
AutoCAD Map 3D
BIM 360 Design
Civil 3D
Dynamo Studio
Forge
InfraWorks
Navisworks
ReCap Pro
Revit

Project Description

Digitalization, BIM and space programming all play a strategic role in campus development and asset management in order to provide an inspirational and sustainable campus to work, study and live, according to Catherine Lau, Senior Space and Design Manager of the Campus Development Office, who has had this aspiration since working for the campus. “Our work scope covers capital works, minor works, space analysis, defects and asset management with different goals to manage, analyse and improve the campus facilities.”

Project Challenges

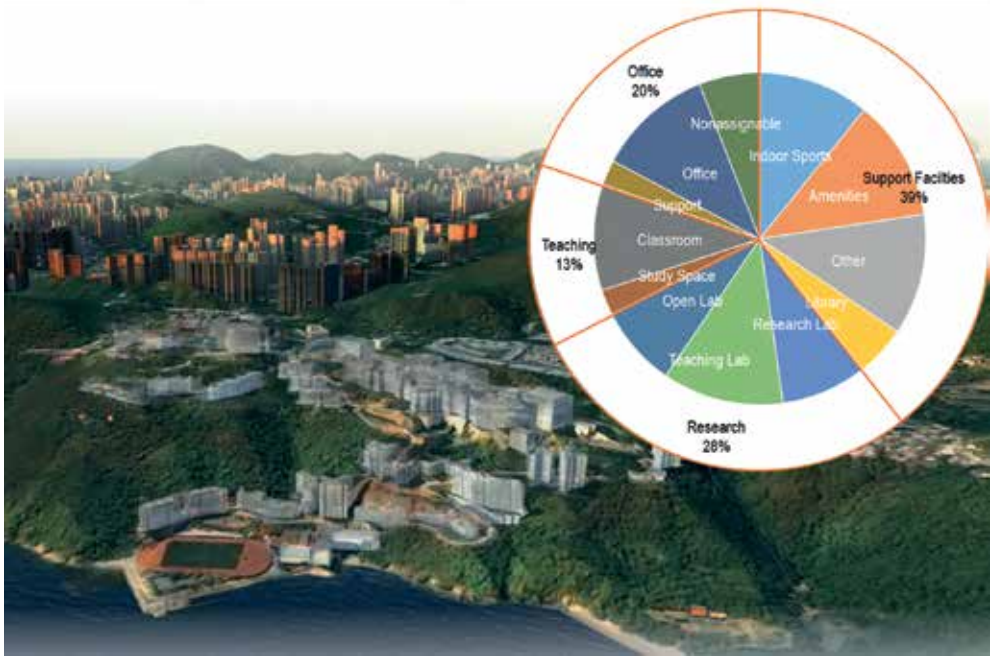
The Campus Development Office manages campus space data from multiple sources. To achieve the 3D space management, there are two solutions: one is by setting up a platform for 3D GIS and the other is to leverage BIM. We make use of both solutions to connect between the virtual world and the real world, by integrating the aerial photo, drone imagery government maps and statutory plans. The seamless integration of the real world 3D information, GIS, BIM and space data enables efficient use of space data.

Our Digital Team embraces changes and expanding horizons will always bring wonders to our work and life.
Image Courtesy of The Hong Kong University of Science and Technology - Campus Development Office

Solutions for challenges

“We need a common platform that is accessible by our team and frontline members to understand each space. The information in the central database should be well-organized and viewed in web browser.” added Catherine. To digitize the campus and develop the platform, we do this by empowering our students to digitalize around six thousand drawings. These are the data sources for our facility, floor, space, etc.

To deal with multiple sources of information exchange and integration, robot automation using python and



A critical step for data analysis and robotics automation.
Image Courtesy of The Hong Kong University of Science and Technology - Campus Development Office

Our digital team worked efficiently together, staging and accomplishing tasks quickly.
Image Courtesy of The Hong Kong University of Science and Technology - Campus Development Office

node.js are used for pilot data analysis and robotic process automation to further increase the efficiency.

How does BIM benefit the project?

"BIM brings benefits to our campus, the team, key stakeholders and even the surrounding environment. We will further apply BIM in other projects to enhance the efficiency of our works." said Catherine.

Forge viewer and BIM360 are convenient tools to quickly review the BIM models, to validate sheets and data within the web browser. The continuous change of facilities and space are another big challenge. BIM can be a common platform to store the information. As opposed to the conventional way of onsite measuring and photo recording, we use photogrammetry to view and measure the space to allow remote working.

Our community is diversified, with different kinds of members, buildings and spaces.
Image Courtesy of The Hong Kong University of Science and Technology - Campus Development Office

BIM360 is our preferred platform with multi-level of files, access without software, without barrier.
Image Courtesy of The Hong Kong University of Science and Technology - Campus Development Office

Better with BIM

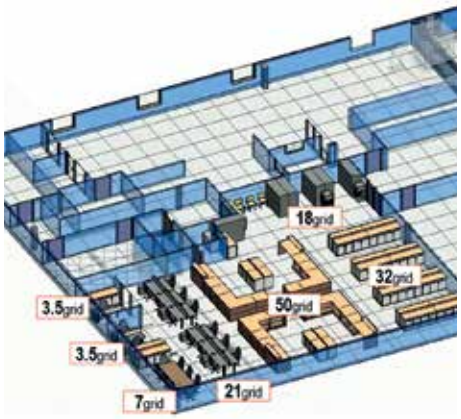
"Connecting the real world and filling data gaps, we can filter off some spaces and items in a building, which do not need to be displayed for analysis." added Catherine. "Many of us still prefer to work with the latest photo, more than BIM models. This is a tool that can visualize data (real world) and fill data gaps (virtual), labor cost to up keep the models will be reduced."

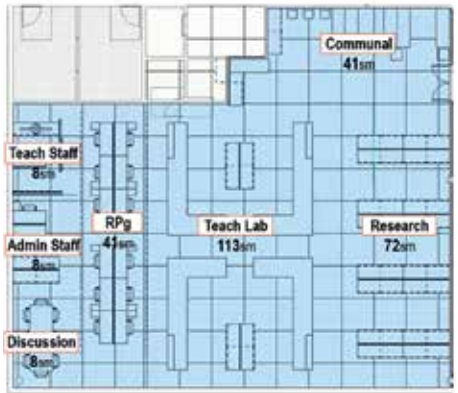
She reckoned that embracing changes, working with the young students and expanding horizons will always bring wonders to our life, and fill every day with enjoyment and hope.

"Typical FM services we are concerned into building hardware, including elevator, lift, essential assets, energy and sustainability." shared by Catherine. "Essential assets we are talking about if some facilities broken down that will affect our services. We need to identify. Another areas we concerned are user experience, including events, catering, residence, transportation" added Catherine.

"That's why we brought together students they have insights and innovative ideas. They drive the industry's transformation and shape our campus towards a more efficient and sustainable era."

Image Courtesy of The Hong Kong University of Science and Technology - Campus Development Office





In our physical campus, many of us count space by ceiling grids.
Image Courtesy of The Hong Kong University of Science and Technology - Campus Development Office

Honorable Mentions

ORGANIZATION

Drainage Services Department, HKSAR Government
AECOM Asia Company Limited
China State Construction Engineering (Hong Kong) Limited
MTECH Engineering Company Limited

PROJECT

Relocation of Sha Tin Sewage Treatment Works to Caverns - Site Preparation and Access Tunnel Construction

ORGANIZATION

Drainage Services Department, HKSAR Government
Black & Veatch Hong Kong Limited
Vircon Limited

PROJECT

Construction of Dry Weather Flow Interceptor at Cherry Street Box Culvert

ORGANIZATION

Kerry Properties Limited

PROJECT

Residential Property Development Project at 3 Lung Kui Road, Beacon Hill, Kowloon

ORGANIZATION

Nan Fung Development Limited

PROJECT

AIRSIDE

ORGANIZATION

Water Supplies Department, HKSAR Government

PROJECT

Uprating of Chai Wan Salt Water Supply System

ORGANIZATION

Water Supplies Department, HKSAR Government
AJC Joint Venture
Black & Veatch Hong Kong Limited
WSP (Asia) Limited

PROJECT

Design, Build and Operate First Stage of Tseung Kwan O Desalination Plant

ORGANIZATION

Wheelock Properties (Hong Kong) Limited

PROJECT

Proposed Residential Development at NKIL 6584, Off Sin Fat Road, Kwun Tong, Kowloon & Residential Development at NKIL 6564 Kai Tak Area 1L, Site1, Kai Tak, Kowloon

ORGANIZATION

Yee Fai Construction Company Limited

PROJECT

Commercial Development at KTIL240, 98 How Ming Street, Kowloon, Hong Kong

COMPANY
Drainage Services Department, HKSAR Government
AECOM Asia Company Limited
China State Construction Engineering (Hong Kong) Limited
MTECH Engineering Company Limited

PROJECT
Relocation of Sha Tin Sewage Treatment Works to Caverns - Site Preparation and Access Tunnel Construction

LOCATION
Nui Po Shan/A Kuk Kok Street/Mui Tsz Lam Road, Sha Tin, New Territories, Hong Kong

TYPE
Civil/Geotechnical/Structural/Infrastructure

SCHEDULED TIME OF COMPLETION
24 Feb 2022 (Contract 1)

About Drainage Services Department, HKSAR Government

Since 1989, DSD has been striving to provide world-class wastewater and stormwater drainage services. We have acquired noticeable achievements such as Happy Valley Underground Stormwater Storage Scheme. We implement various projects to uplift the flood protection level and sewage treatment capacity to alleviate the flood risk and improve the hygiene in the areas concerned, such as relocation of Sha Tin Sewage Treatment Works to Caverns. We endeavour to uplift the integrity of the sewer and drainage systems by rehabilitating pipes with high risk.

About AECOM Asia Company Limited

AECOM is the world's premier infrastructure consulting firm, delivering professional services throughout the project lifecycle – from planning, design and engineering to program and construction management. We partner with our clients to solve their most complex challenges and build legacies for generations to come. AECOM is a *Fortune 500* firm and its Professional Services business had revenue of approximately $13.6 billion in fiscal year 2019.

AUTODESK PRODUCTS USED

Advance Steel
AutoCAD
3ds Max
BIM 360
Civil 3D
Dynamo
InfraWorks
Navisworks Manage
ReCap Pro
ReCap Photo
Revit
Robot Structural Analysis
Vehicle Tracking

Successful BIM Applications and Implementation of Integrated Project Delivery (IPD) in Sha Tin Caverns Project

Project Description

The objective is to relocate Sha Tin Sewage Treatment Works (STSTW), the largest secondary sewage treatment works in Hong Kong, into caverns to release scarce land resources. STSTW occupies 28 hectares of land and serves a population of about 630,000 in Sha Tin and Ma On Shan Districts, which produce 340,000m3 of sewage per day. Given the complexity of the relocation, the project will be implemented in 5 stages. Currently, site preparation and access tunnel construction are in full swing.

Project Challenges

Being a large-scale public infrastructure project, the total duration was expected to be 13 years. Different construction tasks, including site formation, blasting, steel bridge construction, were required to be implemented concurrently. This required a huge amount of information exchange and collaboration among multiple disciplines, such as civil, structure, geotechnical, blasting, land surveying, quantity surveying, safety, environmental and quality team, across the entire project lifecycle. Public engagement was also vital in this project so as to minimize the construction impacts to Sha Tin and Ma On Shan citizens.

Solutions for challenges

The collaboration between multi-disciplinary project stakeholders was the major challenge of this project. In lights of this, an integrated team entity was assembled by key project stakeholders early in the process. With BIM and digital construction technology, the most updated project information was allowed to be shared to different stakeholders and across various levels. The success of the project always closely linked with the successful coordination of parties. Therefore, multi-lateral open sharing and risk sharing were highly encouraged and fostered.

How does BIM benefit the project?

Integrated Project Delivery (IPD), Virtual Design and Construction (VDC) and Lean Construction were adopted in different areas of the project to resolve project challenges. BIM and Digital Construction technology were used in the construction phase planning to streamline multiple construction programs across various zones. BIM for Virtual Design and Construction was applied to reduce design changes and rework. BIM-enabled latest construction methodologies -Design for Manufacture and Assembly (DfMA) and Modular Integrated Construction (MiC) were adopted to reduce the construction wastage while improving quality and safety.

Better with BIM

IPD through BIM with a connected common data environment BIM360 enabled the access of concise and precise information at all phases of the project and by various project stakeholders. This helped to mitigate or avoid the risk of stalling the project.

Another important advantage of a complete digital construction process was its ability to be both predictive and reactive. In contrast with paper-based and 2D CAD, digital twinning through BIMs went beyond simply speeding up analogue processes. It drived improvements in core project management practices, and thereby reducing project delays and enhancing public satisfaction.

Relocation of Sha Tin Sewage Treatment Works to Caverns – Site Preparation and Access Tunnel Construction
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited and China State Construction Engineering (Hong Kong) Limited and MTECH Engineering Company Limited

Architectural Design of Community Liaison Centre
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited and China State Construction Engineering (Hong Kong) Limited and MTECH Engineering Company Limited

Construction Simulation of Retaining Walls of Tunnel Portal
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited and China State Construction Engineering (Hong Kong) Limited and MTECH Engineering Company Limited

Design for Manufacture and Assembly (DfMA) of Temporary Vehicular Steel Bridge
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited and China State Construction Engineering (Hong Kong) Limited and MTECH Engineering Company Limited

As-built Modelling of Cycle Track
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited and China State Construction Engineering (Hong Kong) Limited and MTECH Engineering Company Limited

Point Cloud Scanning of Temporary Vehicular Steel Bridge
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited and China State Construction Engineering (Hong Kong) Limited and MTECH Engineering Company Limited

Revit Model of Community Liaison Centre
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited and China State Construction Engineering (Hong Kong) Limited and MTECH Engineering Company Limited

COMPANY
Drainage Services Department, HKSAR Government
Black & Veatch Hong Kong Limited
Vircon Limited

PROJECT
Construction of Dry Weather Flow Interceptor at Cherry Street Box Culvert

LOCATION
Cherry Street, Tai Kok Tsui, Kowloon, Hong Kong

TYPE
Public Services Utilities

SCHEDULED TIME OF COMPLETION
End of 2022

No BIM No DfMA

About Drainage Services Department, HKSAR Government

Established in 1989 to provide world-class wastewater and stormwater drainage services enabling the sustainable development of Hong Kong, Drainage Services Department (DSD) has strived to upgrade sewage treatment and flood protection levels in Hong Kong, and committed to introduce new technologies for projects implementation and operation of facilities. DSD will continue to promote BIM technology, with resources being deployed on development, so as to upgrade the accuracy of project design and shorten works period.

About Black & Veatch Hong Kong Limited

B&V has over 80 years of wide-ranging engineering experience in Hong Kong, B&V's vision is to continue developing the talent of professionals and contributing to a range of meaningful and sustainable water-related works in Hong Kong and abroad.

About Vircon Limited

Vircon has over 20 years of BIM experience in Building Life Cycle for improving the productivity and reducing pollution on earth.

BIM PARTNER

China Metallurgical Group Corporation - Top Express Construction Engineering Limited Joint Venture

AUTODESK PRODUCTS USED

BIM 360 Doc and Design
BIM Recap
Dynamo for Revit
Navisworks Manage
Revit

Project Description

The existing Cherry Street box culvert (CSBC) collects runoff from Kowloon Tong, Mong Kok and Yau Ma Tei districts and discharges into the New Yau Ma Tei Typhoon Shelter (NYMTTS). At present, the water quality at the typhoon shelter and the odour associated with it remains unsatisfactory. An underground Dry Weather Flow Interceptor (DWFI) and a pumping station at the seafront of NYMTTS will be constructed to intercept the polluted stormwater from the CSBC and deliver to the nearby sewer.

Project Challenges

The extremely congested site and tight time frame necessitate the DWFI and pumping stations works to be carried out concurrently. Design for Manufacture and Assembly (DfMA) is the solution as it is a design approach that focuses on ease of manufacture and efficient assemble in the minimum time and at a lower cost as well as minimize nuisance to the surrounding. However, it requires high accuracy in the design stage without any errors or mistakes. In addition, owing to different contractors apply various types of BIM software, information loss was found during file conversion from Tekla to Revit.

Solutions for challenges

In order to deliver the project smoothly, the manufacturer utilized BIM 3D and 4D in design, drawing production, manufacturing. During the design and manufacturing process, the manufacturer used BIM models on cloud platform for design review in order to enhance the communication between consultants and the main contractor. Drawings were then produced from the BIM and passed to manufacturer to fabricate the DfMA components. Because of data lost during file conversation, the project team applied Dynamo for scripting to retrieve the building data for drawing preparation in Revit platform.

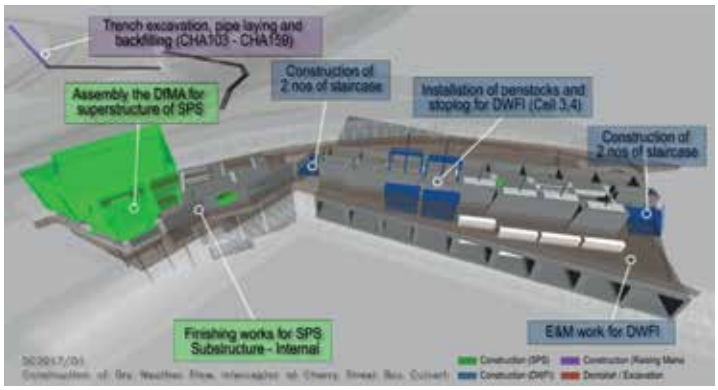
How does BIM benefit the project?

BIM allows the project team to foresee the constructability of DfMA during the early design stage. The encountered design and foreseeable construction problems could be resolved to prevent any abortive work on site which ensures smooth delivery of the project on time. Not only BIM is adopted in design and construction stages, IoT tags are also installed into the DfMA components during manufacturing stage to integrate BIM data and construction record for asset management use.

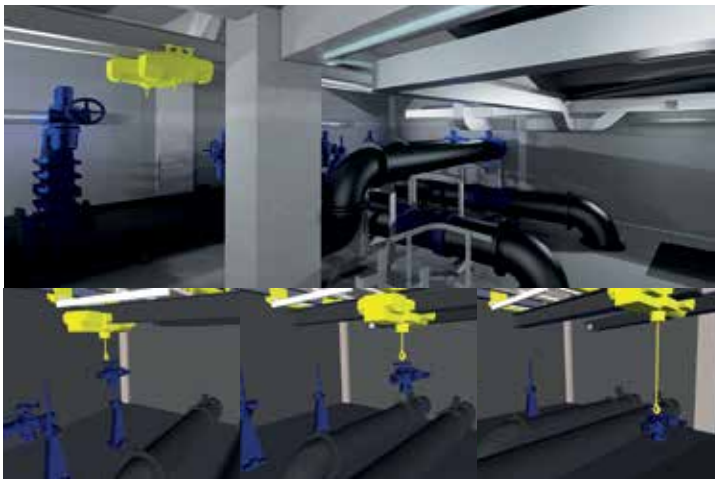
Better with BIM

- BIM facilitates the project team to carry out 3D design which enable DfMA construction that requires extreme accuracy at early stage.
- BIM allows the project team to monitor the progress and review the sequence of works with aid of 4D planning.
- BIM enhances communication between parties by cloud platform during coordination meetings.
- BIM could also be used in assets management when retrieving information and data stored in the model.
- BIM becomes our essential tool and process in our project mindset.

Photomontage of Proposed Cherry Street Box Culvert
Image Courtesy of Drainage Services Department, HKSAR Government and Black & Veatch Hong Kong Limited and Vircon Limited

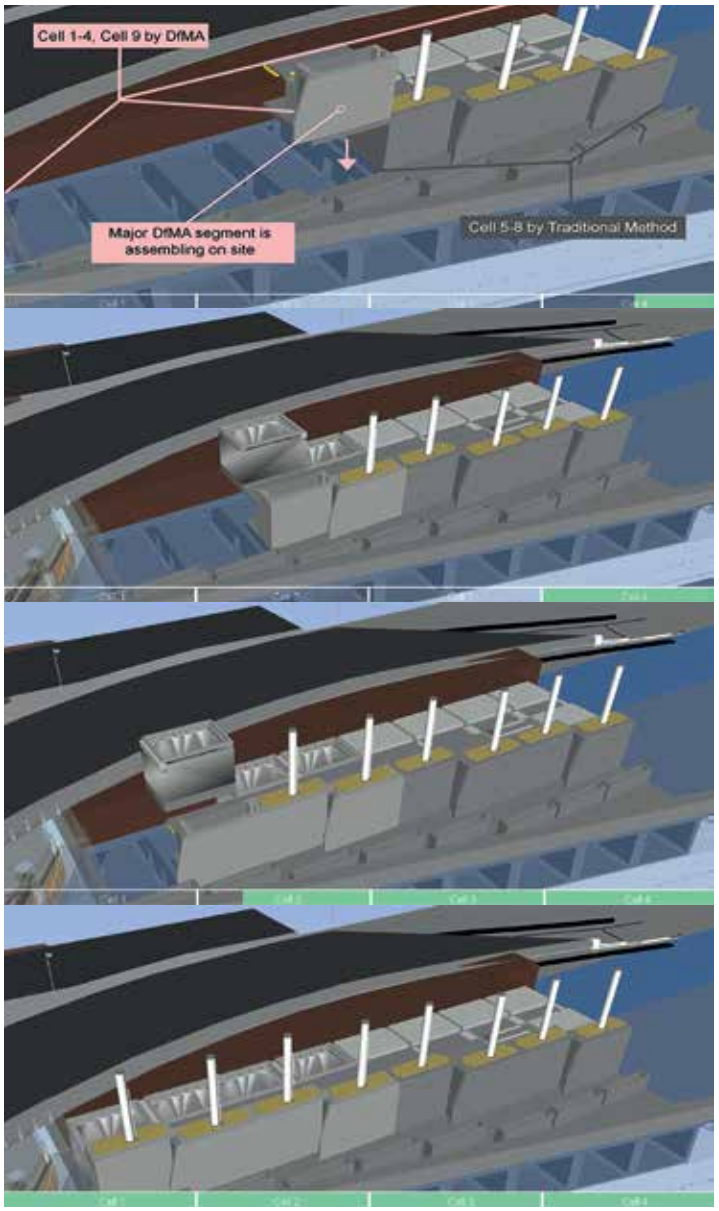


Phase Planning to Present the Construction Planning
Image Courtesy of Drainage Services Department, HKSAR Government and Black & Veatch Hong Kong Limited and Vircon Limited



Simulation of Maintenance Access
Image Courtesy of Drainage Services Department, HKSAR Government and Black & Veatch Hong Kong Limited and Vircon Limited

360 Glues and VR Application Using BIM Model
Image Courtesy of Drainage Services Department, HKSAR Government and Black & Veatch Hong Kong Limited and Vircon Limited



DfMA 4D Planning
Image Courtesy of Drainage Services Department, HKSAR Government and Black & Veatch Hong Kong Limited and Vircon Limited

COMPANY
Kerry Properties Limited

PROJECT
Residential Property Development Project at 3 Lung Kui Road, Beacon Hill, Kowloon

LOCATION
3 Lung Kui Road, Beacon Hill, Kowloon

TYPE
Residential Propertry Development

SCHEDULED TIME OF COMPLETION
Q1 2021

Landscape in BIM - Integrated Design Indeed

嘉里建設
KERRY PROPERTIES

About Kerry Properties Limited

Kerry Properties Limited (HKEx: 683), incorporated in Bermuda with limited liability, is a leading property investment and development company in Mainland China and Hong Kong. Leveraging on its decades of experience, expertise and brand equity in property development, the company focuses on building high-quality residences and mixed-use projects in prime locations of the major cities. It also owns and operates a premier investment portfolio of office, commercial and residential properties in prestigious neighbourhoods.

Kerry Properties acts on principles of fairness and integrity, and values the many relationships developed with staff, suppliers, partners, government agencies, and other key stakeholders.

BIM PARTNER

aimPD Limited

AUTODESK PRODUCTS USED

3DsMax

AutoCAD

Naviswork

Revit

Project Description

Lying next to Mont Rouge, this awarded project, Residential Property Development Project at 3 Lung Kui Road, Beacon Hill, Kowloon, is another timeless luxurious residential project curated by Kerry Properties Limited ("KPL"). Occupying an area of 235,000 square feet, the site will be developed into an upscale low-density residential property with a buildable GFA of approximately 343,000 square feet. The project is scheduled to be completed in 2021.

KPL adopted Building Information Modelling ("BIM") at the preliminary design stage of the awarded project with an aim to alleviate the fragmentation in the project development life-cycle and to embody our commitment to strive for the high-quality deliverables.

Project Challenges

A well-designed landscape would add an exciting touch to this exclusive and prestigious project. With this in mind, we studied the feasibility of adopting BIM in landscape development at the beginning of the project. However, we realised that BIM was not commonly used in the field of landscape design as most of the design consultants were rarely engaged in the development of inter-disciplinary BIM models to facilitate the project design and coordination. This fragmented BIM process may result in abortive works and additional workload on incomplete information.

Solutions for challenges

After assessing the BIM knowledge and skills acquired by different design consultants, our project management team found ways to align the levels of BIM maturity for all design categories in order to ensure the BIM process can be carried out smoothly. With a view to enhancing the BIM capabilities of the landscape design consultants, a BIM & VR specialist was employed to lead an integrated design team, for elevating the importance and application of BIM process, in particular the preparation, review and approval process in the design stage and collaboration between architect and landscape designer.

How does BIM benefit the project?

The project management team believes that a higher quality of BIM deliverable would facilitate and expedite the approval process, which allows more time for the team to prepare detailed communication and lower the chance of occurrence of abortive works and additional works caused by the information discrepancies at the construction stage.

We believe that the application of BIM model would not be limited to approval seeking process for design impression but also planting and growing locations assessment and schedule planning for purchase and delivery.

Better with BIM

Adopting BIM process is not something new in Hong Kong but for landscape design. The integrated design review (Federated BIM model) enables the team to present more comprehensive information in a clearer way and workshops are no longer needed for reviewing every design package.

If you have never participated in the BIM process before, you will never know what the true value of BIM is. We have demonstrated the benefits of applying BIM in landscape design and it's time for you to try.

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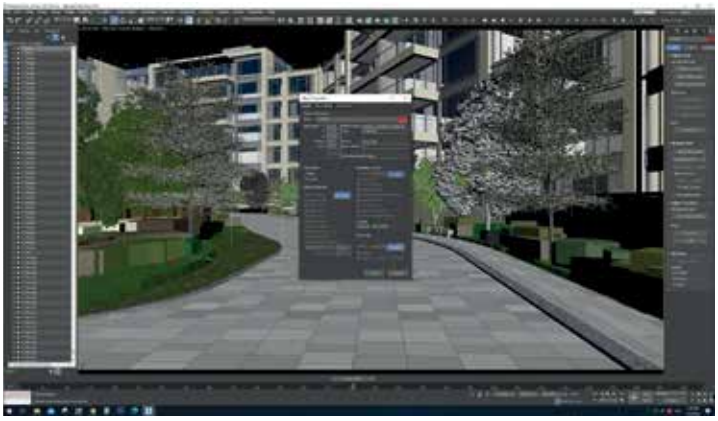
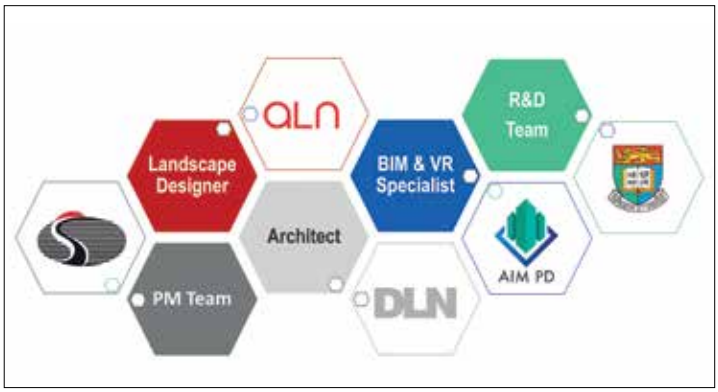
Rendering image for presenting architectural design
Image Courtesy of Kerry Properties Limited

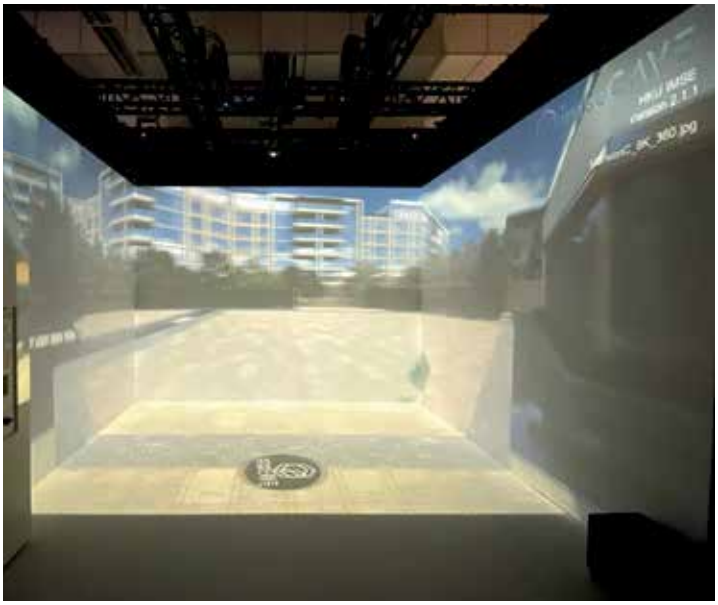
Bird's eye view in the BIM model
Image Courtesy of Kerry Properties Limited



Captured image of preparing landscape model
Image Courtesy of Kerry Properties Limited



The Integrated Design Team
Image Courtesy of Kerry Properties Limited



Collaboration with HKU - Integrated Design Review in BIM by using imseCAVE
Image Courtesy of Kerry Properties Limited

COMPANY
Nan Fung Development Limited

PROJECT
AIRSIDE

LOCATION
New Kowloon Inland Lot No. 6556, Kai Tak Area 1F Site 2, Kowloon, Hong Kong

TYPE
Mixed-use Commercial Development

SCHEDULED TIME OF COMPLETION
Q1 2022

Real-time global collaboration through connected BIM

南豐集團 NAN FUNG GROUP

About Nan Fung Development Limited

Nan Fung Development Limited is a subsidiary of Nan Fung Group, one of the largest privately-held conglomerates in Hong Kong with global interests in real estate development and investment and holds a well-diversified, substantial financial investment portfolio. The Group was founded in 1954 and has a track record spanning over 50 years with over 165 projects including residential, commercial and industrial buildings. The Group also strategically focuses on first-tier cities in Mainland China and recognises attractive opportunities for development and investment overseas, including New York and London.

In recent years, the Group expanded its investment focus on ICE (Innovation, Creativity and Entrepreneurship), exemplified by its signature project, the Mills, a revitalization of its legacy yarn factories into a hub promoting tech-style and destination for culture and learning. The Group also made significant progress in investments related to life sciences in the US via Pivotal; and in Mainland China via an affiliate, New Frontier, which focuses on healthcare, elderly care, education and new technology.

BIM PARTNERS

Hip Hing Construction Company Limited

Ronald Lu & Partners (Hong Kong) Limited

Ove Arup & Partners Hong Kong Limited
J. Roger Preston Limited

Arcadis Hong Kong Limited

AUTODESK PRODUCTS USED

AEC Collection

BIM 360 Design

BIM 360 Docs

Project Description

AIRSIDE is a 1.9 million sq. ft mixed-use commercial development in the Kai Tak area - the new Central Business District (CBD 2.0). This flagship project, which set a record HK$24.6 billion land bid in 2017, comprises of a 47-storey mixed-use development building including an over 30-storey Grade A office and a multi-storey retail complex with an interconnected underground shopping street connecting the entire Kai Tak area. The total investment in the project will reach HKD$32.0 billion.

Project Challenges

AIRSIDE is a large scale mixed-use commercial project with a fast-track construction schedule involving a number of stakeholders. The development features building elements with unconventional, complex forms both in interior spaces and external envelope systems designed by internationally acclaimed Norwegian architecture and design firm Snøhetta which presented challenges in inter-disciplinary works coordination. Combined with the top-down construction of the underground structure, the complexity of the construction works, and fast-track schedule, the project team across different regions required more agile and collaborative works coordination platform and change management system.

Solutions for challenges

Use of cloud-based CDE and cloud-workshared BIM enabled the project team to collaborate on the same model and share project information with minimum delay despite various physical locations of team members across different timezones. During the design stage, the Design Architect in Oslo, Norway and the Executive Architect in Hong Kong responsible for different areas in the development simultaneously updated a single architectural model and coordinated the interfaces. During the construction stage, all contractors covering the major packages updated shared cloud-based BIM models for coordination and shop drawing production. The use of cloud-workshared BIM models made the whole workflow involving a large number of stakeholders more transparent as the project team could monitor the status of model update in real-time, thus enabled more agile design coordination and project information management during both design and construction stages.

How does BIM benefit the project?

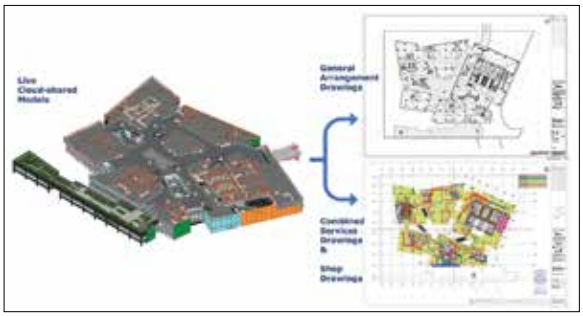
For the AIRSIDE project, the Main Contractor is required to submit BIM models for each Architect's Instructions involving Variation as 5D models, within the specified time frame as stipulated in the contract. This 5D BIM workflow has facilitated not only prompt works coordination by the contractors with timely update of changes but also greatly assisted in the quantity surveyor's estimation and valuation workflow with model-based quantities extracted from each 5D BIM submitted. The 5D BIM models introduced a new level of traceability for each AI estimate based on the model comparison, provided better visualization of design changes, and improved estimate accuracy that ultimately helps the project team for better budget control.

Better with BIM

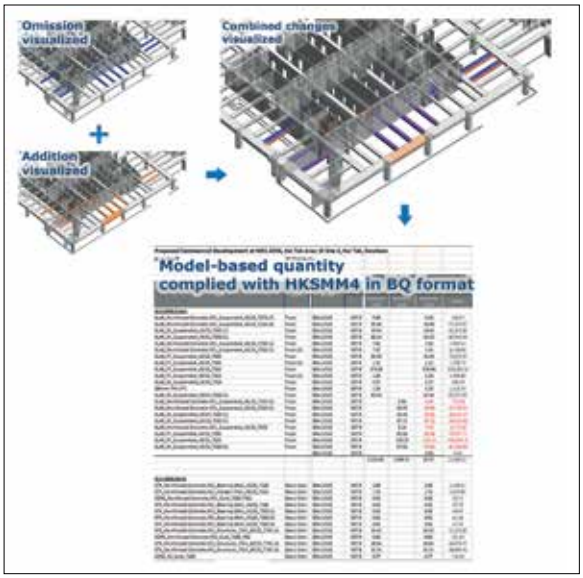
Implementation of BIM and CDE from early design stages has improved "traceability" of project information for the AIRSIDE project team. Cloud-based CDE keeps a record of all transmittal records in contract administration in the cloud which made it possible for project members to track the status of certain documents and its linked responses. Submission of 5D BIM model for each AI helped quantity surveyors to visualize changes and track exact elements that are affected by the change, and extract accurate quantities based on the model. With improved "traceability" through the use of BIM as a means of organizing project information, the project team is not lost in project information transmitted among stakeholders and able to make more informed decisions.

AIRSIDE is a large scale mixed-use commercial project that features building elements with unconventional, complex forms both in interior spaces and external envelope systems designed by internationally acclaimed Norwegian architecture and design firm Snøhetta.
Image Courtesy of Nan Fung Development Limited

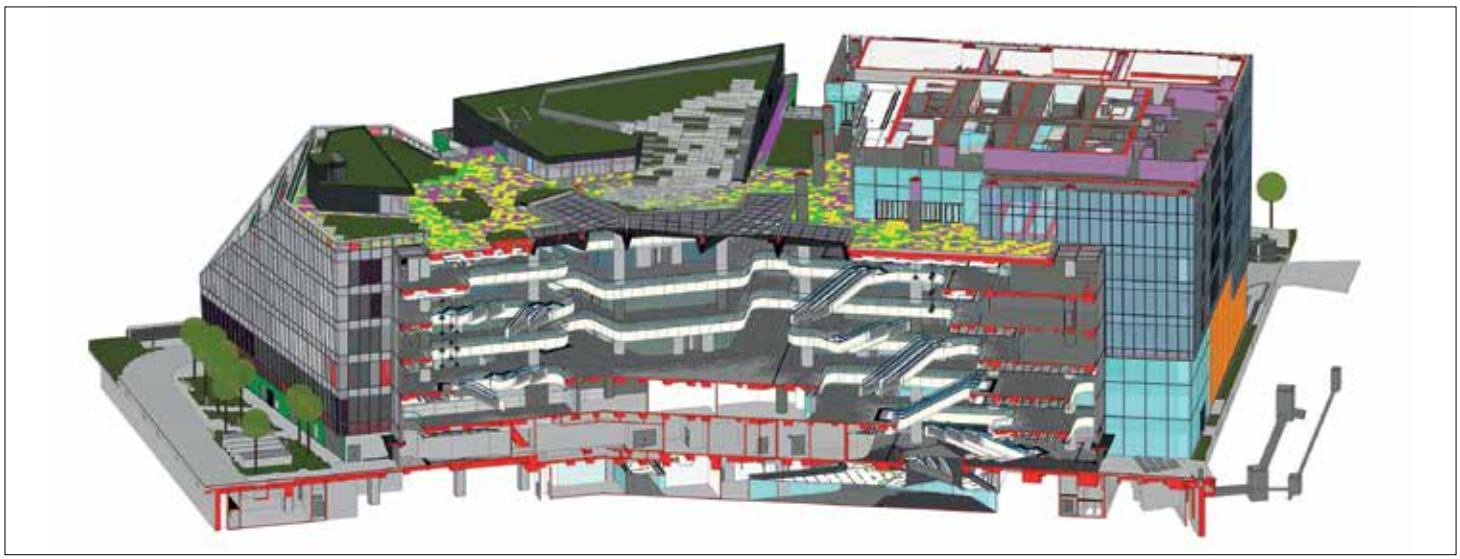
Use of parametric model for complex forms such as sculptural footbridge column made it possible for project team to respond to design changes and model update after inter-disciplinary coordination more rapidly.
Image Courtesy of Nan Fung Development Limited



2D Shop drawings exported from the models were submitted together with source BIM via BIM 360 platform to facilitate the review and approval process by the consultants, reducing the number of potential RFIs.
Image Courtesy of Nan Fung Development Limited



The 5D BIM models introduced a new level of traceability for each AI estimate based on the model comparison, provided better visualization of design changes, and improved estimate accuracy.
Image Courtesy of Nan Fung Development Limited



Design elements featuring complex geometry with almost no right angle presented challenges for project teams interface coordination
Image Courtesy of Nan Fung Development Limited

COMPANY
Water Supplies Department, HKSAR Government

PROJECT
Uprating of Chai Wan Salt Water Supply System

LOCATION
Chai Wan and Siu Sai Wan areas

TYPE
Water Supply

SCHEDULED TIME OF COMPLETION
2021Q2

Our BIM Journey in WSD

水 務 署
Water Supplies Department

About Water Supplies Department, HKSAR Government

The Water Supplies Department (WSD) is responsible for providing reliable and adequate supplies of fresh water and seawater (for flushing) to a population of over 7.5 million in Hong Kong for the territory's sustainable and long-term developments. In 2019/20, WSD supplied 998 million cubic metres (Mm3) of fresh water and 310 Mm3 of seawater with about 3.08 million customer accounts (as at 31 March 2020).

BIM PARTNERS

Summit Technology (HK) Limited

CW – CMGC Joint Venture

AUTODESK PRODUCTS USED

AEC Collection

AutoCAD

BIM 360 Design

Civil 3D

InfraWorks

Navisworks Manage

Revit

Project Description

To cope with the rising demand and enhance the reliability of salt water supply system in Chai Wan and Siu Sai Wan areas, this Project aims to uprate the output capacity of the existing Siu Sai Wan Salt Water Pumping Station (SSWSWPS) from 30 million litres per day (MLD) to 41.7MLD, and laying of about 3.8 km salt water mains ranging from 150 mm to 600 mm in diameter together with associated works. BIM is adopted throughout the design, construction and operation stages.

Project Challenges

The Project involved laying salt water mains at the existing SSWSWPS and in urban areas with congested underground utilities which involved liaison and engagement with different stakeholders including utilities companies during design and construction. There was a need to establish a systematic and effective communicating platform, which should include BIM, to ensure close coordination and collaboration.

This Project aimed at visualization of real-time flow rate and pressure in salt water mains during on-site inspection in order to understand the network operating condition. It was challenging to develop a dynamic and synchronized approach in data monitoring and the state-of-the-art Asset Management (AM) system to visualize the network condition.

Solutions for challenges

A 4-dimensional BIM model was developed to allow for better illustration of interfacing works and enhance collaboration among multiple parties working at the congested site. The construction programme and sequence could also be incorporated into the model so that variations of the 3-dimensional model against time could be visualized through Construction Method Simulation (CMS).

This Project incorporated the use of BIM, HoloLens, Supervisory Control and Data Acquisition system and Global Positioning System to facilitate remote collaboration between inspector on site and engineer at office. The visualization of real-time asset data during on-site inspection allows for quick decision and follow-up actions.

How does BIM benefit the project?

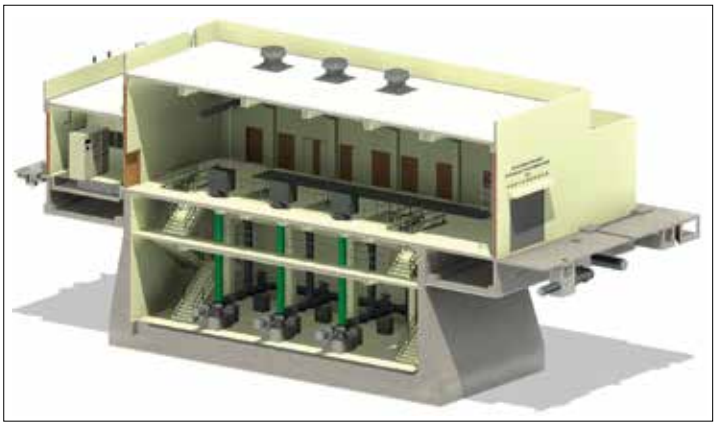
BIM allows for adoption of 4-dimensional modelling and CMS, which enable effective information exchange and collaboration between multi-disciplinary project teams. Such features allow for visualization of interface works within a tight timeframe. In particular, to minimize nuisance to the public, duration of water supply suspension can be shortened to minimum through an advance simulation of interface works.

The BIM model integrated with Construction Operations Building Information Exchange (COBie), Virtual Reality (VR) & Augmented Reality (AR) technologies enable operators to interact with the as-built 3-dimensional BIM model to facilitate asset management, thus safeguarding quality and reliability of the water supply system.

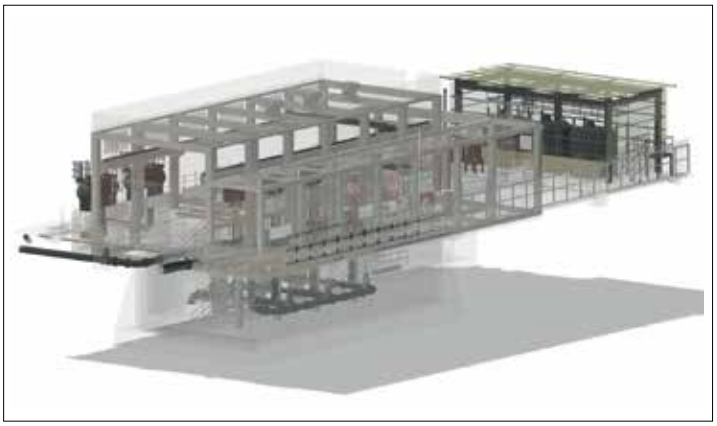
Better with BIM

With the adoption of BIM model throughout the asset life cycle from design, construction, operation and maintenance, a complete asset management data set can be developed to facilitate future information exchange. To allow successful phase transition, the Project comprises the application of BIM Specifications for AM and interface solution between BIM and WSD's AM system using COBie for a systemised exchange of information. The Project also adopts the concept of BIM-AM with deployment of AR and VR. We aim at exploring a wider application of BIM to further promote the benefits of BIM application and usage in future waterworks projects.

Overview of the Siu Sai Wan Salt Water Pumping Station
Image Courtesy of Water Supplies Department, HKSAR Government

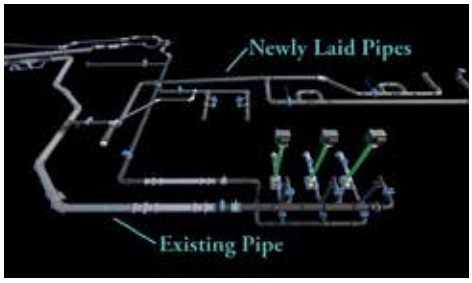


Cross section of the Pumping Station
Image Courtesy of Water Supplies Department, HKSAR Government



Transparent view of the Pumping Station
Image Courtesy of Water Supplies Department, HKSAR Government

Point Cloud using Photogrammetry
Image Courtesy of Water Supplies Department, HKSAR Government



4-D simulation on the water mains construction sequence
Image Courtesy of Water Supplies Department, HKSAR Government

Digital Interface with HoloLens
Image Courtesy of Water Supplies Department, HKSAR Government

Walkthrough with simulation
Image Courtesy of Water Supplies Department, HKSAR Government

COMPANY
Water Supplies Department, HKSAR Government
AJC Joint Venture
Black & Veatch Hong Kong Limited
WSP (Asia) Limited

PROJECT
Design, Build and Operate First Stage of Tseung Kwan O Desalination Plant

LOCATION
Tseung Kwan O (TKO) Area 137, Hong Kong

TYPE
Design, Build and Operate

SCHEDULED TIME OF COMPLETION
2023

Global Synergy - Fresh water resilience for Hong Kong through BIM

About Water Supplies Department, HKSAR Government

The Water Supplies Department (WSD) is responsible for providing reliable and adequate supplies of fresh water and seawater (for flushing) to a population of over 7.5 million in Hong Kong for the territory's sustainable and long-term developments. In 2019/20, WSD supplied 998 million cubic metres (Mm3) of fresh water and 310 Mm3 of seawater with about 3.08 million customer accounts (as at 31 March 2020).

About AJC Joint Venture

AJC Joint Venture is a consortium of top tier contractors (including Acciona Agua, JEC Engineering and China State) to apply their expertise to design, build and operate the first reverse osmosis (RO) desalination plant in Hong Kong.

About Black & Veatch Hong Kong Limited

Black & Veatch Hong Kong Limited is WSD's Consultant who committed itself to grow a collaborative team across the globe and providing innovative solutions to the world's most important needs.

About WSP (Asia) Limited

WSP (Asia) Limited is AJC's Consultant who looks at complex problems from different angles and delivers solutions that break paradigms.

BIM PARTNERS

WSP Hong Kong Limited
Architectural Project Unit Limited
Arcadis Hong Kong Limited

AUTODESK PRODUCTS USED

AutoCAD Plant 3D
BIM360 (Docs, Design, Coordinate)
Civil 3D
COBie (Revit Add-ins)
Dynamo
Enscape (Revit Add-ins)
Navisworks
Recap Pro

Project Description

WSD proposed to construct a seawater desalination plant, using reverse osmosis (RO) technology (process using partially permeable membrane to remove ions, unwanted molecules and larger particles from seawater turning it into drinking water) with a water production capacity at 135,000 m3 per day with provision for future expansion to production capacity up to 270,000 m3 per day. To cater for extreme dry weather brought about by climate change, Hong Kong needs to develop strategic alternative water resource which is not susceptible to climate change to build resilience in fresh water supply.

Project Challenges

The most pressing challenge was to tackle the coordination of multiple stakeholders from six geographical regions due to conflicting time zones, working culture, difference design practice (Revit, Plant 3D and COBie) and information sharing.

Besides, the project needs will change throughout its lifecycle, from design, construction to operation and maintenance, to suit the stage and operational requirements. Accessing the correct and up-to-date information is essential to prevent abortive work in design coordination. Establishing an accurate BIM model of the constructed assets for continuous supervision of assets and workflows of site activities will benefit the construction phase.

For facility management, it is also vital to integrate the data and essential information within the model for operation and maintenance application throughout its lifecycle.

Solutions for challenges

The project adopts BIM360 as the project centralization design and data platform. Within this common data environment (CDE), the 3D model (visualization made possible via BIM) is utilized for the design development, multi-discipline coordination, even the document submission, review and approval are also conducted within the same platform. The information sharing is so instantaneous, which breaks the constraints in geographical location and time zone. It prevents any misleading and incorrect information exchange. Moreover, the platform can also maintain those revision record for future analysis and history checking. By adopting the difference design applications, the project teams utilize the .rfa format within the Revit and Plant 3D for the collaborative arrangement. For future facility management, it will utilize the COBie plugin in Autodesk Revit/BIM for data collection.

How does BIM benefit the project?

By utilizing this cloud-based BIM360 collaboration platform, standardized design collaboration technique, revit work-sharing and the online conference facilities, the multi-region design teammates can discuss the design details on the same platform. It assists the team in working through project checkpoints effectively and achieving the project deliverable schedule within the target time frame.

Through visualizing the elements in BIM360, the complex technology such as ActiDAFF (pre-treatment process which combines flotation and granular bed filtration) and Reverse Osmosis can be easily explained to teammates with different background. It can also highlight the main design consideration for the architectural team, the structural team, and the fire services team, optimizing the decision-making process to suit the process need and the local regulation.

Better with BIM

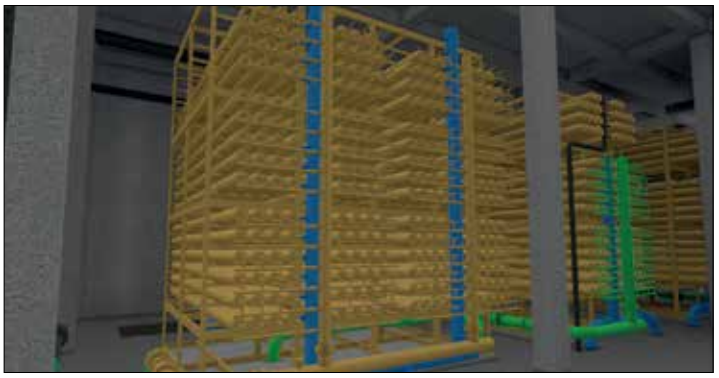
Without the BIM, all the documents/drawings are just in 2D. It relies heavily on the teammates' experience in reading these 2D drawings for this kind of complex project. With BIM in place, the plant will be in 2D, 3D and 4D. It provides us with a clear, complete and thorough view each component of the plant before construction.

Integration with Virtual Reality technology would enable users to visualize the plant in a virtual world. This can increase communication efficiency and facilitate training of workers during construction and operation phase.

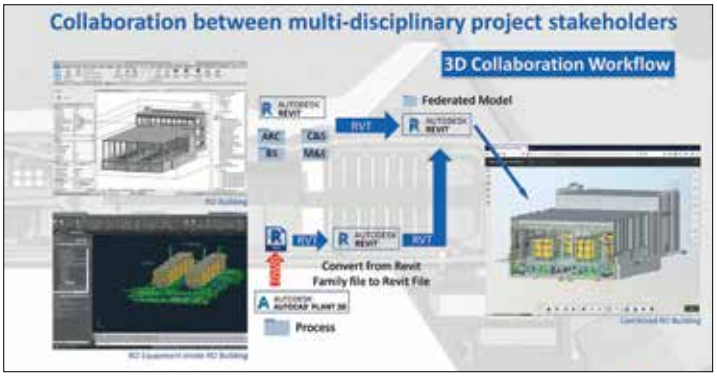
To acquire point cloud data by Scan, it provides the site work information to plan for the DfMA, site transport arrangement, availability for the delivery route and the on site installation sequence.

TKO Desalination Plant Overall View
Image Courtesy of Water Supplies Department, HKSAR Government and AJC Joint Venture and Black & Veatch Hong Kong Limited and WSP (Asia) Limited

4D Simulation
Image Courtesy of Water Supplies Department, HKSAR Government and AJC Joint Venture and Black & Veatch Hong Kong Limited and WSP (Asia) Limited

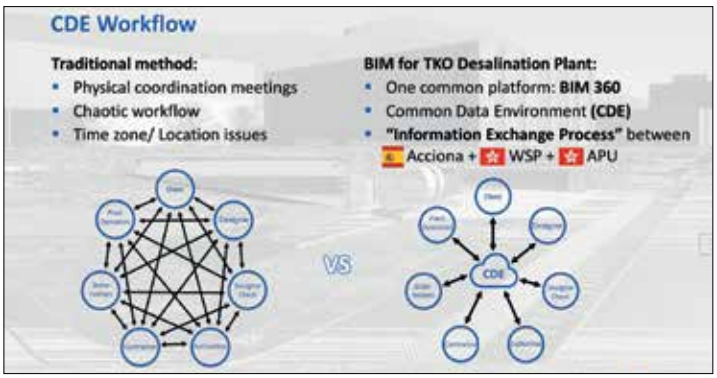


Reverse Osmiosis Building inside view
Image Courtesy of Water Supplies Department, HKSAR Government and AJC Joint Venture and Black & Veatch Hong Kong Limited and WSP (Asia) Limited

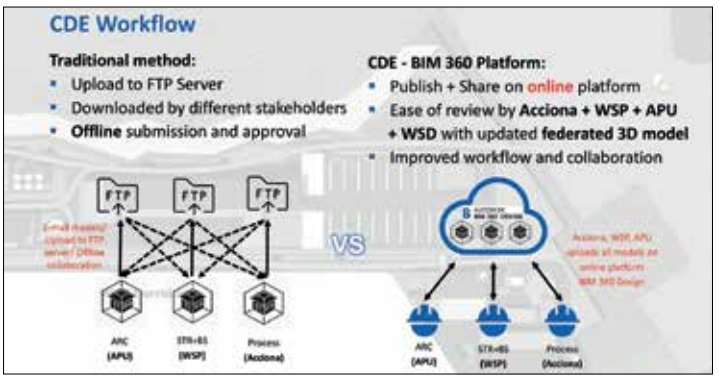


3D Collaboation Workflow
Image Courtesy of Water Supplies Department, HKSAR Government and AJC Joint Venture and Black & Veatch Hong Kong Limited and WSP (Asia) Limited

2D Collaboation Workflow
Image Courtesy of Water Supplies Department, HKSAR Government and AJC Joint Venture and Black & Veatch Hong Kong Limited and WSP (Asia) Limited



Common Data Environment Workflow1
Image Courtesy of Water Supplies Department, HKSAR Government and AJC Joint Venture and Black & Veatch Hong Kong Limited and WSP (Asia) Limited



Common Data Environment Workflow2
Image Courtesy of Water Supplies Department, HKSAR Government and AJC Joint Venture and Black & Veatch Hong Kong Limited and WSP (Asia) Limited

COMPANY
Wheelock Properties (Hong Kong) Limited

PROJECT
Proposed Residential Development at NKIL 6584, Off Sin Fat Road, Kwun Tong, Kowloon & Residential Development at NKIL 6564 Kai Tak Area 1L, Site1, Kai Tak, Kowloon

LOCATION
NKIL 6584, Off Sin Fat Road, Kwun Tong, Kowloon & NKIL 6564 Kai Tak, Kowloon, Hong Kong

TYPE
Residential Development

SCHEDULED TIME OF COMPLETION
End 2022

Design Visualization, BIM Collaboration and Coordination of Large Scale Projects

WHEELOCK PROPERTIES 會德豐地產

About Wheelock Properties (Hong Kong) Limited

Wheelock Properties is a wholly-owned subsidiary of Wheelock and Company Limited. Its principal activities include the undertaking of property development, sales and marketing, and asset management functions of certain Wheelock and Wharf Group properties.

BIM PARTNER

isBIM Limited

AUTODESK PRODUCTS USED

Autodesk Revit

BIM360

BIMTrack

Fuzor

Navisworks

Project Description

For NKIL 6584, this project consists of 8 residential buildings and two-floor podium with swimming pool in total GFA is 76,788m2. Due to the large project scale, the site has been divided into three phases. For NKIL 6564, it has two towers and four mansions with a two-floor basement. To have a better quality of construction and optimize cost, BIM is adopted to reduce design problems & clashes as much as possible before constructing any element. Also, BIM Manager was adopted to monitor all the models progress and quality, and organize BIM meetings to review and resolve clashes found in BIM model.

Project Challenges

Since the scale of the two projects are enormous and tightness construction period, it is difficult to indicate all the clashes before constructing each element based on 2D drawings. Also, data management is one of the main challenges of this project. When there are clashes found in the drawings / BIM Models, RFIs are issued to consultants and request the information to resolve those clashes. A considerable number of information are exchanged through email, so that information missing, discrepancy and misunderstanding may be occurred due to the huge information without systematic management.

Solutions for challenges

Before constructing any elements, BIM models required to be reviewed at least once. All clashes will be labeled from the BIM models, presented by Main Contractor during BIM meetings, and solved by the Consultants. Also, CSD and CBWD are generated from BIM models such that Consultants can review the drawings based on the models.

To have a good collaboration during the project, Consultants are required to join the BIM meeting to review the clashes found in the models. Various team members can propose the feasible solutions to deal with the clashes or discrepancies. Also, BIM360 was adopted to organize all BIM information. BIM models, clash reports, and BIM-RFI. Those are uploaded to BIM360 by weekly to record the BIM model progress and the result of BIM meeting, such that it is easy to record and track the actions belongs to the parties.

How does BIM benefit the project?

BIM creates a good platform for information exchange. Consultant team were invited to participate the BIM meeting. It is an efficient way to solve the design problems or modeling issues which was indicated by BIM Manager to enhance the design and retain a high quality of model. Clashes can be identified and solved quickly through the models. Using BIM models to coordinate has greatly reduced the no. of RFI, turnover time and abortive works. Moreover, FM data were inputted in the models, so that information can be found easily by FM teams during the O&M stage.

Better with BIM

After adopting BIM, further applications can be applied using the BIM models, not only including finding & solving clashes, but Virtual Reality and 4D simulation.

4D simulations were made to simulate the construction sequence, such that all parties can understand the master programme easily. Some critical area where need to be improved can be identified on the simulation, such that better construction sequences can be applied to optimize the master programme.

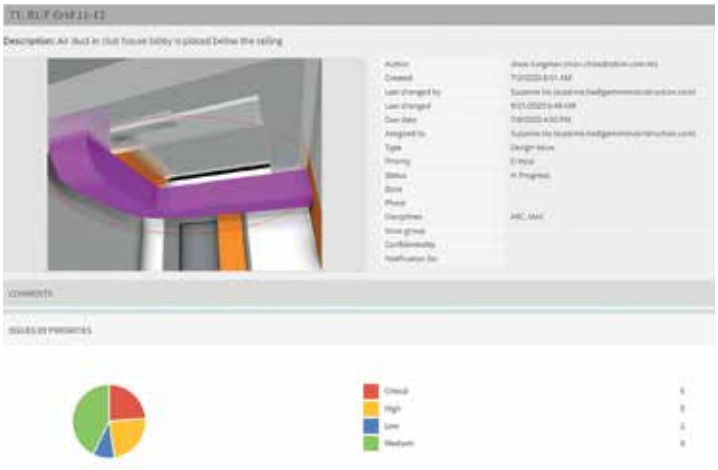
Virtual Reality was applied, so that client and consultants can walk through the models in first-person point of view. All parties can easily review and understand the building design.

Rendering image for overall view of Sin Fai Road Residential Buildings
Image Courtesy of Wheelock Properties (Hong Kong) Limited

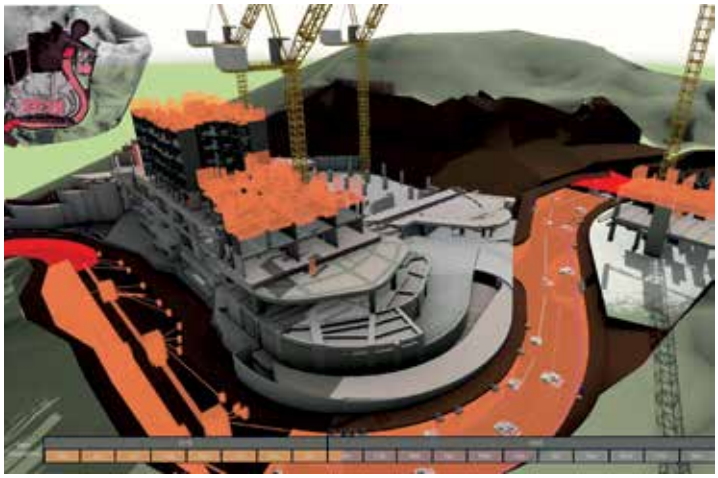
Rendering image for overall view of NKIL 6564
Residential Buildings
Image Courtesy of Wheelock Properties (Hong Kong) Limited

Rendering image for the Outdoor Swimming Pool of NKIL 6564 Residential Buildings
Image Courtesy of Wheelock Properties (Hong Kong) Limited

Show Flat Walkthrough using VR
Image Courtesy of Wheelock Properties (Hong Kong) Limited



Clash Report generated by BIM Track and Recorded in BIM 360 for Easy Data Management
Image Courtesy of Wheelock Properties (Hong Kong) Limited



4D Animation to simulate and optimize the construction programme using Fuzor VDC
Image Courtesy of Wheelock Properties (Hong Kong) Limited

COMPANY
Yee Fai Construction Company Limited

PROJECT
Commercial Development at KTIL240, 98 How Ming Street, Kowloon, Hong Kong

LOCATION
98 How Ming Street, Kwun Tong, Kowloon, Hong Kong

TYPE
Commercial

SCHEDULED TIME OF COMPLETION
1-October-2022

Greater Value from Early Value: BIM in VDC

About Yee Fai Construction Company Limited

Yee Fai is a wholly-owned subsidiary of Sanfield (Management) Limited. Operating in Hong Kong building construction sector since 1974, we focus on our customers' needs with our capabilities and resources to bring extra values through our innovative and sustainable solutions. Our core values are "Building Homes with Heart" and "Safety, Quality, Speed and Efficiency".

BIM PARTNERS

KT Real Estate Limited
Turbo Result Limited
AGC Design Limited
WSP (Asia) Limited
Ove Arup & Partners Hong Kong Limited
Arcadis Hong Kong Limited
Lik Kai Engineering Company Limited
Ridgid Plumbing Limited
SUNeVision Super e-Technology Services Limited
Alpha Idea International Limited
G&M Engineering Company Limited
Entasis Limited
Kai Shing Management Services Limited
bimSCORE Limited
Summit Technology (Hong Kong) Limited

AUTODESK PRODUCTS USED

3ds Max
AEC Collection
AutoCAD
AutoCAD Raster Design
BIM 360® Docs
Dynamo for Revit
Navisworks Manage
PlanGrid
ReCap™ Pro
Revit

Project Description

This Redevelopment Project – KTIL240 is located at Lots where a Kowloon Motor Bus (KMB) Depot had operated since 1966. In conjunction with other developments at the same district such as Millennium City, APM and Landmark East, KTIL240 is now taking part in the transformation processes to modernize Kwun Tong as one of the oldest urban districts in Hong Kong into an area for Grade A offices, as well as exciting retail and entertainment hubs.

Project Challenges

Building projects in Hong Kong are not easy, as we always have very tight design and construction period. And the industry is also looking for a more efficiency way to add more value and make more profits, so as this project. Since the design and construction time is so limited, we need a more collaborative process to achieve higher quality project deliverables.

Meanwhile many projects treat BIM as burden and failed due to lack of participation of project team members. We seek for a solution that could bring benefits to all project stakeholders and hence motivate them to embrace BIM.

Solutions for challenges

If you are familiar with the MacLeamy Curve, our target is to pull our coordination process to as earlier as possible, and therefore save time and costs due to any design changes or lacking of coordination.

Since the building uses "top-down" construction method, there will be very limited coordination time before site commencement. The construction team joined the design coordination process almost immediately after awarded to ensure construction concerns are incorporated during design collaboration.

While at the beginning, a dozen of BIM uses are planned covering different disciplines and project stages, ensuring all parties getting positive feedback from BIM.

How does BIM benefit the project?

Since BIM model is the natural good centralized platform storing project information, virtual design and construction (VDC) process is used to utilize BIM process to facilitate project collaboration. Such VDC process in a way increases the transparency of project informaiton, and making the BIM-based and value-driven collaboration consistent and accountable.

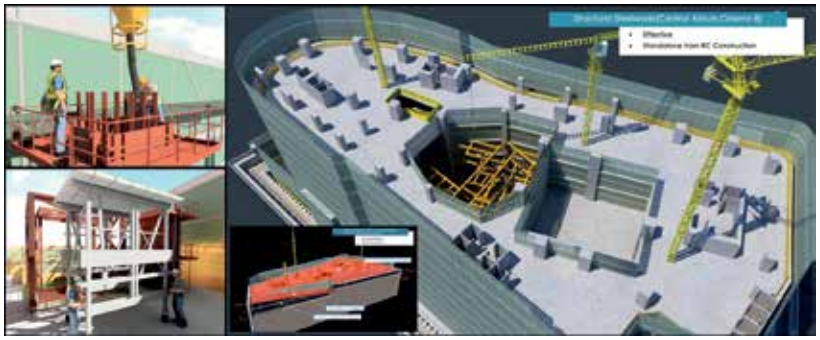
Up to current construction progress, no abortive work has been incurred by insufficient BIM review and collaboration. The well coordinated BIM lead to submission drawings purely from models, and with the help of latest innovation technologies, we are now able to transform the digital building to physical one.

Better with BIM

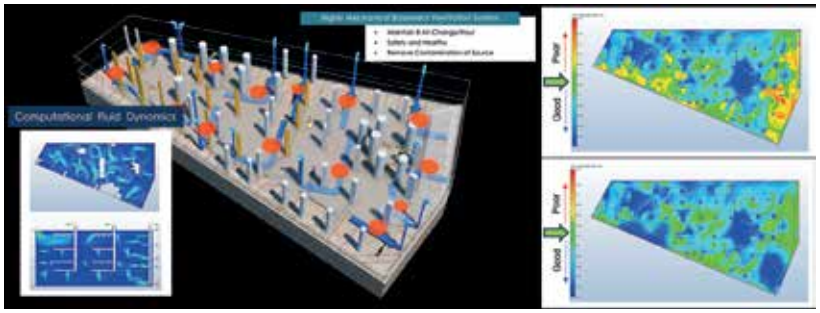
In order to extend BIM to cover most of project life cycle, goals are set in later operation stage to use BIM for asset and facility management. These goals include achieving accuracy as-built drawings with less than 3mm deviations, reducing FM data search time from 2-3 hours to minutes, and providing a proactive informed FM system.

The early participation of facility management team turns their requirements into model development specifications, keeping us to provide a just-in-time and just-enough BIM process. And as the experience we achieved in this project, to have Greater Value from Early Value with BIM in VDC.

Fly View of Overall Site and Surroundings
Image Courtesy of Yee Fai Construction Company Limited



4D Simulation of Construction Sequence and Site Safety
Image Courtesy of Yee Fai Construction Company Limited



CFD Simulation for Basement Temporary Air Ventilation and Smoke Extraction
Image Courtesy of Yee Fai Construction Company Limited

Demolished KMB Depot and Laser Scanning for Curtain Wall Fabrication
Image Courtesy of Yee Fai Construction Company Limited

Site Condition and BIM Model Comparison by MR Equipment and Panoramagram
Image Courtesy of Yee Fai Construction Company Limited

Overview of Building Façade Design
Image Courtesy of Yee Fai Construction Company Limited

Nearby Park View of Building
Image Courtesy of Yee Fai Construction Company Limited

Virtual Mockup with VR Equiped Exploration
Image Courtesy of Yee Fai Construction Company Limited

Advisors' Comments - Introduction

This year, we are extremely honoured to receive the invaluable support from the local supporting organisations and overseas BIM advisors. Locally, an advisory panel was formed by the representatives of local supporting organisations to discuss and review the selected projects, and their comments were consolidated and recorded. In addition to the comments of the selected projects, the overseas advisors also shared with us about the BIM development in other parts of the world.

Advisory Panel

Martin Riese
Architect
A Chapter of The American Institute of Architects

Ryan Leong
Director
Architects Association of Macau

Froky Wong
MSc BSc MHKIBIM MIET CCBM
Immediate Past Vice-Chairman
Autodesk Industry Advisory Board

Simon James Gallagher
Hong Kong Centre Chair
Chartered Institute of Architectural Technologists, Hong Kong Centre

Ar Ada Fung, BBS
President
Hong Kong Alliance of Built Asset & Environment Information Management Associations (The Hong Kong Chapter of buildingSMART International)

Vincent Yeung
Council Member
Hong Kong Information Technology Joint Council

Dr. Francis Chan
Chair of Professional Standards and Accreditation
Hong Kong Institute of Project Management

Ir Ng Chun Keung
President
Hong Kong Institute of Utility Specialists

Jake Lucier
Director, Digital Practice
Hong Kong Revit User Group

Ir Steven Lai
Council Co-opted Member
Institution of Public Private Partnerships

Dr. Calvin Kam
FAIA, PhD, PE, LEED AP
Founder and CEO
Strategic Building Innovation · bimSCORE

Wong Hon Fai
MSc, MCIOB, FCInstCES, MAIB, MHKICM, MHIREA
Chair
The Chartered Institute of Building (Hong Kong)

Sr Daniel Sum
Chairman
The Chartered Institution of Civil Engineering Surveyors (Hong Kong Region)

Ir Dr George Wong
Board Member
The Hong Kong Institute of Building Information Modelling

Leung Kai Chun, Michael
Director of BIM Affairs
The Hong Kong Institution of Engineering Surveyors

Ir Raymond Lui
Committee Member
The Hong Kong Institution of Engineers (IT division)

Advisory Panel - Award Winners

CLP Power Hong Kong Limited
Shing Kai Road 132kV Substation

BIM had facilitated the stakeholders to identify hazards and risks of building a substation. It also helps to make corrections, preventions and develop related safety plans before actual construction. Safety is one of the core values of CLP Power. The fire evacuation plan or manage flooding risk of the substation, and other possible crisis management scenarios could be revealed in BIM for evaluation. BIM is a very effective tool to facilitate communications with the different stakeholders especially when the public often bear a 'not in my back yard' attitude to the substation development within their local community. CLP has established the in-house BIM standard to improve the design process and maintain consistency of the substation development.

Drainage Services Department, HKSAR Government
AECOM Asia Company Limited
ATAL-Degremont-China Harbour Joint Venture
Design, Build and Operate San Wai Sewage Treatment Works – Phase 1

BIM is an excellent collaboration tool for this infrastructure project. It is operated under the Design-Build-and-Operate (DBO) contract, which means contractors can execute the design and construction stages with due consideration given to the life cycle costs while stakeholders can share information with BIM. Smart helmets integrated with BIM and IoT technologies are used to achieve construction management and staff monitoring. This allows site supervisors to allocate manpower efficiently to meet the distinct installation progress as well as to prevent workers from overworking. In addition, the collected data was used to estimate the duration of installation works and to plan for similar types of work for better site programming.

Gammon Engineering & Construction Company Limited
Global Switch Hong Kong - Design and Built Data Centre at TKO

The project owner has adopted a variety of BIM technologies throughout the design and construction stages such as cloud platform, MEP fabrication and Computational Fluid Dynamics Simulations. Design for Manufacturing and Assembly (DfMA) approach was applied to directly export the fabrication information or order from model to the mainland factory, this shorten the ordering and manufacturing time and zero waste was achieved during the fabrication process. As-built methodology was established with the client in the early design coordination stage to align the high standard requirements with standard forms, sets of rules to manage the field measurement, as-built BIM verification, and data validation.

Hip Hing Engineering Company Limited
Architectural Services Department, HKSAR Government
Provision of Temporary Facilities at Existing Open Playground of Junior Police Call Permanent Activity Centre and Integrated Youth Training Camp at Pat Heung

BIM acts as a project accelerator for the temporary quarantine facility at Pat Heung. The contractor was being challenged to complete the project within 70 days, which contains foundation work, design and build of 120 units of quarantine modules at the existing site. With the Design for Manufacture and Assembly (DfMA) approach and Modular Integrated Construction (MiC), the whole project was completed in 63 days (14% faster than expected time). One of the user requirements to these MiC modules is to be easily dismantled and altered functionally to temporary transitional housing after its quarantine usage. BIM model has the capability to give a full insight to designers and engineers on the entire building life cycle for this special case.

Advisory Panel - Award Winners

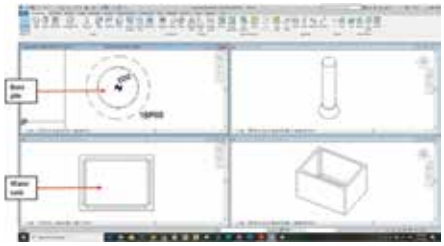
Hip Hing Engineering Company Limited
Hong Kong Science and Technology Parks Corporation
Leigh & Orange Limited
InnoCell

InnoCell is a multi-functional building that contains shared living/working space with the residential units. It is the first high-rise permanent Modular Integrated Construction (MiC) pilot project in Hong Kong. With this construction approach, the construction progress was much shorter than expected and was recorded 6-month ahead of the planned schedule. Other advantages such as improve the quality of fit-out, reduce reworking and wastage, and resolve problems prior to site construction. To deliver hundreds of modular units was a significant challenge, 3D simulations on surroundings and vehicle tracking were used to assist engineers to identify the optimized site logistic. BIM-AM Standards have been established between owner and contractor in the early stage of the project, in result of a smoother transition of access from construction to occupation and to usage.

Hip Hing Engineering Company Limited
Kai Tak Sports Park Limited
Home Affairs Bureau, HKSAR Government
Kai Tak Sports Park

This mega project is extremely complicated, the project team consists of more than 70 companies from 10 different regions. The Sports Park project has applied the Design-Build-and-Operate (DBO) contract for 25 years, the construction period is estimated around five years. The BIM collaboration would be difficult to achieve without the application of cloud technology. The project documentation is stored on BIM 360 platform. As the BIM models expand continuously, the project team is worry free to work on the project since the platform provides unlimited storage space and accurate version control. In addition, all design reviews such as issues and markups are recorded and could be reviewed at any time. New technology such as intelligent car park management system uses BIM data to monitor occupancy of all parking spaces in the site, and displays vacancy information via dashboards, display boards or mobile apps for drivers of incoming vehicles to park easily.

Advisory Panel - Industry Influencer Awards



Independent Checking Unit, Office of the Permanent Secretary for Transport and Housing (Housing), HKSAR Government
Development of the Technology to Use Building Information Modelling for Statutory and Building Control Submission

This is a developed process for Statutory and Building Control Submission for Hong Kong. It aims to reduce manual or repetitive tasks of drawing production including General Building Plan, Superstructure Plan & Foundation Plan. The Revit plug-in was used which has been fully tested in many BIM models of public housing projects of Hong Kong Housing Authority and some other projects of Architectural Services Department.

The Hong Kong University of Science and Technology - Campus Development Office
Shaping a Digital Future - BIM, Space and Asset

HKUST has developed a BIM workflow on managing institutional space while the sources and types of information were diversified. There are 12 major space categories with more than 150 sub-categories. The space data includes a designation of function with a separate room code. With integration of BIM, room asset, space and utilization data, it can represent facility needs, resource allocations for research and activities. Dynamo and Python were used to standardize the different naming, generating worksheets, and extracting useful data. Connecting each room (space) to GIS, each space acts as 3D indoor GIS.

Advisory Panel - Honorable Mentions

Drainage Services Department, HKSAR Government
AECOM Asia Company Limited
China State Construction Engineering (Hong Kong) Limited
MTECH Engineering Company Limited

Relocation of Sha Tin Sewage Treatment Works to Caverns - Site Preparation and Access Tunnel Construction

This project was delivered with Integrated Project Delivery (IPD) approach, which means all people, process and systems are linked closely to achieve the lean construction. To speed up the steel bridge assembly on a busy road, detailed design was created with BIM for fabrications. And the vehicle tracking analysis was used to simulate the steel parts delivery. Assembly sequence simulation has helped the project team to understand the whole process of assembly. This enhances the safety and speed to ensure the completion of the job.

Drainage Services Department, HKSAR Government
Black & Veatch Hong Kong Limited
Vircon Limited

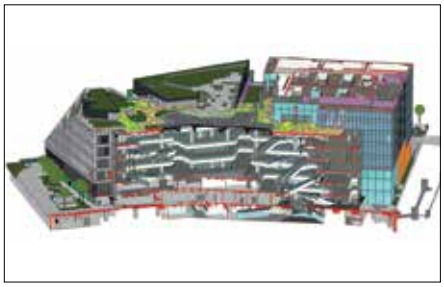
Construction of Dry Weather Flow Interceptor at Cherry Street Box Culvert

A variety of BIM tools and approaches have been applied in this project. Project coordination, visual presentation, drawing documentation and BIM data transfer to Asset Management system have been smoothly carried out during the process. Some challenges have been successfully resolved, such as integrated the RFID system with BIM and applied Design for Manufacture and Assembly (DFMA) method for construction.

Kerry Properties Limited

Residential Property Development Project at 3 Lung Kui Road, Beacon Hill, Kowloon

This is an experimental project to apply BIM on landscape development. This is a real challenge since the BIM's maturity is relatively low in comparing with architectural, structural, or building services fields. The project team has analyzed the traditional workflows of landscape design and intended to create new workflow for this case. Although this is only a trial project, it has brought more awareness in the industry.



Nan Fung Development Limited

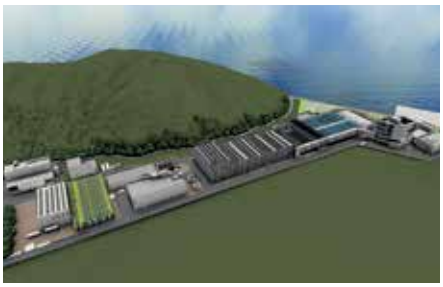
AIRSIDE

The BIM strategy in this project was well planned, and the outcome was satisfactory to all project stakeholders. The owner, design consultants and contractors have migrated the BIM concept to their daily workflows. With the usage of a centralized cloud platform, all coordination activities, information outputs, overall construction progress and project performance could be tracked in a real time basis. In addition, the owner has put a step further to develop AI application on BIM data.

Advisory Panel - Honorable Mentions

Water Supplies Department, HKSAR Government
Uprating of Chai Wan Salt Water Supply System

This is a good example to showcase how BIM data could maximize its value beyond design and construction stages. The public facilities always have a high demand of data accuracy to maintain a stable and reliable service quality to citizens. Therefore, in-house BIM standards for Asset Management (AM) and COBie API have been developed to guide the project teams on integration of BIM data with the government's AM system.



Water Supplies Department, HKSAR Government
AJC Joint Venture
Black & Veatch Hong Kong Limited
WSP (Asia) Limited
Design, Build and Operate First Stage of Tseung Kwan O Desalination Plant

This civil project is an extraordinary plant building in Hong Kong, it applies Reverse Osmosis (RO) technology to process seawater into drinking quality water for local consumption. Chemical and other dangerous items are treated in the delivery and construction process. BIM acts as a good planning and coordination platform to support the construction in terms of information exchange, data management and model visualization.

Wheelock Properties (Hong Kong) Limited
Proposed Residential Development at NKIL 6584, Off Sin Fat Road, Kwun Tong, Kowloon & Residential Development at NKIL 6564 Kai Tak Area 1L, Site1, Kai Tak, Kowloon

BIM and cloud technologies have been adopted in this large-scale of residential project, which has proven the successful coordination of workflow among project stakeholders throughout the design and the construction phases. In order to improve the service quality of Facility Management (FM) to the next level in a long term, FM team was involved and attempted to immerge BIM to existing FM workflow and practice in the early stage of the project.

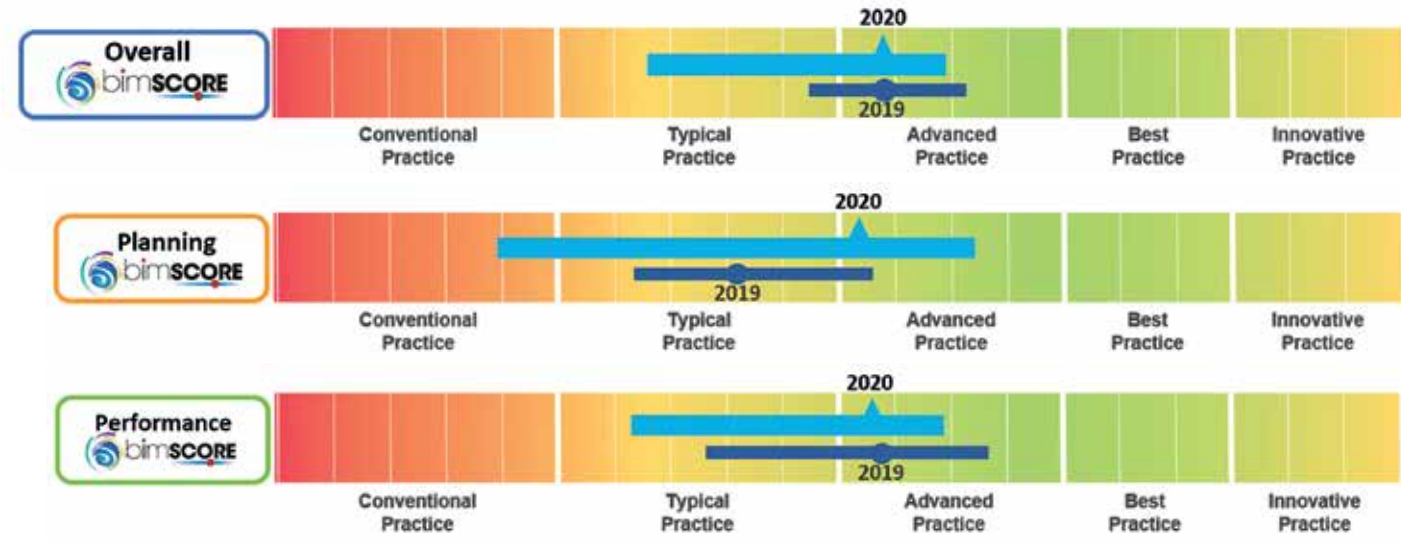
Yee Fai Construction Company Limited
Commercial Development at KTIL240, 98 How Ming Street, Kowloon, Hong Kong

The BIM spirit is the highlight of this project. Management team took BIM adoption seriously. Not just hard selling BIM to project members or treat this project as one go task, management has carefully reviewed the BIM practices with a series of in-house workshops and measurement tools on a regular basis. Project members were also encouraged to adopt new BIM technologies and examine various workflows. This working culture would produce a strong core to facilitate BIM development in the company.

Dr. Calvin Kam, FAIA, PhD

Overview

The 2020 Hong Kong BIM Awards witness a diverse collection of projects that champion a great variety of leading-edge and creative BIM-enabled processes and technology adoption supported by well-informed planning and team collaboration. The winning projects have leveraged BIM to innovate and achieve successful outcomes across a range of projects - ranging from a Temporary Quarantine Facility to a Sports Park Development at the Heart of the city. It is delightful to see several 2017, 2018 and 2019 Hong Kong BIM Award winners (e.g., CLP, Hip Hing, DSD) also appeared as awardees this year, and they have further **expanded on boundaries in BIM standards and BIM use, and pioneered new BIM-based technologies** for better project performance. Applying our Strategic Building Innovation (SBI) bimSCORE evaluation framework for a preliminary assessment based on the evidence provided in the submissions, we have benchmarked this year's winners against our global knowledge base of hundreds of projects from over 16 countries using our 5 maturity tiers ranging from "Conventional" to "Innovative" practices. Within the global context, **2020 winners fit between "Typical" and "Advanced" Practices**. The winning projects are further analysed with respect to the bimSCORE's four evaluation areas: Planning, Performance, Adoption, and Technology. The figures below illustrate the Overall bimSCORE and four area scores of the 5 winning projects in 2020, referenced against the performance of the 2019 awardees.



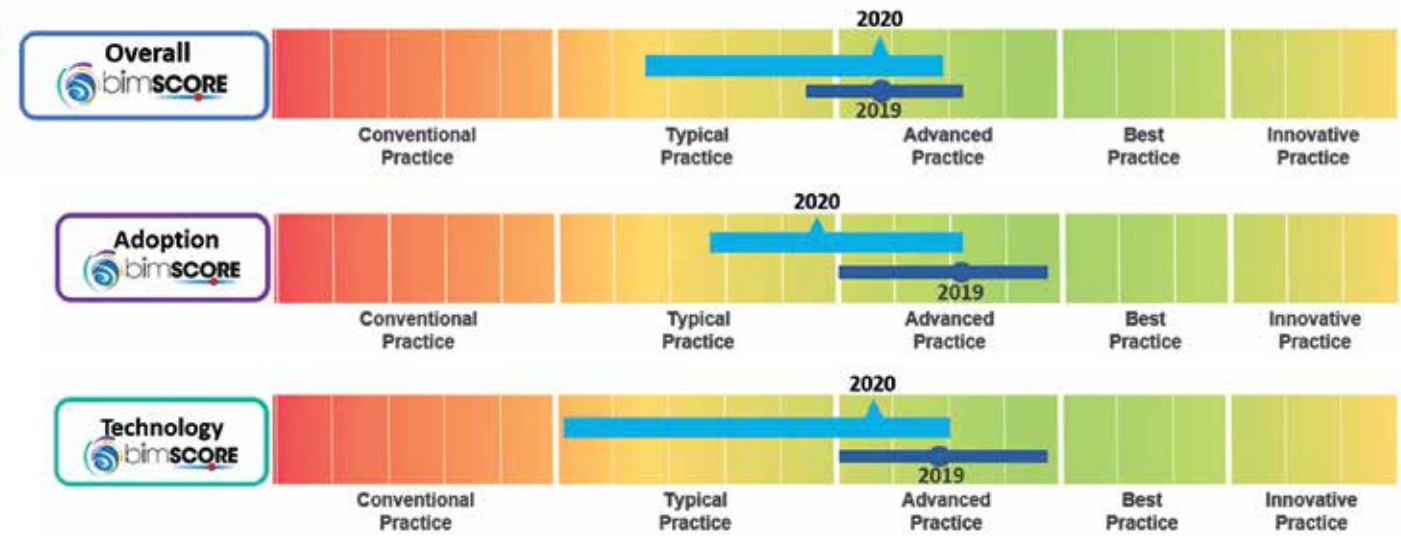
*** Projects were evaluated based on the materials submitted by the applicants without interviews.*

Planning and Performance

Planning for BIM implementation requires targeting objectives for success, supporting achievement with the needed tools and training, technical processes, and developing standards to guide an integrated project team. ***Performance*** monitoring of objectives is enabled through BIM and increased automation in quantitative tracking of project performance metrics to inform design and project management decisions.

The award winners recognize the importance of the alignment of BIM capabilities among project stakeholders. **CLP** (Innovative Sub Station) implemented dynamic BIM standard to improve the stakeholder alignment and design process for the project. The project also reduced the Carbon Emission by 25% and construction wastage by 70%. **Home Affairs Bureau** (Kai Tak Sports Park) defined the objectives for the whole project in the starting itself to ensure sustainable development including progress tracking, construction coordination, design optimization, among others. The project was also able to save 70% time on construction process and 80% time on Quality control. **Hip Hing** (Temporary Quarantine Facility) ensured online meetings and remote quality inspection to overcome the challenge of limited physical contact during the pandemic. The project was able to save 85% time during coordination and was 10 days ahead of schedule. **HKSTP** (Innocell) was able to resolve 400 design issues with the help of BIM and brought its overall construction 6 months ahead of schedule. Overall, more number of performance metrics were tracked and documented by 2020 awardees including quantity of construction waste, carbon emission and time investment on QC & installation processes. However, clearcut comparison is difficult to make considering the different performance metrics tracked by 2019 & 2020 awarded projects. Also in a formal setting of bimSCORE evaluation, *Performance* score takes into account the emotional/qualitative responses of stakeholders, but this measurement was not taken as the evaluation of the projects were solely based on submitted documents. So the confidence level of the *Performance* scores is relatively low.

Some variations were observed among different projects in the Planning and Performance area, ranging from lower "Conventional" to upper "Advanced" practice on the global scale. Organizations are therefore encouraged to establish BIM-based objectives, give recognition to exemplary projects that demonstrate auditable, repeatable, and objective quantification of benefits and develop respective quantifiable measures of success to track project performance and realize improvement throughout the project lifecycle.



*** Projects were evaluated based on the materials submitted by the applicants without interviews.*

Adoption and Technology

Adoption of BIM is measured across the project lifecycle (design through operations) and project stakeholders (designers, builders, owners and agencies) to understand the degree of BIM implementation. ***Technology*** considers the informed selection of BIM analyses and tools that are supported by interoperable information exchanges and information-rich models.

We have witnessed a growth in effective BIM-based multi-disciplinary coordination among different stakeholders across multiple project phases, with a deeper level of technology integration. **CLP** (Innovative Sub Station) implemented BIM for cost planning, constructability analysis and energy analysis, with the help of 3D and 4D simulations using Fuzor, Navisworks, A360, Enscape, etc. The project also developed an AI-based chatbot to search relevant project information. **Home Affairs Bureau** (Kai Tak Sports Park) carried out BIM-based design optimization, 3D printing, progress tracking and costing using Recap, BIM360, Ecotect, Civil 3D, etc., involving 70 organizations and 520 BIM users. **Hip Hing** (Temporary Quarantine Facility) ensured BIM-based collaboration including just-in-time logistic management, QR code-based inspection using A360, Vehicle Tracking, Civil 3D, Dynamo, etc. **HKSTP** (Innocell) carried out BIM-based 5D cost aggregation, 3D mockup printing, laser scanning and shop drawing production using Revit, Dynamo, Navisworks, etc.

In comparison to 2019 awardees, 2020 awardees have established better project outcome objectives by making them quantitative and have better prepared and adopted BIM standards and guidelines. This has contributed to higher scores in the Planning Area. On the other hand, this year's Adoption scores fell behind last year's scores, showing fewer signs of integrative and concurrent approaches. The use of integrated project delivery (IPD) and integrated concurrent engineering (ICE) methods tend to contribute to higher scores in Adoption, but the pandemic may have prevented the teams from collocating and using big rooms for extreme collaborations. Projects owners are encouraged to better balance breadth and depth of BIM uses in response to the project and client objectives, as well as the project team and market capability.

Dr. Calvin K. Kam
FAIA, PhD, PE, LEED AP
Founder and CEO, Strategic Building Innovation • bimSCORE
Adjunct Professor Center for Integrated Facility Engineering, Stanford University

Dr. Calvin Kam is the Founder of Strategic Building Innovation (SBI) and bimSCORE.com - the "GPS Navigator" for any enterprise or project team charting courses for construction innovation. SBI was invited to present and facilitate at both the 2014 and 2015 APEC workshops and to author APEC publications. Dr. Kam teaches undergraduate, graduate, and professional courses and leads research as an Adjunct Professor at Stanford University's Center for Integrated Facility Engineering, where he partners with industry members in areas such as Building Information Modeling, Virtual Design and Construction as well as Smart and Sustainable Developments. Calvin was a former National Chairman of the Center for Integrated Practice and the Technology in Architectural Practice Knowledge Community (supported by 10,000+ professionals) with the American Institute of Architects, for which he had also served on the Board Knowledge Committee.

Dr. Kam has been working with Construction Industry Council, Development Bureau, English Schools Foundation, Hong Kong Housing Authority, Lands Department, Sun Hung Kai Properties, University of Chicago, Walt Disney Imagineering, etc. In 2011, Singapore government's Building & Construction Authority appointed Calvin as an international expert to advise its construction productivity and BIM roadmap. In 2013, China's National BIM Union and Standard appointed Calvin as the only international Honorary Director to advise the international harmonization and collaboration of its nationwide BIM standards/development. In 2015, Calvin was appointed an Expert Advisor to the Shanghai government's BIM advancement center.

A recipient of various honors/awards including ENR's "20 under 40" and BD+C's "40 under 40", Calvin is a Registered Architect, Professional Engineer, and LEED AP in USA with Ph.D. from Stanford University. Dr. Kam has presented at 100+ industry events/universities across 18 countries and regions and published a number of book chapters and journal publications. Calvin has served as an Expert Advisor of the Hong Kong AIAB BIM Awards since 2008.

Ir. Lee Ming Kiu, Owen

MBA (Distinction), MSc (CPM) (Distinction), BEng (CivE) (Hons), PgDip (Arb & Med), ProfDip(OSH), CCBM, CEng, MICE, MIMMM, FGS, MCIHT, MCInstCES, MCIArb, MHKIE, MIEAust, CPEng, MIES, MASCE, MCSCE, MHKIBIM, MHKICBIM, FHKICAdj, UK RegGEP, Approved Reviewer of IOM3 and RoGEP

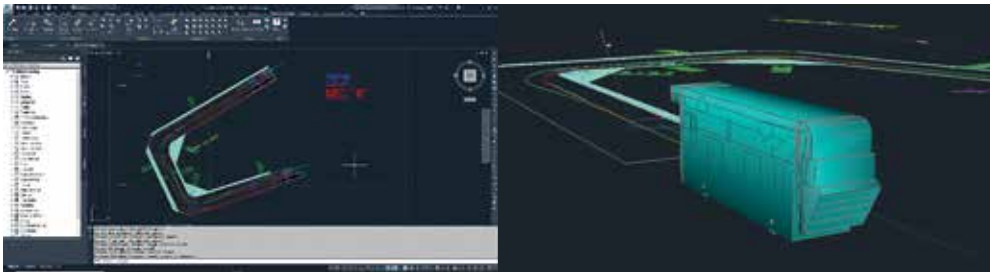
Ir. Owen Lee is currently the Resident Engineer of AECOM Asia Company Limited, leading the digital transformation, BIM adoption and construction innovation of the Sha Tin Caverns Project.

Owen is a Chartered Civil and Geotechnical Engineer, Civil Engineering Surveyor, CIC-Certified BIM Manager, Registered Ground Engineering Professional and Accredited Adjudicator with extensive experience in tendering, construction, engineering design, contract administration and BIM management of mega infrastructure projects.

Owen is also Lecturer (Part-time) at the Technological and Higher Education Institute of Hong Kong (THEi) and the Hong Kong Institute of Vocational Education (IVE) teaching BIM and construction management. He is a member of BIM dispute committee of the Hong Kong Institute of Construction Adjudicators and a professional member of HKIBIM & HKICBIM.

Owen holds a Master of Science in Construction Project Management (Distinction), a Master of Business Administration (Distinction), a Bachelor of Engineering in Civil Engineering (Honours), a Postgraduate Diploma in Arbitration and Mediation and a Professional Diploma in Occupational Safety and Health.

Design for Manufacture and Assembly of Temporary Vehicular Steel Bridge Across A Kung Kok Street of Sha Tin Caverns Project



Swept path analysis of steel bridge deck using Autodesk® Civil 3D
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited

Introduction

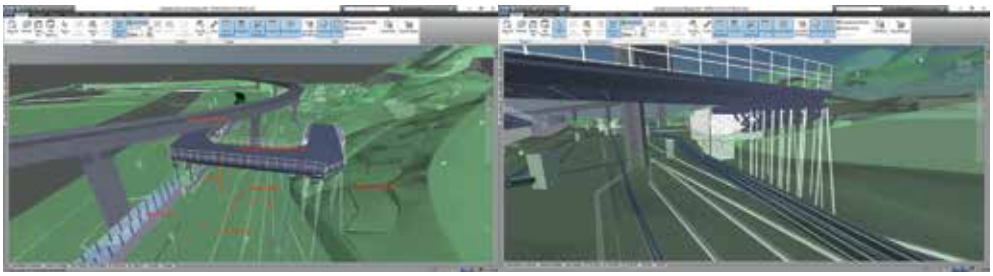
AECOM used Autodesk® AEC Collection and BIM 360 in the design and construction of temporary vehicular steel bridge of Drainage Services Department's Sha Tin Caverns Project. The design and construction of this bridge were particularly challenging because there were design constraints such as existing utilities, topography and bored pile wall and construction constraints such as the closeness of existing Tate's Cairn Highway Flyover and the requirement of maintaining live traffic at A Kung Kok Street during construction.

Bridge Design

Vehicle tracking was adopted to determine the optimum size of the bridge deck through a swept path analysis. The preliminary design model of the temporary steel bridge developed by Civil 3D was imported to the Revit and further analysed using Robot Structural Analysis. The principles of Design for Manufacture and Assembly (DfMA) and Design for Safety (DfS) were adopted in the design, the bridge deck was divided into segments in consideration of the ease of transportation and lifting as well as minimizing the working at height and on-site welding works.

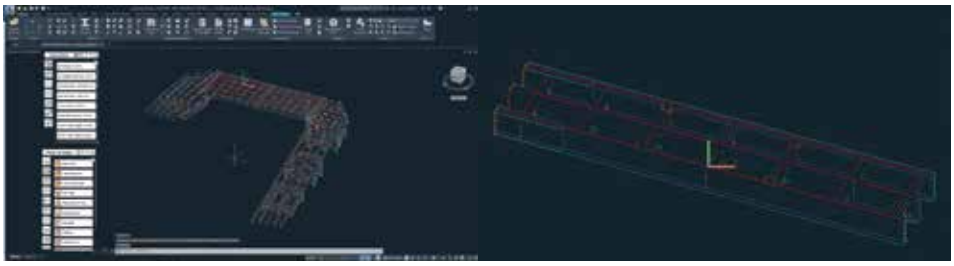
Fabrication Detailing

The Revit model of steel structure was subsequently imported to Advance Steel for steel connection detailing. The interoperability streamlined the BIM workflow without the loss of data. Advance Steel offered a library of parametric steel connections that allowed us to model complex steel connections by just entering

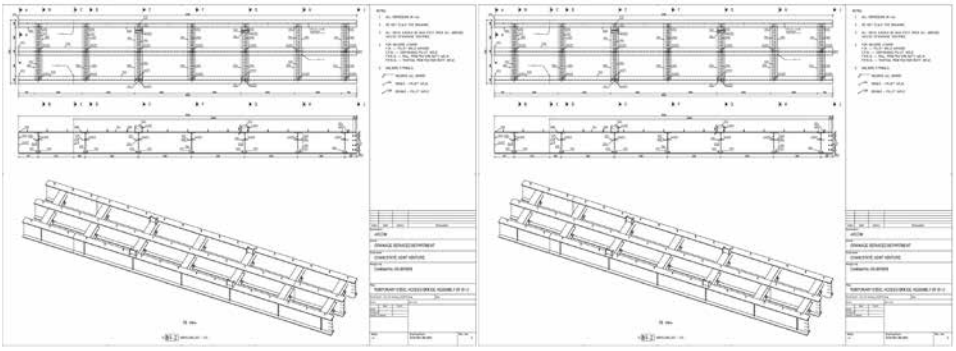


Preliminary design review using Autodesk® Navisworks Manage
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited

Detailed design model of temporary steel bridge modelled using Autodesk® Revit
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited



Autodesk® Advance Steel Model of the temporary steel bridge
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited



Shop drawings generated from Autodesk® Advance Steel
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited

Construction simulation of temporary steel bridge using Autodesk® 3ds Max
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited

the parameters, leading to substantial time saving when comparing the time required for modelling the same connections in Revit. Since the workflow was bidirectional, in case of any design change, the Advance Steel model of steel bridge could be imported back to the Revit for updating the model of the steel bridge.

Shop Drawing Production

Shop drawings were automatically generated from Advance Steel by using the Document Manager function. There were several shop drawing styles provided which allowed users to choose their preferred style. The shop drawings generated were subsequently reviewed by the construction team and delivered to the steel manufacturer in Mainland China for fabricating the steel structure.

Lifting & Assembly

The lifting work of the bridge deck segments was challenging because of the closeness of bridge deck and two piers of the existing Tate's Cairn Highway Flyover and requirement of maintaining traffic at A Kung Kok Street. Also, the construction team also needed to compete with time since the team only has two hours to complete the lifting work of three segments.

With the good design and construction planning enabled by BIM and concerted efforts of the project team, all the segments were lifted to the designated installation location according to the lifting plan safely and within the time limit and finally assembled.

Outcomes and sustainable development

The use of BIM brought many merits to the project team such as facilitating faster decision throughout the project life cycle, reducing time spent in DfMA design as well as decreasing cost and duration of construction through better planning. The ability of BIM application to foster collaboration among the project team, 4D simulation of construction sequence and detection of clash during the logistic planning that eliminated risks and errors during the lifting operation amid constraints of live traffic above and below and two existing piers in the vicinity. To conclude, it is proven that BIM application in temporary steel bridge construction helped in managing the Sha Tin Caverns project effectively in various aspects.

Survey check and measurement using Autodesk® Recap Pro
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited

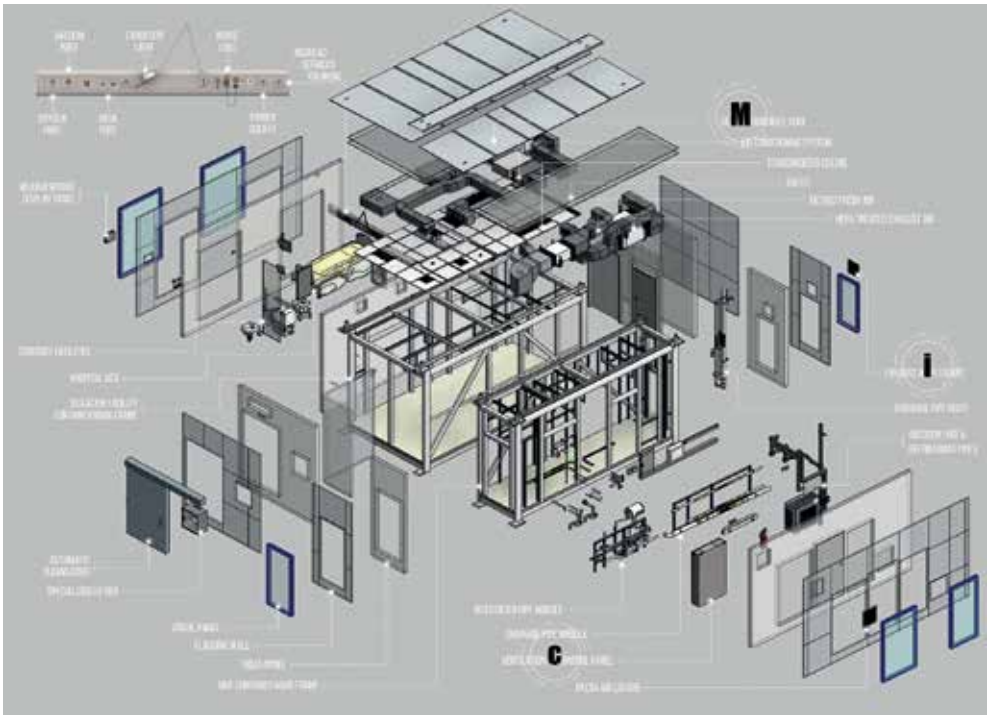
Lifting of the bridge deck segments at night and completed steel bridge
Image Courtesy of Drainage Services Department, HKSAR Government and AECOM Asia Company Limited

Wan Cheuk Lam, Nelson
BSc(Hons) MHKIBIM MHKICBIM

Mr. Nelson Wan Cheuk-Lam has over 7 years of experience on digital transformation and integrate construction ideas with BIM. Currently working as a Deputy BIM Manager in a mega scale design and build data Center project at Gammon Construction Limited. He joined the company at 2017, and obtained HKIBIM , HKICBIM in 2019. He is a young leader to drive full BIM implementation with LOD500, demonstrating DfMA approach in BIM throughout project life cycle.

Nelson also lead his team to deliver from design to as-built by BIM. Expertise on maximising benefit of BIM at manufacturing and procurement from a contractor aspect.

Digitalization of Design for Manufacturing and Assembly (DfMA)



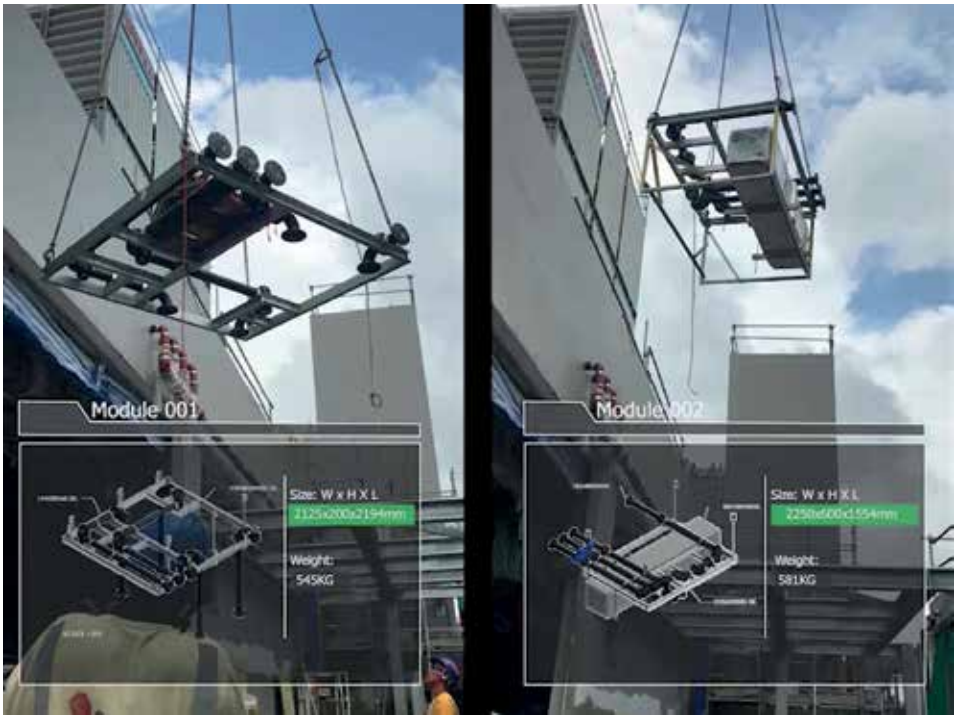
Digitalization of Design for Manufacture and Assembly (DfMA)
Image Courtesy of Gammon Engineering & Construction Company Limited

Digitalization and automation of routine works in construction industry has recently been a hot topic. It has always been a challenge in the construction field where relies a lot of traditional thinking and norms on site. However, with the government and Construction Industry Council support, Building Information Modelling (BIM) has taken a great leap in the past 5 years. As a tool able to generate and manage digital representations of physical and information, it also can innovatively integrate with traditional Manufacture and Assembly and form a whole new project life cycle, called DfMA (Design for Manufacture and Assembly) as an innovative digitalize solution.

Adopting common data environment (CDE) to enhance efficiency for collaboration with different project stakeholders in design and construction stage. Designers, engineers, subcontractors, quantity surveyors and manufacturers would then be able to collaborate the concept together to design installation which would be tailor made to the building to suit for installation challenges, in order to achieve better safety and quality on the outcome. The accuracy of the BIM model would also require to a certain level of detail in order to mimic the actual site situation, in order to facilitate the virtual way to build, as well to avoid unnecessary design and coordinate fault on production.

Battling against the traditional mindset of using 2D drawings with 3D BIM model is always one of the most challenging task to overcome. While engineers and supervisors demand 2D drawings in various location of the site which is the most practical means to carry out works on site with dimension and clear indication, there always have people want to find shortcuts on generating 2D drawings without using the common data environment under BIM platform. Here on this project, we established a stringent workflow control of drawings to site, as well aligning the operational team and subcontractors, for all 2D drawings even the manufacturing drawings at factory shall all be derived from BIM. Not only that, the as-built BIM requirement has always required to be at

BIM Design Review Meeting
Image Courtesy of Gammon Engineering & Construction Company Limited



Delivery of DfMA
Image Courtesy of Gammon Engineering & Construction Company Limited

the LOD500 which at the end of the day if BIM is not being followed, it would be all parties to suffer but not just the BIM team to as-built back the whole model. This mindset has been implemented to all team members on day one, facilitating all the factory works able to be coordinated under a BIM environment, read by the factory, manufacture the modules off site, and install on site in one goal. The project execution has been so clearly tied together on first day of execution, where all stake holders truly have the mindsets to understand and willing to execute the coordination and design in a virtual way via BIM then to actual site installation, as one team together from main contractor and the MEP contractor, in order to strife for a win-win situation. A lot of time were spent throughout the project life cycle together with the project in charge to educate this concept together with client, designer, subcontractor, engineer and manufacturer.

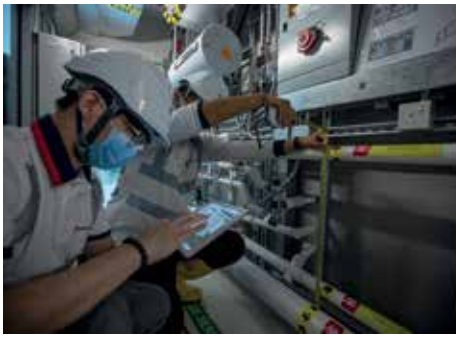
Not only that, the detail for fabrication drawings would be much higher compare to traditional shop drawings in DfMA approach. Not only the module itself, clear indication on maintenance, connection details, overall configuration would also be a critical demand on generating fabrication drawings for DfMA in order to suit actual site installation. Clear supporting details would be required in order to make installation work, regardless it is not a requirement under LOD500 not a requirement under specifications, the BIM model has to be on a very high level of accuracy containing information of each components under the BIM environment. To tackle this challenge, we set up a separate team solely developing Revit Family under the autodesk software capacity and build up our own data base. We also make use of these family to animate the method statements of different DfMA component installation to ensure it works on site.

The examples of this job and our experience pioneered the possibility of how far the concept of DfMA can go with the aid of autodesk software. From this we also develop a few other examples for project further evolving to Modular Integrated Construction (MiC). The experiences also being shared across within the company and set as a norm for upcoming Gammon project adopting DfMA, facilitating elimination of hot works, and demanding a higher quality of installation with a shorter site construction period. The outcome of this project has been demonstrated to different stake holders in the industry at different technical site visits, as well as a case sharing in order to support recent government initiation to DfMA and MiC with the help of Autodesk software.

Digitalization of Modular Plant Room
Image Courtesy of Gammon Engineering & Construction Company Limited

DfMA of Factory Quality Assurance
Image Courtesy of Gammon Engineering & Construction Company Limited

Digital Fabrication of DfMA
Image Courtesy of Gammon Engineering & Construction Company Limited



BIM As-Built Verification
Image Courtesy of Gammon Engineering & Construction Company Limited

Chung Cheuk Hang
Ho Koon Kau
Kong Cheuk Kin
Leung Ka Ho

INSTITUTION
The Chinese University of Hong Kong

PROJECT NAME
Renovation for Humanitarian Project – Zheng Sheng College

PROJECT LOCATION
Zheng Sheng College

TYPE
Humanitarian Project/Educational

AUTODESK PRODUCTS USED

AutoCAD
Autodesk Viewer
BIM 360 design
CFD
Insight
Revit

Girls' Dormitory
Image Courtesy of The Chinese University of Hong Kong

Integrating BIM and CFD to improve living quality in humanitarian project

Girls' Dormitory – Section
Image Courtesy of The Chinese University of Hong Kong

Project Background

This is a humanitarian project carried on by three students (Chan Wing Chun, So Wing Kei, and Leung Ka Ho) and applied with Autodesk package by our team from school of architecture in CUHK.

Zheng Sheng college, labelled as "underprivileged group" in HK, under the scope of Humanitarian architecture, which is defined as the demonstration of the power and simple skills of design to improve lives. To us, Autodesk package perfectly showcases of that force. For example, insight highlights the overheat gain of existing asbestos roof when CFD suggests us the effective headroom to increase wind velocity under the roof.

Project Challenges and Solutions

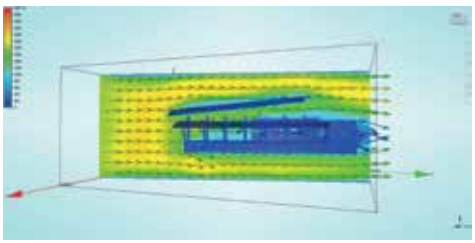
As an educational humanitarian project, limited resources is our major limitation during the year of our thesis, in terms of consultant fee in professional simulation. However, being a " real project" rather than fictional thesis, precise simulation, improving human comfort, becomes important consideration undeniably, especially the school without air conditioning system in the whole year.

With an educational license, we could enjoy a full version of Autodesk package including Revit, AutoCAD, Insight, CFD and BIM 360 for team collaboration. The package serves us the whole design stages including concept presentation, drafting, simulation, calculation, final presentation, and also exporting different file format, e.g. stl., for model making.

How does BIM help for your project?

By using BIM, it provides us with a rich and multi-directional experience in our architectural design project, which do not limit in model making and architectural submission, but also for conceptual graphic presentation, simulation, and communication in different stages of our project.

During the year, there were several interim presentations in searching different design options for the end users, Revit allows us to save different options in one file and produce drawings for presentations. Insight, a great auxiliary tools, helps to automatically create energy models from concept to detail design. Moreover, It provides solar PV performance analysis quickly. CFD, the fluid dynamics simulation software predict and boost efficiency of wind energy to cool down the environment under the pavilion. BIM 360 benefits internal communication in our group.



Girls' Dormitory - CFD Simulation
Image Courtesy of The Chinese University of Hong Kong

Finally, we sincerely thank Prof. Edward Ng, and principal Alman Chan for all the help in the project.

Lai Chi Ching, Angel

Poon Kwok Ho, Parson

Wong Kok Yiu, Peter

INSTITUTION
The Hong Kong University of Science and Technology

PROJECT NAME
Integrating BIM-GIS with IoT-AI for Urban Walkability Analysis

PROJECT LOCATION
Kwun Tong, Kowloon, Hong Kong

TYPE
Analysis of pedestrian flow and urban walkability

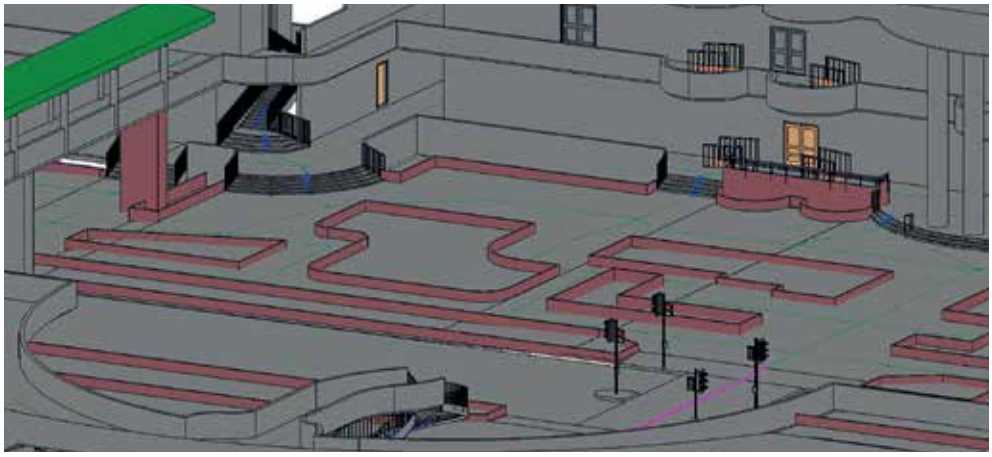
AUTODESK PRODUCTS USED

AutoCAD

BIM360

Dynamo

Revit



Constructed BIM Model in Revit
Image Courtesy of The Hong Kong University of Science and Technology

Integrating BIM-GIS with IoT-AI for Urban Walkability Analysis: Smart Walkability Analytics for Smart Urban Design

Project Background

Walking is a basic transportation mode of citizens which facilitates the sustainable development of a city. There has been worldwide promotion for incorporating walkability analysis into urban planning, for creating a pleasant walking environment. Yet, walkability broadly covers many region-specific factors regarding infrastructure and pedestrians. Conventional methods for regional walkability assessment include on-site audit of walking facilities and pedestrian survey. However, these are labor-intenstive in data collection, and may require non-trivial analysis to devise improvement measures. Therefore, a more effective methodology is developed, by integrating BIM-GIS for infrastructural modeling and IoT-AI for pedestrian flow analytics based on CCTV videos.

Project Challenges and Solutions

Walkability analysis faces two challenges. Firstly, conventional methods of walkability analysis such as on-site surveying are labor-intensive, since pedestrian walking behaviors largely differ among different pedestrian groups and different regions. Secondly, current practices of walking facility audit quantify walking scores of different facilities separately, which could not fully capture infrastructure conditions such as regional connectivity. To address the first challenge, IoT technologies are utilized to facilitate pedestrian flow analytics, based on automated CCTV video processing powered by our developed AI engine. Pedestrian flow statistics are efficiently obtained, which could help understand different pedestrian behaviors in a specific study area. As for the second challenge, BIM-GIS modeling is incorporated into our 3D pedestrian network construction, which integrates rich geometric and semantic attributes of a study area. An integrated 3D walkability network is constructed, which captures the regional connectivity and rich infrastructure conditions, for conducting fine-grained pedestrian flow simulation and walkability analysis.

Automatic Pedestrian Detection from CCTV in HKUST
Image Courtesy of The Hong Kong University of Science and Technology

How does BIM help for your project?

In our BIM platform based mainly on Revit, GIS information are firstly imported to construct coarse dimensional details, e.g. AutoCAD 1:1000 digital maps from Lands Department to form the geometric boundaries of roads and buildings. Subsequently, a BIM-based data model is developed to specify the fine-grained geometric and semantic attributes of facilities to be modeled. Furthermore, 3D pedestrian walking network is efficiently generated with our developed Dynamo plugin. To construct the network, BIM family object templates are defined to categorize the attributes of different facility types, enabling an object-oriented management of the network elements. The constructed BIM model could then be imported to an agent-based 3D pedestrian simulation engine called Pathfinder. The well-categorized BIM objects enable an efficient process of geometry extraction and definition of pedestrian agents' behaviors for simulation. Moreover, BIM360 greatly facilitates collaboration, where relevant drawings, site visits' photos and BIM sub-models are shared within our team.

A I A B
Autodesk Industry Advisory Board

About AIAB

AIAB (Autodesk Industry Advisory Board) is formed by a group of experts who are willing to share their valuable experience from Building, Civil, Media and Entertainment industry.

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Autodesk Industry Advisory Board - AIAB - Hong Kong

Mission

Autodesk Industry Advisory Board (AIAB) is an informal and non-profit making interest group that acts as a bridge between the industry and Autodesk for solid and bidirectional communications. AIAB, as its title suggests, has an advisory role. Its main objectives include, but not limited to:

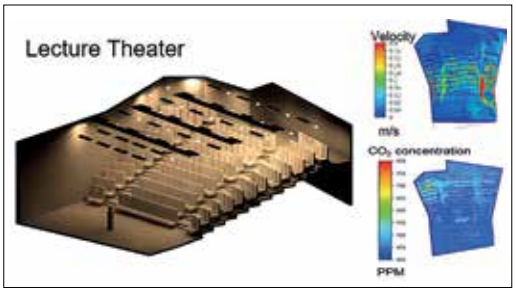
- Act as a platform for technology exchange and experience sharing
- Advance the professional standards on Autodesk products
- Express and share opinions and views on technology development
- Promote the development, usage and awareness of design technology in HK, mainland China and Macau
- Provide cross-border technology exchange/visit
- Provide latest technology update

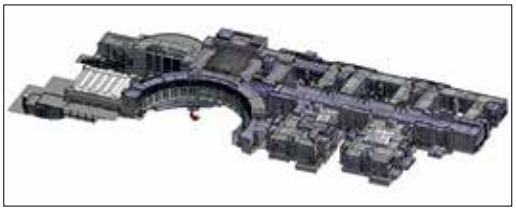
Dr. Jack C.P. Cheng
PhD MPhil BEng MHKIBIM
MHKICIM MASCE CCBM CAP

Dr. Jack Cheng is currently the Chairman of Autodesk Industry Advisory Board (AIAB). He is an Associate Professor, Director of BIM Lab, and Associate Director of GREAT Smart Cities Institute at the Hong Kong University of Science and Technology (HKUST). He has been teaching and conducting research related to BIM and digital construction at HKUST for over a decade. A graduate of Stanford University, Dr. Cheng focuses on research areas in BIM, IoT, digital twin, AI and big data, construction informatics and management, and green buildings. He is also the Chairperson of Hong Kong Construction Industry Council (CIC) BIM Standards Task Force, Honorary Treasurer of Hong Kong Institute of Building Information Modeling (HKIBIM), President of American Society of Civil Engineers Greater China Section, and Director of Hong Kong Green Building Council (HKGBC). He has co-authored over 250 publications. He is a CIC Certified BIM Manager, a Professional Member of HKIBIM, and a Certified ISO 19650 Information Manager. He has received the CIC Construction Industry Outstanding Person Award in 2019 and the CIC Young BIMer Award in 2014.

BIM Audit and Commitment: Unlocking the Values of BIM

BIM has revolutionized the AEC industry. With the mandate and increasing adoption of BIM, we are now more concerned of the quality of BIM models, deliverables, workflows and tools. As we are moving towards ISO 19650, information management has been a focus of the digital transformation of our industry. It is important to ensure the quality of the information in BIM (graphical, non-graphical, and documentation data) in terms of correctness, consistency, completeness (3C). Therefore, BIM audit is essential for quality assurance of BIM. Garbage in, garbage out. If the information in BIM models do not have good quality, the generated deliverables and supported workflows will likely have problems.





To take initiative for BIM adoption and upkeep its quality requires much effort. BIM is still a relatively new area to many practitioners in the industry. Tools and materials such as BIM standards and execution plans are important to help support BIM implementation. But willingness and commitment of BIM implementation among stakeholders, from both top down and bottom up, are often keys to successful BIM projects, as BIM is not only about tools and technologies, but also workflows, practices and policies, in which people take a big part. BIM adoption needs joint efforts from project teams, organizations, and even the industry.

BIM can provide great potential values for our AEC industry, but good quality and strong commitment of BIM implementation are necessary to unlock its values. Look forward to more and better implementation of BIM in our AEC industry in near future.

Kelvin Tam

Kelvin Tam is currently the BIM Director of Simon Kwan and Associates, spearheading BIM implementation and digital transformation of the firm. Mr. Tam is a well-experienced US Registered Architect and CIC BIM certified BIM Manager with over 20 years of project experience across the USA, Middle East and Asia. He has been a BIM user and leader since 2005. Over the years he has been a BIM leader in corporate architecture firms in the USA, Hong Kong, Qatar, Abu Dhabi and Singapore; leading the effort of migrating from 2D CAD to 3D BIM practice by implementing BIM process in projects, making firm wide BIM strategies and standards, coaching and mentoring internal users. For the past 15 years, he has been focused on the development, implementation and support of advanced BIM/VDC technologies to continuously improve the delivery process to clients.

Mr. Tam is a BIM expert well-known in this field and loves to share his knowledge and expertise with fellow BIM learners. Since 2010, Mr. Tam has been actively speaking in major international BIM conferences such as Autodesk University Las Vegas, Autodesk University Extension Dubai, Revit Technology Conference (Australasia, North America, Europe, Asia), Hong Kong Institute of Building Information Modeling Conference, BILT Asia and BILT North America. Mr. Tam is the founder of the Hong Kong Revit User Group, vice chairman of Autodesk Industry Advisory Board, committee member of Global BIM Centre of Excellence, external advisor (BIM) of the Hong Kong Institution of Engineering Surveyors, BIM Accreditation Assessor of the Hong Kong Institute of Architects.

Reshaping the AECO Practice

The evolution of BIM is not only about technology disruption but more an Industrial Revolution of the AECO industry. This revolution has changed the way we work, the tools we use, the attitude we have, the services and products we provide. With technology advancement alone we cannot be successful unless we are willing to develop or completely change our practice to fit into the ever-demanding digital age. To make Building Information Modeling sensible and meaningful, we must see 3D model and information as the primary deliverable rather than a supplement or "as a reference" document. There is no doubt that BIM projects are asking us to provide way more (2D, 3D, 4D, 5D, 6D, 7D, FM, COBie…) than what we used to provide (2D) traditionally. Time is always the most important factor to consider when practicing, no matter you are design consultant or main contractor or sub-contractor in a project with fast moving mode. Neither our projects will slow down nor design consultants and contractors will gain extension of time for the reason of projects adopting BIM. So, what is the solution? We all understand we can only do with limited resource, "Give and Take" would be a fair deal. It is not to say reducing our services and products but more accurately is escalating the quality and cutting unnecessary procedures and deliverables. 4 strategies in my humble opinion would help reshaping practice to make BIM work better with the business:

Collaboration in Virtual Office

In the light of COVID-19 pandemic, working from home has become a norm. With cloud technology, instant messaging and virtual meetings, we are experiencing working from home no different from work in office. In fact, home office is making us even more productive by saving the time of commuting, freeing from hassle and unnecessary meetings in office. Home office is pushing us to fully utilize technologies to collaborate on cloud.

"Less is More" Approach

With BIM models, we are providing a lot more information. Why do we still need to produce many 2D drawings while 3D models can tell the complete story? Redundant drawings with repeated information should be avoided. Save time, save paper and save the environment.

Co-op

BIM is about collaboration. The more we can collaborate and share, the more benefits we can get out of it. Imagine we have a BIM cooperative co-owned and operated by everyone in the BIM community, that serves as a central library of BIM resources (workflows, content, scripts, apps…). Imagine we have BIM experts contributing to this CDE for the benefits of the entire AECO community. Would it be wonderful to extend the idea of BIM of project based to community level to create a Hong Kong BIM hub?

Standards on Process vs Standards on Deliverable

Standards has been a hot topic in BIM implementation discussion. Currently local standards are more focused on Level of Development, file naming convention of deliverables while the processes are less emphasized. In fact, Processes are way more crucial in the success of a BIM project and must be well managed and policed. Would it be great if there is a BIM process standard to guide BIM practitioners to carry out tasks properly and efficiently?

Remember BIM is a relief but not a burden. Make work smart and lean.

Ho Han Hsi
PMP, CCBM, MHKIBIM

Han Hsi is the Founder of Han Hsi Ho & Company Limited and Co-founder of Platform Design Associates Limited. She brings to the table international experiences in building information modelling, teaching and training, project and operations management, and design. As a tireless promoter of "Big BIM" (Building Information Modelling for large scale urban design and planning project lifecycles), Han Hsi is invests in knowledge sharing as Assistant Professor at the University of Hong Kong, Lecturer of Building Information Modelling and Technology at Washington University of St. Louis, and Presenter at Autodesk Universities in the US and China. She is part of the team authoring standards for Airport Authority Hong Kong, Hong Kong Housing Authority, and BIM Harmonisation amongst WDs.

Han Hsi is an accredited PMP and has a BArch from Cooper Union, MAUD from Harvard GSD, MBA from HKUST, and PhD candidate at Asia University Taiwan.

Building Information Management: Standardization, Education and Implementation

While many have known Building Information Model or Modelling, at Ho & Co, we believe that M can also stand for Management. As BIM is getting more traction and awareness in Hong Kong with governmental and industry support, it is imperative that there be consistent and clear standards to serve as common ground. Our team has had the privilege to work on BIM specifications, specifications and execution plans for Airport Authority, Housing Authority and BIM Harmonization among WDs. The experiences on standardization has also enhanced our team's ability to participate in the project lifecycle as the deliverer of BIM models. We are proud to work on larger governmental infrastructural projects such as DSD's Shek Wu Hui Effluent Polishing Plant as well as private residential projects. In addition to core mandatory DEVB BIM Uses such as Design Authoring, Design Review, Drawing Generation and 3D Coordination, the construction stage projects especially focuses on Digital Fabrication, Site Utilization Planning, Phase Planning (4D Modelling`) and Cost Estimation (QTO and 5D Integration). Finally, As-Built Modelling allows client / asset owner to have an up-to-date set of geometric and non-geometric information that can be easily visualized for Asset Management purpose. Throughout the project lifecycle, we focus heavily on visualization to bridge the increase stakeholders' (including client, designer and contractor) buy-in of BIM as a management tool.

To further promote BIM and lifecycle information continuity (both geometric and non-geometric), I also teach at the University of Hong Kong's Faculty of Architecture. In Urban Design Technology and Innovations course, various BIM and GIS software are taught, and their interoperability are emphasized to encourage students to use parametric design methods towards a single source of truth, rather than single-use modelling and diagramming.

In addition, Ho & Co is also establishing its presence in Taiwan in hope to bring our Hong Kong experience to expand the awareness of BIM standardization in the multidisciplinary life cycle.

Simon Ng

Simon is the Head of BIM in China State Construction Engineering HK Ltd. Simon leads a team of more than 50 BIM specialists to support BIM implementation across projects, his team also serves as central support in development of corporate BIM standard, workflow of various BIM application, training plan, new BIM technology adoption, automation tools, etc.

Being awarded as the "Young BIMer of the Year 2014" award by the CIC of Hong Kong, Simon has extensive experience in BIM management such as modelling standard, execution plan, template, family database, skills development, training, etc.

Simon is a Mechanical Engineer and had a wide range of experience in engineering design, project management and application of Information Technology in construction industry.

BIM - What's Next?

BIM has been used in Hong Kong projects over 10 years. It is good to see that the industry has become more and more mature that projects has adopted BIM for design, coordination, construction planning and control, and handover to FM.

So, what should be the next stage of BIM development?

I believe that BIM will be developed in 2 directions:

1. Supply Chain

Nowadays some projects start to engage sub-contractors and suppliers to provide information directly in BIM format instead of providing 2D information to main contractors who "covert" into BIM. e.g. equipment families in BIM, shop drawings in BIM, fabrication design in BIM. Therefore, Main contractor's BIM role is shifting from BIM production to BIM management.

In the near future, BIM will become an ecosystem. A BIM model is a federation of building design and supplier's product, a Common Data Environment (CDE) is a platform for project team's members information exchange including sub-contractors and suppliers. In such an ecosystem, information flow follows same direction as supply chain, for example, approved suppliers provide equipment families in the CDE similar as catalogue libraries, designer / contractors browse the available families and information to develop their design, and the procurement will base on the approved BIM model.

2. From BIM to CIM

According to Development Bureau Technical Circular (Works) 9/2019, as-built BIM models for government projects will be integrated with the GIS as well as the Common Spatial Data Infrastructure (CSDI). This form a base of City Information Model (CIM), each BIM model become components of CIM.

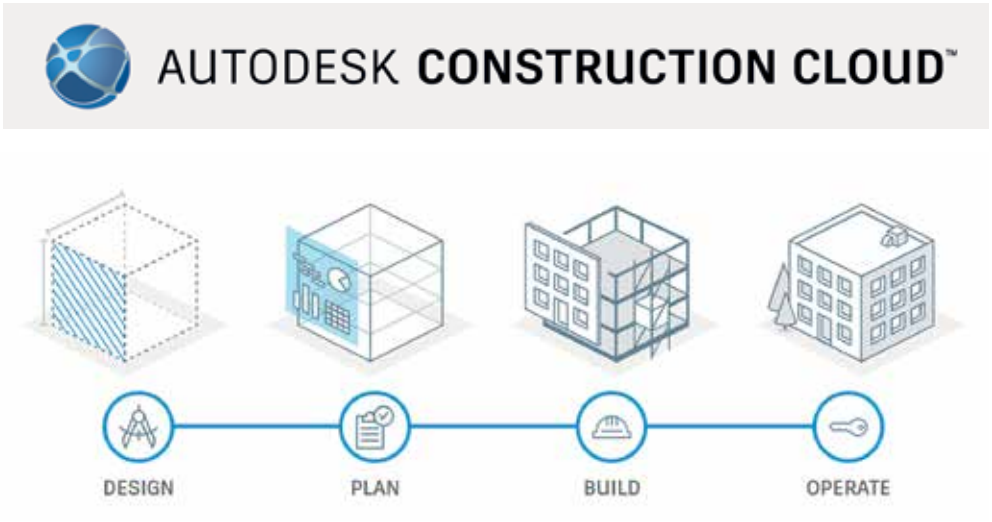
I believe that, in the future when BIM become part of business and part of people's daily life. The driving force of BIM shift from top-down to bottom up. Suppliers have to do BIM in order do business, and everyone need accurate information from CIM so it push all owners to offer accurate as built BIM model. The development of BIM is so natural and harmonized that we don't need to talk about "true BIM" or "fake BIM", but simply "the BIM we need".

Ir Dr George C.K. Wong
PhD MPhil BEng MIStructE MHKIE
RPE CCBM

Ir Dr George WONG is a chartered Structural Engineer and a CIC-Certified BIM Manager with over 25 years of experience in construction industry. He had involved in projects of various scales and in many places such as the CASL Hangar project in Hong Kong International Airport, Parcel 7&8 of the Cotai Hotel Development in Macao and a 6-Storey operation centre in Myanmar. Ir Dr Wong also had years of teaching experience at the University of Hong Kong for undergraduate courses in the Civil Engineering department. He received the Faculty Outstanding Teaching Award (Team Award) in 2013.

Since 2016, Ir Dr Wong has been focused in BIM promotion, standardisation and training missions for Hong Kong construction industry. His BIM experience is from modelling, teaching BIM courses for structural engineers as well as technical implementation of BIM for 3D modelling with structural design and analysis data to generate drawings for statutory submissions. He is now working for the Construction Industry Council in building capability and capacity in BIM of the construction industry in Hong Kong. He is also an active board member of the Hong Kong Institute of Building Information Modelling (HKIBIM) as well as a member of the bSI committee of the Hong Kong Alliance of Built Asset and Environment Information Management Association (HKABAEIMA).

Construction Digitalisation is not an option but a must if you want to stay in the infinite game



What is Construction Digitalisation? Or what is "Digitalisation"?

While digitisation is the process of converting information from a physical format into a digital one, **Digitalisation** is the process of leveraging digitisation to improve business processes. Construction Digitalisation, to be more specific, is to move away from manual work and paper-based processes towards real-time sharing of information and automated processes across all stages of any built asset. Building Information Modelling (BIM) is an example of construction digitalisation that we are implementing in Hong Kong. Obviously, digitalisation is more than just BIM. We could digitalise processes in procurement, logistic of materials to be delivered to sites, site safety inspection records etc. without BIM and still improve time, cost and quality at project level for example.

Then what is an Infinite Game?

There are Finite Games that you play with agreed (fixed) rules and known players to end it. At the end of a finite game, there will be a winner or winners and loser(s). An example of finite games is a football game. An infinite game, however, is played with usually no agreed rules, known and unknown players with the sole purpose of staying in the game. There is no end to an infinite game. Business in construction industry fits the characteristics of an infinite game: there may be known and unknown players; new players could join at any time; players have their own strategy; there is no agreed or fixed rules (though law may operate as semi-fixed rules); and there is no end to the game i.e. no one plays to end it.

If you follow the trend closely then you will notice that the rules of the game are changing. First in 2018 where BIM is mandatory for government projects of cost more than $30 million. Then there are MiC and DfMA which to most extend based on BIM to thrive. This year, the government is requiring the adoption of the Digital Works Supervision System (DWSS) in capital works contracts under the Capital Works Programme, with pre-tender estimate exceeding $ 300 million. And DWSS does not necessarily require BIM.

Now you see why, if you want to stay in the infinite game of business in the construction industry, that you must embrace construction digitalisation. If you decided to play this infinite game, there are many solutions out there for you. Go to CITF's website to look for those pre-approved (http://www.citf.cic.hk/?route=search) and get subsidised for. Autodesk, as always, has all the solutions for you and this time in its Autodesk Construction Cloud. One final note, life itself could be treated as an infinite game and we should all "play" it with the mind of an infinite-game player i.e. not just to win one game but to sustain (in a health way) in playing the game. Interested reader could read The Infinite Game by Simon Sinek or Finite and Infinite Games by James P. Carse.

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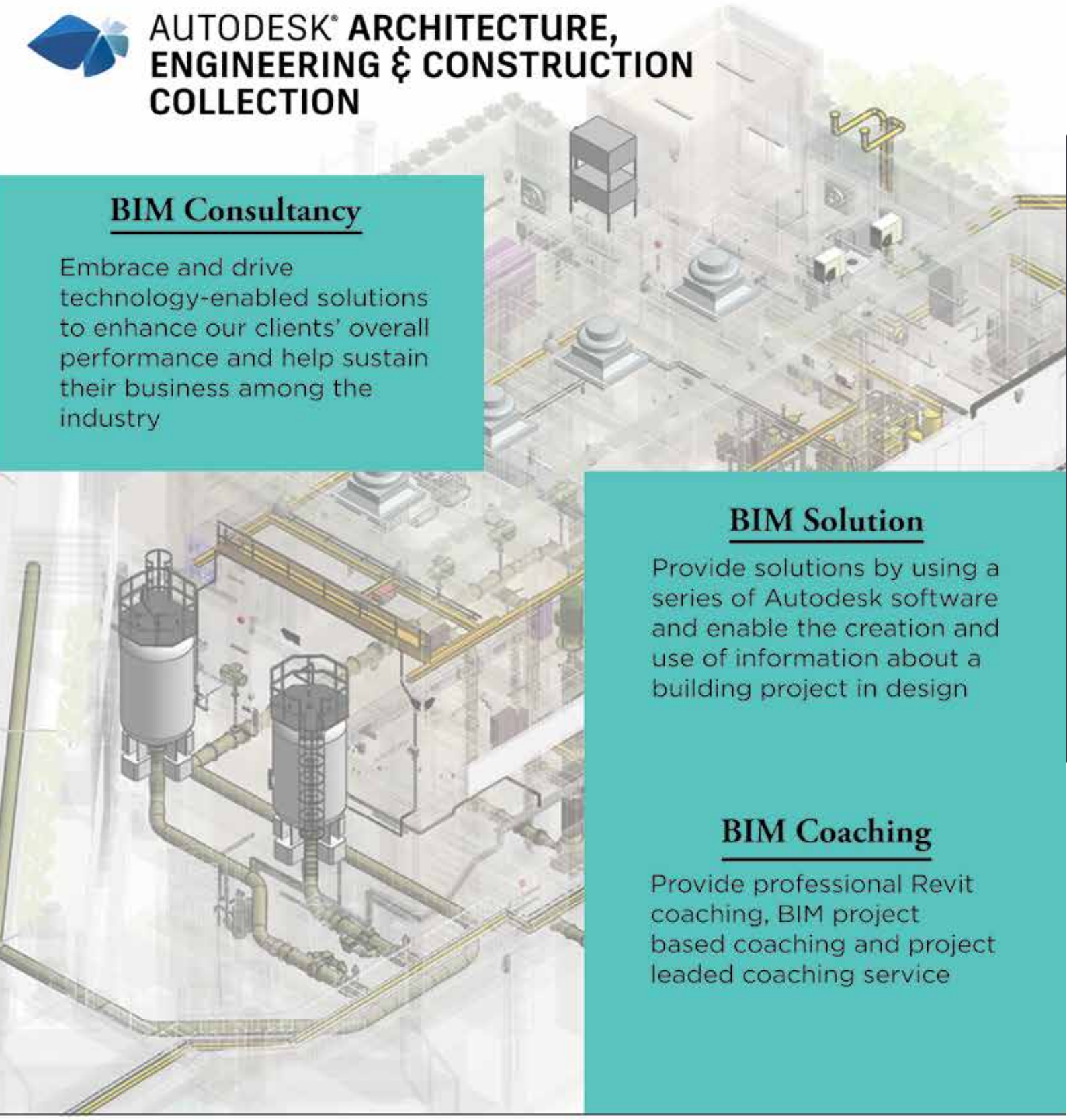

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- 15.6 diagonal
- UHD (3840 x 2160)
- NVIDIA® Quadro® P1000 graphics card
- Backdoor feature: Upgradeable RAM and SSD
- 85% Adobe RGB (CIE1931) typical
- Wacom Stand included

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