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AIAB Autodesk Industry Advisory Board

bSHK 型建香港

CIAT Hong Kong Centre

珠海學院 CHU HAI COLLEGE OF HIGHER EDUCATION

chArch chu hai architecture

香港資訊科技聯會 HONG KONG INFORMATION TECHNOLOGY JOINT COUNCIL

HKIPM

HKIUS 香港管綫專業學會 Hong Kong Institute of Utility Specialists

IVE Member of VTC Group VTC 機構成員

HKLG

公私營合作學會 Institute of Public Private Partnerships

CIOB THE CHARTERED INSTITUTE OF BUILDING

chartered ices

建築 中大 School of Architecture THE CHINESE UNIVERSITY OF HONG KONG

The Hong Kong Institute of Building Information Modelling 香港建築信息模擬學會

HKIE THE HONG KONG INSTITUTION OF ENGINEERS 香港工程師學會 Information Technology Division 資訊科技分部

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

THE UNIVERSITY OF HONG KONG 香港大學 faculty of architecture 建築學院 Department of Real Estate and Construction 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 the pioneer of BIM award - Hong Kong Housing Authority, HKSAR Government and the award winners - Arup & Greenwich Investors Limited, Civil Engineering and Development Department, HKSAR Government & AECOM Asia Company Limited & Leighton-China State Joint Venture, CLP Power Hong Kong Limited, Hip Hing Construction Company Limited, Link Real Estate Investment Trust & Nan Fung Development Limited, Urban Renewal Authority, Water Supplies Department, HKSAR Government & Ming Hing – Ming Hing Civil – Vasteam Joint Venture & Summit Technology (Hong Kong) Limited and the honorable mentions - Architectural Services Department, HKSAR Government, Nan Fung Development Limited, Urban Renewal Authority, in providing such valuable information and pictures of their projects. Besides, we are extremely grateful for the contributions of the AIAB committee and members, Dr. Jack C.P. Cheng, Mr. Froky Y.H. Wong, Mr. Ken Mao and Mr. Ian W.S. Wong who are profiled in this booklet.

Table of Contents

Shaping Buildings of the Future with Connected BIM

Reading the articles on this year's award-winning projects, there's a recurring term that stands out, which you might never have seen just a few years before: Connected BIM. This is not a one-year wonder, but signals a major new development for the construction industry, as it increasingly adopts Connected BIM, which we at Autodesk define as "BIM, plus the power of the cloud" – or, more grandly, "The nexus of designing, building, and operating".

Just a few years ago, of course, we had to carefully explain BIM, Building Information Modeling. Yet today, it's well known throughout the industry, even if some companies are yet to experience the benefits it can deliver.

Now, Autodesk is helping drive the technological transformations that have swiftly taken the industry from designing on paper, through 2D Computer Aided Design, to creating virtual 3D models that can be used throughout a building's lifecycle, spanning design, construction, management, and even demolition.

For all its benefits, BIM has proven challenging to adopt, in part as it required powerful desktop computers. Yet with cloud-enabled, Connected BIM, essentially unlimited computation and storage capabilities are available to any device – whether an engineer's workstation or a job superintendent's tablet in the field.

This is a boon for collaboration between project team members who might be in multiple locations, and can readily access the BIM model as a single source of truth, with up to-the minute information that makes building workflows more efficient and effective.

As this booklet demonstrates, Hong Kong is among the global pioneers of BIM, and projects are increasingly unlocking the multiple benefits of Connected BIM. On behalf of the Autodesk Asia Pacific team, I would like to congratulate all this year's award winners, and thank the project teams for sharing their experience and insights.

Haresh Khoobchandani
Vice President, Asia Pacific
Autodesk

Connecting Project Team Members with Realtime Data

Though Connected BIM might seem a simple concept, it involves a mix of advanced technologies, which are disrupting the way buildings and infrastructure are designed, built, and used. Embracing these new technologies may seem daunting, as it has potential downsides including the need to retrain teams, put faith in the cloud and mobility, and make the transition from a 2D comfort zone into the world of 3D models and BIM. Yet these challenges are more easily overcome than they might seem; and Connected BIM delivers multiple benefits.

For instance, BIM allows enormous amounts of data to be captured, created, and analysed, enabling the evaluation of alternatives in a real world context. Insight early in the design phase supports "best possible" performance of completed projects, with teams making informed decisions before construction begins.

There is far more seamless integration of processes from design to fabrication to construction. Digitalisation can be extended to the construction site, with sensors and surveys by drones and laser scanning leading to a real-time connection between a physical construction site and its digital twin in the cloud.

With Connected BIM, data is useful across the lifecycle of the project - enabling continuous improvement of decision making, informing maintenance decisions, and enhancing operations.

Project team members can stay up to date no matter whether they are in the office or on site, sharing and collaborating without barriers. Thanks to the cloud, they can stay connected even if they are in different districts, cities or even countries. And as joint ventures become more prevalent in the industry, Autodesk helps connect teams whether they are on different city blocks or in different cities.

With connectivity through cloud computing, this is the time to embrace BIM, to improve predictability, efficiency, quality, drive innovation – and stay ahead in the competitive construction industry.

In this booklet, you can read accounts of this year's Autodesk BIM award winning projects. I hope these success stories will help spur other companies and organisations to even greater achievements as they deploy BIM and, increasingly, Connected BIM.

On behalf of the Autodesk Greater China team, I would like to congratulate all this year's awardees, and thank them for sharing their stories.

Richard Li
Managing Director, Greater China Region
Autodesk

Hong Kong to Remain at Forefront of BIM Development

Hong Kong has been at the forefront of BIM usage for over a decade, and is set to retain this position as the Hong Kong Government has expressed its determination to take the lead in adopting BIM in major capital works projects. Starting from this year, more than 30 projects in the pipeline will adopt BIM in their design and construction stages.

This government support, together with the Construction Industry Council expressing commitment to BIM's industry-wide adoption, sends a signal to the private sector that the time to transform and apply this new technology has come.

As the articles in this booklet make clear, those who have experience with BIM clearly know the considerable advantages of using a 3D model that incorporates a wealth of data that can be both up-to-the-minute, and instantly shared with project team members, even if they are in very different locations. There are challenges in adopting BIM, yet they are more than repaid by the multiple benefits.

Now, the path to BIM adoption looks set to be easier as Hong Kong's 2018-19 budget included a plan to set up a Construction Innovation and Technology Fund, to support the industry with harnessing innovative technologies such as BIM. This includes support for tertiary students and industry practitioners to receive training on innovative construction technologies, and professionals to receive continuing education in innovation and technology.

Plus, the Construction Industry Council has a dedicated committee on BIM, with aims that include promoting the use and facilitating the application of BIM; promoting cross-disciplinary collaboration and adoption of BIM in project delivery processes including planning and design, construction, facility and asset management; developing standards, specifications and common practices for BIM; and promoting research & development for BIM.

Autodesk, as one of the world's premier BIM software developers and drivers of BIM adoption, will work closely with the government and the Construction Industry Council in realising these objectives. This will be in tandem with our strong customer focus, as we strive to enhance our products to allow customers to get the most out of Autodesk software, so that they can stay at the forefront of this new era.

As you will see in the following articles, projects by the recipients of this year's Autodesk BIM Awards help show why the government and Construction Industry Council are so committed to fostering usage and development of BIM. We applaud the seven winning projects for their outstanding use of BIM - including the Housing Authority, as our first Pioneer of BIM awardee. Congratulations!

Dr Wendy Lee
Regional Manager, Taiwan, Hong Kong and Macau,
Autodesk

Autodesk Hong Kong BIM Awards 2018

Congratulations to the pioneer of BIM award, award winners, honorable mentions and outstanding students!

PIONEER OF BIM AWARD

香港房屋委員會
Hong Kong Housing Authority

AWARD WINNERS

ARUP GREENWICH INVESTORS LTD. CEDD AECOM LEIGHTON Leighton - China State Joint Venture

CLP 中電 協興 HIP HING 領展 LINK 南豐集團 NAN FUNG GROUP

市區重建局 URBAN RENEWAL AUTHORITY 水務署 Water Supplies Department Vasteam Construction Limited Summit

HONORABLE MENTIONS

建築署 Architectural Services Department 南豐集團 NAN FUNG GROUP 市區重建局 URBAN RENEWAL AUTHORITY

OUTSTANDING STUDENTS

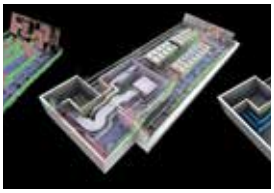
Chan Chun Tat, Kwok Helen Hoi Ling, Li Alison Tan Yui, Lui Kin Leung, Tang Chloe
The Hong Kong University of Science and Technology

PIONEER OF BIM AWARD

ORGANIZATION
Hong Kong Housing Authority, HKSAR Government

PROJECT
Housing Authority's New BIM Standard and Guideline
"Setting a New BIM Standard for Hong Kong"

AWARD WINNERS



ORGANIZATION
Arup
Greenwich Investors Limited

PROJECT
Renovation Works of Greenwich Centre

ORGANIZATION
Civil Engineering and Development Department, HKSAR Government
AECOM Asia Company Limited
Leighton-China State Joint Venturet

PROJECT
CEDD Contract NE/2015/01 Tseung Kwan O - Lam Tin Tunnel

ORGANIZATION
CLP Power Hong Kong Limited

PROJECT
Smart Sustainable Substation

ORGANIZATION
Hip Hing Construction Company Limited

PROJECT
Main Contract Works for the Proposed Development at Tung Chung Town Lot No. 2 and 11

ORGANIZATION
Link Real Estate Investment Trust
Nan Fung Development Limited

PROJECT
The Quayside

ORGANIZATION
Urban Renewal Authority

PROJECT
Project TKW/1/002 Ma Tau Wai

ORGANIZATION
Water Supplies Department, HKSAR Government
Ming Hing – Ming Hing Civil – Vasteam Joint Venture
Summit Technology (Hong Kong) Limited

PROJECT
In-situ Reprovisioning of Sha Tin Water Treatment Works (South Works) – Advance Works

COMPANY
Hong Kong Housing Authority, HKSAR Government

PROJECT
Housing Authority's New BIM Standard and Guideline "Setting a New BIM Standard for Hong Kong"

LOCATION
Hong Kong

TYPE
BIM Guide

SCHEDULED TIME OF COMPLETION
July 2018

Level Up! - Housing Authority Develops New BIM Standards

"Our new HABIMSG achieves two main breakthroughs:

(a) The entire guide is centered on a "Purpose Driven BIM" approach to ensure that the "means" (i.e. modeling input) are driven by the "ends" (i.e. various BIM implementation output like statutory submissions. etc.).

(b) Most BIM Guides are either too general or too technical. The HABIMSG bridges this gap and provide comprehensive guidance for all members of a project team, from managers to technicians, to implement BIM from start to finish."

— Mr. Edmund SC Chan

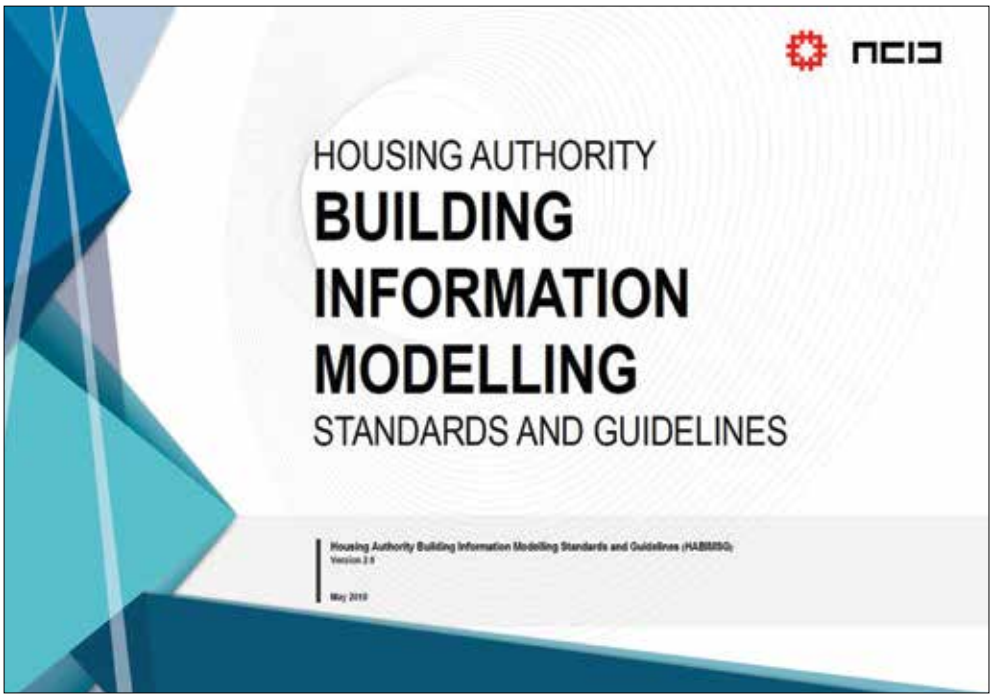
Senior Manager, Business Information Technology (Construction),
Hong Kong Housing Authority,
HKSAR Government

BIM PARTNER

Advanced Construction Information Development Limited

AUTODESK PRODUCT USED

Revit



Housing Authority's Building Information Modelling Standards and Guidelines.
Image courtesy of Hong Kong Housing Authority, HKSAR Government

Setting a new standard for BIM development in HK

Hong Kong's construction industry urgently needs to adopt a common and aligned set of BIM standards and guidelines. BIM implementation requires a high degree of collaboration among stakeholders and a well-coordinated BIM standard and guideline is key for the whole process. To this end, the Construction Industry Council (CIC), being the coordinator for HK's BIM development, published the CIC BIM Standards (Phase One) in 2015 as an important first step.

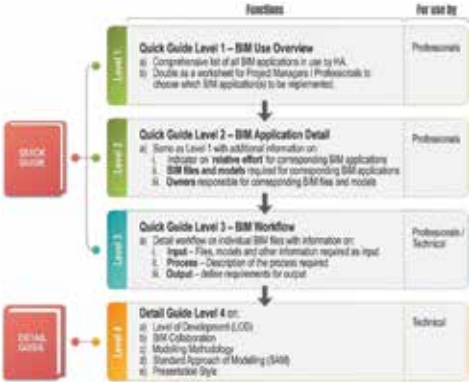
With the intention to dovetail with CIC's Phase 1 BIM Standard, the Hong Kong Housing Authority embarked on revamping its BIM Standards and Guidelines (HABIMSG) in 2016. The new HABIMSG sets to achieve the following main objectives:

(a) To revamp HABIMSG in alignment with the framework set by CIC's Phase 1 BIM Standard, whereby setting an example for other organizations to follow and hoping to create a synergistic effect for HK's BIM development.

(b) To supplement CIC's Phase 1 BIM Standard by covering a wide range of technical details, modeling and collaboration methodologies, file and folder naming conventions, resource planning and other essential information.

"Purpose Driven BIM" – A practical guide for Managers and Technicians

The new HABIMSG achieves two main breakthroughs:



The Four Hierarchical Levels of the HABIMSG
Image courtesy of Hong Kong Housing Authority, HKSAR Government

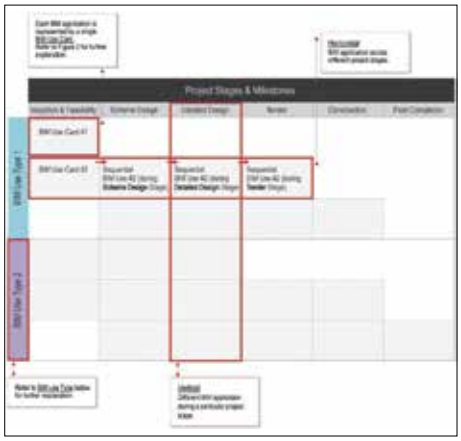
(a) The entire guide is centered on a "Purpose Driven BIM" approach to ensure that the "means" (i.e. modeling input) are driven by the "ends" (i.e. various BIM implementation output) for target-oriented results.

(b) Most BIM Guides are either too general or too technical. The HABIMSG bridges this gap and provide comprehensive guidance for all members of a project team, from managers to technicians, to implement BIM from start to finish.

A clear hierarchical structure

The HABIMSG comprises four hierarchical levels, each with a specific target user group and purpose.

These levels also represent four sequential stages of action by the project team, progressing from a broad level to a more detailed one. Working through the four stages will ensure that all elements of a BIM model are properly created, so they contain all necessary information to deliver defined BIM goals with minimum input in terms of time and human resources.



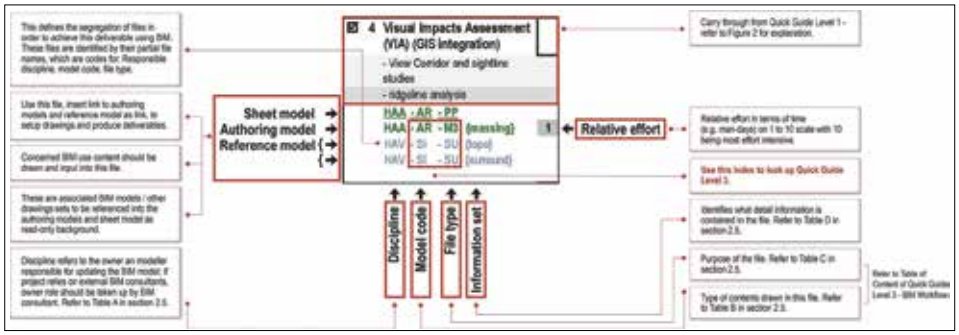
Matrix of BIM Use Types and Project Timeline
Image courtesy of Hong Kong Housing Authority, HKSAR Government

User-friendly, comprehensive and step-by-step

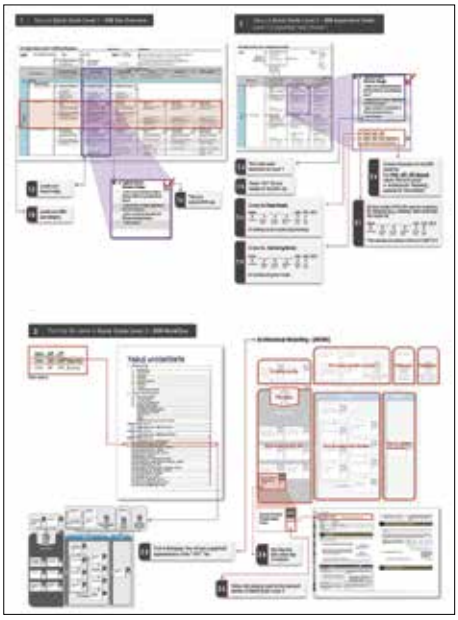
HABIMSG is a user-friendly document, with ample annotations, diagrams and graphs to facilitate understanding. Plus, HABIMSG covers a large number of BIM applications. It is comprehensive in terms of the development of each BIM element over the entire life cycle of a construction project.

Despite the vast array of BIM uses in HABIMSG, their usage is simplified with a well structured matrix and "BIM Use Cards". BIM applications are tabled in a matrix of BIM Use types (vertically listed) against project timeline (horizontally listed).

Going down the matrix, BIM applications are arranged in categories (in the order of planning, design, analysis and simulation, cost estimation, documentation and presentation, construction planning, multi-disciplinary design collaboration, and existing condition survey and 3D scanning), to enable easy identification and selection. Each application has a series of sequentially arranged BIM Use Cards, to match relevant project stages or milestones (inception and feasibility, scheme design, detailed design, tender, construction and post-completion). Pre-defined information and recommended actions are provided on each card, to guide the user on to the next step.



Example of a Level 2 BIM Use Card
Image courtesy of Hong Kong Housing Authority, HKSAR Government



An Example from Level 1 to Level 2 Progressing to Level 3 of HABIMSG
Image courtesy of Hong Kong Housing Authority, HKSAR Government

Resource Indicator: project start made easy

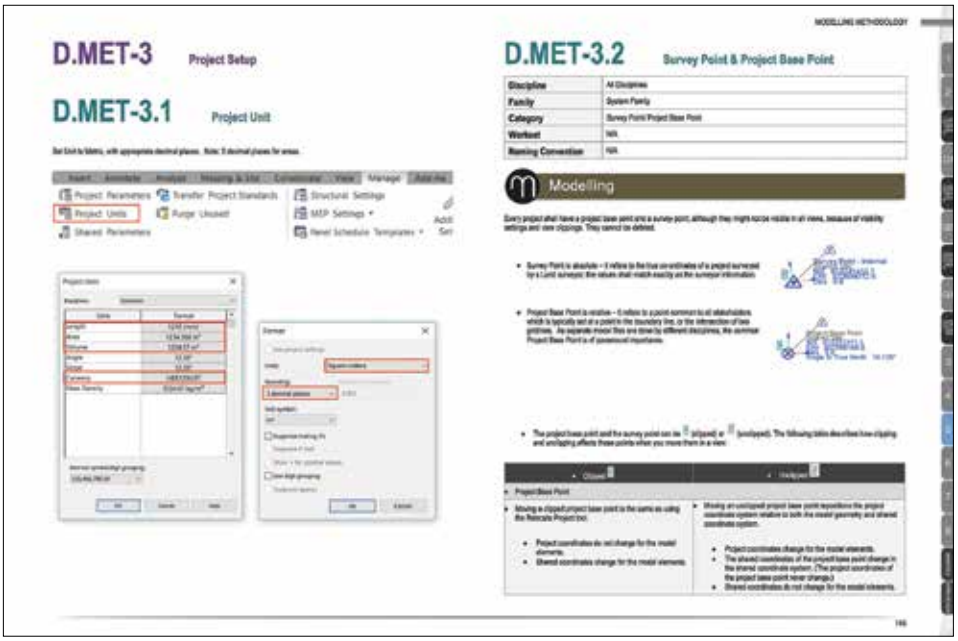
One of the best facilities offered by HABIMSG is the Resource Indicator. While BIM makes it possible to efficiently generate and holistically manage a construction project's digital information, experience shows there must be a realistic estimation of the resources required to implement BIM for the project and carry it through the entire project life cycle.

The BIM Use Card at Quick Guide Level 2 for each BIM application indicates the relative implementation effort in terms of time (e.g. man-days) on a scale of 1 to 10. For a BIM user who is unfamiliar with a particular BIM application being considered, this helps with estimating the effort required on the basis of past experience in another, familiar BIM application.

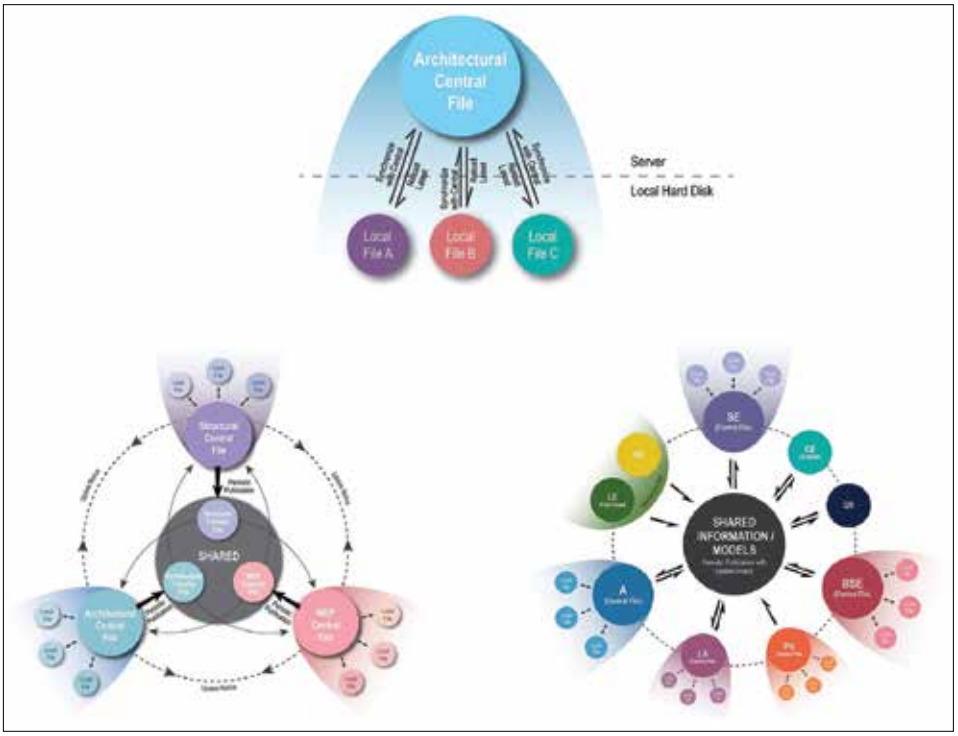
After the initial steps, the project team just needs to follow the BIM Use Cards to progress from Level 1 to Level 4, to complete each element of the BIM model and navigate through the different stages of the project.

Collaboration with clear ownership, responsibility and liability

HABIMSG sets out detailed provisions on internal collaboration (among different users within the same discipline) and cross-discipline collaboration (a



Reaches Level 4 of HABIMSG
Image courtesy of Hong Kong Housing Authority, HKSAR Government



Internal Collaboration (within the Same Discipline) and External Collaboration (among All Disciplines)
Image courtesy of Hong Kong Housing Authority, HKSAR Government

work-sharing mechanism that allows multiple disciplines to work on the same project model concurrently). Any team member can obtain the latest published information from all relevant parties.

All models of various disciplines will be brought together into a single "federated model", comprising linked but distinct component models that would not lose their identity or integrity by being linked. Furthermore, the collaboration will not be limited to the three key disciplines (architects, structural engineers and building services engineers), but all disciplines involved in a project.

Not only are the information management protocols operationally necessary, but they also give all team members a wider perspective of the process, which has the intangible benefit of encouraging active participation in BIM collaboration.

Drawing production

Although BIM is an effective and superior tool to replace traditional 2D drafting, 2D drop-off from the 3D model is still crucial in the construction industry for tendering, construction and statutory submissions. Therefore, a key principle of HABIMSG is to enable the architects, engineers and others involved in a project to produce good quality and consistent drawings from the model databases.

All file setting up and modelling methodologies are designed to serve the drawing production purpose. Specifically, Detail Guide Level 4 in HABIMSG provides detailed guidance on drawing sheet compilation, drawing detail and preparation for publication.

Past BIM studies as reference

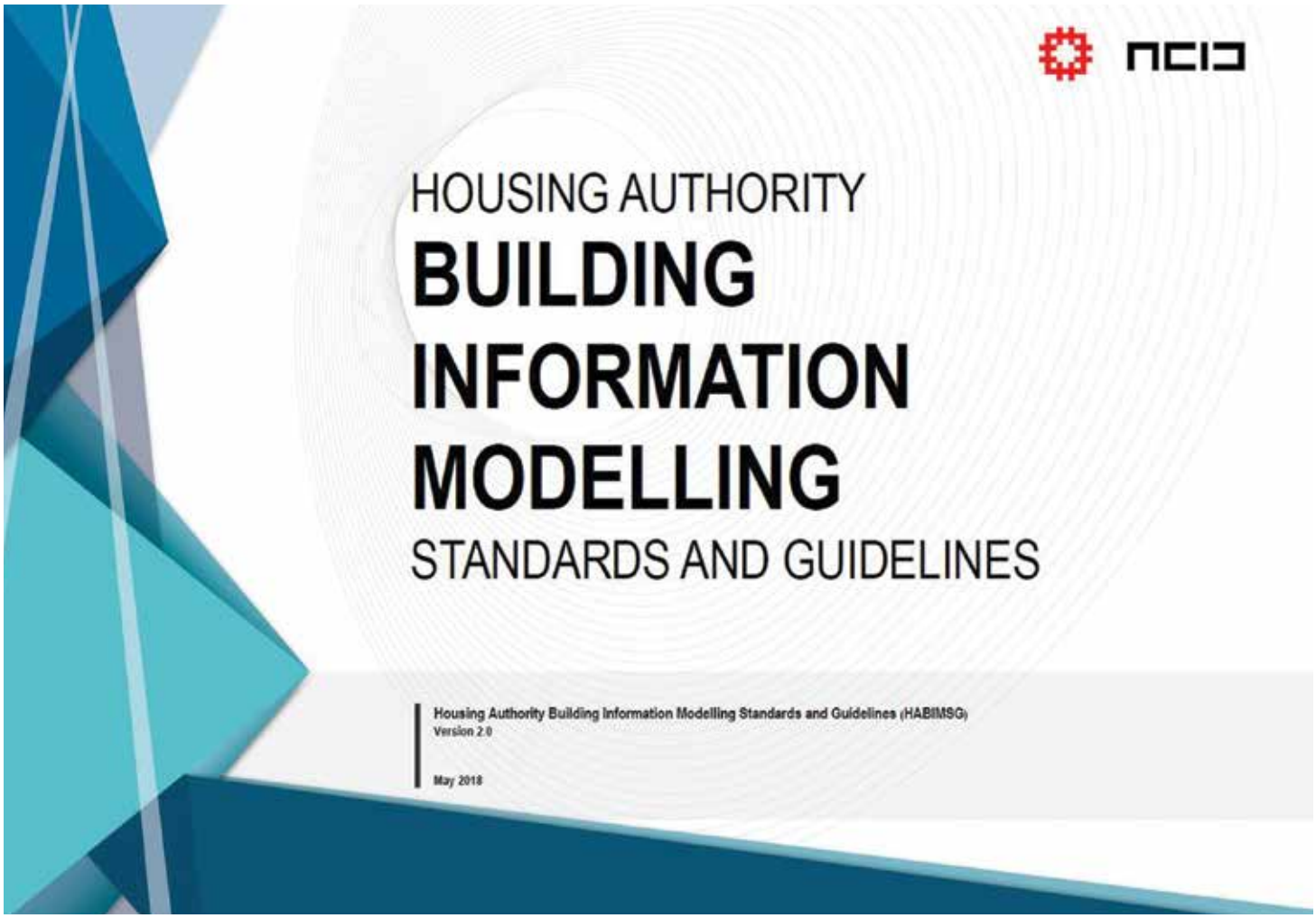
HABIMSG has an Annex providing the highlights of five BIM studies conducted by HKHA, as reference material. The objective is to showcase HA's successes, to encourage wider use of BIM in the construction industry.

Scaling the heights

The adoption of BIM in a large organisation such as the HKHA presents many challenges. Standards and Guidelines are important for effective model building, electronic file exchange, data and information compatibility, and people communication in the multi-disciplinary organisation. HABIMSG is thus an instrument that serves as the backbone of BIM collaboration.

It is hoped that the publication of the revamped HABIMSG, which aligns with the overall direction set out in the Construction Industry Council's Phase 1 BIM Standards, will be a substantive contribution to the further development of BIM in Hong Kong.

香港房屋委員會
Hong Kong Housing Authority



Housing Authority's Building Information Modelling Standards and Guidelines.
Image courtesy of Hong Kong Housing Authority, HKSAR Government

About Hong Kong Housing Authority, HKSAR Government

Hong Kong Housing Authority (HA) is a statutory body established in April 1973 under the Housing Ordinance to provide subsidized public rental housing to low-income families, and to help low to middle-income families gain access to subsidised home ownership. Approximately 30% of the Hong Kong population is now living in public rental housing units. The Housing Department is the executive arm of the HA to help the Government achieve its policy objective on public housing.

COMPANY
Arup
Greenwich Investors Limited

PROJECT
Renovation Works of Greenwich Centre

LOCATION
No.260, King's Road, North Point, Hong Kong

TYPE
Alterations and additions works

SCHEDULED TIME OF COMPLETION
May 2019

The BIM Model that Laser Scanning Built

"At Arup, we focus on providing better solutions for our clients through improved design, analysis and insight, enabled by new digital technologies. We applied the latest 3D mobile scanning technology in an existing building to help us develop a BIM model. This scan-to-BIM approach offers an efficient way of establishing an accurate digital representation for design and construction, as well as future management for existing buildings."

—Ir Clement Chung

Director and East Asia Digital Leader, Arup

BIM PARTNERS

Andrew Lee King Fun & Associates Architects Limited

Chung & Ng Consulting Engineers Limited

King-Tech Engineering Company Limited

Regent Construction Company Limited

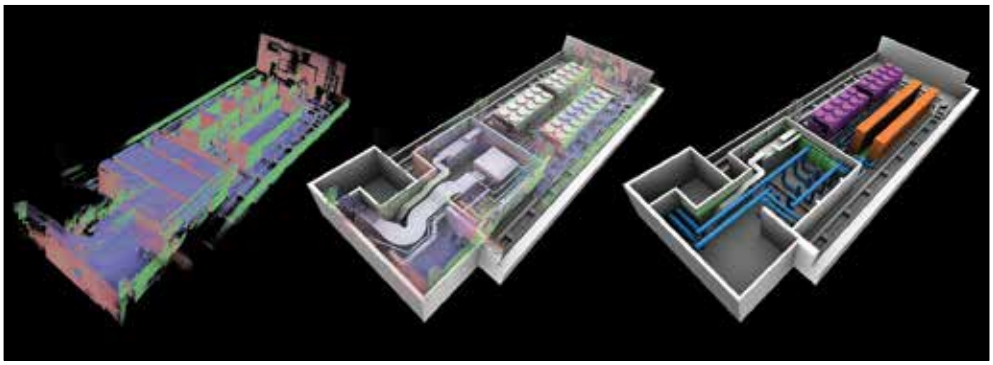
AUTODESK PRODUCTS USED

Autodesk BIM 360

Navisworks

Recap Pro

Revit



Scan-to-BIM approach for existing buildings
Image courtesy of Arup and Greenwich Investors Limited

The work on renovating the Greenwich Centre was a design-and-build project that involved the renovation of the central chilled water system and the façade of the commercial building. Constructed in the 1980s, the building has 23 floors with a GFA of 11,200m².

As the tenants were international banking services providers, financial institutions and leading retail companies, there was a strict proviso against interrupting the building operation or causing a nuisance to tenants during the project. The project construction and migration sequence needed to be well-planned and controlled, to maintain normal building operations.

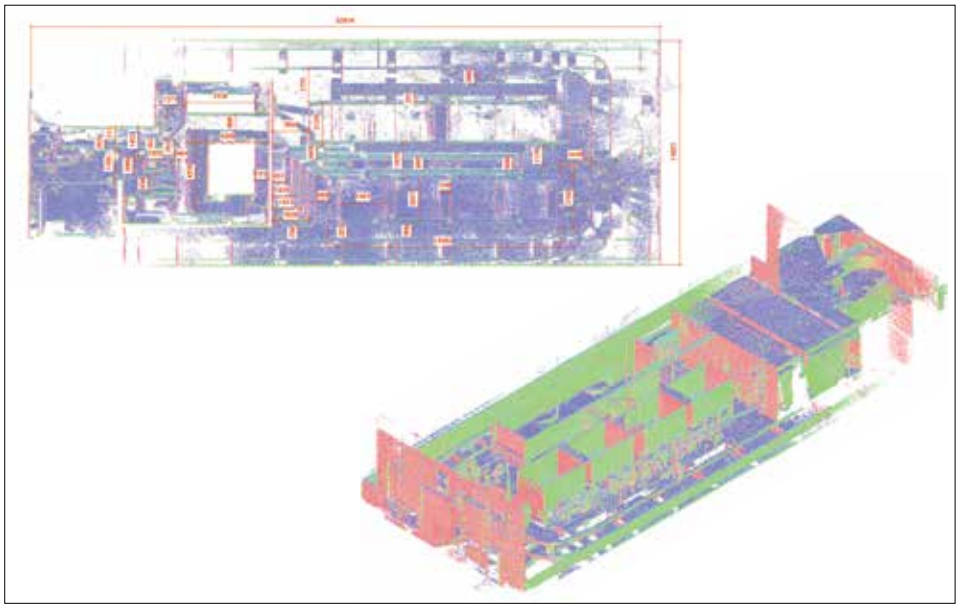
Facilitating future planning and management

To facilitate future planning and management, the project team established a common data environment (CDE) using BIM 360. This would enable effective management, dissemination and recording input / output of project data throughout the project lifecycle. This data included the design model, project specifications, construction information, contractor material submissions, and the as-built information upon completion of the project. An asset information model was also handed over to the client, to facilitate future asset management.

Creating a BIM model using 3D laser scanning

A site investigation and a survey with photos and manual measurements were

BIM 360 as a common data environment
Image courtesy of Arup and Greenwich Investors Limited



Using the 3D mobile laser scanning technology, a point cloud model was produced for highly accurate measurement on Recap Pro or Revit
Image courtesy of Arup and Greenwich Investors Limited

essential for verifying the existing condition before design works commenced. Adding to the project complexity and difficulty, there were many congested and unreachable areas that hindered the on-site manual measurements.

Arup devised a more efficient way for on-site data acquisition. Using 3D mobile laser scanning technology, we produced a point cloud model, for highly accurate measurements on Recap Pro or Revit. Based on this model, the project team then created a 3D BIM model of the existing condition. This BIM model was uploaded to the CDE as the basis for the project, and subsequently used to develop the design for the chiller plant upgrade.

Multidisciplinary collaboration from design, through construction to future asset management

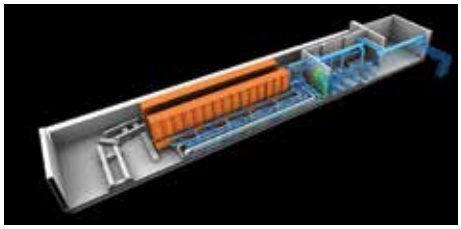
With this newly developed BIM model, feasible options for the chiller plant upgrade were produced during the design stage. Different options with different spatial requirements were reviewed in terms of time and cost implications, as well as the architectural and structural modification work required. Detailed spatial analyses and coordination were conducted before construction. Using this method provided a thorough understanding of the construction sequence, facilitating coordination and communication with stakeholders.

The BIM model also enabled the team to appreciate the complexities of the project and envision the underlying risks and issues in the design stage, so that mitigation measures could be proposed to ensure smooth construction. Moreover, it enabled early engagement with the building operators, so they could provide the specific requirements from the operation and maintenance perspective, and to align their expectations with the final product and ensure future maintainability.

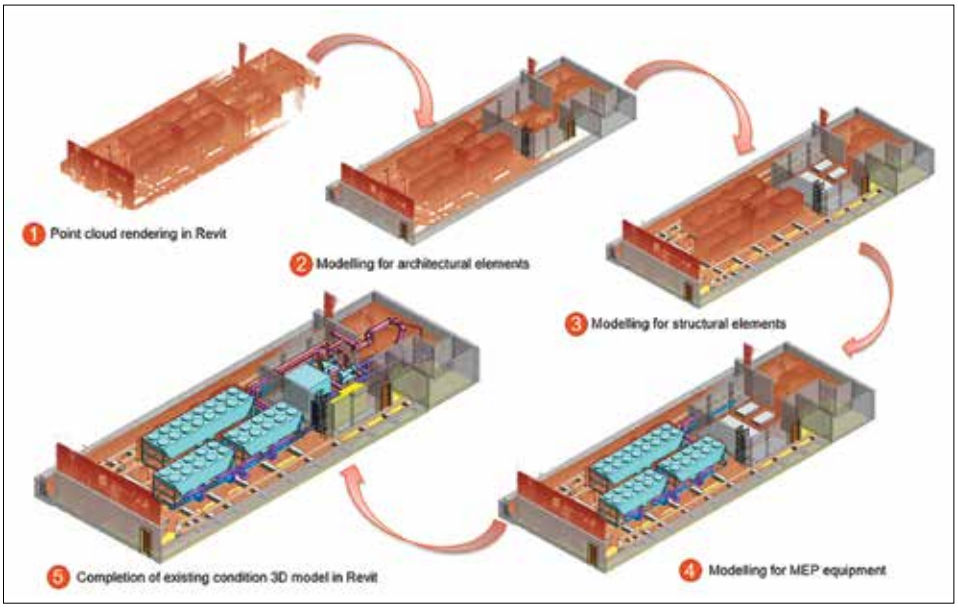
This process helped minimise the design risks by resolving clashes in the early stage of the renovation, and facilitate the subsequent construction stage by reducing abortive works arising from design issues and inconsistencies across different disciplines. The fully-coordinated model also ensured a perfect fit of elements that could be built off site, allowing these components to be easily installed in place, rather than manufactured on site.

The construction sequence of this chiller plant renovation was divided into multiple phases in Revit. The models were further exported to Navisworks, to create an animation for illustrating the construction sequence. The animation was then uploaded to BIM 360 cloud space, to help the project owner "visualise" the construction phases, thoroughly understand the project execution plan and logistics handling, and easily evaluate potential impacts on the building operations during the construction stage.

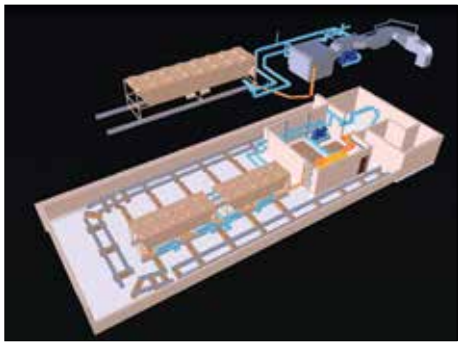
The BIM model will be enriched to include equipment ratings, performance data, model information, supplier information and etc. and become an asset information model (AIM), for handover to the building operator, and use in future asset management.



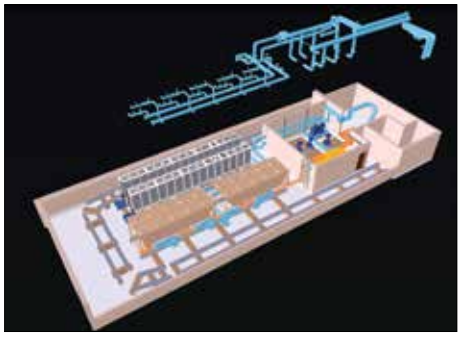
Multidisciplinary collaboration and spatial analysis for new equipment
Image courtesy of Arup and Greenwich Investors Limited



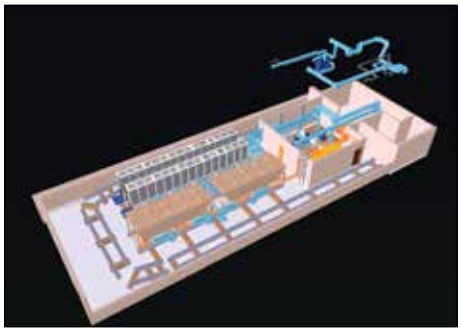
Modelling process from point cloud to BIM model
Image courtesy of Arup and Greenwich Investors Limited



Visualisation of the construction sequence:
Phase 1 – Demolition of existing chiller, pipeworks and ductworks
Image courtesy of Arup and Greenwich Investors Limited



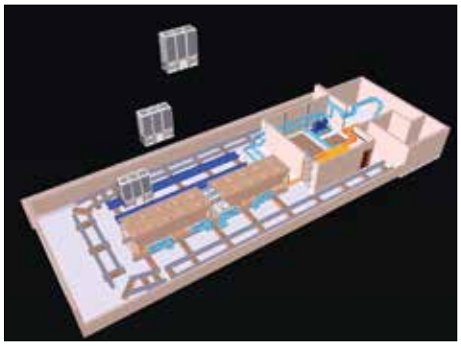
Visualisation of the construction sequence: Phase 2 –
Installation of new water pumps and associated pipeworks
Image courtesy of Arup and Greenwich Investors Limited



Visualisation of the construction sequence:
Phase 3 - Demolition of remaining equipment
Image courtesy of Arup and Greenwich Investors Limited

BIM: a sustainable way to manage old and existing buildings

BIM has been extensively adopted in the construction industry, offering an integrated solution from the design stage to the building operating phase. However, such an approach is not common in renovation of existing and old buildings, due to the complexity of creating a 3D BIM model for the existing condition. Building owners tend to think that the BIM approach implies a higher cost and would rather opt for traditional 2D drawings, which are considered to "cost less".

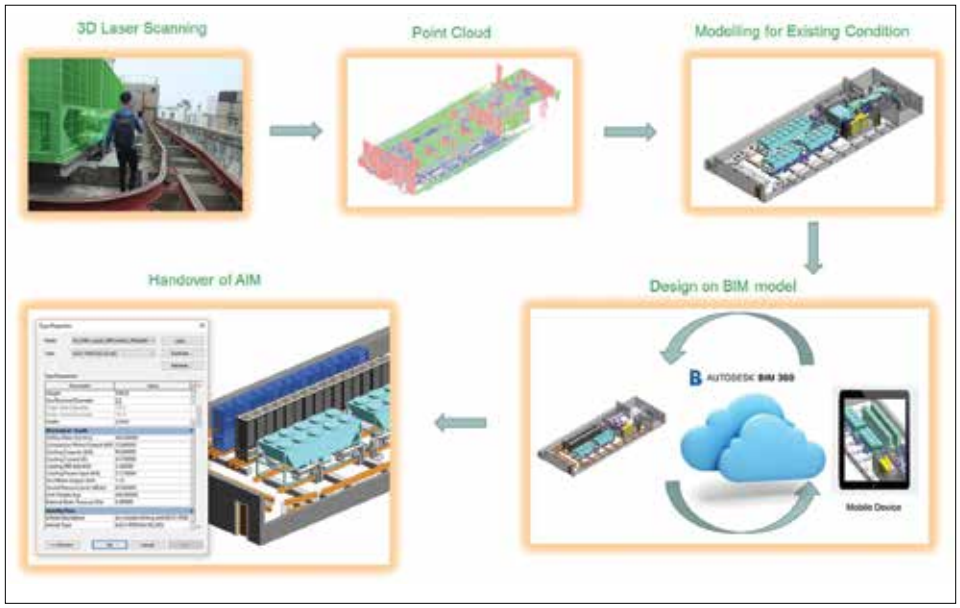


Visualisation of the construction sequence:
Phase 2 – Installation of new modular chillers
Image courtesy of Arup and Greenwich Investors Limited

3D mobile laser scanning was adopted in this project to capture and measure the existing condition of the chiller plant, saving the time required for the labour-intensive on-site manual measurements, which are also often subject to errors. This technology has been widely used in large-scale applications such as landscapes, tunnels and facade engineering. In this project, 3D mobile laser scanning was deployed in an MEP plant for a renovation work, and connected to the BIM process as part of the project delivery.

With this scan-to-BIM approach, the project team saved 50% of the time required for site surveys and measurements, compared to traditional manual measurements, while the initially planned design period was shortened by one third. Also, the construction period was shortened from 14 months to 11 months, as the fully-coordinated BIM model resulted in reduced RFI and abortive works during construction.

This scan-to-BIM approach will become more extensively adopted in future renovation projects, especially those with a tight programme and challenging spatial requirements.



The new workflow can be applied in renovation works of existing buildings
Image courtesy of Arup and Greenwich Investors Limited

ARUP

GREENWICH INVESTORS LTD.

Renovation Works of Greenwich Centre
Image courtesy of Andrew Lee King Fun & Associates Architects Limited and Greenwich Investors Limited

About Arup

Arup is the creative force at the heart of many of the world's most prominent projects in the built environment and across industry. We offer a broad range of professional services that combine to make a real difference to our clients and the communities in which we work.

We are truly global. From 87 offices in 34 countries our 14,000 planners, designers, engineers and consultants deliver innovative projects across the world with creativity and passion.

Founded in 1946 with an enduring set of values, our unique trust ownership fosters a distinctive culture and an intellectual independence that encourages collaborative working. This is reflected in everything we do, allowing us to develop meaningful ideas, help shape agendas and deliver results that frequently surpass the expectations of our clients.

The people at Arup are driven to find a better way and to deliver better solutions for our clients. We shape a better world.

COMPANY
Civil Engineering and Development Department, HKSAR Government
AECOM Asia Company Limited
Leighton-China State Joint Venture

PROJECT
CEDD Contract NE/2015/01
Tseung Kwan O - Lam Tin Tunnel

LOCATION
Lam Tin - Tseung Kwan O

TYPE
Civil Works

SCHEDULED TIME OF COMPLETION
2021

BIM Benefits Abound in Major Tunnel Project

"Building Information Modelling extends the dimensions we work and provides a collaborative, metadata rich and visually dynamic platform. We are able to manage more complexity and interfaces. This allows our teams to optimise safety, innovate, and expand their delivery capabilities, resulting in greater efficiency, productivity and value sustainable projects."

—Jan Torka

Project Director,
Leighton Contractors (Asia) Limited

BIM PARTNER

Spatial Technology Limited

AUTODESK PRODUCTS USED

AutoCAD
Civil 3D
Naviswork Manage
Revit

Aerial view of Lam Tin Interchange
Image courtesy of Civil Engineering and Development Department, HKSAR Government and AECOM Asia Company Limited and Leighton-China State Joint Venture

Tseung Kwan O – Lam Tin Tunnel – Main Tunnel ("TKO-LT Tunnel") and Associated Works is a government project comprising the construction of the main tunnel, branch tunnels and portal facilities, ventilation and administration buildings, slip roads, viaducts, bridges and slopes; and the implementation of the associated building, civil, structural, marine, electrical and mechanical, landscaping and environmental protection and mitigation works.

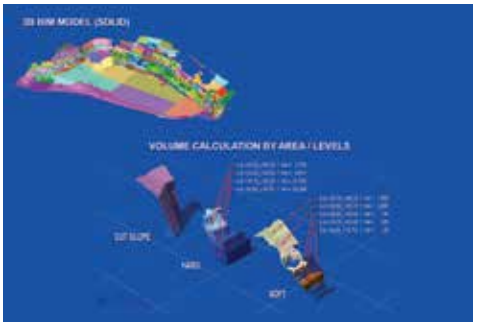
The client is the Civil Engineering and Development Department (CEDD); the consultant is AECOM Asia; and the contract was awarded to Leighton China State Joint Venture (LCSJV). Construction work commenced in July 2016, with an anticipated completion date in 2021.

BIM benefits quickly realised

Leighton Asia first implemented BIM in 2006, on the City of Dreams project in Macau. This was soon followed up on the Express Rail Link project which saw the main roof fully coordinated in a 3D environment. Now, we place significant emphasis on the implementation of BIM, and are starting to realise the multiple benefits that can be achieved through increased efficiency in both time and cost. Our processes have become more streamlined and are providing greater cost certainty.

BIM was adopted on West Kowloon Terminus as part of the contract requirements, but the value was quickly realised, and the use of the model then extended beyond the contract requirements to include quantity take-off and fabrication.

Applications of BIM in the project include: incorporating programme information in the BIM model to review constructability methods by using Construction Method Simulations (CMS), and to enhance safety



Integrate excavation progress with UAV workflow to shorten time for design and planning and reduced safety risks
Image courtesy of Civil Engineering and Development Department, HKSAR Government and AECOM Asia Company Limited and Leighton-China State Joint Venture

on site; checking critical dimensions and ensuring there are no spatial conflicts; generating TQs to give stakeholders a better understanding of the design and reduce design conflicts; sharing information to all stakeholders through cloud technologies; developing an effective Construction and Demolition (C&D) waste management system; controlling the inspection workflow using BIM360; and Cost Savings Design (CSD) reviews to provide more accurate estimations of excavation volume and construction time.

The BIM model helped with constructing major elements of the project, including seven bridges that are built with precast segments. Each viaduct was modelled in Civil 3D, according to the design setting-out information, which enabled the transfer of digital information for future fabrication via shop drawings.

The project also involves several buildings containing multiple E&M services, which can be challenging to design and install using traditional 2D designs. All elements were modelled in Revit, then checked for clashes using Navisworks, aiming to ensure all elements are fully coordinated prior to construction. The pipework and ductwork have been modelled according to shop drawings, so that we can apply Design for Manufacture and Assembly DfMA directly to site, for easier construction.

General view of Administration Building
Image courtesy of Civil Engineering and Development Department, HKSAR Government and AECOM Asia Company Limited and Leighton-China State Joint Venture

Plus, BIM helped overcome challenges arising from the site being adjacent to sensitive areas such as a school and a cemetery. Using the BIM model, the project team could plan concurrent construction activities in an attempt to eliminate potential hazards at an early stage – minimising nuisance to the public, while also avoiding abortive works.

Collaboration and positive outcomes of BIM

A further benefit of BIM arose through the model facilitating collaboration between multi-disciplinary project stakeholders – helping the team in ways such as more efficient clash analyses, planning, scheduling, quantity take-offs, de-risking, safety, and costing.

While the BIM workflow requires a high degree of commitment from the team, we have noticed the rewards far outweigh the initial investment. While the workflow differs significantly, the benefits include: improved design co-ordination, better management of project schedules, reduced errors and better control of costs.

True collaboration has been achieved for all project stakeholders, with the BIM model published and updated with a record of all technical queries and clashes. In return, resolutions have been identified and returned. More recently, we have adopted BIM360.

Although only a fraction of the overall schedule has elapsed, the project has already achieved positive outcomes in cost and time savings, risk identification and mitigation, monitoring progress, and planning.

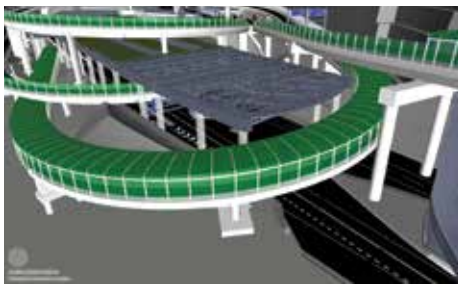
Notably, the frequency of site visits and man hours for site survey monitoring have been minimised, increasing efficiency and safety. BIM enables weekly updates on excavation volumes, for better control of the construction programme schedule. The design can be explored by manipulating the BIM model, to develop the optimum excavation volume, which has so far saved nearly three months in construction time. Plus, field conflicts with other elements are reduced or even eliminated, ensuring better quality control of the design.

Information is rapidly updated in the master BIM model and communicated across all stakeholders. With BIM 360 Field we can store project information and documentation in one place, which helps in terms of QA/QC.

Innovations

By adopting BIM and related advanced technologies, we have introduced several innovations that deliver considerable benefits compared to traditional methods. For instance, TKO-LT Tunnel is one of the biggest construction sites in Hong Kong to have applied weekly drone surveys instead of traditional survey techniques. This reduces the workload from a 4-person team for a full day, to a 1-hour operation by a 2-person team.

Also, we have adopted BIM 360 Field to



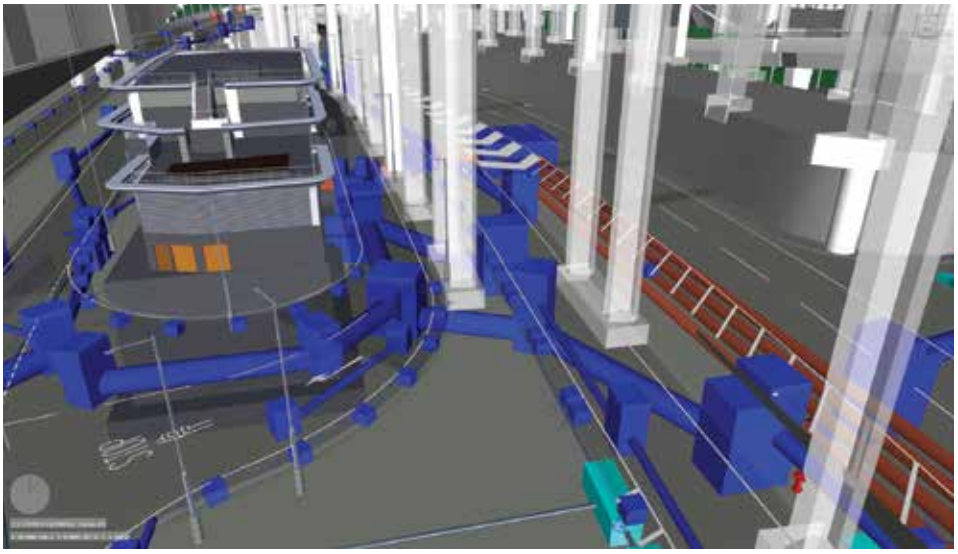
Congestion of structures in Lam Tin Interchange
Image courtesy of Civil Engineering and Development Department, HKSAR Government and AECOM Asia Company Limited and Leighton-China State Joint Venture

Falseworks for buildings to eliminate major system conflicts, control site safety and cost control
Image courtesy of Civil Engineering and Development Department, HKSAR Government and AECOM Asia Company Limited and Leighton-China State Joint Venture

digitise project forms and reduce the need for paper, providing environmental benefits.

As well as employing Unmanned Aerial Vehicle (UAV) photogrammetry surveys, we also use the model to translate method statements into Construction Methodology Simulations (CMS). These are then shared to the frontline staff prior to works beginning, so they can view the works in a virtual environment before actual implementation on site. Simulations such as these are becoming a vital tool to foresee safety risks, and to help improve the industry's overall safety performance.

Terrain model by drone to increase accuracy and reduced survey time of existing site condition
Image courtesy of Civil Engineering and Development Department, HKSAR Government and AECOM Asia Company Limited and Leighton-China State Joint Venture



Underground utilities coordination to reduce potential rework and to ensure constructability
Image courtesy of Civil Engineering and Development Department, HKSAR Government and AECOM Asia Company Limited and Leighton-China State Joint Venture

Future investment in BIM

At Leighton Asia, we have seen a huge increase in the demand for BIM implementation across our projects in Hong Kong. As a result, the number of BIM literate staff within our workforce has increased significantly, through hiring experienced people and up-skilling our existing staff.

It has been a challenge maintaining consistent BIM standards throughout the entire construction team, especially sub-contractors, given the adoption of BIM is still not common amongst our supply chain. Further training on execution planning is a key area for future improvement.

For future use of BIM, we are also looking at more extensive use of cloud platforms such as BIM360 for document management.

Aerial view of Tseung Kwan O
Image courtesy of Civil Engineering and Development Department, HKSAR Government and AECOM Asia Company Limited and Leighton-China State Joint Venture

About Civil Engineering and Development Department, HKSAR Government

With the commitment of the HKSAR Government to speed up infrastructure development for promoting economic growth, we are actively undertaking the planning and implementation of various major development projects spanning the territory. We are committed to providing high quality civil engineering services to meet Hong Kong's development needs.

CEDD's new five-year strategic plan 2015/16 - 2019/20 was promulgated in March 2015. The following five strategies were formulated to maintain the Department's momentum of continuous improvement, to tackle the challenges ahead, and to better serve the community.

· Streamline processes and reduce red tape
· Develop a caring work environment
· Strengthen staff training and development
· Strive for technical excellence
· Strengthen stakeholder engagement

About AECOM Asia Company Limited

AECOM is a global network of design, engineering, construction and management professionals partnering with clients to imagine and deliver a better world. From high-performance buildings and infrastructure, to resilient communities and environments, to stable and secure nations, our vision is to be the premier, fully integrated infrastructure firm. For the last four years, we have been named one of Fortune's World's Most Admired Companies. Additionally, we have been ranked #1 in Transportation and General Building in Engineering News Record's 2018 "Top 500 Design Firms" and recognized as Construction Dive's "Company of the Year" for the second year in a row.

About Leighton Contractors (Asia) Limited

Leighton Asia, established in 1975, is a leading international construction company. Headquartered in Hong Kong, Leighton Asia delivers high-profile infrastructure projects throughout Asia in the construction, civil and engineering and offshore oil and gas sectors. We deliver complex tunnel, rail and road networks, renewable energy infrastructure, and buildings. Leighton Asia currently operates in Hong Kong, Indonesia, India, Macau, Malaysia, Philippines, Singapore, Thailand and Iraq.

We are a member of the CIMIC Group, one of the world's leading international construction and mining groups.

CIMIC Group has businesses in construction, mining and mineral processing, operation and maintenance services, public private partnerships and engineering. Our mission is to generate sustainable shareholder returns by delivering innovative and competitive solutions for clients and safe, fulfilling careers for our people.

About China State Construction Engineering (Hong Kong) Limited

China State Construction started its construction business in Hong Kong since 1979. It is a vertically integrated construction powerhouse, engaging in building construction and civil engineering operations as well as foundation work, site investigation, mechanical and electrical engineering, highway and bridge construction, ready-mixed concrete, pre-cast production and infrastructure investment. In July 2005, China State Construction was listed on the Main Board of The Hong Kong Stock Exchange (stock code : 3311).

China State Construction is amongst the largest construction contractors in Hong Kong to deliver Buildings, Port Works, Roads and Drainage, Site Formation and Waterworks. Currently the Company is one of the biggest NW2 contractors for Hong Kong Housing Authority projects.

COMPANY
CLP Power Hong Kong Limited

PROJECT
Smart Sustainable Substation

LOCATION
Hong Kong Boundary Crossing Facilities (HKBCF), Chek Lap Kok, New Territories

TYPE
Hong Kong-Zhuhai-Macao Bridge Substation

SCHEDULED TIME OF COMPLETION
2019

Smart BIM - Smart Sustainable Substation

"BIM helped us to solve the challenges in adopting a systematic and innovative approach to developing green practices for the Hong Kong-Zhuhai-Macao Bridge Substation."

—Yeung, Arras Yuk Yin

Acting Senior Project Architect - Civil Design,
CLP Power Hong Kong Limited

AUTODESK PRODUCTS USED

A360

Autodesk 3ds Max

Navisworks Freedom

Revit

BIM is a smart technology that facilitates the development of the Smart Sustainable Substation
Image courtesy of CLP Power Hong Kong Limited

The Hong Kong-Zhuhai-Macao Bridge Substation is built on an artificial island adjacent to the Hong Kong International Airport. The substation is a strategic facility, critical for the long-term reliability and integrity of the electricity supply system. CLP Power has incorporated the concept of sustainability into the development and operation of this smart sustainable green transmission substation building. With its distinctive features of efficient use of natural resources and less impact on the environment, the substation received a Provisional Platinum Rating in the BEAM Plus by the Hong Kong Green Building Council.

Substation with low carbon initiatives

A systematic and innovative approach has been adopted to developing green practices for the substation. The development of this substation addresses various aspects of environmental protection throughout the entire project life cycle.

With more than 30% of the area covered by greenery – including a vertical green wall – the substation appears welcoming, and blends in with the surroundings of the new transportation hub. A rainwater recycling

BIM model is an effective tool for helping stakeholders understand the building design and surrounding development
Image courtesy of CLP Power Hong Kong Limited

system and automatic dripping irrigation system will save more than 70% of the water required for irrigation, compared with the conventional irrigation system. Photovoltaic (PV) panels with solar tracking devices will maximise the harvest of solar energy, to further reduce the substation's power consumption. A solar tube will be provided to enhance the use of clean natural energy for the interior space. The green substation not only marks the standard for CLP Power's future substation design, but also acts as a milestone of the company in continuously striving for environmental excellence.

BIM helps to solve the challenges by the use of an information rich model, facilitating information exchanges between project team members, supporting the different phases of the lifecycle of the substation project.

Simulated visual impact of the substation on the surrounding environment
Image courtesy of CLP Power Hong Kong Limited

By using BIM, PV solar tracking devices can simulate and evaluate the substation's overall energy efficiency and consumption.

Smart and innovative use of BIM

The BIM process enables collaboration among various stakeholders during different project phases. For example, the building operators can state their detailed requirements regarding future cable installation during the planning and design stage. The designer can also provide detailed plans and information regarding the future cable installations by using the virtual 3D model during the design stage, to assist in the subsequent construction and operation phases.

By using the BIM model, users can easily understand and interpret information that is actively linked to the relevant 3D object. Misinterpretation of the information by users in the other project phases can be avoided.

Moreover, BIM reduces the time for retrieval of information that is passed from one project phase to another. All project data is defined at a level of granularity that allows for flexible tracking and retrieval of information across the lifecycle of the project, without the need to regenerate the information.

The BIM process promotes the work safety, collaborative working culture and environmental conservation / management through the presentation of 3D visualisation of the building and work procedures, which help with facilitating project management, engaging staff, fostering cooperation and commitment to improving safety, achieving consistency and driving continuous improvement through periodic reviews with stakeholders.

Simulated visual impact of the substation on the surrounding environment
Image courtesy of CLP Power Hong Kong Limited

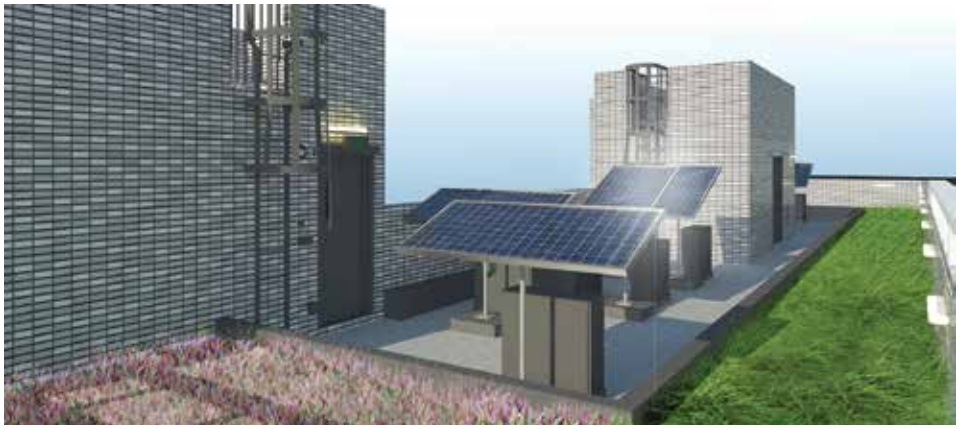
BIM enhances the multidisciplinary collaboration. The configuration is optimised for installation of high voltage plant equipment
Image courtesy of CLP Power Hong Kong Limited

Communication and collaboration

Adopting BIM throughout the design and construction process enables collaboration and effective communication among stakeholders including company's executives, architects, engineers, project managers

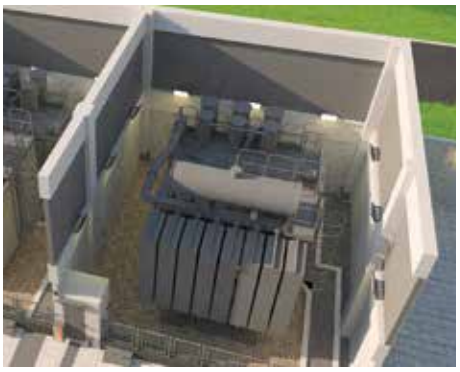
Visualisation of the aerial view of the substation
Image courtesy of CLP Power Hong Kong Limited

Visualisation of the aerial view of the substation
Image courtesy of CLP Power Hong Kong Limited



Virtual model showing sun screening effect of the PV panel installation above the outdoor air conditioning units
Image courtesy of CLP Power Hong Kong Limited

Simulated view from people on the upper roof of the substation
Image courtesy of CLP Power Hong Kong Limited



Virtual model of the high voltage transformer bay facilitates the planning for future operation and maintenance activities
Image courtesy of CLP Power Hong Kong Limited

and front-line workers to identify and control risks.

Advanced BIM tools are adopted in the substation project, formulating the delivery routes and arrangement of plant equipment and transformers. It also aids communication with both internal and external stakeholders for the delivery of plant equipment. The collaborative process within BIM implementation is essential for exchanging project information and professional knowledge among the stakeholders.

Green vision

Care for the Environment is always one of the core values of CLP Power, and has been fully demonstrated in the substation project. A holistic approach has been adopted for the design, construction, operation and maintenance for the substation – and this will serve as a strategic blueprint for reengineering the future substation projects.

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

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
Hip Hing Construction Company Limited

PROJECT
Main Contract Works for the Proposed Development at Tung Chung Town Lot No. 2 and 11

LOCATION
Tung Chung Town Lot No. 2 and 11

TYPE
Private Retail and Hotel Development

SCHEDULED TIME OF COMPLETION
2019

3D Scans to BIM Create Value for Renovation Project

"The construction industry is adapting to new technologies for better construction planning and management. I believe this is not only a trend, but also improves the common practices and maximises the effectiveness of general applications."

— Mr. Froky Wong Yuen-hung
Manager (BIM),
Hip Hing Construction Company Limited

BIM PARTNERS

AECOM Asia Company Limited

LWK & Partners (HK) Limited

Ove Arup & Partners Hong Kong Limited

Newfoundworld Project Management Limited

WT Partnership (HK) Limited

AUTODESK PRODUCTS USED

A360

Navisworks

Recap Pro

Revit

Project Overall View
Image courtesy of Hip Hing Construction Company Limited

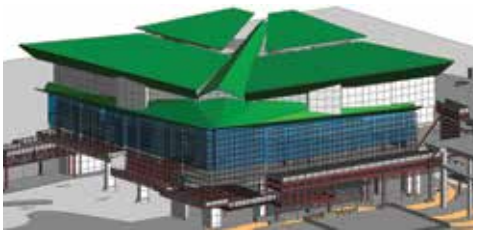
In 2016, Hip Hing was awarded a main contract for a private retail and hotel development at Tung Chung Town Lot (TCTL) Nos 2 and 11. The project comprises structural alterations to the shopping arcade and cinema at TCTL No 2, and construction of new facilities at TCTL No 11. The work must not interfere with normal operations of the public transport terminal underneath and existing shopping mall adjacent to TCTL No 2.

3D scanning survey during early stage

At the beginning of project development, 3D scanning was conducted at Lot No 2, with both exterior and interior surveys for project planning and execution – as we lacked drawings and had insufficient data for A&A works design. The 3D scanning model could provide the project team with accurate coordinate system data on the existing building and identify the critical zone for demolition, which helps to reduce planning time and safety hazards.

For example, the Level 2 food court area should be demolished, other than for inclined steel beams. However, there is no as-built drawing for the existing structure; the ceiling headroom is over 10 metres in the food court, and most of the steel beams are hidden by the ceiling. Meanwhile, the food court is still operating, and opening the ceiling for inspections was not permitted as we needed the data. Plus, it was difficult to obtain the coordinate system by traditional surveying, especially for the part within the ceiling, where setting control points would be dangerous.

Using a 3D laser scanner simplified field work procedures and execution. There was no need to set control points within the ceiling area, which provides a safer way to capture data on hidden beam parts. All features of the existing steel beams and surroundings are accessible in the point cloud model. After cleaning the noise by using Recap, the point cloud model can help provide a quick verification of the



Temporary Works Design with Scaffolding
Image courtesy of Hip Hing Construction Company Limited

3D Laser Scanning of Exterior & Roof feature
Image courtesy of Hip Hing Construction Company Limited

location of steel beams and facilitate construction planning.

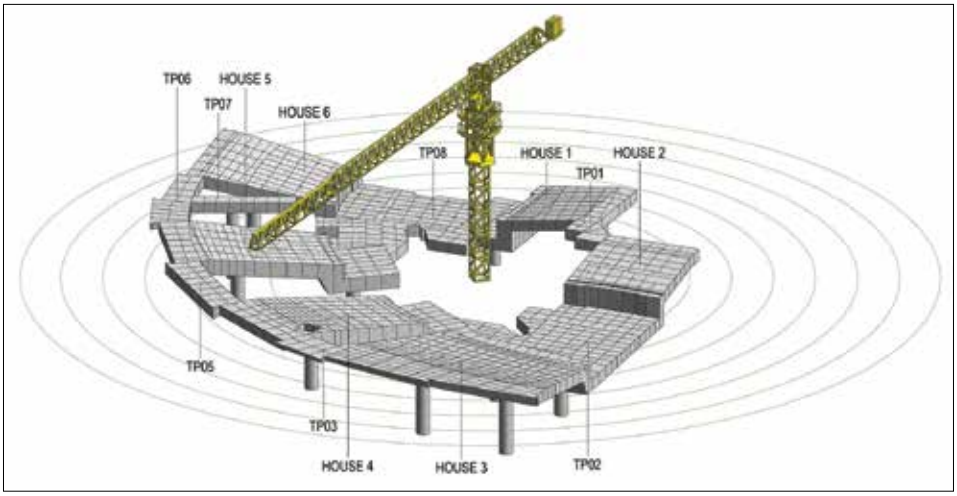
Another example is the demolition of Lot No 2, from Level 2 to the roof. Scaffoldings and catch fans should be constructed to facilitate the demolition work. However, there was not sufficient as-built data for the existing cantilever roof and overlapping roof area that would facilitate scaffolding design. Conducting traditional surveys could not satisfy the tight schedule for designing and planning temporary works.

The overall exterior of Lot 2 shopping mall was scanned with the help of a 3D scanner. Capturing data on the overall exterior proved 10 times faster than using traditional methods, and provided sufficient data for and facilitated earlier design of temporary works. Various types of scaffolding were designed and simulated with the help of BIM, which improved site safety and efficiency.

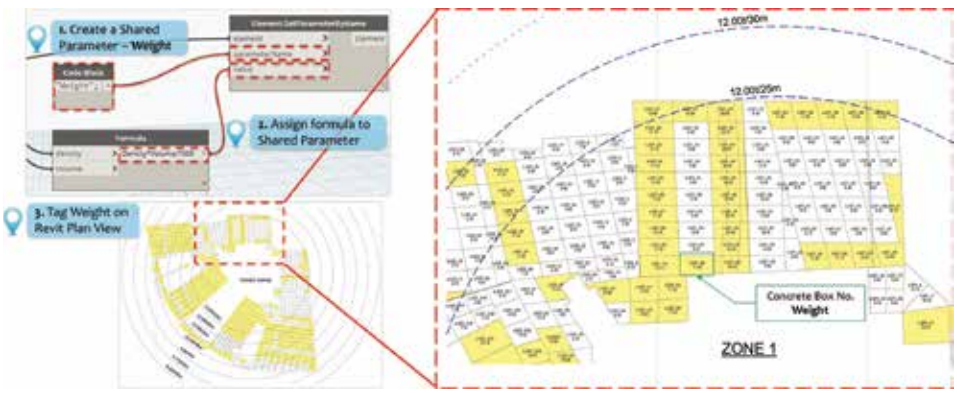
BIM enables smooth logistics planning

The overall project was complex, with a tight timeframe. New construction and demolition work were carried out simultaneously at different lot numbers. Meanwhile, adjacent buildings and site surroundings affected logistics planning. Therefore, the delivery route was critical, and affected site progress.

The project's new construction, demolition and reconstruction work sequences were simulated with the help of BIM technology (4D BIM), which could assist in construction coordination and reviewing constructability. It also allowed understanding of how the process would proceed and how the resources would be consumed at any construction stage. Through 4D BIM visualisations, the project team, client, and other stakeholders could easily understand the project scheduling and progress. In addition, tower cranes, hoarding and temporary work structures were also simulated to facilitate understanding of the progress with the critical construction area, help plan material deliveries, and design equipment operation routes.



Simulation of Transfer Plate Cutting Zones
Image courtesy of Hip Hing Construction Company Limited



BIM-generated Transfer Plate Cutting Plan
Image courtesy of Hip Hing Construction Company Limited

Benefit of applying 3D laser scanning to BIM

In this project, transfer plates under Lot No.2 cinema would be cut into small concrete "boxes", for the demolition this. Before this, a cutting plan should be prepared. There were several concerns regarding the design of the cutting plan. On the one hand, in order to facilitate demolition, propping was constructed under a transfer plate to support each small box. Therefore, the cutting plan design had to take into account the fact the propping could not be cut. On the

other hand, the weight of each concrete box could not exceed the tower crane lifting capacity, and the boxes should be located within the tower crane working radius. Also, the weight of each concrete box should be close to the lifting capacity, in order to reduce the number of lifts needed.

With the help of 3D scanning, the project team could quickly obtain the point cloud model of propping, which was integrate with the transfer plate BIM model to facilitate the cutting plan design. The volume as well as weight of each concrete box could be easily calculated using BIM.

The integrated model helped to dynamically facilitate, verify and optimise the cutting plan. In addition, the BIM team utilised Dynamo to realise automatic generation of the cutting plan, with the weight marked for each concrete box. All these analyses were quickly conducted with the help of BIM, which ensured safe demolition of the transfer plates.

Enhance collaboration between different stakeholders

Various stakeholders (client, designers, sub-contractors and main contractor site team) were working in different locations. Coordination meetings gathering all stakeholders were held twice a week. However, the number of problems coordinated and solved during coordination meeting was very limited.

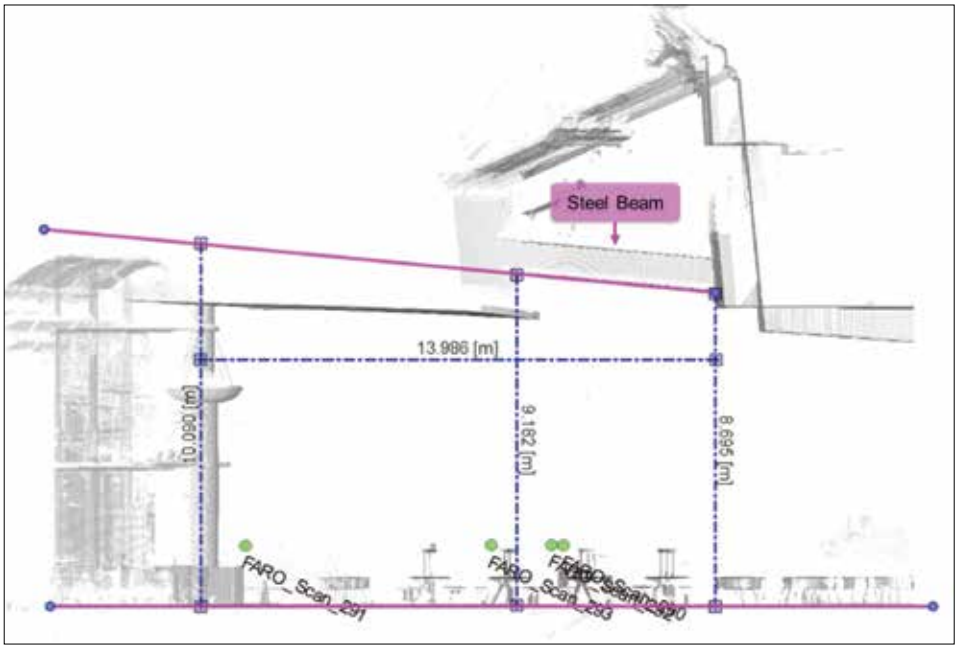
Sharing discrepancies identified by BIM models in advance before a coordination meeting is a good way to improve efficiency. However, the file size of BIM deliverables is usually too large for sharing, as it is typically very time-consuming to upload and download models.

In addition, not all stakeholders can open BIM models on their own devices. They do not have the software license, or the computing power of clients and engineers is too weak to smoothly manipulate BIM models.

A360 is the solution for the above challenge, allowing synchronous and seamless collaboration among different stakeholders. All drawings and BIM deliverables were uploaded to A360 and seamlessly shared with others. Smooth multi-disciplinary communication and collaboration was achieved. The project team could view, share, and review models in the cloud (on the web browser) without downloading them into their own computers, which saved considerable time.

Minor discrepancies were solved within the platform, while major problems were reported to the team(s) responsible for them before the next coordination meeting, significantly improving coordination and communication efficiency. Hence, the project team could achieve faster response times during design coordination.

Planning of Temporary Propping via 3D Laser Scanning
Image courtesy of Hip Hing Construction Company Limited



Existing Structure Verification via 3D Laser Scanning
Image courtesy of Hip Hing Construction Company Limited

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

Project Overall View
Image courtesy of Hip Hing Construction Company Limited

About Hip Hing Construction Company Limited

Since being established in 1961, Hip Hing Construction Co., Ltd. (Hip Hing) has grown to become one of the leading contractors in Hong Kong. During the past 57 years, Hip Hing has been trusted by our clients to construct many of the landmark buildings which define Hong Kong. The expertise and capabilities we have developed allows us to provide comprehensive design, procurement, construction, testing and commissioning and handover solutions.

Hip Hing has been embracing advances in technology to provide professional construction services that meet our clients' needs. For example, Hip Hing has its own internal BIM team to leverage new technological advancements for operation efficiency, Apart from deployment Building Information Modelling (BIM), we also introduced Virtual Reality (VR), 3D Scanning, 3D printing, 3D holography, Drone for aerial photography/ videography and other applications to deliver innovative and sustainable solutions.

While we have rich experience and expertise, we also possess a positive working attitude, which is demonstrated by our commitment, proactiveness, integrity, teamwork and professionalism. We call these qualities the "Hip Hing Spirit", the winning behaviours shared by Hip Hing's staff.

COMPANY
Link Real Estate Investment Trust
Nan Fung Development Limited

PROJECT
The Quayside

LOCATION
77 Hoi Bun Road, Kwun Tong

TYPE
Mixed-use Commercial Development

SCHEDULED TIME OF COMPLETION
Q1 2019

BIM – Key to Success for a Complex Green Commercial Development

"From design coordination, tendering, construction to facilities management, BIM has been instrumental for this green commercial project."

—Nan Fung Development Limited

BIM PARTNERS

AECOM Asia Company Limited
Gammon Construction Limited
P&T Architects and Engineers Limited
WSP Hong Kong Limited

AUTODESK PRODUCTS USED

BIM 360 TEAM
Collaboration for Revit
Navisworks Manage
RECAP Pro
Revit

Visualisation of The Quayside from Hoi Bun Road
Image courtesy of Link Real Estate Investment Trust and Nan Fung Development Limited

The Quayside is a joint venture commercial development between Link REIT and Nan Fung Development Ltd. (NFD). The NFD Project Team was entrusted as the Project Manager to deliver the project with quality design and construction as well as high standards in sustainability and building health with the aim to attract multi-national corporations (MNCs) from the eco-smart communities at the onset of the project. The project has achieved provisional Platinum rating in both the HK BEAM Plus and the US LEED green building certification, and a Gold rating by the International WELL Building Institute.

The Quayside – a Sustainable and Healthy Building

The Quayside is a mixed-use development comprised of a 3-level retail and office lobby podium connected via a sky garden to 17 floors of Grade A offices at the twin office towers above, with a total GFA of approx. 884,000 sf. Lavish landscaping and vertical green walls/columns are interspersed both inside and outside of the building at the retail podium, sky garden, roof garden and open terraces to provide pleasant green working environments with excellent internal air quality (IAQ) for the building users.

To achieve such an ambitious project, Building Information Modelling (BIM) and Virtual Design and Construction (VDC) were adopted at inception of the project to manage the entire development value chain from design and construction to future operations and maintenance.

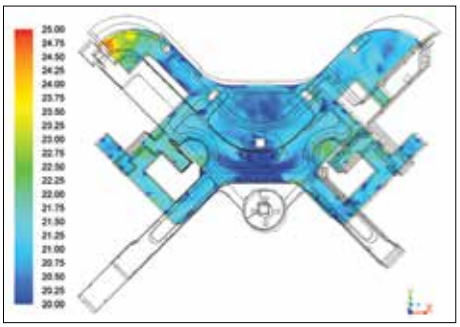
As one of the leading developers in HK, NFD has committed to utilize BIM in the design and construction process since 2014 to deliver high quality buildings for our customers. In-house BIM capacity is a prerequisite in the procurement of our major design consultants, including the

Bird's eye view of The Quayside from Wai Yip Street
Image courtesy of Link Real Estate Investment Trust and Nan Fung Development Limited

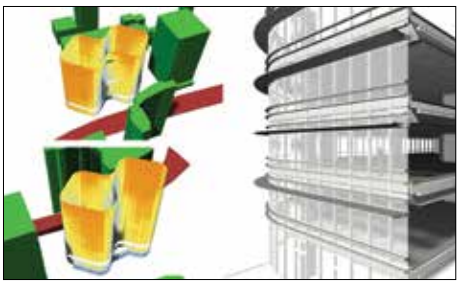
Architect, Structural Engineer, Building Services Engineers, Interior Designer and Landscape Architect.

BIM Model as Single Source of Truth for Design Coordination and Change Management

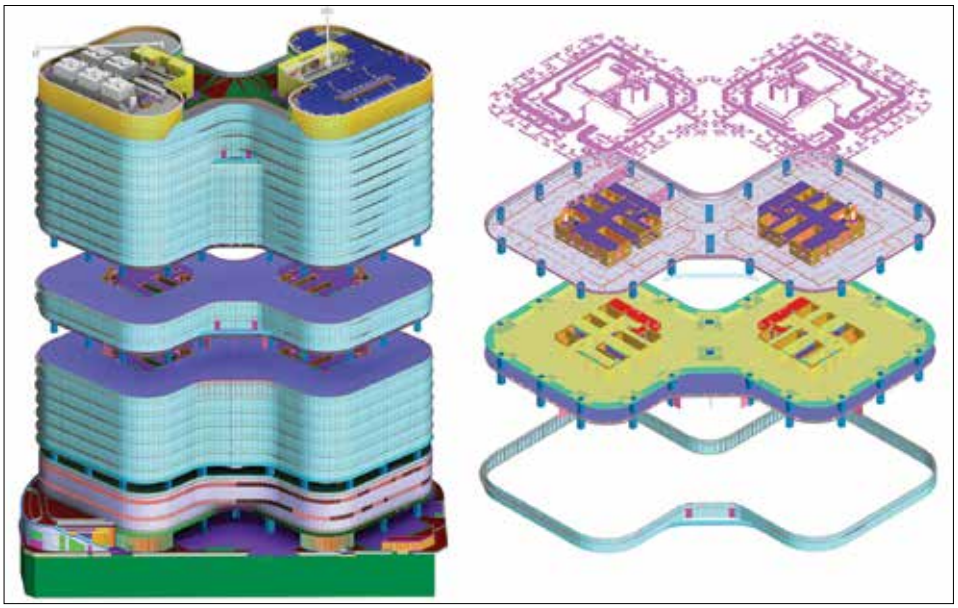
In The Quayside project, the BIM design process was fully implemented starting from detailed design stage to contract documentation. A single BIM model in the Common Data Environment (CDE) was utilized to achieve a "single source of truth" throughout the design stages; it ensured all updates / changes to the project would be reflected in the latest BIM model in real time, which was accessible by all project stakeholders. The BIM model was continuously updated and refined to determine the optimal design solution and to verify design assumptions. Regular design-conflict analysis meetings were held among the consultants to identify clashes and to agree on the corresponding resolutions to ensure all building designs were well coordinated and considered.



Indoor Computational Fluid Dynamics (CFD) simulations were carried out to confirm the design assumptions based on spatial organization of interior spaces exported from BIM
Image courtesy of Link Real Estate Investment Trust and Nan Fung Development Limited



Solar heat gain analysis with building envelope from BIM model was carried out to optimize shading fins design
Image courtesy of Link Real Estate Investment Trust and Nan Fung Development Limited



For The Quayside project, 10+ different trades were involved in BIM process for cross-discipline coordination
Image courtesy of Link Real Estate Investment Trust and Nan Fung Development Limited

BIM Model for Advanced Technical Studies

The BIM model was not only used to explore different architectural designs and visualization of the proposed spatial quality, the same model was used for other advanced technical studies, such as:

- Indoor Computational Fluid Dynamics (CFD) simulations to verify the effectiveness of air distribution within the interior spaces;

- Air flow patterns at the podium sky garden under yearly wind conditions to identify high wind areas as well as stagnant zones where Air Induction Units (AIU) will be installed to induce air flow for maximum user comfort;

- Solar path analysis to ascertain the most effective sun shading configurations on the building facades to satisfy energy performance requirements while balancing aesthetics considerations;

- Overall Thermal Transfer Value (OTTV) calculations based on the building envelope exported from the BIM model.

BIM Model to Facilitate Contract Tender and Construction Planning

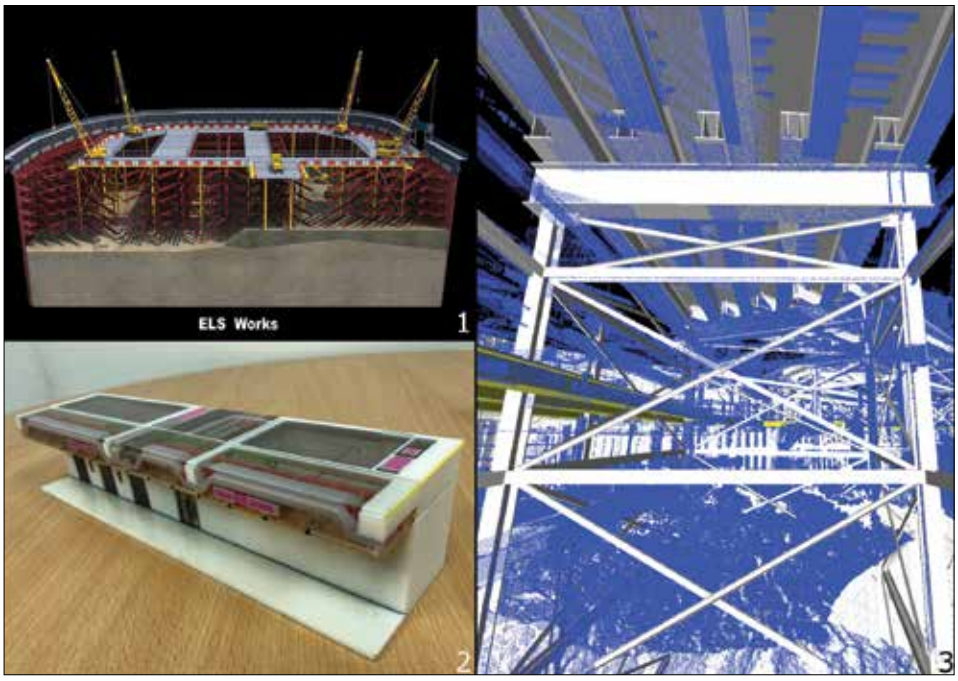
The BIM model was given out to the building contractors at tendering stage as a reference to facilitate their understanding of the scale and complexity of the project. The model helped expedite the tender query process and allowed the contractors to formulate in-depth questions about the project in a relatively short time. Many of the contractors had in fact utilized the BIM model to simulate their proposed construction planning and works sequence to demonstrate their understanding of the project's key issues and constraints during tender interviews.

The BIM model was passed to the awarded Main Contractor during construction to be further developed into a higher Level of Development (LOD) to generate 3D Combined Services Drawings (CSDs) and Combined Builder's Works Drawings (CBWDs) to verify once again the design assumptions against actual site conditions, for example, whether ceiling headroom clearance could be achieved prior to final installations, especially in critical areas like basement parking and the office floors.

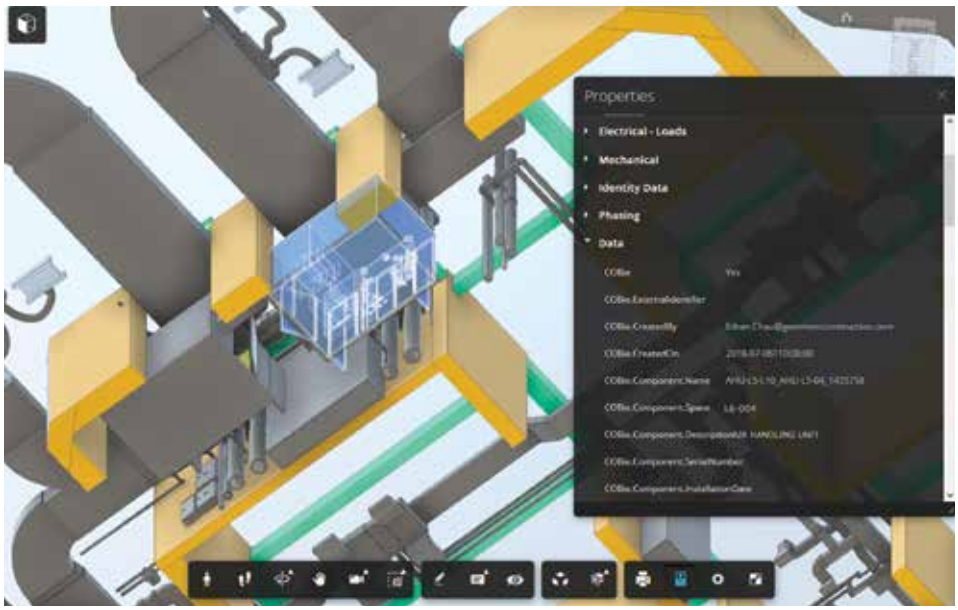
In areas with congested building services, 3D printing was actually utilized to print out such services for better visualization of the potential challenges to install the building services works. For quality assurance, the Main Contractor employed laser scanning regularly to survey the as-built conditions of the completed foundation / ELS works to ensure construction accuracy against the BIM model.

BIM Workflow in Tandem with Laser Scanning to Reduce Abortive Works

The BIM workflow has pushed forward the design coordination process much



1. 4D Construction Sequence Simulation was carried to review works planning, site logistics, constructibility reviews, etc
2. 3D Printing of project BIM models were utilized for areas with congested building services for construction sequence review and potential use for maintenance team's training purpose.
3. Laser scanning was employed regularly on site to survey the as-built conditions to ensure construction accuracy against the BIM model
Image courtesy of Link Real Estate Investment Trust and Nan Fung Development Limited



As-built BIM models with asset information embedded will be exported for Facility Management software and web-based CDE to facilitate future O&M team
Image courtesy of Link Real Estate Investment Trust and Nan Fung Development Limited

earlier than the conventional 2D CAD design approach, in which 3-dimensional relationships among different building elements and services are normally difficult to visualize, and clashes would only come to light on site when the structure is already in place – a major cause of abortive works. The construction of the BIM model required the consultants to agree among themselves on planning strategies, such as zoning and levels of building services in the ceiling voids, and establish design decisions when the BIM model is first constructed in the CAD system.

The use of laser scanning to verify as-built conditions in tandem with the BIM model during construction has enabled the contractors to verify the site works are well within the design tolerances prior to the start of the works downstream.

Though there have been no formal studies on the effectiveness of using BIM to reduce Change Orders, RFIs and Abortive Works (all indicators of how well coordinated the set of design documents are), our experience of low numbers in the above metrics, and much below our projects' average benchmarks, are positive signs of the value of BIM to the project of this scale and complexity.

Looking Ahead for BIM Application in Future Projects and Facilities Management

In looking ahead for the future of BIM application in our projects, NFD is pushing to implement BIM use from 3D to 5D & 6D, i.e. for cost management and facilities management respectively. To achieve that end, we have recently established our own in-house BIM Team to manage the effective use of BIM in our current projects by setting up our own BIM standards and manual.

BIM 5D cost management is being implemented in our new projects. Quantity take-offs from the BIM model will be used to verify the Bill of Quantities (BQ) generated from the conventional method for future claims and VOs assessments. To dovetail the use of BIM in cost control, the design consultants were requested to adopt an internationally recognized specification format such that the same material classification could be used to code the corresponding building elements in the BIM model to ensure a systematic measurement of the building materials and hence accuracy of the cost estimates. NFD is contemplating to harvest the cost data from the various BIM models of our development projects for analysis and forecasting costs for our future developments more efficiently and accurately.

Regarding BIM 6D for facilities management, as part of the main contract requirements for Quayside, information of machinery and equipment from sub-contractors will be embedded in the final as-built BIM models and exported to a facilities management software from the web-based CDE environment to help the future O&M team for works planning.

Visualization of The Quayside from Hoi Bun Road
Image courtesy of Link Real Estate Investment Trust and Nan Fung Development Limited

About Link Real Estate Investment Trust

Link Real Estate Investment Trust is the first REIT listed on Hong Kong Stock Exchange and is a constituent of the Hang Seng Index. We are Asia's largest REIT and also one of the world's largest retail focused REITs in terms of market capitalisation. With a diversified portfolio that consists of retail facilities, car parks and offices across Hong Kong, Beijing, Shanghai and Guangzhou, we aim to deliver sustainable growth and create long-term value for our Unitholders.

About Nan Fung Development Limited

Founded in 1954, 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 has a track record spanning over 50 years with over 165 projects including residential, commercial and industrial buildings. The Group's vertically integrated team enables significant synergies across development to property management.

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.

COMPANY
Urban Renewal Authority

PROJECT
Project TKW/1/002 Ma Tau Wai

LOCATION
Kowloon City, Hong Kong

TYPE
Urban Redevelopment

SCHEDULED TIME OF COMPLETION
2019/2020

"One-click" Automation for Saleable Area

"The Ma Tau Wai project involves a cluster of tenement buildings, one of which collapsed in 2010, leading to the residents living in the deteriorated clusters. The urban recovery required the team to work efficiently together, accomplish tasks quickly, and address social concerns on an ongoing basis.

Being innovative and forward-looking, the URA is taking on the challenges of using BIM to fast track the redevelopment schedule. The project also serves as a pilot scheme for integrating BIM with other technologies in order to promote intelligent design of development projects."

—Catherine Lau

Manager,
Urban Renewal Authority

BIM PARTNER

BIT Building Information Technology Limited

AUTODESK PRODUCTS USED

Dynamo

Formlt 360

InfraWorks

Navisworks

Revit

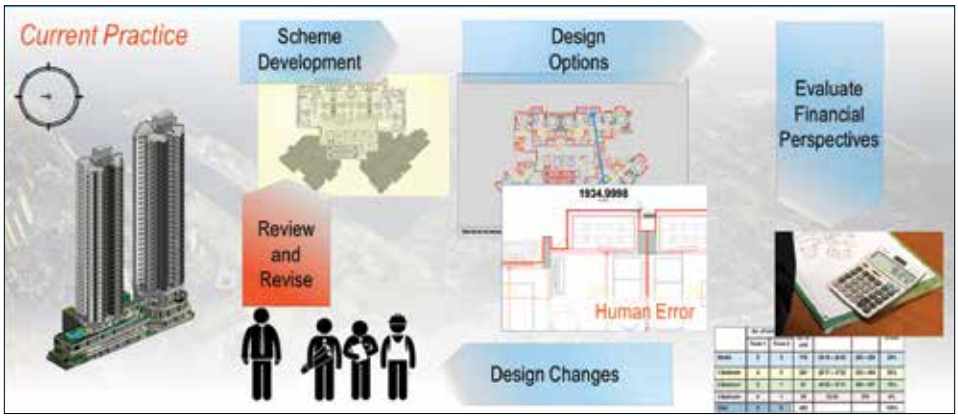
BIM for fast-track urban recovery
Image courtesy of Urban Renewal Authority

Since 2016, the Urban Renewal Authority (URA) adopts Building Information Modelling (BIM). It is well implemented to take out uncertainty in design stage and allow the project team to visualize a project, by identifying clashes, to share information and to enhance buildability. By helping to avoid abortive works, BIM can save considerable time in construction while minimize the cost associated with abortive works and delays.

Despite that further BIM development, such as automated calculation, data management, etc. for building information is not common in Hong Kong. In view of time and accuracy, the URA explores BIM application further in the field of automated calculation of saleable area.

Under the Residential Properties (First-hand Sales) Ordinance (Ordinance), saleable area means the floor area of the residential property, which includes the floor area of balcony, utility platform and verandah. It means the saleable area

FormIt and Infraworks help appending the 3d city models from different sources and formats
Image courtesy of Urban Renewal Authority



Current practice of revising design, floor plans, calculation and area schedule
Image courtesy of Urban Renewal Authority

to be measured from the exterior of the enclosing walls of the residential property. For the case of two adjoining residential properties, the measurement is to be taken from the middle line of the wall.

Traditional Approach

Based on the First-hand Sales Ordinance, the Authorized Person (AP) is currently responsible for determining the area boundary, i.e. outer, middle or inner line of its enclosing walls based on the Ordinance. The AP provides the area boundary in 2D drawings, by calculating each area, copying and pasting the areas into separate spreadsheet to compose the required area schedules. As the whole processes are worked manually, arithmetic errors may be found. It may take days for the AP to calculate and re-calculate manually for each design option. Any changes of each design will involve repetition of the cycle. While maximization of total saleable areas is a priority concern of the clients for assessing the financial impact of different design options, time involvement in the calculations will then be a consequential consumable factor to consider.

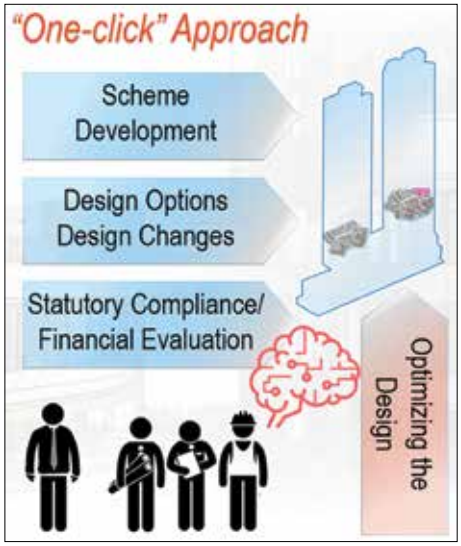
One Click Approach

With BIM, the design and construction drawings are digitized into a 3d platform which has the potential to allow automated calculation. Computer algorithms and modelling parameters are set to comply the Ordinance, while guiding the area boundary of each room elements to be measured from the outer/ middle/ inner wall line. By implementing the validation algorithm as a plug-in function with a button triggered by a mouse click, the areas calculation can be started in such "one-click" action in the BIM authoring software. No matter of any design stages, different schemes, any regulation changed, etc. updating the area calculation can be synchronized instantly.

Time and Accuracy

The AP can generate the plans and areas from the BIM model and generate huge amount of drawing sheets automatically with initial setting of views. The drawing production is streamlined substantially and the accuracy of the deliverables is assured.

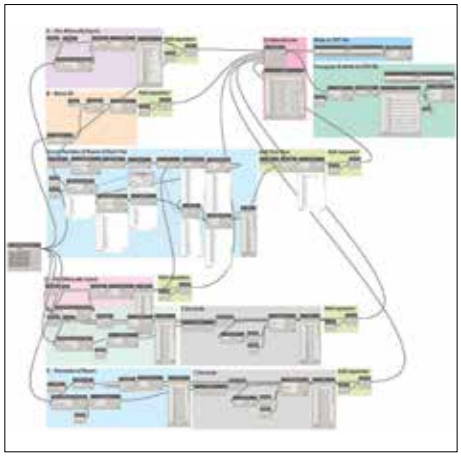
Using BIM, any design changes and even in design options will result in an instant change in the model, worksheets for different options can be generated by "one-click". Saleable areas, efficiency, financial implication, any preset calculations can be viewed instantly as soon as the BIM model is updated. Thus, BIM greatly improves the workflow of the whole process, enabling substantial time and manpower savings. The clients can select the optimal designs that are legitimately and economically sound. BIM can become a fast-track for client's decision making process on design options.



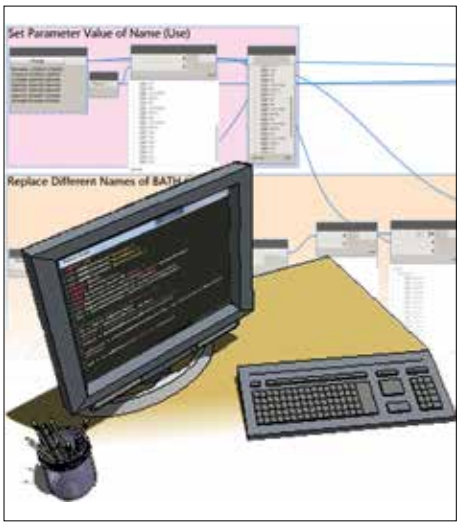
BIM automation can become a fast-track for client's decision making
Image courtesy of Urban Renewal Authority

BIM allows early visualization of a project and identifying potential clashes
Image courtesy of Urban Renewal Authority

Elements involved in saleable area
Image courtesy of Urban Renewal Authority



Dynamo plays important role for data
Image courtesy of Urban Renewal Authority



Interplay of Dynamo and python scripting can streamline the drawing production substantially
Image courtesy of Urban Renewal Authority

BIM is the information hub to store building information, including design and construction drawings, materials, equipment, etc. The team are studying and resolving the problems of the unstructured and scattered data across various systems.

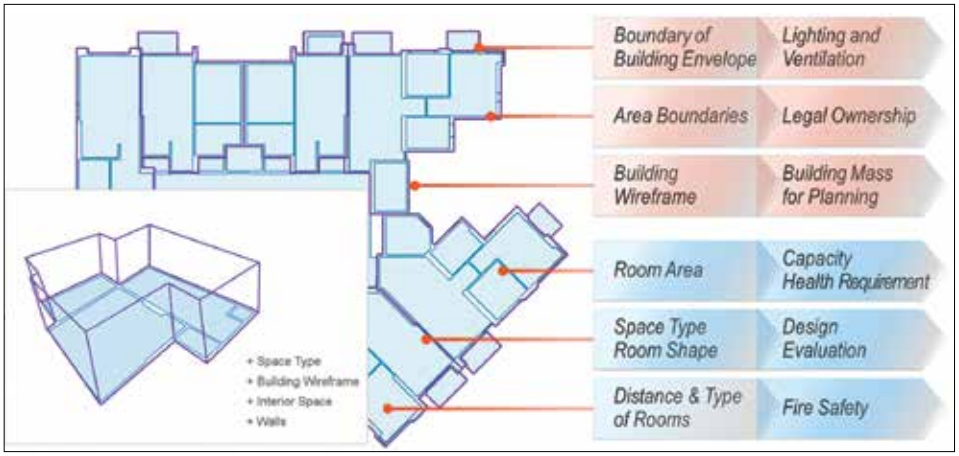
Data Mangament - Rooms and Areas

Rooms and areas are the key spatial data and basis of the data structure across various systems. They are also crucial in the building plans submission as they tie with different constraints of greenery area, usable floor areas, fire separation, etc. “Rooms and areas are simple but intelligent. For example, the outer line of the areas, i.e. the building envelope, is restricted by the lighting and ventilation regulation against the surrounding environment. Each area boundary represents the properties ownership. Building area boundaries represent the massing for urban planning and city management. Each room area is restricted by the regulations including the capacity under the health requirement. Room type and geometry are useful for design evaluation. Distance between each room and its door elements are restricted by the fire safety regulations.” says Catherine. “With the development of plug-in function, the automated calculation can improve the accuracy of the BIM deliverables. The accuracy is very important for data management and realize further data validation.”

BIM takes out uncertainty and allow us to visualiz a project and enhance buildability
Image courtesy of Urban Renewal Authority

Data Validation of BIM

Nowadays, building regulatory controls in Hong Kong are increasingly stringent. The stakeholders cannot timely identify regulatory issues as they are not apparent in 2D drawings. With BIM and software development for compliance checking, they help alerting non-compliance issues and the stakeholders to visualize the building elements in 3D. It can shorten the approval time of building plans and as a whole shorten the whole development process. BIM is not only for the construction but relates to the full spectrum of the building process.



Room and Area are the basis of the data structure across various systems
Image courtesy of Urban Renewal Authority

市區重建局
URBAN RENEWAL AUTHORITY

Looking at the buildings as one in an urban district through BIM-computerized lens
Image courtesy of Urban Renewal Authority

About Urban Renewal Authority

Hong Kong is heading its development towards smart city by enhancing innovation and technology in our living and business environment.

One of the Smart Government's initiatives is to adopt the use of BIM in the building life cycle: Design, Build and Operate.

The Urban Renewal Authority (URA), being a public body, moves forward to integrate BIM with other technologies.

COMPANY
Water Supplies Department, HKSAR Government
Ming Hing – Ming Hing Civil – Vasteam Joint Venture
Summit Technology (Hong Kong) Limited

PROJECT
In-situ Reprovisioning of Sha Tin Water Treatment Works (South Works) – Advance Works

LOCATION
Sha Tin, New Territories

TYPE
Water Treatment Works

SCHEDULED TIME OF COMPLETION
2019

Diverse BIM Applications Help Expand Major Waterworks

"BIM has always been part of WSD's ongoing development agenda and exploration of new BIM applications in projects has always been encouraged. Sha Tin Water Treatment Works (South Works) - Advance Works is a proven example with great success in this area."

—Heinz Wong Hin-chi

Engineer/ Project Management, Water Supplies Department, HKSAR Government

BIM PARTNERS

AECOM Asia Company Limited
A.LEAD architects Limited
ATAL Engineering Limited
Aurecon
Black & Veatch Hong Kong Limited
Vigor Engineering Limited

AUTODESK PRODUCTS USED

3ds Max
Advance Steel
AutoCAD
AutoCAD Civil 3D
Autodesk Rendering
Dynamo
InfraWorks 360
Navisworks
Recap Pro
Revit
Autodesk CFD

General View of the Sha Tin Water Treatment Works after Project Completion
Image courtesy of Water Supplies Department, HKSAR Government and Ming Hing – Ming Hing Civil – Vasteam Joint Venture and Summit Technology (Hong Kong) Limited

Sha Tin Water Treatment Works (WTW), which is the largest water treatment works in Hong Kong, is providing water supply to various areas in Sha Tin, Kowloon, and Central and Western districts of Hong Kong Island. Sha Tin WTW consists of two portions, namely the South Works and North Works. The South Works of Sha Tin WTW was commissioned in 1964 with a treatment capacity of 364,000 m^3 per day while the North Works was commissioned in stages since 1973. After more than 50 years of service, the reliable output of the South Works has reduced to 220,000 m^3 per day, and it has become uneconomical to maintain its operation, thus requiring in-situ reprovsioning of the South Works. Apart from replacing the aged treatment facilities, the treatment capacity of the South Works will also be increased to 550,000 m^3 per day upon completion of the reprovisioning project to meet the increase in water demand arising from the new housing developments in the supply zone.

The Sha Tin WTW (South Works) reprovisioning project is being implemented in two phases, i.e. the current Advance Works and the future Main Works. The Advance Works is to pave the way for implementation of the Main Works. The scope of the Advance Works includes site formation for a new administrating building and construction for a logistics centre, alum tanks, a hydropower plant, a temporary washwater recovery tank, a power house and access roads. The

Visualization of Logistics Centre, Alum Saturation Tanks and Hydro Turbine House
Image courtesy of Water Supplies Department, HKSAR Government and Ming Hing – Ming Hing Civil – Vasteam Joint Venture and Summit Technology (Hong Kong) Limited

UAV Survey Record Rendered as Point Cloud with Autodesk Recap Pro
Image courtesy of Water Supplies Department, HKSAR Government and Ming Hing – Ming Hing Civil – Vasteam Joint Venture and Summit Technology (Hong Kong) Limited

Advance Works commenced in October 2015 for completion in 2019. As a major challenge of implementing the project, the normal operation of the North Works is to be maintained during the reprovisioning for the South Works.

Water Supplies Department (WSD) has continued to promote BIM applications and the associated R&D since its first successful completion of the BIM-Asset Management pilot study on Telegraph Bay Salt Water Pumping Station and Tai Po Salt Water Pumping Station in 2015. Shortly after the pilot study, BIM requirement was incorporated in the tender documents for the Advance Works of the Sha Tin WTW (South Works) in-situ reprovisioning project. In October 2015, the Advance Works contract was awarded to Ming Hing – Ming Hing Civil – Vasteam Joint Venture (MMVJV). Then Summit Technology (Hong Kong) Limited was engaged by MMVJV as the BIM sub-contractor. AECOM Asia Company Limited (AECOM) acted as the Engineer of the project.

Progressive and Diverse BIM Applications

Under the supervision of AECOM, MMVJV and Summit faithfully executed the BIM requirement under the Contract, including design coordination, 4D construction sequencing, construction method statement simulation and preparation of as-built records for future handover. However, typical BIM applications were insufficient to meet many different needs of implementing such a large scale, complex and multi-disciplinary infrastructure project. As such, the Contractor and BIM team had to apply BIM to the project implementation in a progressive and diverse manner.

Resolving Concerns over Design-Construction

For the logistics centre and alum tanks, the largest structures in the project, the Contractor and BIM team established different BIM applications over the design-construction cycle. During design, the team took initiative in utilizing the BIM models for quantity surveying by adopting Autodesk AutoCAD Civil 3D and Autodesk Revit to estimate the excavation volume for the site formation works and concrete volume for the building structural works. This came in handy when the team tried to estimate the excavated soil and rock volume at various basement levels.

During carrying out excavation, how to implement the suppression measure to minimize the impact of airborne dust generated from the excavation area on the operation of the nearby water treatment facilities was one of the major concerns of the operation and maintenance team of the treatment works. To evaluate the effectiveness of the proposed dust screens, the team modelled the layout of the works site and simulated the dispersion of airborne dust generated from the excavation area, such that the height, orientation and layout of dust screens could be arranged in a most effective way to minimize the impact of airborne dust.

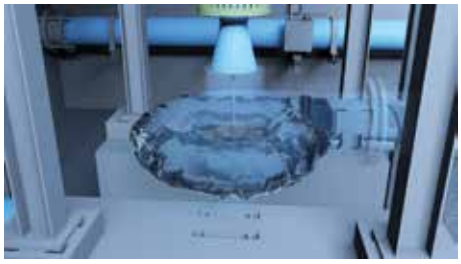
During construction, the team organized weekly unmanned aerial survey (UAV) to record the site works progress. Data from our UAV survey were then processed by Autodesk Recap Pro to form point clouds of the constructed works. The point clouds were then overlaid with the BIM models to check for any discrepancy when compared with the original design. In case any discrepancy was identified, the discrepancy would be reflected in the BIM models, and our designers would evaluate the impact and develop mitigation or rectification measures accordingly.

Environmental-Friendly Measures

As part of WSD's ongoing effort to be sustainable, the Advance Works

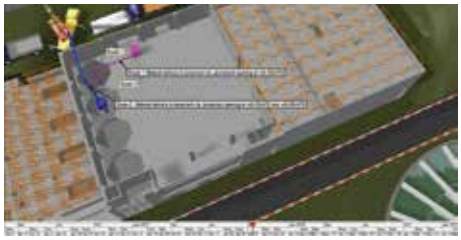
BIM-Oriented Coordination Meeting
Image courtesy of Water Supplies Department, HKSAR Government and Ming Hing – Ming Hing Civil – Vasteam Joint Venture and Summit Technology (Hong Kong) Limited

Visualization of Future Control Training Workshop in the Logistics Centre
Image courtesy of Water Supplies Department, HKSAR Government and Ming Hing – Ming Hing Civil – Vasteam Joint Venture and Summit Technology (Hong Kong) Limited



Generation of Hydro Power by Gravity-Fed Raw Water
Image courtesy of Water Supplies Department, HKSAR Government and Ming Hing – Ming Hing Civil – Vasteam Joint Venture and Summit Technology (Hong Kong) Limited

Visualization of Proposed Woodland Compensation along New Road and Pile Wall
Image courtesy of Water Supplies Department, HKSAR Government and Ming Hing – Ming Hing Civil – Vasteam Joint Venture and Summit Technology (Hong Kong) Limited



4D Simulation of the Logistics Centre's Excavation, Construction and Installation
Image courtesy of Water Supplies Department, HKSAR Government and Ming Hing – Ming Hing Civil – Vasteam Joint Venture and Summit Technology (Hong Kong) Limited

Periodic Removal of Sludge Accumulated in the Temporary Washwater Recovery Tank
Image courtesy of Water Supplies Department, HKSAR Government and Ming Hing – Ming Hing Civil – Vasteam Joint Venture and Summit Technology (Hong Kong) Limited

involved the construction of a new hydropower plant and a temporary washwater recovery tank, which will reduce the ecological footprint of the treatment works. In addition, the use of renewable energy was relatively new to the operation and maintenance team of the treatment works. Considering that any setback in the progress of the Advance Works would impede that of the upcoming Main Works, it was crucial that the current operation and maintenance team fully comprehends the new facilities as soon as possible. To achieve this target, the BIM team and the designers were tasked to simulate the future operation and maintenance procedures through the BIM models.

These simulations were proven to be more pragmatic than a study of stacks of operation manuals.

Besides the new facilities, WSD was also responsible for compensating trees that were displaced under the Advance Works, in order to mitigate the environmental impact arisen during the course of works. The locations of new trees were pre-determined, but the distribution of trees in these locations had not been precisely defined at the outset of the project. As an experimental approach, the Contractor attempted to stimulate the tree distribution through a combination of Autodesk 3ds Max, Autodesk AutoCAD Civil 3D, Autodesk Infraworks and Autodesk Dynamo. Site information from Civil 3D was put into Dynamo, which applied the prerequisite to automatic distribution of trees in selected locations. The end results were combined from 3ds Max and Revit for demonstration in Infraworks.

Works to be Done

Going forward, BIM will remain a crucial part in WSD's development of asset management strategy. As one of WSD's pilot projects to incorporate BIM for design and construction, it is intended to handover the project data through BIM. To achieve this, the Contractor and the BIM team will develop Autodesk Revit-based application programming interfaces that allow data export to the Integrated Materials and Job Records Management System and Construction-Operations Building Information Exchange, which are respectively the existing and future WSD's asset management information system.

Although the Advance Works is coming to completion, our initiatives in diversifying BIM applications in the project will further fuel WSD's continuous resolution to expand BIM implementation within the department. The research and applications in this project will be documented as references for review and integration into future WSD's works whenever applicable. Following the successful completion of the pilot study on BIM for asset management in 2015, WSD has continued to adopt BIM applications in the Advance Works of the Sha Tin WTW (South Works) reprovisioning project and will remain steadfast in advocating BIM culture and BIM diversity in waterworks.

Visualization of the Hydro Turbine House's Plant Room
Image courtesy of Water Supplies Department, HKSAR Government and Ming Hing – Ming Hing Civil – Vasteam Joint Venture and Summit Technology (Hong Kong) Limited

水務署
Water Supplies Department

Vasteam Construction Limited 浩隆建築有限公司
MING HING - MING HING CIVIL - VASTEAM JOINT VENTURE
明興–浩隆 聯營

雲峰 Summit

Location of the Sha Tin Water Treatment Works
Image courtesy of Water Supplies Department, HKSAR Government and Ming Hing – Ming Hing Civil – Vasteam Joint Venture and Summit Technology (Hong Kong) Limited

About Water Supplies Department, HKSAR Government

Water Supplies Department (WSD) is responsible for supplying fresh water and seawater (for flushing) for consumption by Hong Kong's population of 7.3 million for domestic and non-domestic use. In 2015/16, the WSD supplied 982 million cubic metres (Mm^3) of fresh water. In the same year, WSD supplied 268 Mm^3 of seawater for flushing. As of 1 April 2016, WSD administered 2.91 million water accounts.

About Ming Hing – Ming Hing Civil – Vasteam Joint Venture

Ming Hing – Ming Hing Civil – Vasteam Joint Venture (MMVJV) is formed by Ming Hing Waterworks Engineering Co., Ltd., Ming Hing Civil Contractors Ltd., and Vasteam Construction Limited (which is a subsidiary of Chun Wo Development Holdings Limited). MMVJV aims to provide its clients with the best quality of work by utilizing the BIM technology and leveraging the expertise and strengths of waterworks and constructions.

About Summit Technology (Hong Kong) Limited

Summit Technology (Hong Kong) Limited is a Hong Kong-based private limited company dedicated to actively working with the local AEC industry in providing BIM product, project solution, R&D, training and coaching. Summit advocates for a shift to the traditional working culture and embraces BIM culture, which requires changes to the stakeholders, the technology and work process.

HONORABLE MENTIONS

ORGANIZATION
Architectural Services Department, HKSAR Government

PROJECT
Seamless Conversion from Revit Structural Model to CSWP Drawings and Bridging BIM throughout the Project Cycle

ORGANIZATION
Nan Fung Development Limited

PROJECT
Island Garden

ORGANIZATION
Nan Fung Development Limited

PROJECT
LP6

ORGANIZATION
Urban Renewal Authority

PROJECT
Application of BIM concept to Building Rehabilitation Works

COMPANY
Architectural Services Department, HKSAR Government

PROJECT
Seamless Conversion from Revit Structural Model to CSWP Drawings and Bridging BIM throughout the Project Cycle

TYPE
Government Building Projects

Futuristic BIM Can Seamlessly Generate 2D Drawings

建築署
Architectural Services Department

About Architectural Services Department, HKSAR Government

The Architectural Services Department is a department of Hong Kong Special Administrative Region Government, which performs functions in relation to Government-owned and Government-funded facilities in the areas of facilities development, facilities upkeep, monitoring and advisory services.

AUTODESK PRODUCTS USED

AutoCAD

Navisworks

Revit

Project Description

The Structural Engineering Branch of the Architectural Services Department is adopting BIM throughout projects' design and construction stages. To reap the benefits of this new technology while upholding the quality of 2D AutoCAD drawings, the Structural Engineering Branch has developed a seamless bridging operation to convert Revit Structural Models to CSWP-compliant drawings. In the Tsui Ping River Garden project, BIM also assisted the Project Structural Engineer with streamlining his work in design, drawing preparation and construction supervision.

Project Challenges

Although a BIM 3D model can greatly enhance the effectiveness of building structural design, 2D drawings are still the most commonly adopted and essential media in the local construction industry. With implementation of BIM throughout the project cycle, it is inevitable that 2D drawings will be generated from BIM models; but generating drawings that can comply with existing requirements (the Development Bureau's CAD Standard for Works Projects–CSWP) is a challenging process. In addition, the structural design process in a building life cycle involves many participants that it is difficult to transfer the necessary information from one party to another without information loss.

Solutions for challenges

In order to bridge the Revit BIM 3D models and AutoCAD 2D drawings, the Structural Engineering Branch of ArchSD has developed a customised export setup in Revit, which transforms Revit categories to match CSWP layers in AutoCAD. In-house Autolisp programs in AutoCAD have also been developed, for conversion to drawing content that complies with CSWP.

In addition to generating CSWP-compliant 2D drawings, BIM also enhances the effectiveness of the structural design process, particularly for complicated structural forms. BIM allows the Project Structural Engineer to obtain precise setting out and dimensions of steel members for his analysis and design.

How does BIM benefit the project?

2D drawings are generated from the BIM model, which means they are synchronised with any updates throughout project development, and human drafting errors can be eliminated. The CSWP-compliant drawings can also facilitate a smooth e-tender process and suit the operational needs of contractors and sub-contractors.

Various BIM applications–such as generation of steel member schedules for cost estimates; 3D printing of complicated steel connections; and VR walkthroughs–allow the project team to resolve many problems during the design stage, so that errors and abortive works during construction can be minimised.

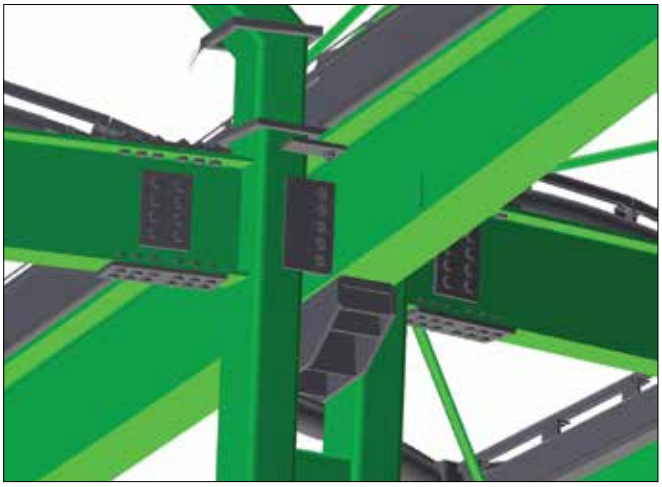
Better with BIM

The steel canopy structure of Tsui Ping River Garden involves complicated connection details, with joints between members in different alignments, on all 3D planes. Furthermore, it has a tension fabric cover that is designed and fabricated by the specialist sub-contractor.

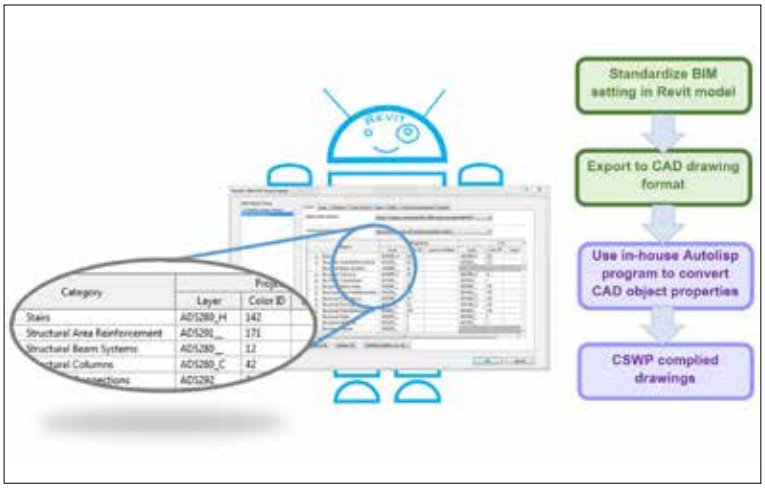
BIM has proved its capabilities to be a very effective medium, helping the Project Structural Engineer in his design and communication with project team members including the architect, BS engineer, contractor and site supervisory staff. During construction, BIM models viewed using mobile devices and 3D printouts also allow site staff and frontline workers to understand the construction sequence and minimise abortive works.

Collaboration with tension fabric specialist contractor using BIM model
Image courtesy of Architectural Services Department, HKSAR Government

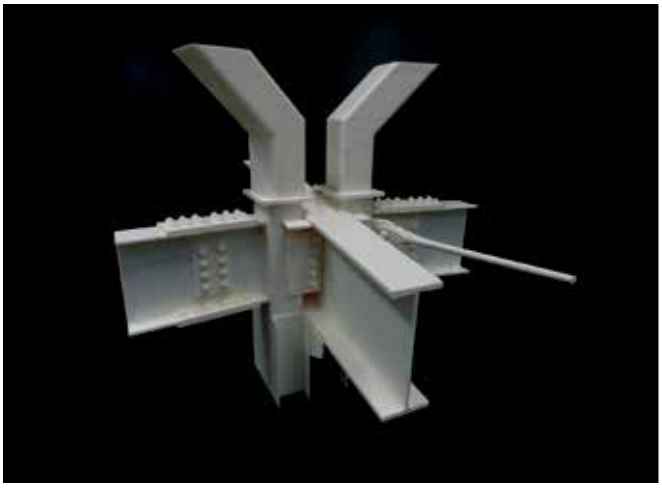
Structural Engineering Branch's in-house developed Autolisp to convert layers, lines, colours, etc. to tally with CSWP requirements
Image courtesy of Architectural Services Department, HKSAR Government



BIM assists the Project Structural Engineer to present the structural steel connection details in a precise manner
Image courtesy of Architectural Services Department, HKSAR Government



Customized export setup in Revit developed by the Structural Engineering Branch, ArchSD
Image courtesy of Architectural Services Department, HKSAR Government



3D printing is adopted to physically demonstrate the "as-built" details during design stage
Image courtesy of Architectural Services Department, HKSAR Government

COMPANY
Nan Fung Development Limited

PROJECT
Island Garden

LOCATION
33 Chai Wan Road, Shau Kei Wan

TYPE
Mass-Luxury Residential Development

SCHEDULED TIME OF COMPLETION
Q1 2019

Using BIM to Anticipate On-Site Design and Construction Issues

南豐集團 NAN FUNG GROUP

About Nan Fung Development Limited

Founded in 1954, 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 has a track record spanning over 50 years with over 165 projects including residential, commercial and industrial buildings. The Group's vertically integrated team enables significant synergies across development to property management.

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 PARTNER

WSP Hong Kong Limited

AUTODESK PRODUCTS USED

BIM 360 TEAM

Navisworks Manage

Revit

Project Description

Island Garden is mass-luxury residential project located at 33 Chai Wan Road, Shau Kei Wan, situated on a hillside overlooking the Eastern District. The development consists of 4 high-rise residential towers with a podium clubhouse and landscape, and multi-storey basement car park. The total domestic GFA. is approximately 42,500 square meters over a site area of approximately 5,314 square meters and 470 residential units are provided. The development is built on a previous residential complex for civil servants.

Project Challenges

During construction stage, several sub-contractors across different trades had little experience in BIM and do not have the necessary resources for BIM coordination. This would jeopardize one of the objectives of using BIM for on-time project delivery and minimization of abortive works.

Secondly, Island Garden is a high-rise residential project with repeating typical unit layouts. The focus of on-site coordination was to establish modularized, typical CSD and CBWD from the BIM model to increase repeatability and standardization across units and floors while ensuring constructability.

Lastly, there was a need for a rapid design-mock up for the client to review the design and materials used.

Solutions for challenges

The project team and main contractor worked together to develop a BIM workflow, which consolidated information from trade contractors' design and performed clash analysis to eliminate abortive works during construction. A BIM consultant was also hired as the BIM Manager for the project to develop and coordinate the construction BIM model. Together, the workflow greatly reduced on-site coordination time and abortive works.

The use of BIM enhanced the repeatability and standardization of the CSD of the typical floor, increasing certainty of the overall construction programme. Also, no-nail zone drawings for conduits were produced from the BIM to determine optimal routing options for services which assisted future fit-out works and maintenance works to avoid damages to the concealed services.

Walk-through simulations and 3D printed scale models from the BIM model were utilized to facilitate design reviews and decision making by the project team.

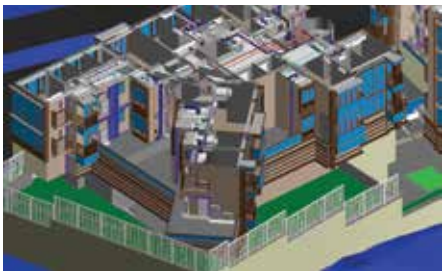
How does BIM benefit the project?

The key benefit of BIM is the multi-disciplinary coordination prior to construction which led to reduction in on-site coordination time and abortive works. As the project is along a hillside, the site area for logistics was naturally constrained. With the help of 4D construction sequencing simulations, we ran multiple construction programme options, allowing us to anticipate potential site logistic problems and the feasibility of each construction option. We also minimised the excavation required to reduce construction wastage and abortive works. Through working closely with our subcontractors, we shared and reviewed the site planning using BIM for their relevant works and how their logistics fit into the overall project's construction planning. This greatly improved the overall construction planning and pre-emptively resolved on-site coordination issues, which in the past would usually only arise when we reach that construction stage.

Better with BIM

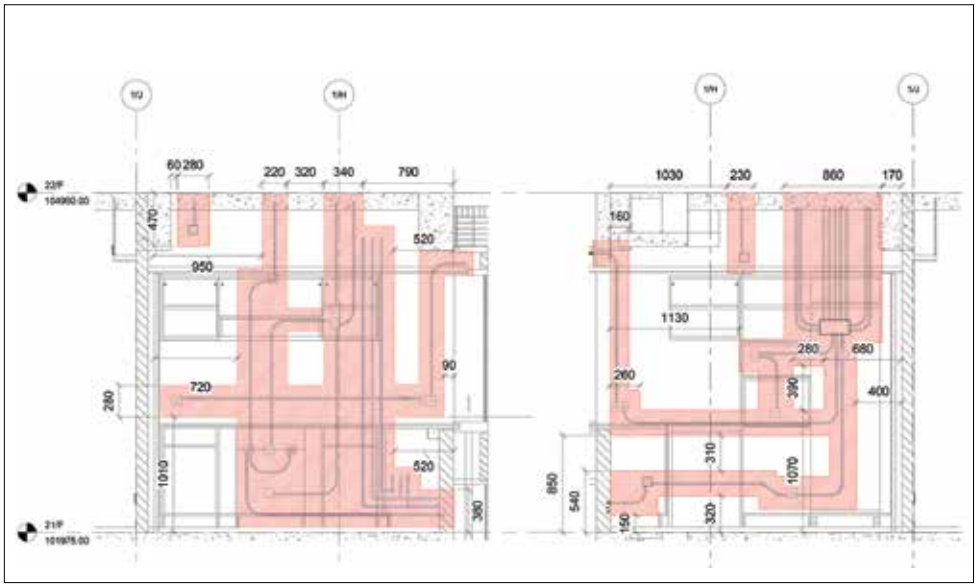
By establishing a Common Data Environment (CDE) with BIM, project managers, architects and engineers could review the latest BIM model updated accordingly based on the site-progress. Comments and mark-ups could be made on the CDE for each team member to review. The cloud-based CDE was a platform to facilitate communication and coordination of the project throughout the entire design and construction stage. Moreover, with RFI workflow integrated with BIM on the CDE, the project team could streamline the review of RFI and issue management workflow by reviewing the areas of concern linked to a specific location within BIM model.

Overall view of Island Garden at 33 Chai Wan Road, Shau Kei Wan
Image courtesy of Nan Fung Development Limited



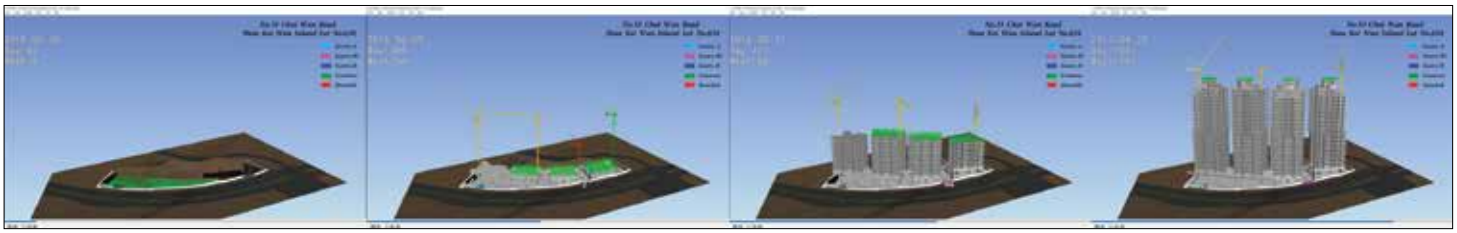
Project BIM models showing Coordinated building services
Image courtesy of Nan Fung Development Limited

Virtual mockups and VR show flat were utilized for design reviews
Image courtesy of Nan Fung Development Limited



'No nail zone' drawing exported from project BIM models
Image courtesy of Nan Fung Development Limited

3D View of 'No nail zone' BIM models on web-based viewer
Image courtesy of Nan Fung Development Limited



4D Construction Sequence Simulation was carried out to compare different construction programmes
Image courtesy of Nan Fung Development Limited

COMPANY
Nan Fung Development Limited

PROJECT
LP6

LOCATION
1 Lohas Park Road, Phase VI of LOHAS Park, Tseung Kwan O

TYPE
Mass Residential Development

SCHEDULED TIME OF COMPLETION
Q3 2020

Using BIM for Resolving Cross-Discipline Clashes and 4D Simulations

南豐集團 NAN FUNG GROUP

About Nan Fung Development Limited

Founded in 1954, 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 has a track record spanning over 50 years with over 165 projects including residential, commercial and industrial buildings. The Group's vertically integrated team enables significant synergies across development to property management.

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

Dennis Lau & Ng Chun Man Architects & Engineers Limited

Hip Hing Construction Company Limited

AUTODESK PRODUCTS USED

BIM 360 TEAM

Collaboration for Revit

Navisworks Manage

RECAP Pro

Revit

Project Description

The residential development at Phase VI of LOHAS Park consists of 4 high-rise residential towers with 2,392 units sitting on a 2-storey podium clubhouse and 2-level basement carpark. The development sits on the waterfront with a 38,000 square feet clubhouse comprising various facilities, including a 20m heated indoor swimming pool and a 40m outdoor swimming pool.

Project Challenges

The project team encountered many cross-disciplinary clashes from design to construction. For the project of this scale, review of architectural, structural elements and building services in conjunction by overlaying 2D drawings would be inefficient. Lack of collaboration among subcontractors often resulted in many interfacing clashes during the production of CSD and CBWD. Moreover, the project adopted a top down construction method and the concreting zones had to be determined by the progress of its plant rooms.

Solutions for challenges

BIM has provided a comprehensive platform to review multi-disciplinary coordination issues compared to using traditional 2D drawings. The client, architect and other stakeholders were able to review the virtual mock up using BIM and make more informed decisions. Semi-automated review of structural openings for building services aided in improving the quality of CSDs. Overall, BIM has enhanced communication among stakeholders and subcontractors, and provided a platform to improve building services coordination.

4D simulation also helped in resources planning. With the 4D simulation of concreting sequence prior to construction, the delivery of the main plant room and installation of E&M services could be done within the schedule of programme.

How does BIM benefit the project?

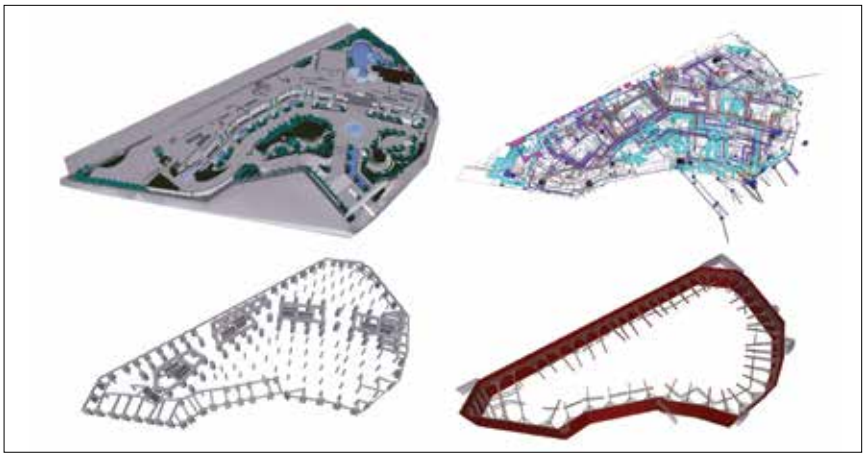
The potential risks of the project have been significantly reduced because of the involvement of all main stakeholders in the BIM process. BIM was the Common Data Environment (CDE) to minimize information discrepancy between teams. The CDE has enabled all trades' drawings to be updated with latest changes along project stages. For critical areas with congested building services, BIM virtual mock-ups created prior to construction eliminated risk of dispute and timely coordination of different trades. 4D simulation also helped with better logistic planning for material delivery and construction sequencing.

Better with BIM

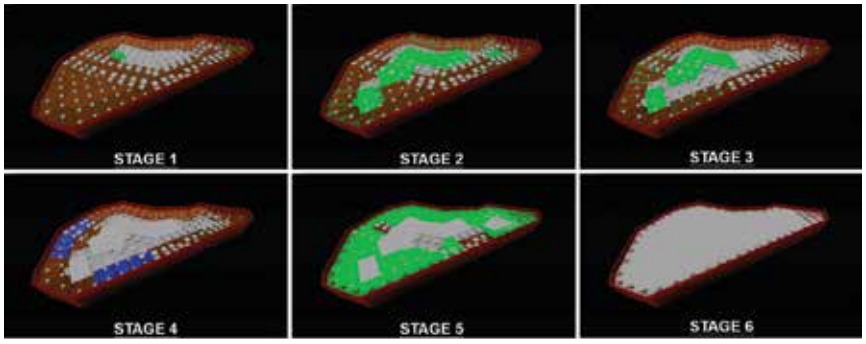
The construction method simulation of building services installation sequence facilitated the project team to better plan the works before installation and gave site staff clearer understanding of the work sequence, thus improving the efficiency and site safety. BIM also improved the quality of building services routing arrangement with consideration of installation and maintenance space required.

For underground structures, 3D laser scanning technology was implemented to allow structural engineers to obtain precise measurement of as-built portions. With the accurate as-built model verified by 3D laser scanning, subsequent works could be modified, minimizing abortive works.

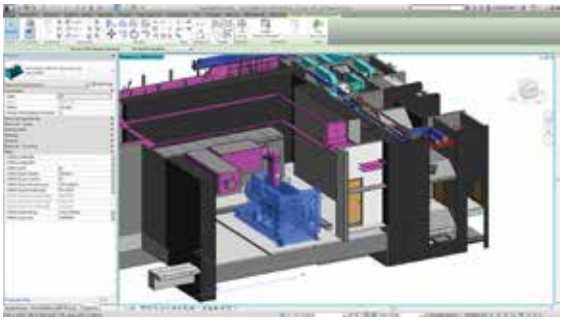
Overall view of Lohas Park Phase 6 at Tseung Kwan O
Image courtesy of Nan Fung Development Limited



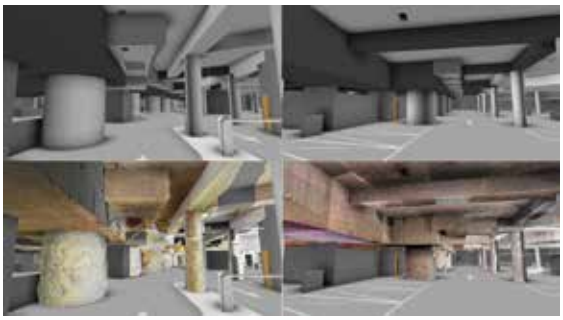
Multi-disciplinary project BIM models of podium and substructure
Image courtesy of Nan Fung Development Limited



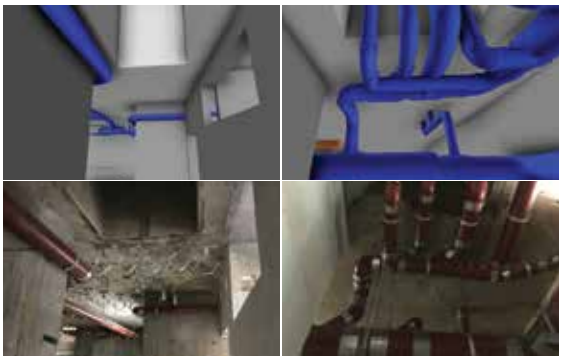
4D construction sequence simulation was utilized to determine optimum concreting sequence
Image courtesy of Nan Fung Development Limited



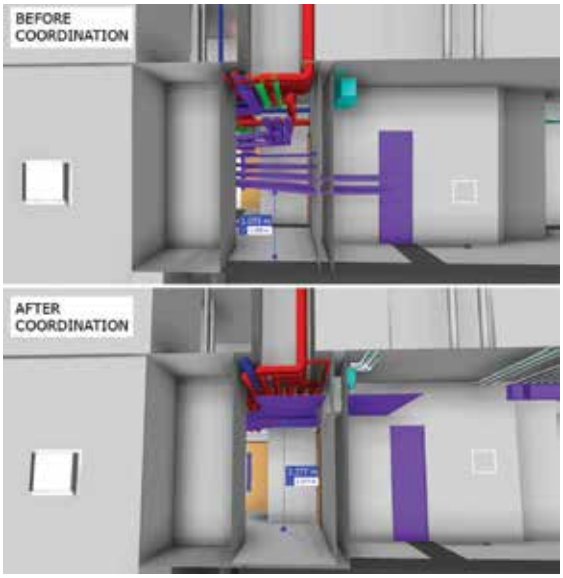
Equipment and asset information embedded in project BIM model
for future Facility Management
Image courtesy of Nan Fung Development Limited



Laser scanning technology was deployed on site to obtain
accurate as-built models
Image courtesy of Nan Fung Development Limited



BIM model with coordinated building services has facilitated
E&M installation on-site
Image courtesy of Nan Fung Development Limited



CSD Coordination in BIM
Image courtesy of Nan Fung Development Limited

COMPANY
Urban Renewal Authority

PROJECT
Application of BIM concept to Building Rehabilitation Works

LOCATION
Coral Court (Blk B & C), No 51-67 Cloud View Road

TYPE
Residential Building Rehabilitation Works under Smart Tender Scheme

SCHEDULED TIME OF COMPLETION
In 4th quarter of 2019 (expected works completion)

BIM Concepts Applied in Building Rehabilitation Works

市區重建局
URBAN RENEWAL AUTHORITY

About Urban Renewal Authority

The URA was established in May 2001 under the Urban Renewal Authority Ordinance as the statutory body to undertake, encourage, promote and facilitate urban renewal of Hong Kong, with a view to addressing the problem of urban decay and improving the living conditions of residents in old districts.

The URA follows the guidelines set out in the Government's Urban Renewal Strategy in the implementation of its urban renewal initiatives under a "people first, district-based, public participatory" approach. The URA adopts a comprehensive and holistic approach by ways of its two core businesses i.e. redevelopment and rehabilitation, as well as heritage preservation and revitalisation, for creating a sustainable and quality living for the people of Hong Kong.

BIM PARTNERS

Leica Geosystems Limited

MES Services Limited

The Hong Kong Institute of Building Information Modelling (HKIBIM)

The Hong Kong Polytechnic University – Department of Land Surveying and Geo-Informatics

AUTODESK PRODUCTS USED

BIM 360

Collaboration for Revit

Recap Pro

Revit

Project Description

Coral Court (Blocks B & C) is located at the mid-level of Fortress Hill, Hong Kong. In October 2016, the Owners' Incorporation (IO) initiated comprehensive building repairs in accordance with the "Smart Tender" Scheme (ST) implemented by the Building Rehabilitation Division, Urban Renewal Authority (URA).

Though BIM has been widely used in newly built or civil projects in Hong Kong for years, it is seldom adopted in the rehabilitation of residential buildings. In late 2017, the URA coordinated with several BIM partners to form a project team, and selected Coral Court as a pilot project to explore how BIM can be applied in building rehabilitation works.

Project Challenges

BIM has been successfully adopted in the construction of new buildings. For some of these, the BIM model is integrated with the building management system to facilitate management. However, for existing buildings, building maintenance is still very traditional or even neglected. Without advanced technology and data analytic methods, traditional building repair works are severely challenged by problems with urban decay. Building consultants also face challenges arising through limited manpower, tight budgets, conflicting requests, and accelerated schedules.

Solutions for challenges

BIM helps these professionals to detect issues in the early stages, and identify the exact locations of discrepancies. URA partnered with several experts in BIM modelling and Quantity Survey, and engaged Coral Court to conduct a pilot study on applying BIM in existing buildings for building rehabilitation. This will be a good case study on assessing the benefits, including ways BIM facilitates effective building maintenance, and can create additional value in the facility management stage. BIM allows an informative provision of scientific building inspection and updated drawings, and helps building owners to visualise consultants' outputs.

How does BIM benefit the project?

By building the 3D model with a re-measurement exercise, BIM provides a holistic view of the building and facilitates building rehabilitation works, along with efficient communications.

The use of BIM in the building maintenance stages allows the owners and the consultant to review the design and make changes as early as the proposal stage. Through advanced scanning and inspection technologies, the model can provide contractors with updated building figures and information on the building's condition. More accurate cost estimations with detailed breakdowns can be provided for owners to consider and to make comparison. Also, updated digital drawings can be generated with BIM, which enhances accuracy and project implementation.

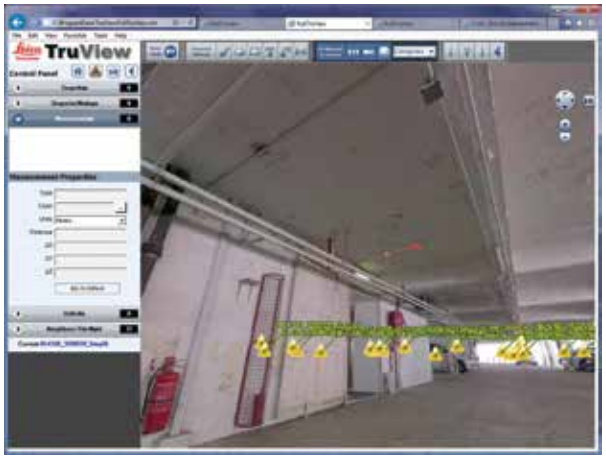
Better with BIM

BIM is used to bridge any communication gaps between the owners and all consultants in this project, allowing all parties to communicate on the same page at all times. BIM is a tool to facilitate collaboration. With BIM support, it becomes much easier to reach consent regarding the repair calculation method, drawing and design, and division of work. The BIM model also allows the consultant to preview the design, to ensure that it provides the best service ability and meets statutory requirements.

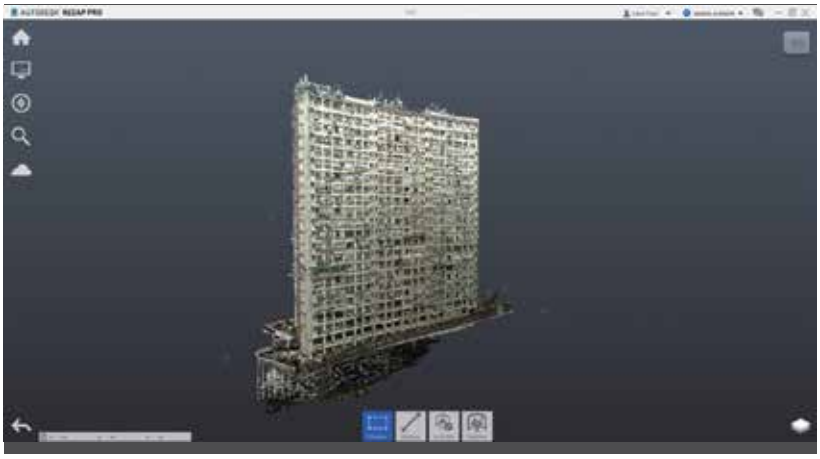
BIM 360 enables an efficient cross-platform collaboration and communication
Image courtesy of Urban Renewal Authority

BIM 360 enables an efficient cross-platform collaboration and communication
Image courtesy of Urban Renewal Authority

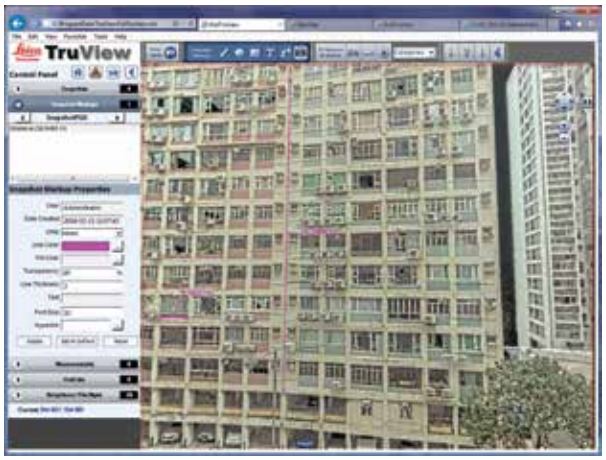
With BIM technology, 3D model can be created from existing drawings as a better way of visualization
Image courtesy of Urban Renewal Authority



We use point cloud to fast check the building condition
with existing structure and facilities
Image courtesy of Urban Renewal Authority



We use point cloud to fast check the building condition with existing structure and facilities
Image courtesy of Urban Renewal Authority



We use point cloud to fast check the building condition
with existing structure and facilities
Image courtesy of Urban Renewal Authority

With BIM technology, 3D model can be created
from existing drawings as a better way of visualization
Image courtesy of Urban Renewal Authority

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

Dr. Jack C.P. CHENG
Chairman
Autodesk Industry Advisory Board

Dr. Calvin KEUNG
Council Member
bSHK

TSOI Ting Chu, John
Member (Chairman, 1997)
Chartered Institute of Architectural Technologists, Hong Kong Centre

Ir Henry CHEUNG
Council Member
Hong Kong Information Technology Joint Council

Dr. Francis CHAN
Chair of External Affairs & Accreditation
Hong Kong Institute of Project Management

Ir C. K. NG
President
Hong Kong Institute of Utility Specialists

CHAN Chak Kwong, Mike
Group Admin
Hong Kong Revit User Group

Walter CHAN
Chairman
Institution of Public Private Partnerships

TANG Chee Man, Paul
Hub Committee
The Chartered Institute of Building (Hong Kong)

Sr YU Lap Chu
Chairman (HK Region)
The Chartered Institution of Civil Engineering Surveyors (Hong Kong Region)

T. C. LO
Vice-chairman
The Hong Kong Institute of Building Information Modelling

Ir LUI Wai Kau, Raymond
Information Technology Division Committee Member
The Hong Kong Institution of Engineers (IT division)

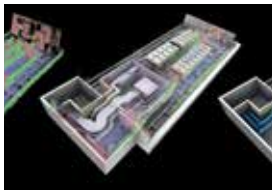
Advisory Panel - **Pioneer of BIM Award**

Hong Kong Housing Authority, HKSAR Government

Housing Authority's New BIM Standard and Guideline
"Setting a New BIM Standard for Hong Kong"

The Housing Authority is always seeking breakthroughs in BIM developments. They were in fact among the early adopters of BIM in the construction industry. This year, the Authority organised and published new BIM standards. This will establish a new direction and serve as an invaluable reference for industry players.

Advisory Panel - **Award Winners**



Arup & Greenwich Investors Limited

Renovation Works of Greenwich Centre

To sustain the building life of Greenwich Centre, renovation works were required. As is typical with many local older buildings, there is no up-to-date as-built information available, since it was constructed 30 years ago. A handheld laser scanning device was used to capture the building details and dimensions; this reduced the survey time by 50 percent compared with traditional measurements by hand. After the project was digitalised in BIM, it was easy to plan and coordinate replacement of MEP equipment– for example, the air handling unit – with existing architectural and structural elements. In conclusion, this practice not only sustains the life of the building but also provides the owner with flexibility to manage the property in the future, as the renewed information has been stored on BIM 360.

Civil Engineering and Development Department, HKSAR Government & AECOM Asia Company Limited & Leighton-China State Joint Venture

CEDD Contract NE/2015/01 Tseung Kwan O - Lam Tin Tunnel

This tunnel project is challenging as it is near MTR "live" tunnels and residential blocks; therefore, a highly complex Excavation & Lateral Support (ELS) and traffic management needed to be carefully planned and designed. In addition, more than three million tonnes of construction and demolition materials were handled on site. BIM's integrated delivery process has been adopted to monitor the construction activities, from design to the completion stage. The excavation strategy had been optimised by drone survey technology. Drone surveying increases safety in surveying work, while helping reduce construction time by three months. The surveyors can use the real-time data to estimate the excavation volumes.

CLP Power Hong Kong Limited

Smart Sustainable Substation

Hong Kong-Zhuhai-Macao Bridge Substation is built on an artificial island adjacent to Hong Kong International Airport. The substation is a strategic facility which is critical for the long-term reliability of the electricity supply system of the Bridge. The project has benefited from using BIM in various aspects of the design, construction, and operations stages. Simulations such as air ventilation and building permeability help optimise the energy efficiency and enhance the rainwater harvesting system. CLP appreciates the ways BIM contributed to the project, and believes it is a new type of valuable digital asset for the organisation, to deliver better operation and planning.

Hip Hing Construction Company Limited

Main Contract Works for the Proposed Development at Tung Chung Town Lot No. 2 and 11

In the past, BIM had typically been used for construction, while we seldom heard about BIM for the demolition of existing buildings. This project is part of an expansion of Tung Chung Town, through demolishing part of existing floors and then constructing new storeys by a top-down approach in the same building. This project faces challenges in the structural engineering design and the construction methodology and is similar to surgery in which diseased parts of the body need to be removed and the good parts remain for the function they provide. To accomplish this complicated task, Hip Hing heavily relied on point cloud data and 3D views to gain a full understanding of the building structure, and identified potential risks that might occur during the demolition.

Link Real Estate Investment Trust & Nan Fung Development Limited

The Quayside

This is a typical commercial building in Hong Kong. There are two major highlights in this project. Firstly, the project team had adopted the latest Autodesk cloud technology - BIM 360, as the Common Data Environment for real-time project collaboration and issues tracking. Compared to the traditional approach, this workflow saved about 10 percent of on-site coordination time, and reduced the cost of abortive works by 5 percent. The other highlight is that CFD simulations had been utilised to enhance the design of aesthetics, indoor air quality and thermal comfort of the building.

Advisory Panel - **Award Winners**

Urban Renewal Authority

Project TKW/1/002 Ma Tau Wai

This is one of the URA redevelopment projects. The project team had embraced BIM in various ways, such as using BIM as a platform for collaborating with project stakeholders; GIS data was merged with BIM to offer a holistic neighbourhood visualisation; the workflow for architects had been streamlined by using Revit API to achieve the automation of area calculations and code compliance checking; Dynamo was applied to keep track of the parameters' consistency, to ensure the accuracy of project inputs for calculations; Python Machine Learning had been used for automated repetitive tasks, with testing of automatically renumbering common rooms in a flat, in a bid to eliminate the traditional manual procedure and so avoid human errors.

Water Supplies Department, HKSAR Government & Ming Hing – Ming Hing Civil – Vasteam Joint Venture & Summit Technology (Hong Kong) Limited

In-situ Reprovisioning of Sha Tin Water Treatment Works (South Works) – Advance Works

This project aims to renew the ageing facility, so that it may continue to supply fresh water in Hong Kong. Many simulations and analyses works were performed in the BIM process, including detailed modelling of the steel platform, the theoretical design of hydropower generation; the operation and maintenance of water recycling tanks, the planning of woodland compensation; and the use of the unmanned aerial vehicle for monitoring progress. These applications can be considered for implementation in other waterworks projects in future.

Advisory Panel - **Honorable Mentions**

Architectural Services Department, HKSAR Government

Seamless Conversion from Revit Structural Model to CSWP Drawings and Bridging BIM throughout the Project Cycle

This is a small-scale project which serves as a great inspiration. A leisure facility at Tsui Ping River Garden proved that even small projects can benefit from BIM during the design and construction stages. In fact, this facility's canopy design involved extensive structural works and detailing. The project team had made good use of Revit steel components and scheduling to enrich the model information.

Nan Fung Development Limited

Island Garden

This residential project adopted BIM from design to construction. Initially, they used BIM 360 as the Common Data Environment for real-time project collaboration. Virtual mock-ups were created for decision-makers to review the design details and materials in virtual reality.

Nan Fung Development Limited

LP6

This residential property used a digital twin in BIM. The Project team monitored and compared the consistency of the information between the existing condition and the Revit model using laser scanning. The verified existing building information can be used for asset management in future. Furthermore, BIM 360 has been used as the Common Data Environment for real-time project collaboration.

Urban Renewal Authority

Project Name: Application of BIM concept to Building Rehabilitation Works

Hong Kong has many aged buildings. It is extremely difficult for owners of buildings to assess building conditions and carry out maintenance and repairs, and to evaluate quotations for renovation if they have no prior knowledge of construction. BIM 360 mobile app provides an excellent medium for reviewing the existing structure in 2D drawings and a 3D model. Based on the Revit model and the rendering outputs, owners can easily perform comparisons between different renovation design options.

Dr. Calvin Kam

Overview

The 2018 Hong Kong BIM Awards witness a diversity of projects that champion a great variety of leading-edge BIM processes and applications supported by well-informed planning and team collaboration. It is delightful to see several 2017 Hong Kong BIM Award winners (e.g., CLP, Housing Authority, URA, WSD) 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 the Strategic Building Innovation (SBI) bimSCORE evaluation framework in a preliminary assessment based on the evidence available from the submissions, we have benchmarked the 2018 winners against our global database of 200+ projects from 16 countries. Within the global context, this year's winners fall between "Typical" and "Advanced" Practices, and these winning projects are further analyzed with respect to the four bimSCORE evaluation areas of Planning, Adoption, Technology, and Performance. The included figures illustrate the Overall bimSCORE and four area scores of the 7 winning projects, referenced against the performance of last year's awarded projects.

Planning and Performance

Planning for BIM implementation requires targeting objectives for success, supporting achievement with the needed tools and technical processes, and developing standards to guide an integrated project team.

Performance monitoring of objectives is enabled through BIM and increased automation in the quantitative tracking of project performance metrics to inform design and project management decisions.

The award winners recognize the importance of establishing and tracking objectives throughout the project lifecycle. **Hong Kong Housing Authority** revamped its BIM Standards and Guidelines in alignment with industry's existing BIM Standards by providing comprehensive and practical guidance in BIM implementation covering a wide range of technical details and establishing examples for other organizations to study. **Nan Fung Group** reduced the abortive works in the construction stage of the Quayside project by setting up the BIM objectives in advance, and by incorporating the BIM requirements in the tender documents. A BIM Execution Plan (BEP) was also implemented to clearly specify the BIM leaders for different project phases along with the required deliverables. **The Water Supplies Department (WSD)** established multiple objectives and BIM requirements to resolve interface issues between existing and new buildings. **Hip Hing Construction** also defined clear objectives for all the project phases from Planning through Operations and Maintenance (O&M), and a BIM Manager and BIM modeler were allocated to support multidisciplinary collaboration. **CEDD & AECOM & Leighton and Arup** both recorded metrics to quantify BIM benefits, e.g., 90% time reduction in excavation process monitoring, and 50% time reduction for collecting data of existing site condition.

Some variations were observed among different projects in the Planning and Performance area, ranging from lower "Typical" to upper "Advanced" practice on the global scale. Organizations are therefore encouraged to establish BIM objectives in the tender stage itself for effective BIM implementation. Incorporating BIM Standards will also help organizations to track the progress on BIM objectives throughout the different project phases from Planning to O&M. Many performance improvement opportunities are available to lead Hong Kong from Advanced Practice to Best Practice range in the coming years.

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.

This year witnessed a wide variety of BIM implementation among different stakeholders across multiple project phases. BIM Managers/Modelers were assigned throughout project lifecycles for periodic and effective coordination. **CEDD & AECOM & Leighton** implemented an Integrated Delivery Process for tracking technical and modelling issues through systematic coordination between various stakeholders. BIM supported excavation feasibility, logistics management, and construction progress monitoring that helped them to reduce time spent on the design and excavation process. **The Urban Renewal Authority (URA) & Arup** involved various stakeholders in the BIM implementation process ranging from the design to construction phase. Specific training was also imparted to different levels of users for effective BIM implementation. **The Water Supplies Department (WSD)** main contractors allocated and facilitated meetings for BIM coordination in addition to leading training sessions for sub-contractors to improve BIM awareness. **CLP** conducted various BIM-based environmental analysis and assessment of green building certification.

The overall score and scores in the 4 areas have generally shown some improvement over the 2017 HK BIM Awardees, but also increased variation. This can be improved by formalizing an organizational level Standard or Rulebook for effective BIM implementation across all the verticals of a project. To promote advances in Technology and Adoption, project owners should standardize requirements for BIM uses and collaboration among project stakeholders to drive lifecycle application of BIM and advanced design and construction analyses.

Dr. Calvin K. Kam
PhD, AIA, PE, LEED AP
Founder, 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. Dr. Kam was invited to present and facilitate over 20 countries and economies in their BIM Start-Up Journeys at both the 2014 and 2015 Asia-Pacific Economic Cooperation (APEC) and ASEAN workshops in BIM, and was retained by APEC to author the APEC's Official BIM Start-Up Guide (2013), the APEC Guide to Performance Metrics and BIM to support Green Building Objectives (2015), and present at Smart City Workshop during the 2017 APEC Senior Officials & Related Meetings in Vietnam.

Dr. Kam has served as an Expert Advisor of the Hong Kong AIAB BIM Awards since 2008. He was invited to present at Hong Kong Construction Industry Council (CIC) Conference 2013, led team to facilitate CIC's Client Summit in 2014 and Inaugural Asia Pacific Regional BIM Group Meeting and Forum in 2018. Calvin also facilitated a variety of industry activities with Walt Disney Imagineering and worked with Mass Transit Railway (MTR) on facility operation and performance evaluation.

Since 2009, Dr. Kam was invited to present in China, including Beijing, Shanghai, Guangdong, Inner Mongolia, Shanxi, Henan, etc. in the fields of BIM, VDC, and Smart City Development. Since 2011, Singapore government's Building & Construction Authority has appointed Calvin as an international expert to advise its construction productivity and BIM roadmap. Since 2012, China's National BIM Union and Standard have appointed Calvin as the only international Honorary Director to advise the international harmonization and collaboration of its nationwide BIM standards/development. Since 2015, Calvin was appointed an Expert Advisor to the Shanghai government's BIM advancement center.

Dr. Kam is an Adjunct Professor at Stanford University. He is a recipient of various honors/awards including ENR's "20 under 40" and BD+C's "40 under 40". Calvin has presented at 100+ industry events/universities across 18 countries and regions and published a number of book chapters and journal publications.

Chan Chun Tat
Kwok Helen Hoi Ling
Li Alison Tan Yui
Lui Kin Leung
Tang Chloe

INSTITUTION
The Hong Kong University of Science and Technology

PROJECT NAME
Modelling of Indoor Air Quality (IAQ) Using BIM Technology

PROJECT LOCATION
33 Wang Chiu Road, Kowloon Bay, Kowloon, Hong Kong

TYPE
Indoor Air Quality and Solar Analysis

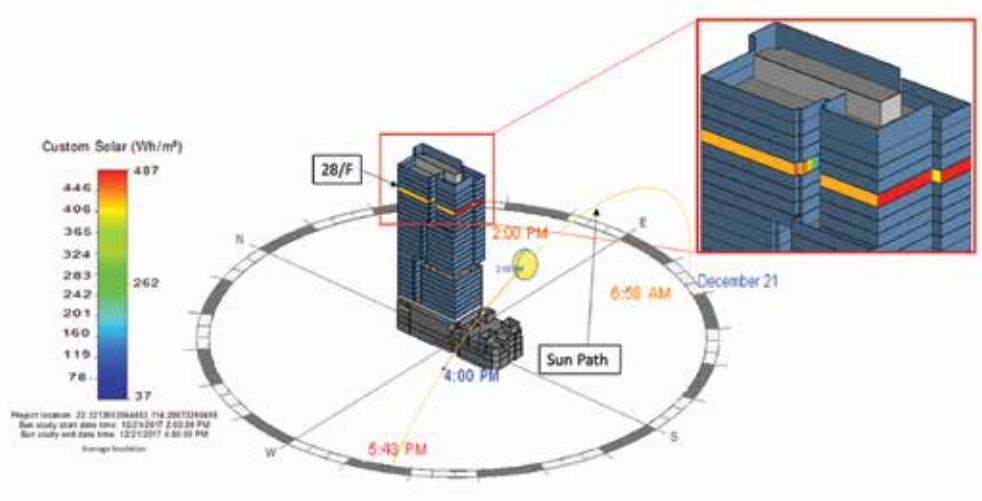
AUTODESK PRODUCTS USED

Revit

Autodesk CFD

Insight 360

A360



Solar Analysis Results of Exchange Tower

Seeking a Better Indoor Environment

Project Background

As people spend 80% of their time indoors according to Hong Kong Environmental Protection Department, indoor air quality (IAQ) could significantly impact people's health, e.g. causing sick building syndrome. This project aims to investigate air quality variations on a floor level, and potential ways to improve the overall indoor experience.

Exchange Tower, managed by Sino Group, was selected for this project as it is a typical office building with a mixing ventilation system and H-shaped corridors. A BIM model of an office floor was then created – including mechanical, electrical, and plumbing (MEP) components – to conduct computational fluid dynamics (CFD) simulations and solar analyses.

Project Challenges and Solutions

There were three real-world challenges for this project. Firstly, setting up AQ measurement devices in the office building for modelling data input required substantial effort for liaison among different parties. This project would not have been possible without the research ideas from academics, professional advice from building consultants and arrangements by the facility manager.

Secondly, in the data quality control process, since data drifting is a common problem in portal sensors, we had to design a rigorous sampling protocol for achieving accurate data.

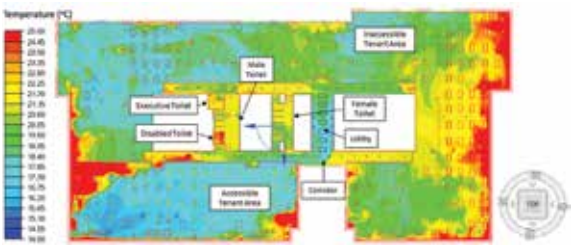
Thirdly, creating a whole-floor simulation is ambitious because of problems with incomplete information. It is impossible to collect data in inaccessible tenant areas. But we finally managed to solve this problem by using BIM to make reasonable assumptions on the dataset, through referring to the results of our measurements.

In summary: when it comes to a project which reflects the real-world situation, there are not only scientific questions but also practical issues to be resolved.

How does BIM help for your project?

To determine indoor building conditions and air quality in unknown areas, we utilised BIM to support CFD in Autodesk CFD. A BIM model was created in Revit – based on architectural drawings, MEP design drawings and operation information provided by the facility manager – in order to provide sufficient information on building geometry, materials and boundary conditions for CFD simulations.

In addition, a solar analysis was needed to quantify the amount and distribution of solar heat gain on the office floor, in order to improve the accuracy of the CFD simulation. Since BIM model contains building information, which includes geometry, material, location, orientation and weather data of the building, this information can be imported into Insight 360 directly for solar analysis.



Temperature Distribution on Human Nose Level

The CFD results on floor level were then validated with field measurement, and showed within 2SD of measurement results. Therefore, the CFD results on nose level can be used to study IAQ and thermal comfort for office occupants.

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.

Mission

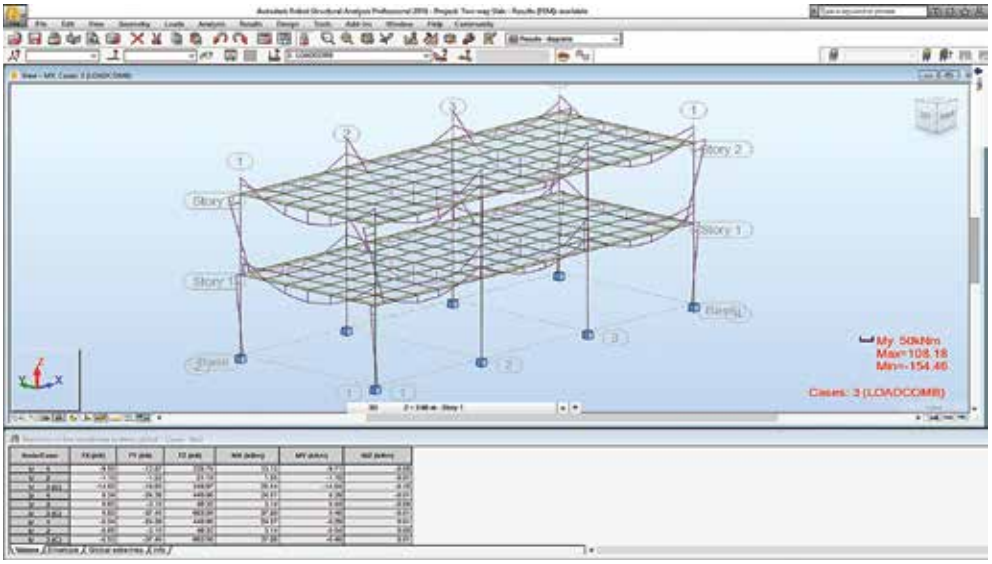
Autodesk Industry Advisory Board (AIAB) is an informal and non-profit making interest group that acts as a bridge between the industry and Autodesk for solid and bidirectional communications. AIAB, as its title suggests, has an advisory role. Its main objectives include, but not limited to:

- 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

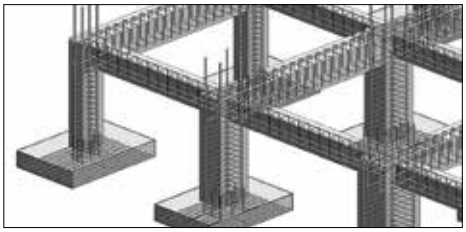
Want to know more about AIAB? Please visit: **http://www.aiab.org**

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

Dr. Jack Cheng is currently the Chairman of Autodesk Industry Advisory Board (AIAB). He is an Associate Professor in Department of Civil and Environmental Engineering, Director of RFID Center, and Associate Director of GREAT Smart Cities Center at the Hong Kong University of Science and Technology (HKUST). He teaches BIM, Construction IT and Construction Management at HKUST. A graduate of Stanford University, Dr. Cheng focuses on research areas in BIM, 3D GIS, Internet of Things (IoT), artificial intelligence and big data, construction informatics and management, green buildings, and sustainable construction. He is an author of over 160 referred publications in international journals and conferences. He has delivered seminars overseas as well. He is currently Chairman of Hong Kong Construction Industry Council BIM Standards (Phase 2) Task Force, Chair of ASCE Global Center of Excellence in Computing, Treasurer and Director of ASCE Hong Kong Section, and Editor or Editorial Board Member of several international journals. In 2012, he received the School of Engineering Distinguished Teaching Award at HKUST.



Next Step for BIM

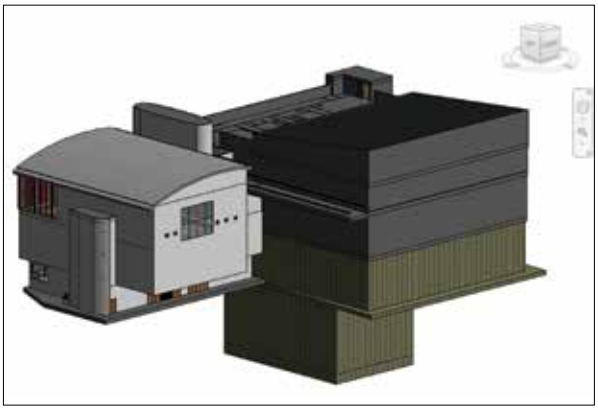


2018 is a special and exciting year to the Hong Kong BIM community. After several years of BIM implementation, BIM becomes mandatory in Hong Kong for major public capital projects exceeding HKD 30M. It is therefore expected to see substantial increases in the amount of BIM projects and demand for AECO practitioners who know BIM.

With numerous BIM projects upcoming, standardization becomes more crucial in near future. BIM standards and guidelines can enhance consistency and common understanding across stakeholders, lifecycle stages, and even projects. It is important to have a unified way for BIM model representation, information delivery, and workflow. Countries like UK, Singapore, and China have been developing different BIM standards to support different trades and purposes. International standards ISO 19560-1 and 19560-2 are being developed to support information management for BIM. In Hong Kong, Construction Industry Council (CIC) and organizations like Housing Authority and EMSD have paid much effort in BIM standards development. These efforts will help support sharing and integration of BIM information, thereby moving our BIM implementation to another level.

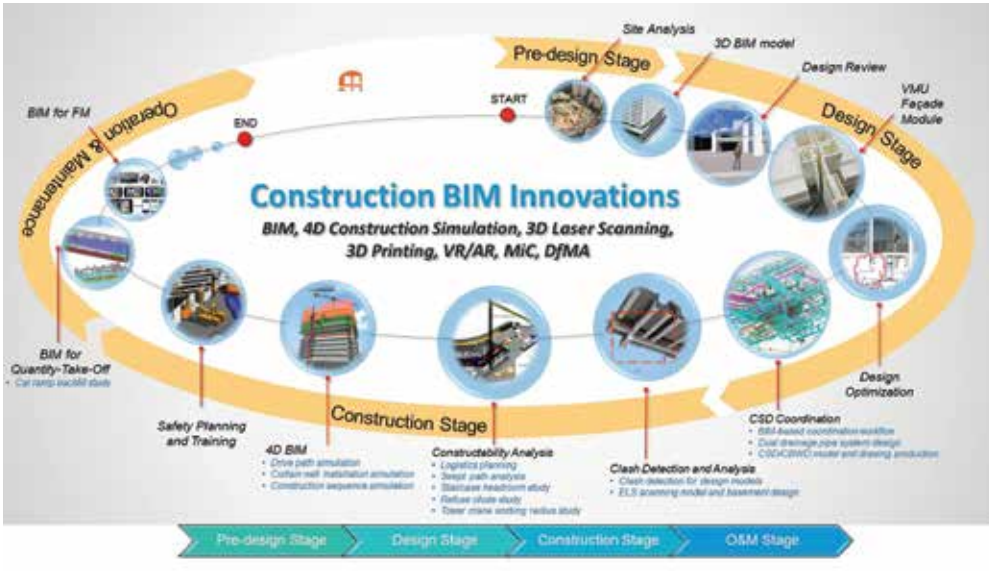
In parallel, we need to build up our BIM capability as a whole. Besides technology, people are no doubt a very key element for BIM implementation. BIM training is therefore a must. On the demand side, it is an exciting phenomenon that non-BIM professionals in the AECO industry are increasingly aware of the BIM technology and engaged in various BIM training. The newly established CITF that supports BIM training will be a strong encouragement to industry practitioners. On the supply side, several professional institutions and tertiary education institutions have recently launched or increased BIM training courses to industry practitioners and students. HKUST, for example, has offered BIM education to students of different levels from junior UG, senior UG, to MSc and MPhil/PhD. BIM education targeting at industry will soon be delivered at HKUST as well. In addition, “train-the-trainer” exercises have started. BIM training in Hong Kong will soon reach a new equilibrium with higher demand and higher demand simultaneously.

BIM is now moving towards Building Information Management, together with concepts of digital transformation, BIM+, smart construction, DfMA, automation, and smart city. Yet, several issues like interoperability, workflows, and legal still need to be resolved for BIM. As more governments mandate BIM, BIM will become widespread in the AECO industry. What comes next is the need for more hard work and for innovative ideas to better and more fully utilize the power of BIM and BIM-related technologies in different applications. The future of BIM is bright and exciting.



Froky Y.H. Wong
MSc BSc MHKIBIM MbSHK

Mr. Froky Y.H. Wong, professional member of HKIBIM and Manager of BIM Department in Hip Hing Construction Co. Ltd, who leading his team winning several BIM awards for construction projects. He has obtained a Master Degree in Intelligent Building Technology and Management. Over 11 years on BIM implementation, development and management in AEC industries and involved in design and construction projects in Hong Kong, Shanghai, South Korea, Australia, UAE and Qatar.



Adaptability of BIM in Hong Kong's Construction Projects

BIM is a mix of technology, process and cultural change, looking back about Building Information Modelling (BIM), BIM has been used in Hong Kong more than 10 years. After all these years, Government, Developers, Consultants, and Contractors are known the benefits of BIM. Many companies in Architecture, Engineering, Construction, and Operation (AECO) are equipped with professionals with BIM skills and employed BIM staffs to facilitate its services, including pre-design stage, design stage, construction stage, and operation and maintenance stage for better construction project management. Nowadays, BIM-related terms, abbreviation, and its requirements are commonly seen in construction contract documents as well as the project specific BIM specifications. Contractor has to refer the contract mentioned BIM standards with interpretation, then confirmed by the BIM project execution plan submission. Hence that different AECO related professionals needs more information about BIM and a central hub to collect BIM documents and events is becomes necessary. In this regard, the Construction Industry Council (CIC) has been updated its BIM webpage which includes not only the useful BIM-related publications and Hong Kong BIM event information for BIM participators, but also BIM standard documents, BIM seminar videos, BIM training course information, and the schedule of BIM events in Hong Kong. This webpage is likes a Hong Kong BIM information hub, it is a useful website indeed for BIM participators who interested to uses BIM in construction industry.

Construction innovation is leading change

The construction industry applies Building Information Modelling (BIM), Integrated Project Delivery (IPD), Modular Integrated Building (MiC), Manufacturing and Assembly Design (DfMA), prefabricated steel reinforcement components and facility maintenance intelligence to form reliable and sustainable projects. Recently, the Construction Innovation and Technology Fund (the CITF) is established to encourage wider adoption of innovative constructive methods and new technologies in the construction industry with a view to promoting productivity, uplifting built quality, improving site safety and enhancing environmental performance. The Construction Industry Council (CIC) is commissioned to be administrator of the CITF. The Fund will be used to encourage the construction industry to use new and proven technologies developed within or outside Hong Kong.

Ken Mao
BSc, BEng, MBA, RPE (BUD), MCIOB, MHKIE, MHKIBIM, MbSHK

Ken is currently a Senior Technical Manager working for Paul Y. Engineering Group. In his career, he has engaged in planning and coordination work for a range of construction projects such as commercial & residential buildings, roadwork, slope maintenance and foundation works, etc. over 15 years. In recent years, apart from planning and coordination work, he assists the company to establish an in-house BIM team which provides BIM deliverables to construction projects.

BIM and Innovation for Construction

We see innovation applications can be realized by introducing new cutting edge technology which has never been used, modifying current technology to suit end users' needs and shifting mature technology from another industry. For example, technologies like robotic arm and rapid prototyping (3D printing) being maturely adopted in automobile industry and product design have been adopted to local construction industry in recent years.

Apart from virtual design and construction, BIM could be a common data source evolving itself to create innovative data management via integration to other technology platforms such as Autodesk Forge. End users like project managers, engineers, quantity surveyors may efficiently access and manipulate cost data, field reports, inspection records, clashes data, BIM models, etc. in a single and highly customized cloud platform. In such case, of course, we need a competent Information Manager to look after the big data.

To frontline construction workers and site supervisors, innovation applications don't necessarily mean cutting edge technology. It could simply be a new working approach bringing benefit to their daily work even existing technology or low-tech stuff is used. For instance, making use of BIM models together with virtual reality (VR) and augmented reality (AR) technologies may provide alternative ways to assist safety training and site safety checking.

From experience, bringing the innovation idea to the construction field is a team effort and time-taking process. Most importantly the key to achieve positive result is that the innovation leader shall consider to:

1. Understand the needs of the end users;
2. Thoughtfully explore the technology available in the market;
3. Work out solutions which truly bring benefits to the end users;
4. Start with something simple in order to achieve "small win".

The common things making the innovation applications sustainable are to benefit end users and allow them to have flexibility to cater for changes. No matter how good or bad the innovation applications are working for focused groups or for majority, we shall appreciate the pioneers who put a lot of effort bringing innovation applications to practice.

Ian W.S. Wong
Lecturer, Department of Construction,
Hong Kong Institute of Vocational Education (Tsing Yi)

Before launching his career as a lecturer, Ian registered as a qualified architect in the UK who had worked extensively in Hong Kong, London and Shanghai. Being involved mainly in residential, commercial, retail and health care sector development in different cities at various stages.

Started off using CAD and Architectural Desktop, but then switched to Revit in 2008, by virtue of the UK government enforced future planning application with BIM attachment as part of a compulsory submission. From then onwards, he often shared experience of using BIM with sub consultants and colleagues. Ian is of the opinion that BIM will play an important role in the construction industry in the near future.

BIM Education & Training of the Engineering Discipline of VTC providing Valued Support to AEC Industry

LEARNING

Vocational Training Council (VTC) has been implementing BIM Technology into several Architectural, Engineering and Construction courses back in 2007. For example students of Architecture ought to acquire basic modelling skill through the delivery of 'Computer 3D Visualization and BIM' module. Students of Civil Engineering are taught with the basic drafting skill as well as learning advanced detailing techniques on RC structures. Students of Environmental Engineering are expected to master basic drafting skill as well as analytical skill in climatic data and solar study; students of Building Services Engineering are equipped with BIM knowledge and skill in MEP; whilst students of Surveying are set to master basic modelling skill and capable of creating simple schedules, ensuring that BIM is well utilized within these streams.

VISUALIZATION

VTC has already harnessed VR teaching in a virtual environment. The hands-on experience effectively allows the student to memorise the procedure of fixing and installation. The way of teaching or learning escalates to the next level. The traditional way of learning is through reading by memory, but VR helps students to trigger their memory through a series of actions and visions, and yet the learning process is more vivid and interesting.

COLLABORATION

With the emerging of new BIM technology of Common Data Environment (CDE), terrestrial laser scanning, digital photogrammetry with drones, etc. there is an increasing demand for working with real-time project data from design through construction. To cope with the rapidly changing technology, VTC BIM Innovation Hub (BIM*i*Hub) is to be established in late 2018 to support the new technology and to provide a central connection hub amongst BIM Centres and BIM Labs of VTC's member institutions to facilitate BIM collaborations with a view to further extending the collaborations with industry.

CROSS DISCIPLINES

As the key VPET provider, VTC strives in exploring a hard-nosed approach harnessing BIM technology across disciplines. Teaching staffs are encouraged to engage in Industrial Attachment for learning utmost knowledge and cutting-edge technologies. With the state-of-the-art equipment and software, BIM*i*Hub not only serves as a training venue for students and practitioners in BIM Technology, it also promotes and incubates research and collaboration with industry.

FORIDA LIMITED

The Best in Class Quality Assurance Software for your BIM projects

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BLUEBEAM REVU 2018

Bluebeam Revu pushes the limits of digital markup and collaboration for design and construction teams.

An enhanced PDF tool exports functionality to streamline your workflow through the design process, move the project forward during construction, and preserves important project data through completion and beyond.

- Markup
- Collaboration
- Expedited Workflows
- Easy Adption and Scale
- 3D PDF Plugin for AutoCAD, Revit

SOLIBRI

SMC

Solibri Model Checker (SMC) helps you stay on top of BIM Quality Assurance and Quality Control in your building projects.

Using an open standards IFC file exchange, find potential faults in your model before a single brick is laid.

- Advanced Clash & Deficiency Detection
- BIM and Accessibilty Compliance
- Model Comparison
- Full Information Take Off
- Rule Based Quality Audit

Established in 1993, FORIDA LIMITED provides the latest CAD/GIS/FM/BIM solutions and applications for AEC industry.

Services we provide include Building Information Modelling, spatial information for facilities management, devising BIM standards, consultation in BIM implementations, as well as BIM System customizations and developments. We also provide hardware and software systems supports and training on the use of our products.

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工程學科 ENGINEERING YOUR FUTURE 工程 創未來

IVE
Member of VTC Group
VTC 機構成員

Professional Certificate in Building Information Modelling (Building Works) [EG424115P]

Core Module:
Building Information Modelling for Construction Management (30 hours)

Elective Modules* (Select any 1 out of 3)
- BIM - Architecture (48 hours)
- BIM - Structure (48 hours)
- BIM - Building Services (48 hours)

Core Module:
Building Information Modelling Basic* (12 hours)

**Students will take the related Hong Kong Institute of Building Information Modelling (HKIBIM) Certified Expert CEI / CEII Examinations as end-of-module assessment for selected modules. If they pass the examination with a good grade that satisfies HKIBIM requirement, they will be qualified for HKIBIM Certified Expert status (Student will need to apply for HKIBIM members and subject to conditions)*

資歷架構 Qualifications Framework

Professional Certificate in Building Information Modelling (Building Works) is recognised under the Qualifications Framework (QF).
For details, please visit: www.hkqf.gov.hk.

QR Registraion No.:	17/000498/L4
Registraion Validity Period:	29/05/2017 to 31/08/2021
QF Level:	Level 4

Remarks:
This programme is under Engineering Training Subsidy Scheme. Successful applicants will be refunded 60% of the tuition fees, subject to a maximum of $45,000 per person.

Enquiries 查詢
T: 2435 9423
E: EDiT@vtc.edu.hk
W: https://EDiT.vtc.edu.hk

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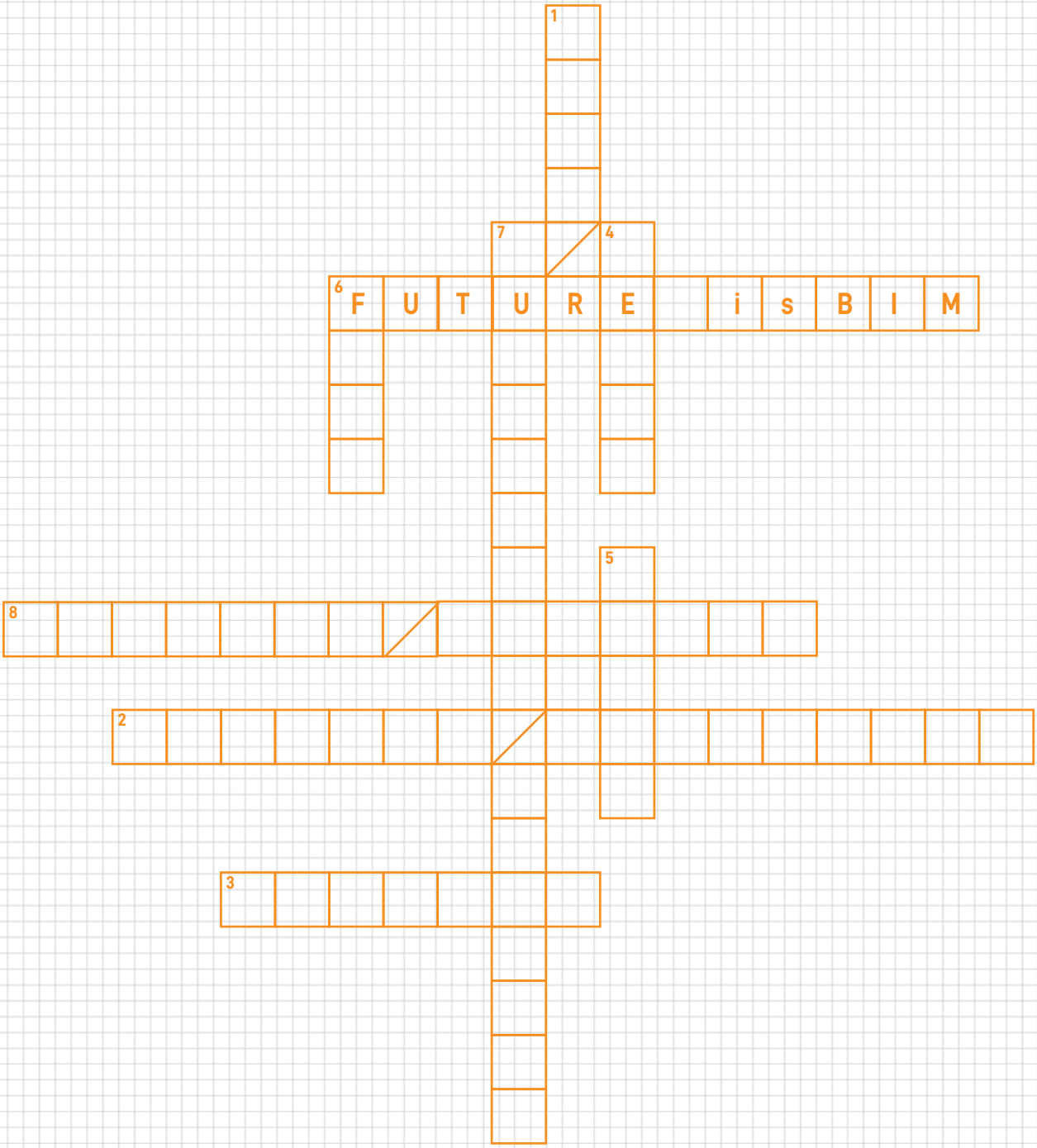

1. The year Development Bureau (DEVB) mandates the use of BIM for all public projects over $30 million
2. The government sector has started piloting BIM since 2006
3. The Autodesk software that has been published for over 30 years and still widely used.
4. One of the most used BIM softwares by Autodesk.
5. A digital platform that allows architects, engineers and project stakeholders to work together and to store data.
6. Construction Innovation and Technology _ _ _ _ beneficial for construction industry was mentioned in 2018-19 Budget.
7. AR enables users to view and access BIM model data overlaid onto a view of the real world. What is AR?
8. VR enables users to see a complete immersion of a finished project with a 360-degree view. What is VR?

Scan For Answers

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The Opportunities & Challenges

On 1 December 2017, the HK SAR Development Bureau mandated that “Capital works projects with project estimates more than $30 Million shall use BIM technology.”

As developers & contractors, how can you leverage with this mandate to implement Common Data Environment (CDE), automate construction workfllows, increase visibilities of the construction data/processes and improve productivity ?

Does BIM merely mean to you having 3D models for visualization & clash detection? How can you meet with the BIM challenges in civil infrastructure projects involving more complex level of process/workflow integration ?

How can the value of BIM be maximised in not only design & construction phase but also for operation & maintenance?

The Solution

BIM Consulting Services provided by Spatial Technology Limited help building & infrastructure practitioners at any level of maturity realize the benefits of BIM according to your unique needs at faster pace. Our BIM experts will guide you through the business process changes with **BIM Training (Pre-approved for CITF)** , **BIM Coaching**, **BIM Consuting, BIM Implementation** and **BIM Solution Integration Services.**

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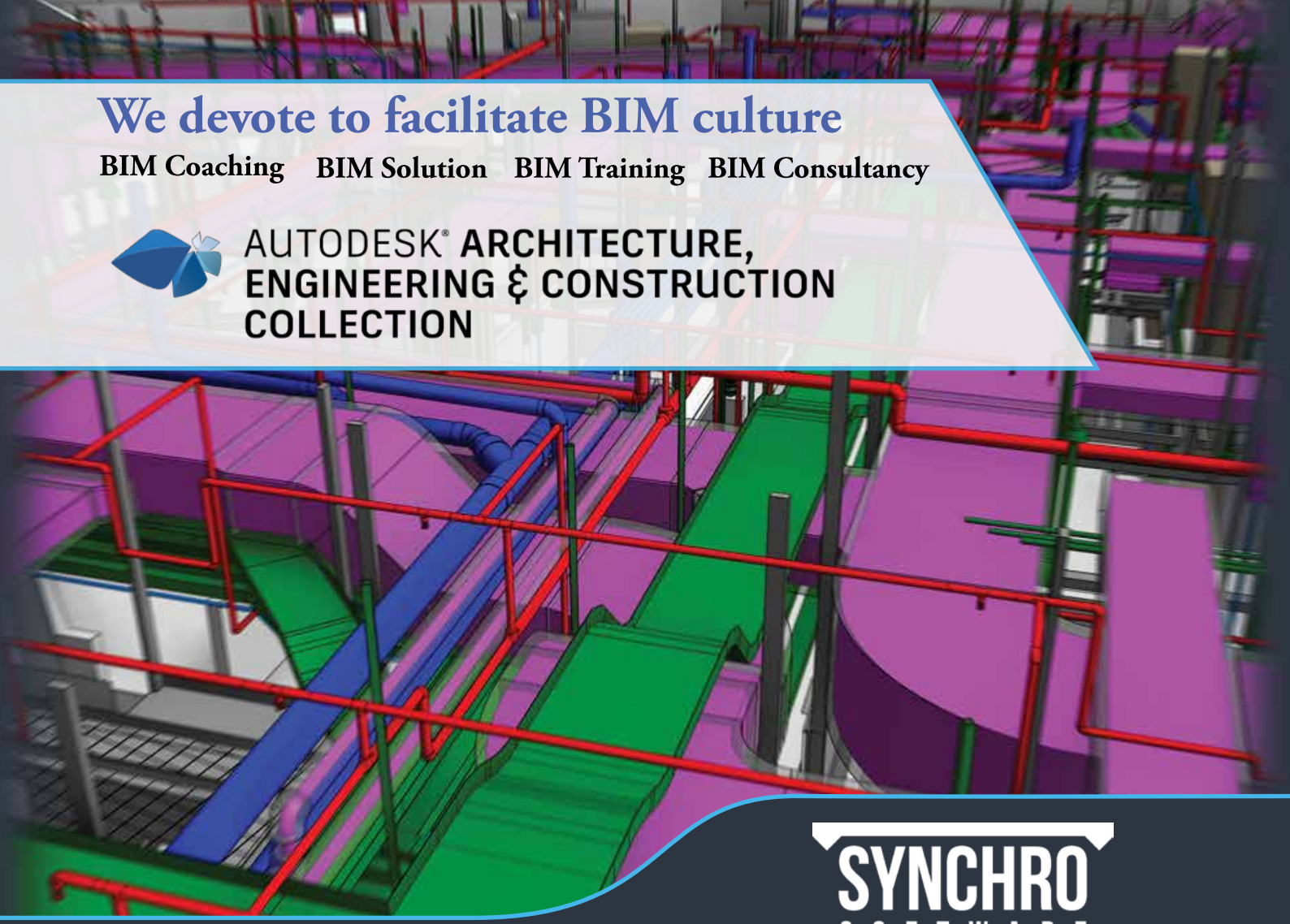
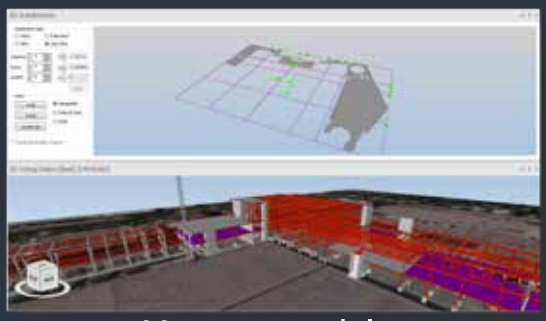
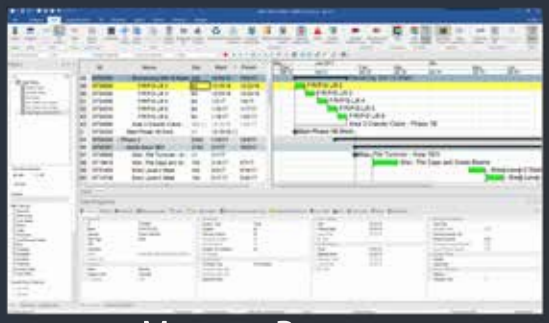


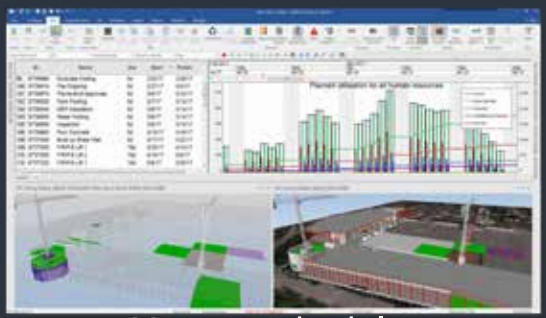
SYNCHRO SOFTWARE



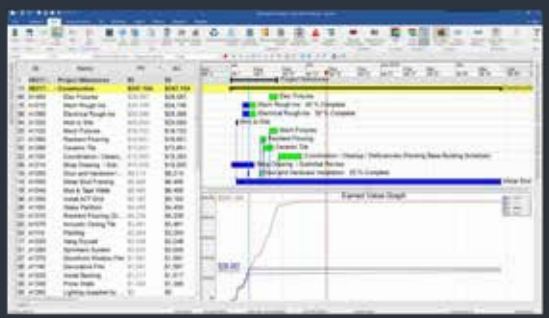
• Manage models



• Manage Resources



• Manage schedules



• Track Costs

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2018 榮獲HKIBIM Merit Award in Training Institution, 增設BIM交付管理課程系列, 強化業界實踐BIM標準

2017 增設課程 "BIM for Constrcution Managers", 讓工程管理者更有效融入BIM流程

2013 擴充BIM培訓系統, 常設MEP, Strcuture及Navisworks等課程, 讓學員更全面學習BIM應用

2012 成為Autodesk Ahthorised Academic Partner, 推動學界應用Autodesk軟件於專上教育。

2008 提供教授Revit的持續進修基金認可課程。同期亦引入Autodesk專家認證服務。

2007 榮獲Autodesk頒予香港區最佳認可培訓中心名銜。

2006 開設 Civil 3D 課程, 並獲持續進修基金認可。是本港最早期的BIM訓練課程

2003 Welkin Systems Limited 成為Autodesk Authorise Training Centre, 提供Autodesk認可培訓服務

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實時體驗・大膽構思・激情創作

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- Intel® 3D RealSense™ 攝影鏡頭適合實施創意工作的產品設計師、CAD 工程師和 3D 塑模師。
- Wacom Stand† 有助您改變三種舒適的工作姿勢，還可以折疊放平以方便出行。
- 數位筆上的 ExpressKeys™、觸控環（Touch Ring）和便利功能，使用者可藉此快速輕鬆地設定單鍵捷徑。
- Wacom 無線鍵盤† 是 MobileStudio Pro 以及您最愛的創意和辦公應用程式的完美伴侶。
- Cintiq Connect™ 技術可讓使用者將 Wacom MobileStudio Pro 連接至任何 Mac 或 PC，讓電腦成為標準 Cintiq 顯示器。

聯強國際

詳情請與相關銷售人員聯絡
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