

Autodesk Hong Kong BIM Awards 2016



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SPONSOR



SUPPORTING ORGANIZATIONS



ACKNOWLEDGEMENT

Sincere thanks to the awarded organizations - AECOM Asia Company Limited & Drainage Services Department of HKSAR Government, Architectural Services Department of HKSAR Government, CLP Power Hong Kong Limited, Drainage Services Department of HKSAR Government, Hip Hing Joint Venture and the honorable mentions - Architectural Services Department of HKSAR Government, Electrical and Mechanical Services Department of HKSAR Government, P&T Architects & Engineers Limited, Sun Hung Kai Real Estate Agency Limited, SUNeVision Holdings Limited, Water Supplies Department of HKSAR Government, in providing such valuable information and pictures of their projects. Besides, we are extremely grateful for the contributions of the AIAB committee and members, Mr. Simon Ng, Dr. Jack Cheng, Mr. Nelson Kwong, Mr. Thomson Lai, Ms. Erica Lam, Ms. Can Leung and Mr. Ken Mao who are profiled in this booklet.

DISCLAIMER

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The BIM Paradigm Shift Gathers Pace

Though the term BIM can seem deceptively simple - as if limited to creating virtual models of buildings complete with information on them, in practice it is an extremely wide ranging tool, with a wealth of applications.

At Autodesk, we define BIM as, “An intelligent model-based process that helps make design, engineering, project and operational information accurate, accessible and actionable for buildings and infrastructure.”

At the heart of BIM is data - information. While this typically includes structural design information, along with routings for building services and more, there is no limit to the data that might be within and associated with a model. Importantly, the data can be shared between all members of a project team, helping all stages of the project, from initial design through construction to maintenance.

Nor is BIM only for buildings, or architects. Worldwide, contractors are among the adopters of BIM, which is being increasingly employed for infrastructure. And as the winners of this year’s Autodesk BIM awards show, BIM is not just for mega projects: it can benefit small, unique construction projects, and asset management for existing facilities.

We are entering an exciting new age, which Autodesk calls the “Era of Connection”, where collaboration will occur in an unprecedented scale; virtually unlimited computing power will be made available via cloud computing; connectivity between screens and devices will change how people interact with interfaces and objects, while enabling them to contribute to projects from anywhere and at anytime. BIM is helping drive this change, enabling us to build smarter cities, work smarter, and live smarter.

Autodesk offers a suite of strategic products that offer the software and cloud-enhanced services needed to help meet the world’s growing demand for BIM, allowing firms who have adopted BIM to remain competitive and those seeking to move to BIM the flexibility to transition with greater ease.

On behalf of the Autodesk APAC and Emerging Markets team, I would like to congratulate all this year’s award winners, and thank all project teams for sharing their insights, which will surely inspire others who are eager to learn about the varied and exciting ways BIM can be deployed.

A blue ink handwritten signature, appearing to read 'Patrick Williams', written in a cursive style. The signature is positioned above the printed name and title.

Patrick Williams
Senior Vice President, Asia Pacific
Autodesk



At the Forefront of Greater China's BIM Adoption

Autodesk's vision is to help people imagine, design, and create a better world. And nowhere is this more evident than with BIM, which is helping to shape the towns and cities where we live and work.

Greater China is among the world's fastest-growing regions for adoption of BIM - and as the Autodesk BIM awards show, Hong Kong is at the forefront of developing and expanding the uses of this transformative, disruptive technology.

Agility, mobility, and connection are what today's technology is all about. Cloud computing, mobile technology, social connection and collaboration are the technology trends that will dominate the years to come. All are now integral to BIM, with virtual models incorporating a wealth of information that can be shared across project teams whose members might be in multiple locations worldwide.

As BIM technology connects more and more people to more complex projects, we're seeing global virtual teams and collaboration on a scale that was previously unheard of.

Yet as this year's award winners show, BIM is also transforming workflows for relatively small projects - enabling faster, smoother design processes, facilitating construction, and supporting facility management. Nor is BIM restricted to typical buildings like office towers. The award winners include a reservoir and associated piping, and in mainland China hydropower projects are likewise adopting BIM.

If you can build it, you can use BIM. And you can do so throughout the project lifecycle, gaining more profound insight - more accuracy, predictability, and precision - than was ever possible before.

Since our founding over 30 years ago, Autodesk has always helped its customers navigate profound eras of technological disruption and opportunity. We are here to offer every opportunity to leverage, explore and enhance the power of BIM.

In this booklet, you can read summaries of this year's Autodesk BIM award winning projects. I hope these success stories will inspire other companies and organisations that are deploying BIM.

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

A stylized, handwritten signature in blue ink, consisting of several loops and a long horizontal stroke extending to the right.

Richard Li

Managing Director, Greater China Region
Autodesk



The Boundless Possibilities of BIM

Every year, I greatly look forward to learning which projects will win the Autodesk BIM awards. They consistently show BIM is outstanding for boosting decision-making and productivity. Yet this does not mean the award winners are always uniform, perhaps predictable. Quite the contrary: the award winners are remarkably varied, reflecting the fact BIM has a versatility enabling uses way beyond 3D design.

This year's five winners span a project to design and build office towers, a unique outdoor performance stage, a pilot study on asset management, and building façade renovation with extensive use of bamboo scaffolding.

Yes – bamboo scaffolding! Using bamboo scaffolding is among Hong Kong's oldest construction methods, yet here it worked wonderfully well in tandem with technologically cutting edge design methods made possible by BIM.

As this and the other award winners help show, BIM is a highly versatile tool, and new uses for it are being continually discovered – including here in Hong Kong, where it was first introduced in 2002.

BIM is likewise evolving, incorporating the very latest developments in information technology, such as cloud computing, in turn further expanding the seemingly boundless scope of possibilities.

At Autodesk, we will continue supporting and encouraging such progress, as our suite of BIM related software helps designers and engineers in the creative process, so together we can help build a better world. We also applaud the BIM practitioners recognised in this year's Autodesk BIM Awards, including the seven receiving merit awards, and especially the five winning projects. Congratulations!

A handwritten signature in blue ink, appearing to read 'Wendy', with a stylized flourish extending to the right.

Dr. Wendy Lee

Country Sales Manager, Hong Kong and Macau
Autodesk

Autodesk Hong Kong BIM Awards 2016

Congratulations to the award winners, honorable mentions
and outstanding student projects!

AWARD WINNERS



HONORABLE MENTIONS



OUTSTANDING STUDENT PROJECTS

Yim Tak On
Chu Hai College of Higher Education

Keung Wun Ting - Iris, Mangal Mohit, Wang Ming Zhu - Annie, Wong Wing Man
The Hong Kong University of Science and Technology

Chen Keyu, Chen Weiwei, Li Kang, Tang Chung Hin
The Hong Kong University of Science and Technology

Award Winners



ORGANIZATION

AECOM Asia Company Limited
Drainage Services Department, HKSAR Government

PROJECT

Shek Wu Hui Sewage Treatment Works
- Further Expansion Phases 1A and 1B
- Design and Construction



ORGANIZATION

Architectural Services Department, HKSAR Government

PROJECT

Eastern District Cultural Square



ORGANIZATION

CLP Power Hong Kong Limited

PROJECT

Refurbishment of External Façade at CLP Shatin Centre



ORGANIZATION

Drainage Services Department, HKSAR Government

PROJECT

Adoption of Knowledge-based Building Information Modeling for E&M Asset Management Supplemented with Mobile Technology - A Case Study in Public Sewage Pumping Facilities



ORGANIZATION

Hip Hing Joint Venture

PROJECT

Design and Construction of West Kowloon Government Offices in Yau Ma Tei

COMPANY

AECOM Asia Company Limited (AECOM)
Drainage Services Department, HKSAR
Government (DSD)

PROJECT

Shek Wu Hui Sewage Treatment Works
- Further Expansion Phases 1A and 1B
- Design and Construction

LOCATION

Sheung Shui, Hong Kong

TYPE

Sewage Treatment Works Design and
Construction and Hand-over to Facilitate
Facility Management During Operation

SCHEDULED TIME OF COMPLETION

Project duration 2015-2025 (tentative)

Sewage Treatment Works Makeover Boosted by BIM

“The best practices developed during this project will be used to implement BIM in wastewater treatment works worldwide. By using BIM we are confident the complex design is viable and as a result we can reduce rework and coordination issues and also improve safety during construction and operation.”

—Jugal Makwana
BIM Director, Asia Pacific



One of The Initial Architecture Schemes of SWHSTW Expansion
Image courtesy of AECOM Asia Company Limited

DSD and AECOM explore benefits from the use of 3D design while working on the first large scale sewage treatment works project to follow a BIM approach.

Shek Wu Hui Sewage Treatment Works (SWHSTW), in North District of Hong Kong, is operated and maintained by DSD. It was commissioned in 1984, and AECOM was contracted to provide design and construction services for an expansion and upgrade of the facility.

Tight space, previous upgrades

The project's major challenges include a very limited construction space in which to perform an in-situ upgrade and expansion. The project was further complicated by performing work in a live plant. Mr. W.W. Lau, Senior Engineer of DSD reports, “the SWHSTW expansion is a very challenging project. We have to double the treatment capacity within an existing footprint plus a small adjacent site, and we have to maintain the daily sewage treatment operation with incoming sewage already reaching 90% of the plant's capacity.

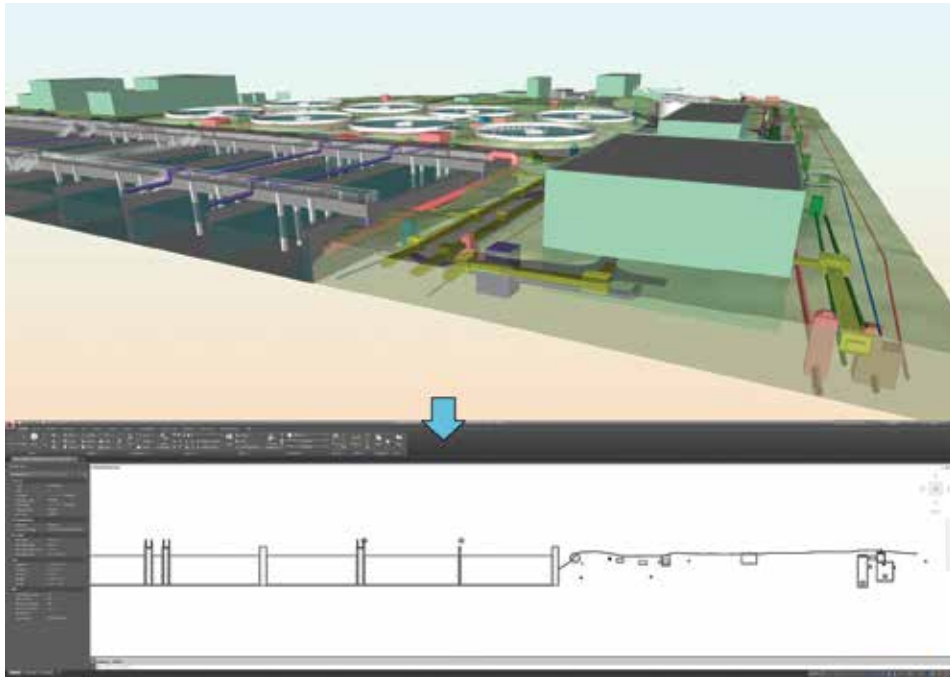
There are five treatment trains that have to be upgraded one by one. Plus, there is a tight construction programme to meet

the rapidly increasing sewage flow from nearby new developments. Through the implementation of BIM in this project, we can plan ahead to avoid potential conflicts in the design and to have a clear picture of the upcoming construction programme to minimize impacts to existing plant's performance.”

There were several previous upgrade projects conducted in the existing SWHSTW, which meant the BIM model had to pull information from the three previous expansion projects and the current design in order to show the site in one single 3D model. The visualisation helped resolve the contradicting information and align the current project with previous construction phases. “This is one of the first large scale sewage treatment projects delivered globally that is using a BIM approach.” says Echo Leong, AECOM's Executive Director, Water & Urban Development. “We worked closely with DSD to help define how BIM could improve project delivery, reliability and safety.”

From sketches to 3D visualisation

The design team began with simple sketches, then developed the design further using BIM models. AECOM's Water



Produce Detailed Utilities Elevation Drawings from 3D BIM Models to Ensure Constructability and Improve Visualisation
Image courtesy of AECOM Asia Company Limited

and Urban Development engineering team brought together design models from each discipline including that of the surrounding topography using latest laser point cloud technology. The highly detailed master model provided an excellent 3D visualization for the client and other stakeholders, which eliminated the need for extensive coordination meetings - as would have been required in a traditional process in 2D.

AECOM set up a BIM enabled collaboration platform as a common data environment that allows all project stakeholders and our client to access and interact with the most up-to-date project information, which is in turn federated out to the master BIM model.

Using 3D model was an advantage in helping show where the different services connected including at what depths and along which angles they connect. "With BIM, we could visualise whether the design was buildable" explains Ms. Can Leung, Senior BIM Manager, AECOM. "It makes it easy to visualise complicated aspects of the design with our client and the project team."

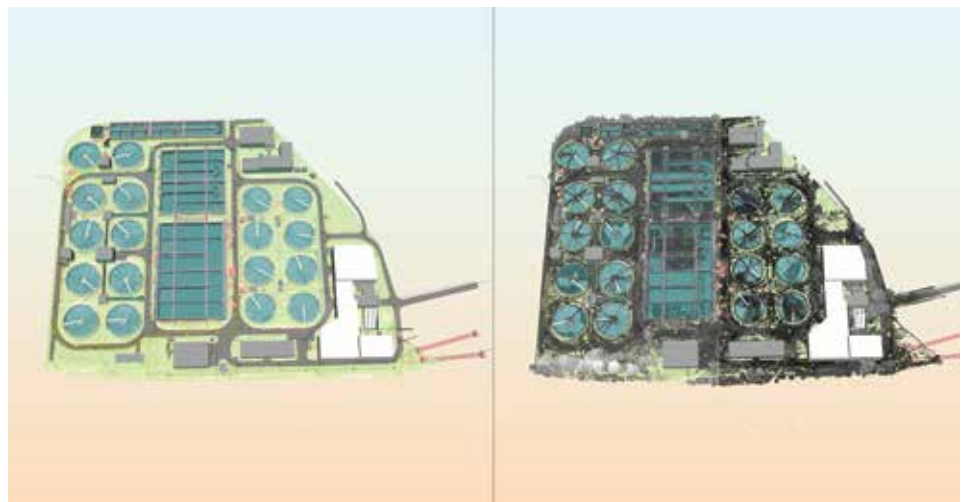
Using BIM also helped save a lot of time that would have otherwise been required for creating 2D drawings. For instance, changing a simple pipe inlet of a treatment building structure could affect a whole series of drawings - yet Ms. Leung notes that the BIM models allowed the automatic creation of a batch of drawings with accurate coordinates.

Critical site locations

The team anticipated that BIM would especially help the coordination between civil, structural, process and mechanical disciplines for construction near the

existing inlet works facilities, where multiple underground utility diversion would be required, and the on-going operation of the overall facility could not be affected. The model allows identification of critical site locations through illustrating the construction sequences step-by-step, and identifying areas to improve safety during construction, operation and maintenance.

"We needed to visualise where the pipes would go", says Ms. Leong. "Determining their arrangement is much clearer in 3D - otherwise, it would require piles of design drawings." By using the as-built drawings from previous upgrades incorporated into a set of federated Revit models, engineers were able to review conditions for rerouting existing pipes and laying new pipes along critical paths, without affecting the sewage treatment works' performance.



Cross-Reference Design Model with Existing Site Conditions to Ensure Consistency
Image courtesy of AECOM Asia Company Limited

The improved centralisation of project information in a common data environment server allowed each discipline to instantly gather synchronised, up-to-date design information. This greatly optimised the decision making process.

Modelling equipment and informing the public

Working from scratch, the design team also created a library of equipment models for sewage / water treatment works. This enabled the engineering team to size up or size down an item of equipment with minimal input.

Another use of the BIM models is as a major tool for public outreach to gain support for the project. The visual element of the model makes it easier to communicate as the public could participate in a virtual flythrough of the sewage treatment works, which allows the other project stakeholders to better



Digital Catalogue of Re-usable Parametric STW Equipment Revit Model Family Allowing Easy Model Adjustment for Specific Applications
Image courtesy of AECOM Asia Company Limited

understand the proposed design - it was easier to convey the innovations and benefits brought by this project, and showcase the finished plant facilities.

Towards a virtual model of the upgraded plant

The information from the BIM models will be incorporated into DSD’s Facility Management system, including scans of existing facility and equipment. It will require careful planning, partly to identify the configuration requirements for the model attribute fields to best suit the plant operators’ needs during the operation and maintenance stage.

After being painstakingly verified, the BIM model will work as a virtual model of the upgraded plant, much like a set of as-built drawings but with much greater ease of use for the operators to locate a specific item of equipment and extract the relevant information within a virtual 3D environment.

It is also proposed to include QR code in as-built models, so operators can use mobile devices to swiftly obtain information on equipment while on site. “DSD looks forward to the benefits of the incorporation of BIM technologies in our asset management system that will return a more reliable and secure sewage treatment services to the community,” says Mr. Lau.

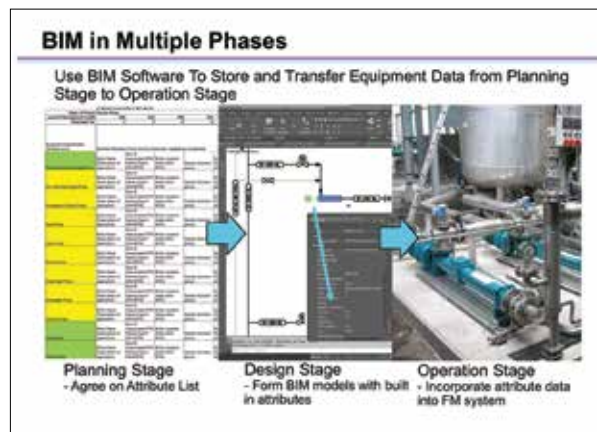
BIM for error free sewage treatment works and more

“We are working towards implementing BIM in other sewage treatment works worldwide, and the best practices developed here will be shared with other teams,” says Mr. Makwana. DSD would also like to have this showcase project as an example of best practices for their upcoming projects.

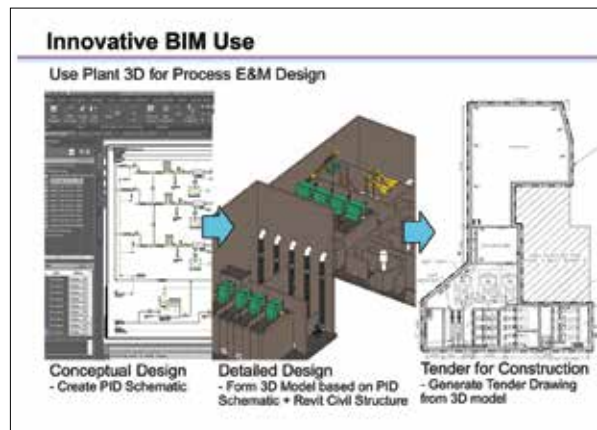
Though AECOM now wants to use BIM in all projects and would like to promote BIM practices in the industry, Mr. Makwana says the entire civil engineering and construction industry has a steep learning curve ahead, especially as clients currently may require delivery of 2D drawings following traditional processes as well as BIM information models.

“Generally, clients expect zero clashes when BIM models are used,” says Ms. Leung, “But it would be more beneficial

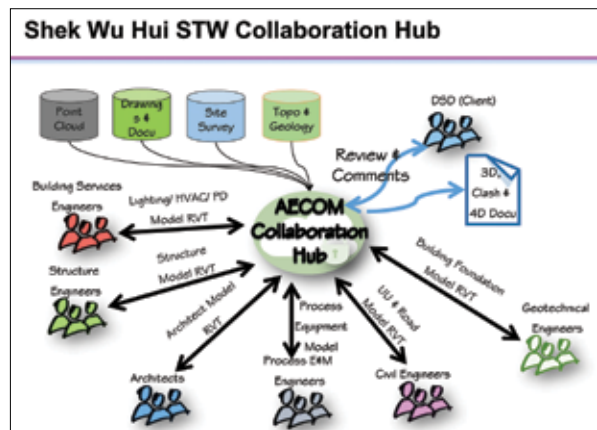
to employ the concept of error free BIM, with defined tolerances, sufficient clearance and sufficient maintenance space. BIM is an excellent tool for public engagement - as the models are visual, clear and easy to understand and can be used through future operation and maintenance cycles.”



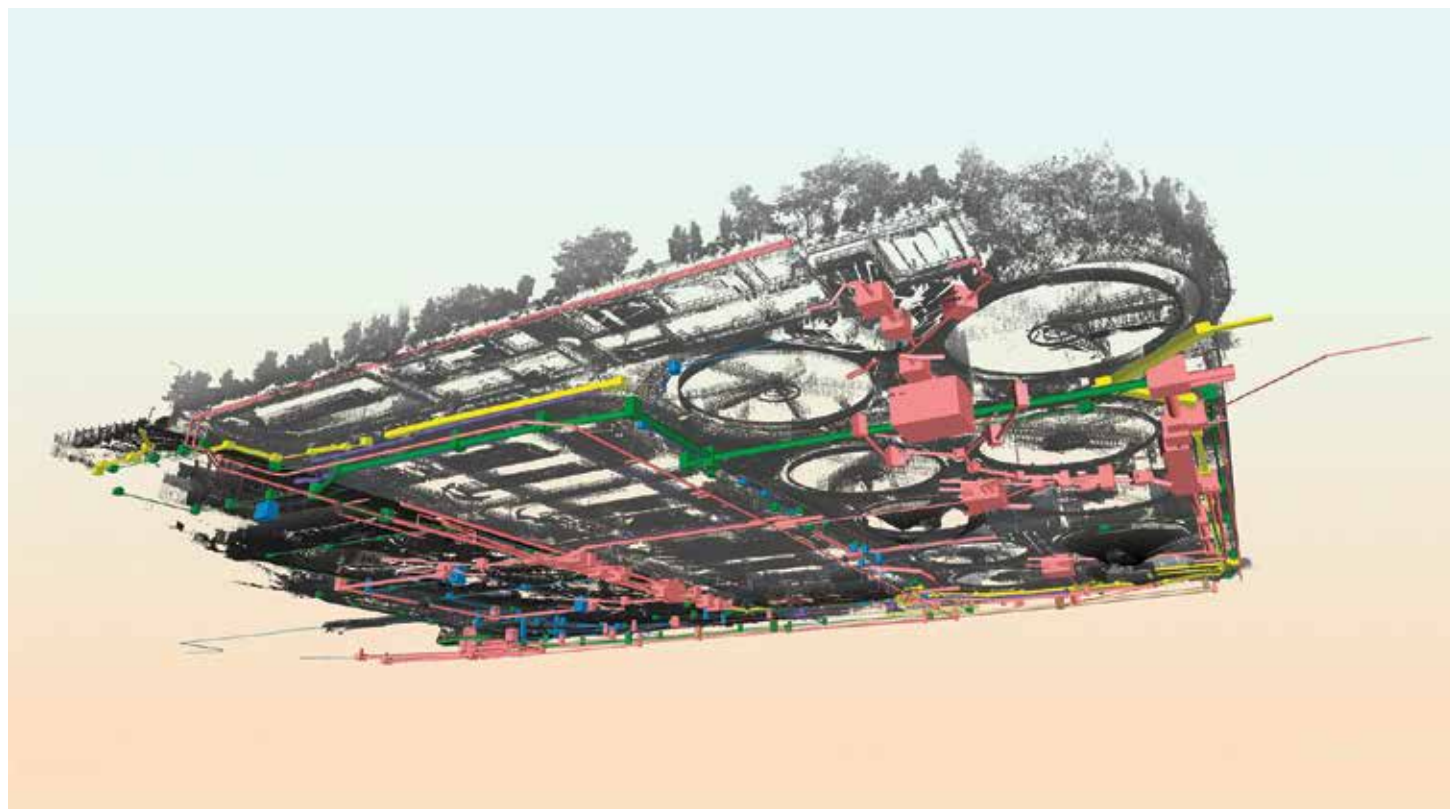
Use BIM Software To Store and Effectively Transfer Equipment Data from Designers to Contractors to Operators
 Image courtesy of AECOM Asia Company Limited



Use Plant 3D for Streamlined Process Electrical and Mechanical Equipment Schematic and 3D Design and Tender Drawing Production
 Image courtesy of AECOM Asia Company Limited



Common Data Environment Server for Efficient Data Management
 Image courtesy of AECOM Asia Company Limited



Precision Point Cloud Scans Combined with Revit Model to Virtually Recreate Existing Plant Facilities
Image courtesy of AECOM Asia Company Limited

AECOM Background

AECOM is built to deliver a better world. We design, build, finance and operate infrastructure assets for governments, businesses and organizations in more than 150 countries. As a fully integrated firm, we connect knowledge and experience across our global network of experts to help clients solve their most complex challenges. From high-performance buildings and infrastructure, to resilient communities and environments, to stable and secure nations, our work is transformative, differentiated and vital. A Fortune 500 firm, AECOM had revenue of approximately \$18 billion during fiscal year 2015. See how we deliver what others can only imagine at aecom.com and @AECOM.

Drainage Services Department Background

Established in 1989, the Drainage Services Department (DSD) has been committed to providing Hong Kong with a world class wastewater treatment and stormwater drainage services. About 93% of the population are now served by the public sewerage system, which includes about 1,700 kilometers in total length and around 300 sewage pumping stations and treatment facilities collecting and treating 2.8 million cubic meters of sewage per day. Flooding risks have been greatly reduced and flooding black-spots have been reduced from 90 in 1995 to 8 in 2016.

COMPANY

Architectural Services Department,
HKSAR Government

PROJECT

Eastern District Cultural Square

LOCATION

Shau Kei Wan, Hong Kong

TYPE

Public Open Space and Amphitheatre

SCHEDULED TIME OF COMPLETION

2018

BIM Enables Sound Checks and More for Signature Project

“BIM allowed accurate specification of sizes and costing. Also, we used BIM to test whether more identical panels can fit the design, and eventually standardised 30 percent of the panels.”

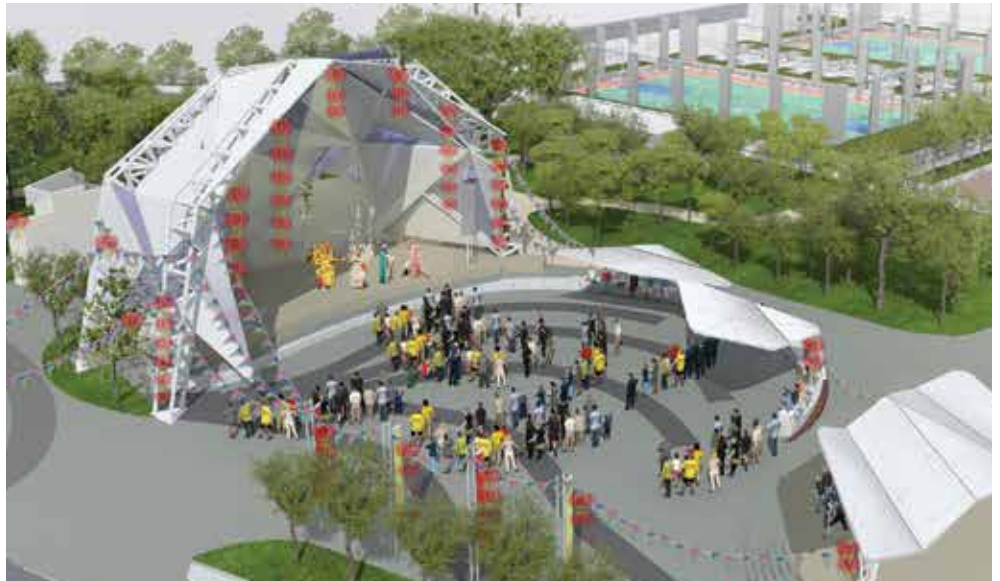
—Kevin Li

Senior Architect, Architectural Services Department

BIM PARTNERS INVOLVED

Shen Milson & Wilke Limited

Advanced Construction Information Development Limited



Overall view of Eastern District Cultural Square
Image courtesy of Architectural Services Department, HKSAR Government

Complex amphitheatre set to host events delighting audiences while not disturbing neighbours - through design made possible by BIM

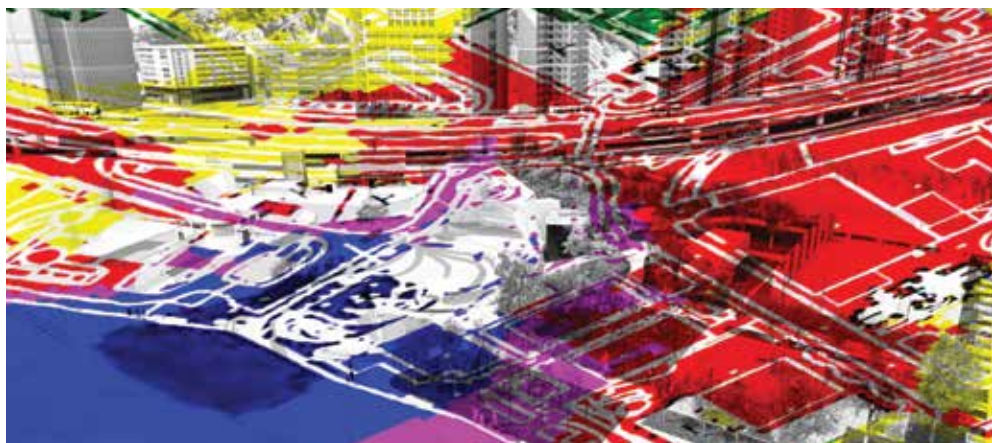
Eastern District Cultural Square is a signature project in Eastern District, aiming to revitalise the waterfront by attracting more visitors – notably by featuring an outdoor performance stage with canopy, together with a square for up to 1000 spectators. The project design is by the Architectural Services Department.

“You rarely find outdoor theatres, due to the low efficiency of sound barriers,

and typically poor sound quality,” says Helen Wong Hoi-ming, Project Architect, Architectural Services Department. But for this stage, the design team is employing BIM to minimise excess sound, optimise sound quality for the audience, while ensuring the structure is buildable and can be completed within budget. “From sketches to detailed design to the tender stage, the entire project embraces BIM,” says Ms Wong.

Optimising sound and vision

A major challenge for the project is to design an effective shelter for the outdoor



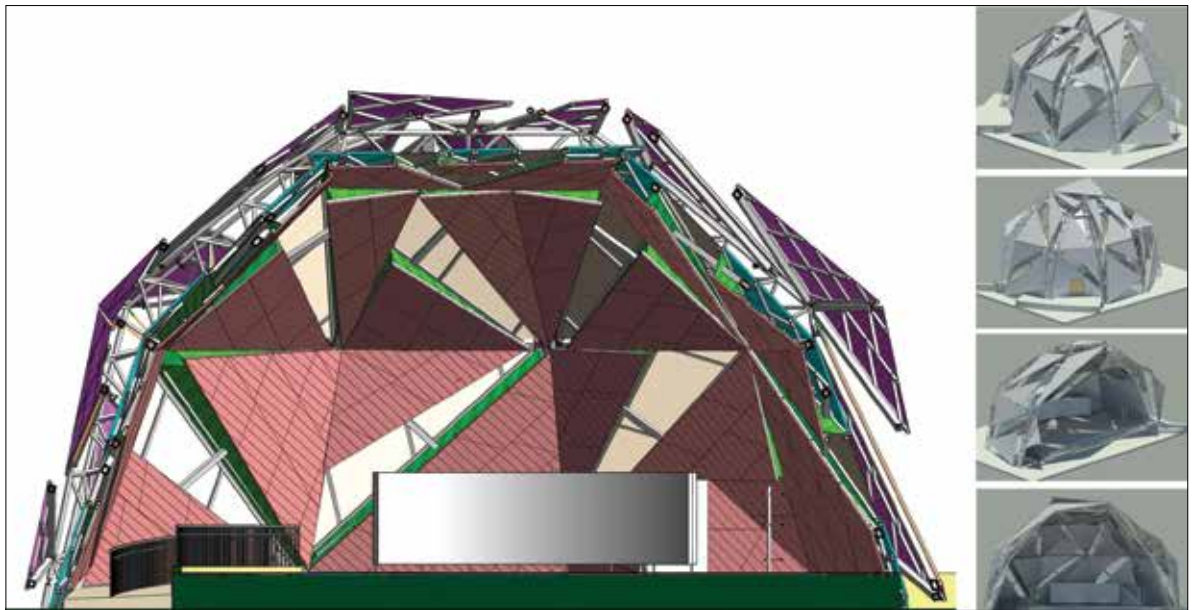
Noise mapping output for noise level distribution at noise sensitive receivers
BIM is used as a tool to select the types of music acceptable for this cultural square
Image courtesy of Architectural Services Department, HKSAR Government

amphitheatre. This will mainly comprise an acoustic aluminium cladding system, which will minimise sounds reaching nearby noise sensitive receivers including a temple, a school and residential premises.

“The acoustic consultant used BIM models to check and ensure the geometry is correct to evaluate the impact of different kinds of music - finding pop, jazz and Chinese opera are okay, but there should be no rock music,” says Ms Wong. “They also tested different forms, such as with walls to serve as noise barriers.”

Also using the model, the consultant checked different arrangements of speakers, verifying there will be a balance of reflection and absorption to achieve optimum sound quality. “Using BIM enhances precision of the design,” says Ms Wong.

Using a process that was only possible through using BIM, the team also tested glazing with different opacity levels, to



Combining noise barriers of different heights and roof design to achieve the most optimal noise barrier performance. The use of steel structure minimise building bulk Image courtesy of Architectural Services Department, HKSAR Government

achieve the optimal stage lighting effect.

BIM copes with complex shape

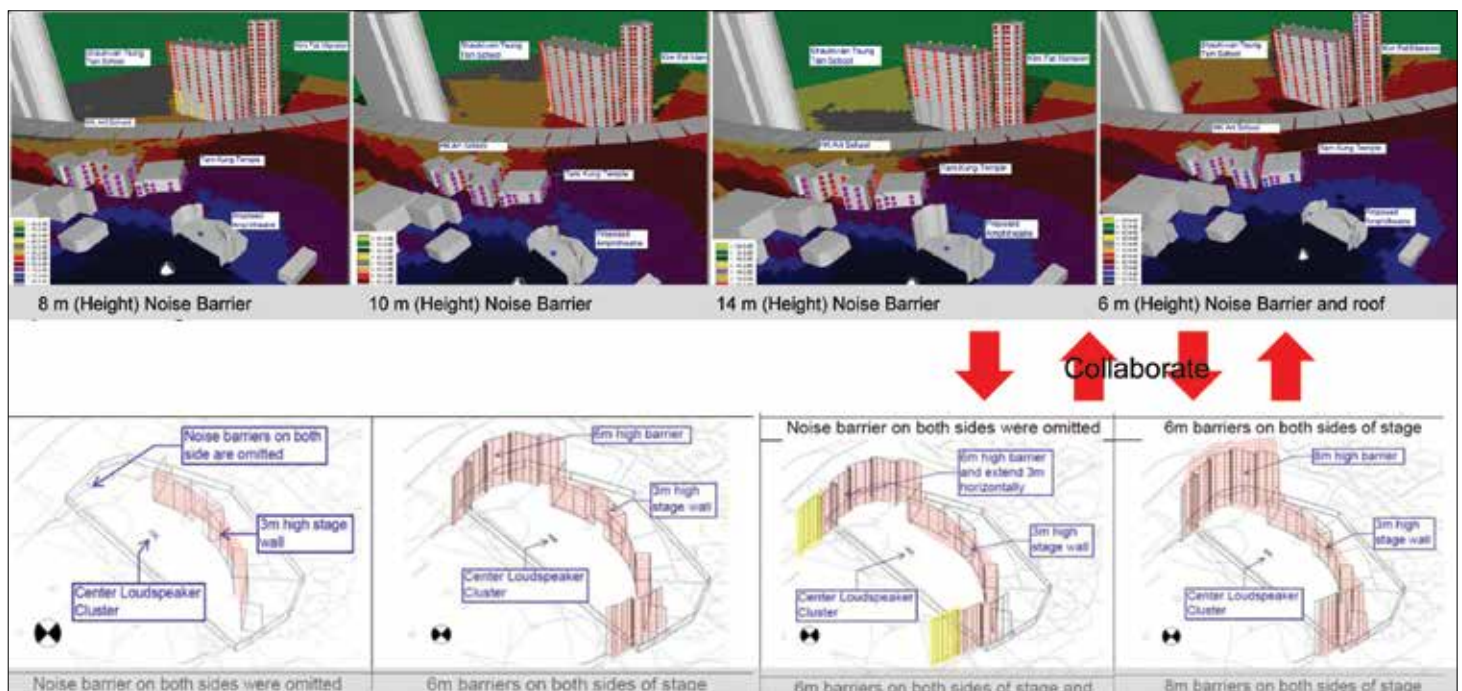
The amphitheatre shelter has a complex shape, which would be extremely challenging to design using traditional 2D drawing – requiring not only technical skills, but also extreme imagination.

“Different elements form different planes,” says Lau Tat-ying, the Design Team Leader of the project, Architectural Services Department. “Determining elements’ lengths, angles, and how they are fixed into each other could not be done in 2D drawings. With BIM, we

show the real situation of how they join together, and can ‘explode’ views of certain elements.”

During the design stage, when the designed structural members and aluminium panels were integrated in the BIM environment, the sizes of certain structural members were too slim to anchor aluminium panels attached to them. The design team corrected the sizes, and verified the connections - solving an issue that in traditional practice would have only been discovered during construction.

The BIM model was also employed in



Acoustic Analysis with the help of BIM to determine the most appropriate Architectural Form Image courtesy of Architectural Services Department, HKSAR Government

analysis to ensure the shelter will be structurally sound, and a maintenance platform can be used.

Effective costing with BIM

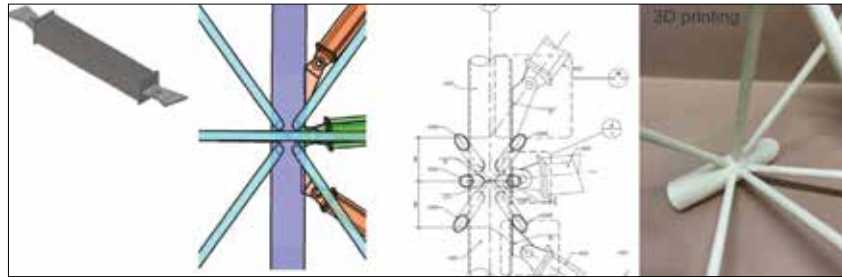
By employing BIM, the project team specified the design accurately, minimizing the need to include a risk premium for uncertain design details.

Plus, it was also possible to provide detailed specifications for structural elements, and standardise as many as possible, to further optimise the project cost. "The panels are tilted, so there's no way to determine their sizes and costs in 2D design," says Kevin Li, "But BIM allowed accurate specification of sizes and costing. Also, we used BIM to test whether more identical panels can fit the design, and eventually standardised 30 percent of the panels."

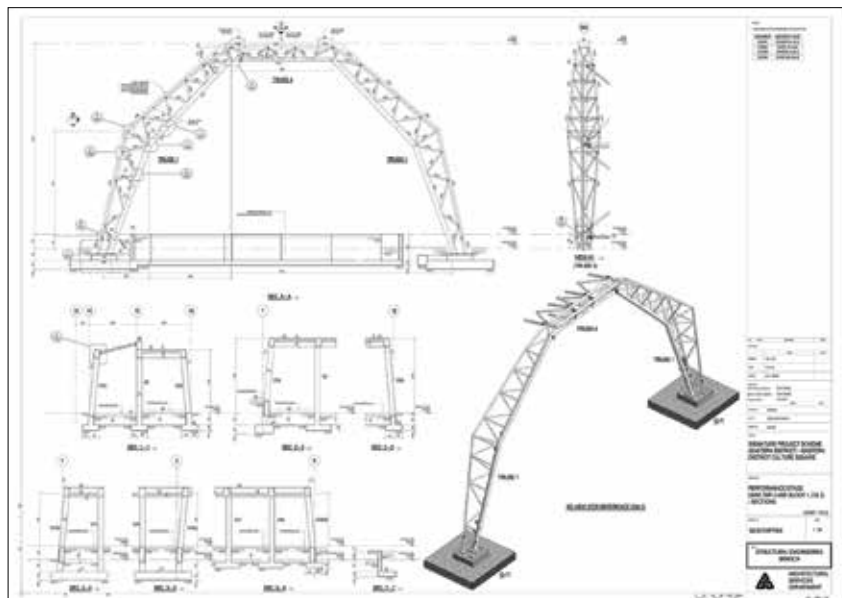
Visualising aided by 3D printout

Drawings from the BIM model can help the project team members and the contractors understand the design easily and hence avoid misunderstandings. Plus, physical models of designed members have been produced by 3D printing, enabling project team members to fit them together rather like jigsaw pieces, and optimise their design to greatly enhance the buildability of the project.

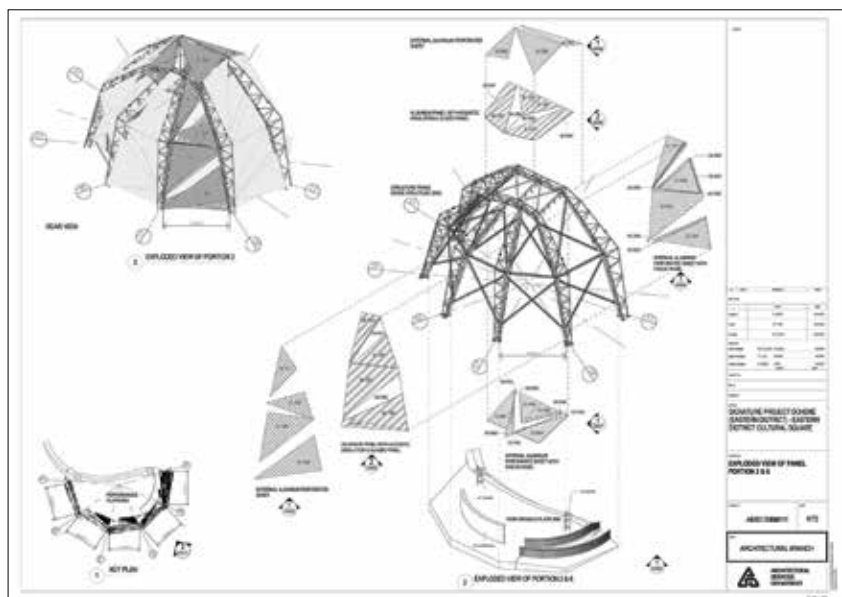
The team also created a 3D printout of the entire amphitheatre shelter design, which is an accurate scale model that sits on the palm of a hand. The Home Affairs Department, a key project client, has been impressed by this along with the drawings - without which, they may not have really appreciated the design until the shelter was built. "Also, we brought the 3D printout to a District Council meeting, where the District Councillors passed it round," says Mr Lau "They loved it."



3D printed connection details are used to test the buildability
Image courtesy of Architectural Services Department, HKSAR Government



Structural tender drawings and statutory submission drawings are prepared by Revit
Image courtesy of Architectural Services Department, HKSAR Government



Architectural tender drawings are prepared by Revit. Different layers of cladding are demonstrated in 3D in tender drawings
Different from traditional drawings, 3D Visualisation in tender drawings allows better communication with tenderers
Image courtesy of Architectural Services Department, HKSAR Government



Overall view of Eastern District Cultural Square
Image courtesy of Architectural Services Department, HKSAR Government

About Architectural Services Department, HKSAR Government

Architectural Services Department (ArchSD) performs the following three core functions in relation to Government-owned and Government-funded facilities:

- 1) Monitoring and advisory services;
- 2) Facilities upkeep; and
- 3) Facilities development.

Architectural Services Department (ArchSD) of the Government of Hong Kong SAR commits to provide quality services to the public which performs monitoring and advisory services, development and upkeep of government-owned buildings and facilities since 1986. ArchSD promote best practices in the building industry with quality professional advisory services to ensure the quality and sustainable development of community facilities. In recent years, ArchSD projects received some recognition including but not limited to the Hong Kong Institute of Architects Annual Awards, the Hong Kong Institute of Landscape Architects Design Awards, Quality Building Award and Green Building Award.

COMPANY

CLP Power Hong Kong Limited

PROJECT

Refurbishment of External Façade at CLP Shatin Centre

LOCATION

6 On Lai Street, Shatin, New Territories, Hong Kong

TYPE

Building Refurbishment

SCHEDULED TIME OF COMPLETION

2016

BIM Can Do For Bamboo Too

“We want to challenge the belief that BIM is only for mega projects, it matches our values, our concern for safety. The subcontractors really appreciate our work, which has been eye opening for them.”

—Mr C.L. Mak
Deputy Director
- Substation Implementation,
CLP Power

BIM PARTNERS INVOLVED

David S. K. Au & Associates Limited
isBIM Limited



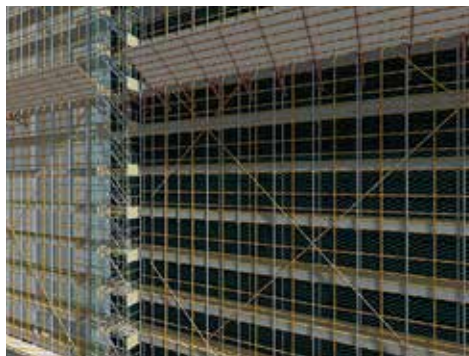
General view of CLP Shatin Centre (with Bamboo Scaffolding) in BIM
Image courtesy of CLP Power Hong Kong Limited

CLP Power finds that BIM delivers benefits even when employing seemingly humble bamboo scaffolding to refurbish a building façade.

To repair the external wall of a high rise building, CLP Power needed to erect scaffolding that would be around 120m high, for workers to inspect and repair the external wall of the building. They adopted BIM to tackle the many challenges.

BIM for safety and cost management

After a survey and assessment revealed the need to improve the situation with the external wall of their Shatin Centre, CLP Power anticipated a variety of challenges



Bamboo scaffolding with metal staircase in BIM
Image courtesy of CLP Power Hong Kong Limited

- notably, ensuring safety. Rather than keeping to traditional methods for a project of this type, they opted to use BIM.

“Usually when BIM is employed for a new project, it’s for a mega project,” observes Mr C.L. Mak, Deputy Director - Substation Implementation, CLP Power. “But we have unique business needs, and put safety as top priority. This type of work is high risk, and another priority is cost management. We wondered: could we employ BIM to address the two areas? We tried, and found it very useful.”

The project team conducted an infrared survey in advance to have a high level estimate on how many tiles needed refurbishing. However, an accurate assessment by other means is reviewed to quantify the refurbishment work and scaffolding work required.

Surprising with safety first approach

“We used a BIM based system to optimise the scaffolding, and found which was best for the project in terms of stability, safety and cost,” says Jackson S.K. Chung, Engineer I, CLP Power. “This was a hybrid system with metal and bamboo scaffolding - primarily bamboo, but for critical places and stability we employed metal.”



Bottom view of CLP Shatin Centre (with Bamboo Scaffolding) in BIM
Image courtesy of CLP Power Hong Kong Limited

Both the main and subcontractors were amazed by CLP Power employing BIM to help them work safely. "We want to show the extent we care, and used this project as a chance to learn best practices," says Mak. "We used video files - with

simple animations - for discussions, and found that younger workers were more accepting of new things like this."

A lot of people who were involved in the project visited the construction site, to check progress - and Mak says they were encouraged to go out onto scaffolding. Before doing so, they were given training, with the BIM model used to show what they were going to do, without which it would have been too much of a risk to walk out.

Jackson was among project team members venturing onto the scaffolding, and says, "We felt more comfortable thanks to employing BIM technology."

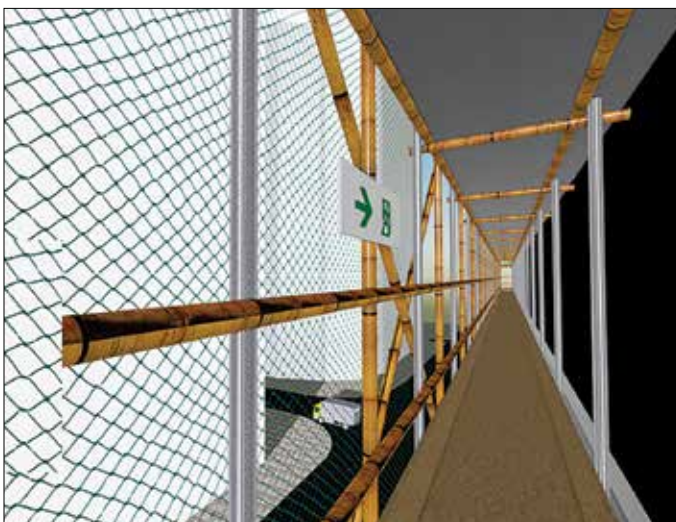
Monitoring costs, and informing stakeholders

As work proceeded, information was added to the BIM model, allowing the project team to closely monitor refurbishment work, and use data to prioritise issues.

"When tiles were refurbished on site; we updated the BIM model for cost monitoring," says Arras Yeung, Architect, CLP Power.

Also, before the scaffolding was erected, the BIM model allowed close calculations of actual numbers of metal and bamboo poles, and couplers, that would be needed - and the quantity take off allowed peace of mind regarding the scaffolding cost.

Virtual models of the work enhanced communications within the project team, and with stakeholders - such as through a virtual model of temporary precautionary and protection measures at entrances of the building, to better inform building occupants.



Proper access with fire escape sign inside Bamboo Scaffolding
Image courtesy of CLP Power Hong Kong Limited



Paperless Inspection by Electrical Recording System
Image courtesy of CLP Power Hong Kong Limited



Sharing of BIM with frontline staffs during Regular Progress Meetings
Image courtesy of CLP Power Hong Kong Limited

On schedule, and a showcase for the future

As well as planning safety, the BIM model ensured the project team could keep to a tight schedule, with 3D animations clearly showing how work would progress. The project was completed within five months, ending well in advance of typhoon season.

“CLP Power is responsible for the whole asset life cycle of the Shatin Centre,” says Jackson. “Now, we can build up the BIM model with more information, to cover more of the building life cycle.”

CLP Power also aims to promote this project to the industry, especially showing how BIM can help with safety. “We want to challenge the belief that BIM is only for mega projects,” says Mak. “It matches our values, our concern for safety. The subcontractors really appreciate our work, which has been eye opening for them.”



Covered walkway to enhance safety of pedestrian in BIM
Image courtesy of CLP Power Hong Kong Limited

About CLP Power Hong Kong Limited

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

COMPANY

Drainage Services Department, HKSAR Government

PROJECT

Adoption of Knowledge-based Building Information Modeling for E&M Asset Management Supplemented with Mobile Technology - A Case Study in Public Sewage Pumping Facilities

LOCATION

Ma On Shan Area 108 Sewage Pumping Station, Sai Sha Road, Ma On Shan, Shatin, Hong Kong

TYPE

Knowledge-based BIM-integrated E&M Asset Management

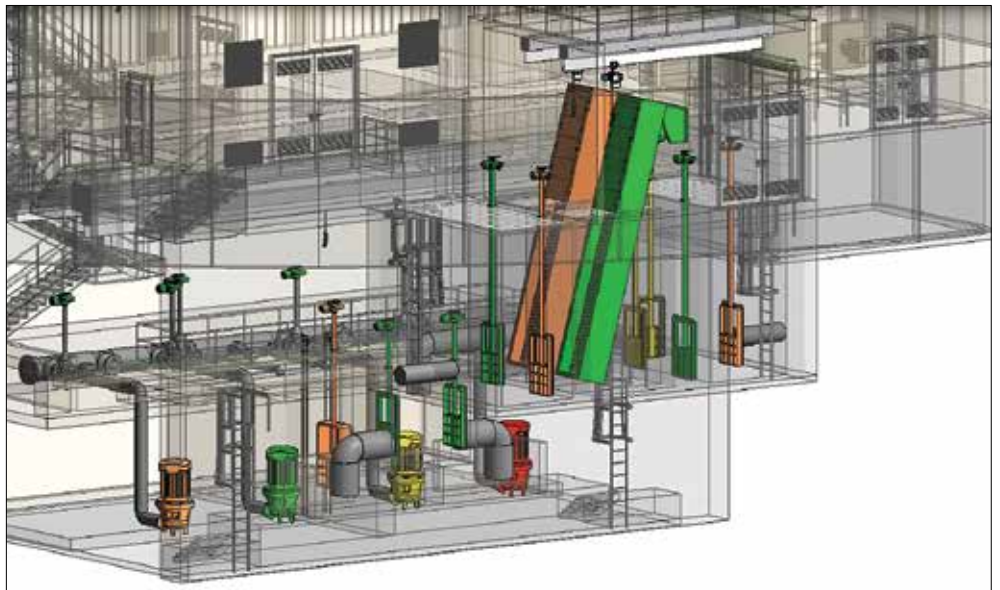
SCHEDULED TIME OF COMPLETION

Nov 2014 to May 2016

Drainage Services Getting Pumped About BIM

“We have discussed what the model should include, with maintenance staff - there are lots of workflows, and we need to compromise and streamline the process by merge & convert approach so they will be happy to use BIM-integrated platform.”

—Dr. Jeff H. Tse
Electrical & Mechanical
Engineer, Drainage Services
Department



Color-coded asset health index in BIM model
Image courtesy of Drainage Services Department, HKSAR Government

Hong Kong's Drainage Services Department discovers BIM can deliver benefits for asset management in trial study of sewage pumping station.

The Hong Kong Drainage Services Department is adopting BIM technology with mobile solutions in an in-service three-storey Ma On Shan Area Sewage Pumping Station, for BIM-integrated maintenance of 15 types of E&M assets. This is the first trial study in the department by in-house staff to implement BIM technology in E&M asset management of an in-service sewage pumping station.

BIM to resolve a data tsunami

“BIM has a lot of different functionalities, but while a lot of stakeholders use it for things like minimising clashes and construction sequencing, we are more concerned about employing digital data for asset management,” says Dr. Jeff H. Tse, Electrical & Mechanical Engineer, Drainage Services Department. “We want to learn how to manage this kind of big data, and resolve our problem with a data tsunami.”

This data includes information on around 360 types of E&M asset system in 290 nos. sewage handling and treatment facilities.

While the emergence of BIM could help to create updated digital asset data for long-term data storage and management, there is no role model for E&M-related BIM data standards. “The problem we had to resolve at the start of the modelling work is that the BIM model fundamentals may not be well defined and standardised in design stage, potentially leading to digital asset information loss when progressing between different life cycle stages,” says Dr. Tse.

A key focus in the study was setting up the standardisation process in creating digital AM-compatible asset numerical and textual data to tally with the department's ISO 55001 specific classifications, fulfilling the parent-child relationships among different model elements. The data would be stored in COBie structured format, and the project team have drafted an internal BIM guide for department use.

BIM model for the pilot plant

The project team began by building the BIM model from LOD (Level of Development) 100 up to LOD 500 for the Ma On Shan sewage pumping station. They also configured the BIM model with AM-compatible asset data mapping.



The digital asset information embedded in each model element
Image courtesy of Drainage Services Department, HKSAR Government

The team also adopted a somewhat streamlined version of asset management, with five common workflows that are normally executed during construction and O&M stages: site management tracking; site safety/environmental inspection; defect reporting and management; equipment functional testing/inspection; and material-on-site inspection.

Friendly user interface

“We can provide a friendly user interface, and have learned how to employ digital data so it can be used by O&M staff,” says Dr. Tse. “This in turn means they can help the management become more informed for making decisions.”

Without BIM, the O&M staff can perform many inspections,

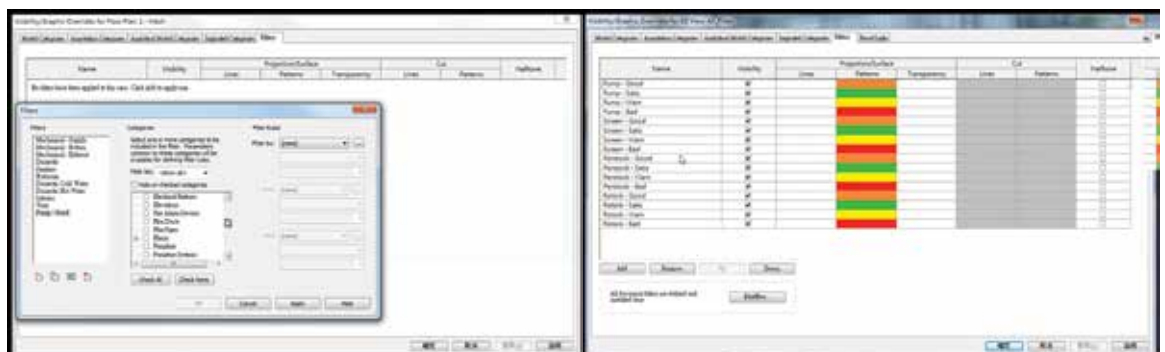
recording the data in paper form. This in turn leads to a mass of information in paper form, which is time consuming to search through. But through the project, the staff will be able to integrate a BIM assisted workflow into asset management.

“We have discussed what the model should include, with maintenance staff - there are a lot of workflows, and we need to compromise so they will be

happy to use BIM, and record information electronically through the BIM platform,” says Dr. Tse. Introducing BIM can supplement the in-service maintenance and management system for asset health monitoring, with the knowledge domain embedded in BIM.

Fault tree concept

The project team adopts a fault tree concept, in which data on identifiable fault symptoms on critical E&M assets



Filtering criteria values with required color patterns in Autodesk Revit software
Image courtesy of Drainage Services Department, HKSAR Government

can be consistently recorded through BIM-integrated mobile applications using the predefined electronic asset inspection form. This enables a combination of digital information and the operations staff's expert knowledge.

With sewage pumping stations, the maintenance staff know the types of critical incidents to avoid. "For instance, they have to avoid sewage bypass, and which key assets may contribute to such an incident," says Dr. Tse. "If we know there can be two or three faults, we can digitise these to e-form, integrated in the BIM model, and then gather statistics on failure rates. The data can then help with more informed maintenance decisions."

Faster with BIM

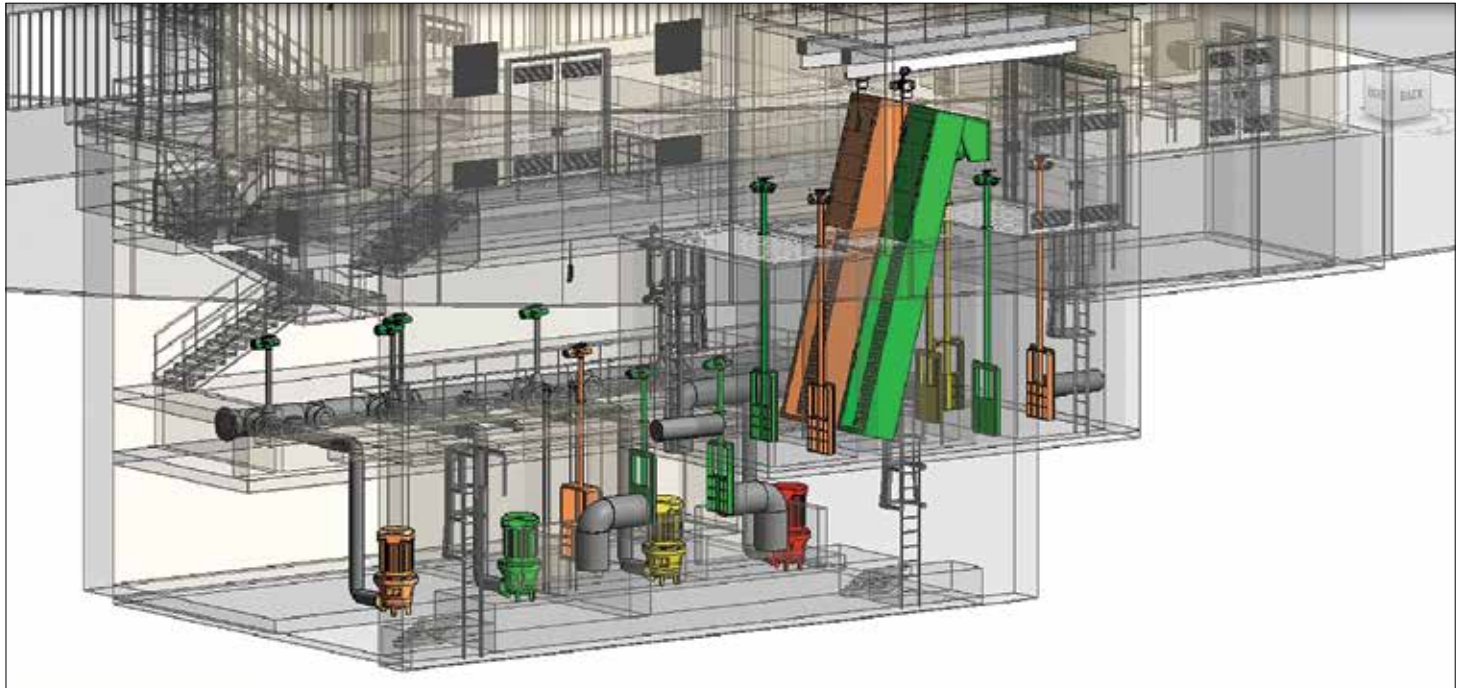
"I think the O&M staff are happy to use BIM if their work routines could be streamlined and digitalized," says Mr. Kim C.H. Lai, Technical Officer, Drainage Services Department. "They can use BIM-integrated mobile application and see the BIM model. They don't want too many drawings on hand, but can click on the iPad, and find information on an item of equipment."

To help filter the wealth of information in BIM, the team are turning to visual presentations, like colour coding for asset conditions of equipment. This is collected from fault-tree derived monthly asset inspection e-form through mobile solutions during their site inspection work, and different colors can be used depending on the predicted condition of a critical asset, ranging from orange for "good", to red that indicates it should be replaced. "For instance, if an asset has a life of 20 years, there can be a count down, and if there are just two years of remaining life the colour can alert or early warning to maintenance staff that it should be replaced - they needn't drill into details to discover this," says Dr. Tse.

"DSD developed a department roadmap in July 2014 to implement BIM pilot projects in new construction / upgrading of sewage treatment works; construction / upgrading of sewage and stormwater pumping stations as well as construction of underground stormwater storage tanks," says Dr. Tse. "We will migrate BIM into O&M."



Chinese-version asset inspection form used by front-line staff through BIM-integrated mobile applications
Image courtesy of Drainage Services Department, HKSAR Government



Color-coded asset health index in BIM model
Image courtesy of Drainage Services Department, HKSAR Government

About Drainage Services Department, HKSAR Government

The Drainage Services Department (DSD) is a department of the Government of the Hong Kong Special Administrative Region responsible for drainage and sewerage. DSD was established in September 1989 with vision to provide world-class wastewater and stormwater drainage services enabling the sustainable development of Hong Kong. DSD has made good progress in both sewage treatment and flood prevention in five major areas: First, to design and construct green architectural features of the sewage treatment plant, sewage pumping stations, drainage & flood control facilities; Second, to operate and maintain sewage-related equipment, use renewable energy, and energy-efficient equipment; Third, clean channel, remove plants impeding the flow of the river and clean up the sludge; Fourth, to implement strategic replacement and rehabilitation plans of underground drains, sewers, rising mains, manholes and the like widely spread over the whole territory; and Fifth, to implement strategic plans to relocate sewage treatment plants into caverns.

COMPANY

Hip Hing Joint Venture

PROJECT

Design and Construction of West Kowloon Government Offices in Yau Ma Tei

LOCATION

11 Hoi Ting Road, Yau Ma Tei, Kowloon, Hong Kong

TYPE

Design & Build

SCHEDULED TIME OF COMPLETION

2018

Design and Build Better Projects with BIM

“We are trying to use BIM to improve the construction process – it’s helping us make the right decisions, and plan the work properly.”

—Ir Derek So Kwok-leung
Executive Director,
Hip Hing Joint Venture

BIM PARTNERS INVOLVED

Architectural Services Department,
HKSAR Government

Andrew Lee King Fun & Associates
Limited

J. Roger Preston Limited

Siu Yin Wai & Associates Limited



Project overview
Image courtesy of Hip Hing Joint Venture

Hip Hing is developing a BIM process for combined services coordination to enhance the design and construction of a government offices project.

Hip Hing has been awarded a contract by the Architectural Services Department (ArchSD) for the design and construction of the West Kowloon Government Offices. Located in Yau Ma Tei, the West Kowloon Government Offices consists of two office towers with two-storey basements for the accommodation of various government departments. With full support from her client ArchSD, Hip Hing has undertaken to explore the value of BIM in this construction project. It was expected that BIM would deliver multiple benefits for project planning, site administration, safety planning, design coordination and clash detection prior to construction.

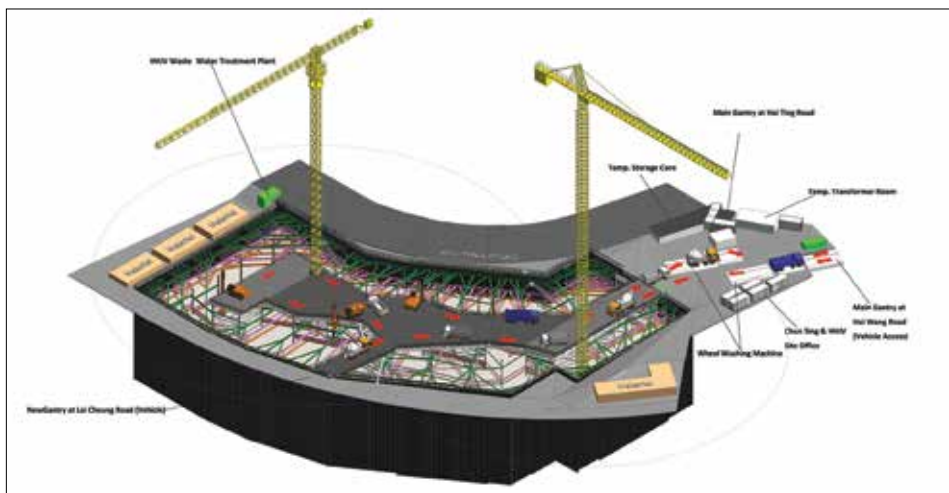
Hip Hing has been working on BIM projects since 2006. On top of her internal BIM section which was established to meet the advanced technological needs of the company as a whole, a dedicated BIM team was formed to improve buildability of the West Kowloon Government Offices project. This special team proactively involves in the whole project life cycle, starting right from the onset of the design stage to the completion of the project.

Basement benefits encourage engineers

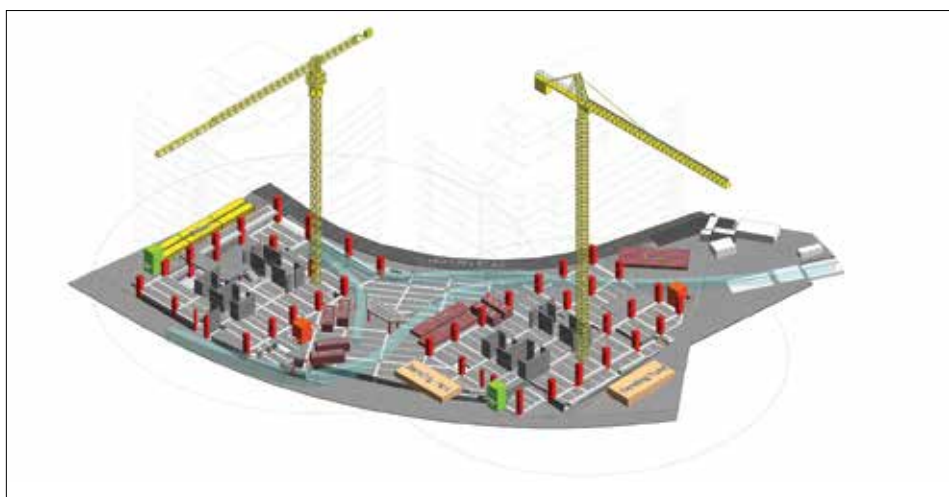
In order to improve site safety, temporary structures like working platform on the Excavation and Lateral Support (ELS) at the basement level were created and optimised within BIM. “BIM model enabled us to identify issues with the ELS, and provide our advices to engineers in a timely manner,” says Mr Froky Wong Yuen Hung, Manager (BIM) of Hip Hing Joint Venture. “At the beginning, engineers were not seeing the benefits of using BIM. They believed 2D drawings were good enough. But, after we presented them a simple model showing a quarter of the ELS to illustrate potential issues. The 3D model not only showed clashes clearly, but also issues like the clearance of elements.” Engineers were being convinced with the benefits of using BIM model after the demonstration and asked if it was possible to have a more detailed walkthrough.

Thereafter, the team deployed BIM to design temporary steel platforms and staircases. During the process, potential safety issues were detected. By conducting swept path analysis, a safer and more desirable truck path and construction sequence was selected.

With help from BIM models, hazards were identified and eliminated in the earlier



Logistics planning during substructure stage
Image courtesy of Hip Hing Joint Venture



Logistics planning during superstructure stage
Image courtesy of Hip Hing Joint Venture

stage of development. It also facilitated the project team to do better site planning. For instance, making optimal use of site space for safe pedestrian paths with railings and convenient vehicular access.

Tower cranes properly positioned

At ground level, the team deployed BIM for site logistics planning, using 4D scheduling and sequencing to identify traffic considerations and potential hazards in the vicinity, especially involving two tower cranes required for construction.

“The site is adjacent to a highway and the work-area of one of the tower cranes will possibly overlap with it,” says Mr Wong. “There will be potential clashes with lighting post and traffic signage. And we need to make sure this will not be the case.”

In the past, engineers need to obtain drawings from government departments and check the cranes against them. But the information could be out of date, so

our project team may have to conduct surveys as well. Upon completion of surveys it still requires some experiences to position the cranes properly.

In this project, the team conducted 3D laser scanning of the site and surrounding areas, and incorporated the data into the BIM model. “3D laser

scanning is fast and making it easier for us to predict the crane movements” says Mr Wong.

BIM Process for Combined Services Drawing

“In traditional BIM, different building services’ trade subcontractors create their own Services Drawings, and put them into the model, before coordination work,” says Ir Derek So Kwok-leung, Executive Director, Hip Hing Joint Venture. “But to improve the coordination process, we adopted a new workflow we call BIM Process for Combined Services Drawing. At the very earliest stage of design, we created the Architectural and Structural BIM model and Building Services BIM model based on single line designs, and then started to find critical areas.”

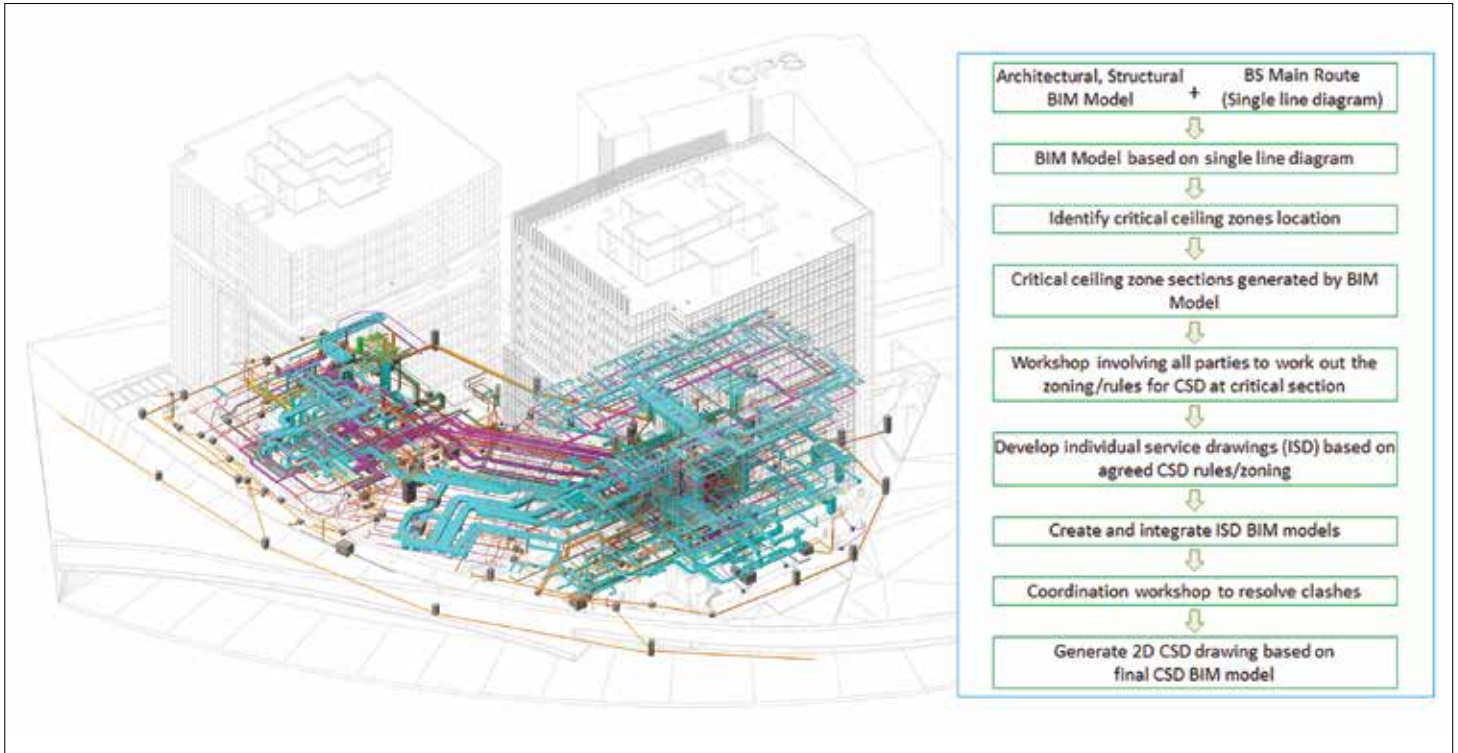
These areas included ceiling zones that were identified based on the BIM model, which was also used to generate sections of these zones. All building services parties were involved in workshops led by the Hip Hing BIM team, to work out the zoning and rules for combining services at critical sections.

“At first, not all building services engineers 100 percent bought in to this process, but they found more effective now with the use of BIM,” says Ir So. “We can combine services more efficiently, with less iteration than in the traditional workflow.”

While the process had previously relied largely on engineers’ experiences, the



Tower crane working radius simulation based on integration of site condition scanning model and project BIM model
Image courtesy of Hip Hing Joint Venture



New workflow for BIM-based CSD coordination
Image courtesy of Hip Hing Joint Venture

Hip Hing BIM team started developing a rule based engine for building services coordination – such as which trade to include first, spatial relationship for individual building services, room for maintenance, etc.

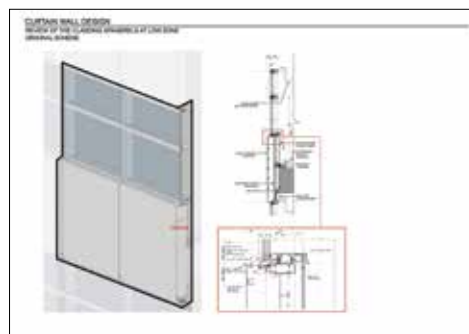
After working on critical zones, the team progressively increased the level of detail in the model. By improving productivity in construction, such as minimising re-working and wastage, they may have saved around two to three percent of the construction cost.

A competitive edge

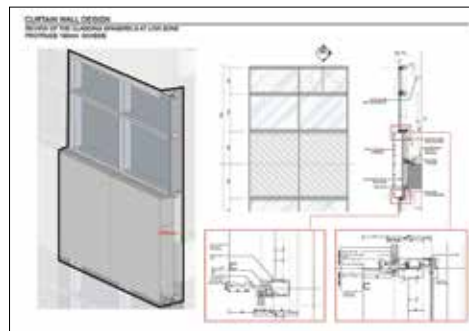
The use of BIM model allows the project team to achieve faster response times for design reviews, including the complicated curtain wall design.

“Plus, we are trying to use BIM to improve the construction process – it’s helping us make the right decisions, and plan the work properly,” says Ir So.

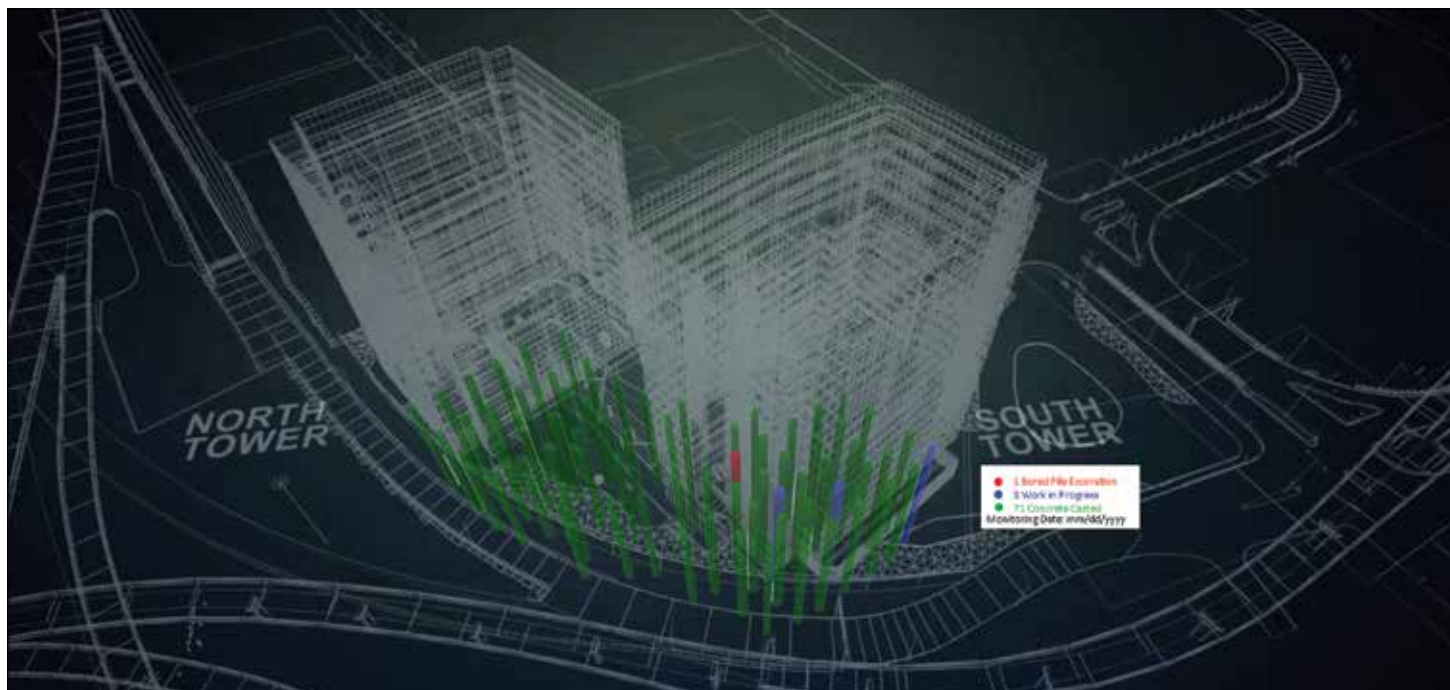
Soon, Hip Hing will deploy BIM for all design and build projects. “All 120 engineers will be trained to navigate and modify objects in BIM models.” says Ir So. “We see BIM as one of our competitive edges, for future projects.”



Curtain wall design original scheme
Image courtesy of Hip Hing Joint Venture



Curtain wall design protrude scheme
Image courtesy of Hip Hing Joint Venture



Site Progress Monitoring
Image courtesy of Hip Hing Joint Venture

About Hip Hing Joint Venture

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 55 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.

Honorable Mentions



ORGANIZATION

Architectural Services Department, HKSAR Government

PROJECT

Fishermen Cultural Centre



ORGANIZATION

Electrical and Mechanical Services Department, HKSAR Government

PROJECT

Lifecycle Building Information Modelling - Asset Management (BIM-AM) System for Buildings Operation and Maintenance



ORGANIZATION

P&T Architects & Engineers Limited

PROJECT

Malvern College Hong Kong



ORGANIZATION

Sun Hung Kai Real Estate Agency Limited

PROJECT

Proposed Residential Development at Sha Tin Town Lot No.566



ORGANIZATION

Sun Hung Kai Real Estate Agency Limited

PROJECT

Proposed Residential Development at T.M.T.L No.515, King Sau Lane, Tuen Mun



ORGANIZATION

SUNeVision Holdings Limited

PROJECT

MEGA Plus



ORGANIZATION

Water Supplies Department, HKSAR Government

PROJECT

Improvement of Water Supply to Sheung Shui and Fanling

COMPANY
**Architectural Services Department,
 HKSAR Government**

PROJECT
Fishermen Cultural Centre

LOCATION
Aberdeen Promenade

TYPE
Park facilities

Pioneering BIM-assisted Statutory Submission



BIM PARTNERS INVOLVED

**Advanced Construction Information
 Development Limited**
**Building Information Technology
 Limited**

About Architectural Services Department, HKSAR Government

The Architectural Services Department (ArchSD) of the Government of Hong Kong SAR is committed to providing quality services to the public. It has been performing monitoring and advisory services, and development and upkeep of government-owned buildings and facilities, since 1986. ArchSD promotes best practices in the building industry, with quality professional advisory services to ensure the quality and sustainable development of community facilities.

The Project

This was a Signature Project proposed in Southern District in 2014, to capitalise on the unique characteristics of Aberdeen and promote tourism. The project was proposed by Home Affairs Department (HAD) with the support of Southern District Council and Home Affairs Bureau.

The Challenges

It was proposed that the project would be built within existing park facilities. It involves complex construction sequence including permanent strengthening works, partial demolition of existing buildings and construction of new structures.

Additionally, utilisation of BIM technology in a statutory submission is still fresh to the local building industry, as conventional submission is a long-established administrative procedure for checking compliance with building standards and codes. The project team aimed to explore and expedite the design, documentation and submission process with BIM, making the project a pioneer BIM-assisted Statutory Submission.

The Solution

In this project, ArchSD experimented with statutory submissions for the first time, by using 2D drawings generated from a BIM model – including general building plan, structural plan, drainage and Fire Services Department submissions. Discrepancies between drawings in the same sets of submissions were eliminated. BIM-generated drawings successfully fulfilled submission requirements of different authorities giving approval, yet can equally be used for consecutive collaboration in design consideration and buildability.

The Benefits

The BIM model allows project team members to examine the relationship between the existing and new structures in an unprecedented manner, assisting evaluation of various design solutions through several scenario analyses. It facilitates the design with its accurate identification of extent of the existing structure to be demolished, early identification of conflicts between existing and proposed building elements – e.g. conflict between existing footing and proposed drainage run – and, through construction simulation, estimation of the stability of the existing structure during different construction stages. BIM allows the project team to utilise 3D visualisation, which helps to make sound decisions in the design development process.

Better with BIM

The BIM model contains a central source of information from which drawings are extracted, which provides a better alternative to traditional design. Unlike 2D monochromatic drawings created in traditional manner, rather than wasting resources in checking consistency of individual drawings, effort is better spent in ensuring the BIM model is a fair representation of the design.

Additionally, BIM can accurately pass applicable and consistent information from the design stage to the construction stage and then to the maintenance stage. It is also a very effective tool for enhancing communication with stakeholders in different professions, who have varying visual and technical expertise.



BIM model was linked to an architectural visualization software for real-time 3D demonstrative walkthrough, professional rendering of images and animations
Image courtesy of Architectural Services Department, HKSAR Government



In early design stage, traditional photo montage was composed by architect to highlight the impression of the project
Image courtesy of Architectural Services Department, HKSAR Government



BIM model was sent to modeling professional in production of large scale model for S16 submission to Town Planning Board
Image courtesy of Architectural Services Department, HKSAR Government



BIM model facilitated project team to explore the best design option and be more responsive to the local community
Image courtesy of Architectural Services Department, HKSAR Government

COMPANY

Electrical and Mechanical Services
Department, HKSAR Government

PROJECT

Lifecycle Building Information Modelling
- Asset Management (BIM-AM) System for
Buildings Operation and Maintenance

LOCATION

EMSD Headquarters Building

TYPE

Pilot

SCHEDULED TIME OF COMPLETION

December 2015

Visually Intuitive and Cross-Referenceable Next-Generation O&M Tools



About Electrical and Mechanical Services Department, HKSAR Government

The Electrical and Mechanical Services Department (EMSD) of the HKSAR Government discharges its services to the public in Hong Kong via two separate teams: Regulatory Services and Trading Services.

Our Regulatory Services team regulates electrical, mechanical and gas safety, and railway safety, as well as energy efficiency, via law enforcement and public education. It also monitors the technical performance and development plans of the electricity supply companies, and gives professional and technical support to the Government's wide range of safety and environmental initiatives from time to time.

Our Trading Services team provides electrical and mechanical, electronic engineering and building services to government departments and public bodies. The team serves diverse client venues including the airport, hospitals, schools, security forces, transport and highways, port and harbour, government offices and law court buildings as well as public recreational and leisure facilities, with the ultimate goal of improving the quality of life for the public.

The Project

EMSD has proposed and implemented a novel architecture for exploiting BIM in integrating asset management (AM) and other operation and maintenance (O&M) systems/tools, including Building Management System (BMS), Closed Circuit Television (CCTV) system, Radio Frequency Identification (RFID) scanning tool, Real Time Location System (RTLS), and wireless ad-hoc devices. An integrated lifecycle BIM-AM System has been developed to implement the novel architecture, and the results have successfully demonstrated the system capabilities and potential for next-generation building O&M services.

The Challenges

BIM application in the O&M stage of the building lifecycle is yet to be explored, and there is still a question regarding whether or not directly applying BIM to AM can significantly benefit O&M. While there are many studies and applications focusing on data population from BIM to facility management/asset management software, no well-established model and commercially available solution for full integration (i.e. visually intuitive cross-referencing) of BIM with AM could be found in 2014. Nor was there well established integration with other proposed O&M systems/tools, namely BMS, CCTV system, RFID scanning tool, RTLS, and wireless ad-hoc devices.

The Solution

EMSD has investigated the appropriate integration between BIM and various O&M systems/tools. The novelty and specialty of the BIM-AM System is at the forefront of BIM integration in terms of the integration diversity and extent. It enables visually intuitive cross-referencing of real world data to BIM models, and even to asset attributes, maintenance record, system topology, manual and system drawing at a mobile terminal. In addition, pre-diagnosis and condition monitoring based on real-time information from BMS, CCTV system, and wireless ad-hoc devices could be achieved. By integrating the BIM-AM System with RFID technology and RTLS, fixed and movable assets could be efficiently located.

The Benefits

BIM offers numerous benefits to this project. BIM is a centralised database model, carrying all interdependent and coordinated information in an effective and efficient manner. Each individual asset could be tied to its 3D geometric location. This is far superior to the non-geometric information exchange between a BIM model and facility management/asset management software applications – thus enabling easy, real-time, seamless and visually intuitive cross-referencing to a BIM model when carrying out O&M activities on-site by quickly manoeuvring the related area.

Better with BIM

BIM not only enables maintenance staff to perform an efficient O&M workflow by identifying faulty equipment and fault locations, but can also provide abundant visual information on any MEP installations, down to detailed piping and ducting works during design simulations. Such visualisation is of paramount importance for effective pre-planning and site preparation in alterations, additions and improvements work. This is particularly useful when a site is not easily accessible or the concerned asset is installed in a concealed area. Moreover, BIM can be of a tremendous help in defect reporting and on-site system handover.



The BIM model of the facade of EMSD Headquarters building as compared with the real photo
Image courtesy of Electrical and Mechanical Services Department, HKSAR Government

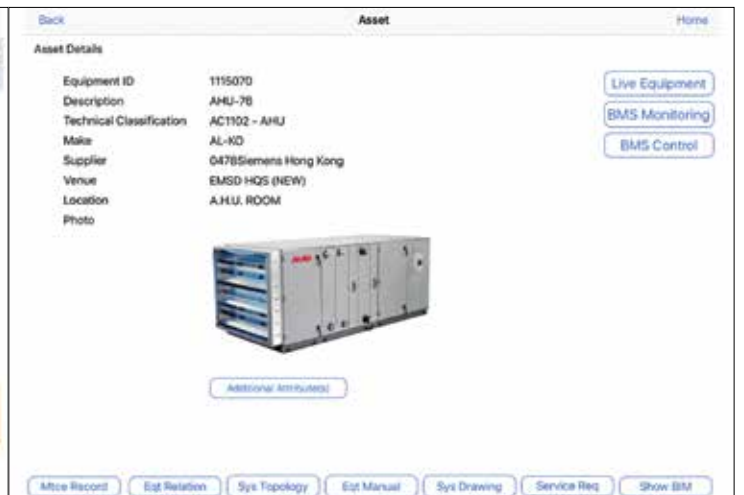


The BIM model of the Lecture Theatre of EMSD Headquarters
Image courtesy of Electrical and Mechanical Services Department, HKSAR Government

The BIM model of the AHU room providing HVAC services to the Lecture Theatre
Image courtesy of Electrical and Mechanical Services Department, HKSAR Government



The screen capture showing the results of RFID scanning at mobile terminal for further enquiry of asset information
Image courtesy of Electrical and Mechanical Services Department, HKSAR Government



The screen capture showing typical asset details and features at mobile terminal
Image courtesy of Electrical and Mechanical Services Department, HKSAR Government

COMPANY

P&T Architects & Engineers Limited

PROJECT

Malvern College Hong Kong

LOCATION

Tai Po, New Territories, Hong Kong

TYPE

Primary and Secondary School

SCHEDULED TIME OF COMPLETION

2018

One company, one Revit model, three disciplines.



BIM PARTNERS INVOLVED

P&T (M & E) Limited**P&T (Structure) Limited**

About P&T Architects & Engineers Limited

P&T Group, formerly known as Palmer and Turner Hong Kong, is the oldest and one of the largest architectural and multidisciplinary design practices in South East Asia. Headquartered in Hong Kong, it has over 1800 staff, and 16 branch offices throughout South East Asia and the Middle East. P&T Group offers a full range of architectural, structural and mechanical engineering as well as planning and project management services. The group's growth is a reflection of the increasing number of large scale projects demanding creativity and multidisciplinary expertise in order to deliver optimised design solutions. Among its core principles, the company has always included adoption of the most advanced technologies available for the building industry as well as for the design and project management process.

The Project

Malvern College Hong Kong is a modern multifunctional campus encompassing top class facilities for primary and secondary schools. Located adjacent to the Hong Kong Science Park, the school aims to be a leading international educational institution in HK, inheriting the fine ethos of Malvern College - the renowned British school with more than 150 years of tradition. The school will open its doors in September 2018, and ultimately provide 960 places for both primary and secondary students.

The Challenges

The ambition of this project was to conduct the design from concept to construction and produce all the deliverables exclusively with the BIM process, and do so for the disciplines of Architecture, Structure and MEP. The most challenging stage turned out to be the Hong Kong statutory submission, due to its specific and strict requirements for the format, graphics and scope of calculations of various project parameters. The format and contents of the submission, which was to be generated in full from the Revit model, were supposed to be identical to the one prepared with traditional CAD methods.

The Solution

Proper configuration and management of a Revit model, so that it contains all the information needed by Hong Kong practice and regulations and can present it in the prescribed manner, requires a lot of upfront customisation work. This can only be successful with deep knowledge of Revit functionalities and application of many non-standard or complex solutions for view templates, view filters, schedules, families, etc. These solutions and workflows comprise a standardised system within Revit, and creating this requires extra time for the first project done this way, but can then be easily used for any subsequent job.

The Benefits

The most important and obvious benefit of using BIM in the design process was perfect coordination between various types of drawings and calculations generated from the model (plans, sections, elevations, schedules) and early detection of conflicts between various disciplines (e.g. structure and MEP). By allowing continuous access to one central model for all three main disciplines (one of the preconditions of BIM Level 3 methodology) many problems could be detected and rectified during the design stage, resulting in earlier delivery of an error-free, coordinated project.

Better with BIM

A customised and tested workflow enabling concept-to-construction management of Hong Kong projects is a crucial asset, which could speed up the adoption of BIM in the territory if it became a part of the BIM standard recognised by the professional and government organisations and freely available for every BIM user.

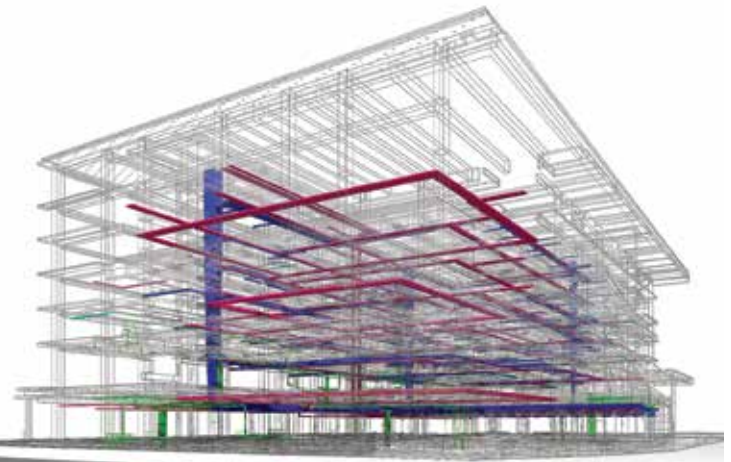
On the other hand, one Revit model with shared access for architects, structural and MEP engineers proves to be a feasible and beneficial solution for large multidisciplinary organisations, which are not bound with legal issues of intellectual property and day-to-day ownership of the BIM model contents during the design process.



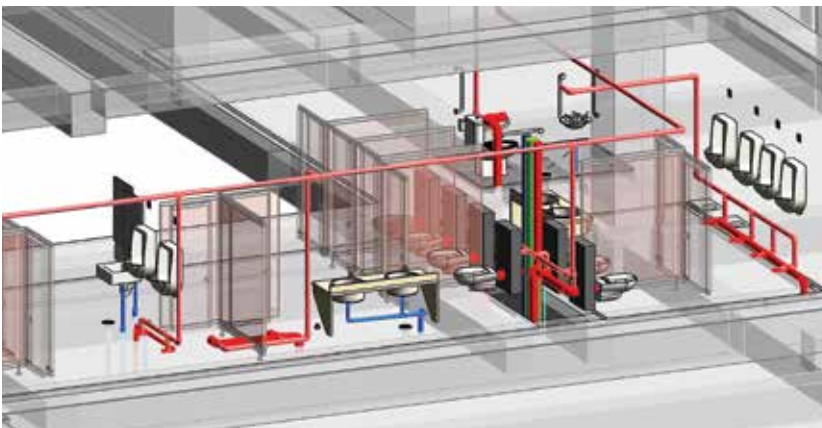
Malvern College. Western elevation
Image courtesy of P&T Architects & Engineers Limited



Malvern College. Translucent model revealing structure
Image courtesy of P&T Architects & Engineers Limited



Malvern College. Translucent model revealing MEP installations
Image courtesy of P&T Architects & Engineers Limited



Malvern College. Male toilette with piping highlighted in colors
Image courtesy of P&T Architects & Engineers Limited



Malvern College. 3D section of the model with highlighted structure
Image courtesy of P&T Architects & Engineers Limited

COMPANY

Sun Hung Kai Real Estate Agency Limited

PROJECT

Proposed Residential Development at Sha Tin Town Lot No.566

LOCATION

Area 56A, Kau To, Sha Tin, New Territories, Hong Kong

TYPE

Residential

SCHEDULED TIME OF COMPLETION

Nov 2016

BIM as Data Centre, Collaborator and Connector



BIM PARTNERS INVOLVED

Chun Fai Construction Company Limited

Consolidated Consulting Engineers Limited

Forida Limited

Guava Hong Kong Limited

Lik Kai Engineering Company Limited

Lik On Security Limited

Ronald Lu & Partners (Hong Kong) Limited

Sanfield (Management) Limited

Siu Yin Wai & Associates Limited

About Sun Hung Kai Real Estate Agency Limited

Sun Hung Kai Properties Limited ("SHKP") is one of the largest property companies in Hong Kong. It specialises in developing premium-quality residential projects, offices and shopping centres. The Group employs more than 37,000 people.

Sun Hung Kai Properties puts its long-standing belief in 'Building Homes with Heart' into practice, on the one hand by developing residences of the finest quality and offering first-class service to its customers, and by contributing to the good of the community.

The group spares no effort to deliver the very best. Vertical integration from planning, material sourcing and construction through to project monitoring and property management ensures high standards in every aspect of a development.

The group's management team follows prudent strategies for long-term business development and the company's philosophy includes a strong sense of corporate social responsibility, both to its customers and to the public.

Sun Hung Kai Properties – We're 'Building Homes with Heart'.

The Project

This is a low-density residential development project at Sha Tin Town Kau To Shan Lot No.566, including 24 houses, 3 towers with a total of 35 flats, basement car park, clubhouse and swimming pool.

The Challenges

In this project, Sun Hung Kai faces the same problems as other projects in terms of workflow: Design information is shared in an inefficient way; and uncertainty regarding how to make BIM a good platform for sharing information among the project team.

On the other hand, the BS consultant and contractor performed some simulations requiring extra modelling, i.e. not BIM-based. The simulations are costly and time consuming; while the report/results are always too professional to be interpreted and visualised among the project team.

The Solution

The project team opted to build a bridge for communication between BIM and designers, engineers and contractors. The BIM models would be shared to multi-disciplinary project stakeholders, and better communication would be employed to connect with them. The designers, engineers and contractors used the models to review their designs, find conflicts and extract useful data. The BIM models also could be improved, or their quality could be validated, by the stakeholders.

Rather than just employing 2D to 3D and coordination, we believe the BIM model can bring us much more value by using the single BIM model for analyses and simulations in other aspects. In this project, we sought the possibilities of performing the following simulations with BIM as an alternative to the traditional practices: Lighting Simulation; CFD Simulation; and CCTV Simulation.

The Benefits

We promote BIM by utilising the model with Autodesk simulation software to run the same simulations in the project; the process is more interactive and the result is more user-friendly and trivial for the project team.

Lighting Simulation: The BIM model was exported to 3ds Max. Then Dialux was used for lighting analysis.

CFD Air Flow Simulation: In the carpark basement level, 50 jet fans are required. The BIM consultant employed the supplier's reported simulation criteria to input to Autodesk CFD to simulate the air flow. The CFD model yielded impressive results, including the air flow direction in the vertical plan, which helped the design consultant to understand the designs with differing scenarios.

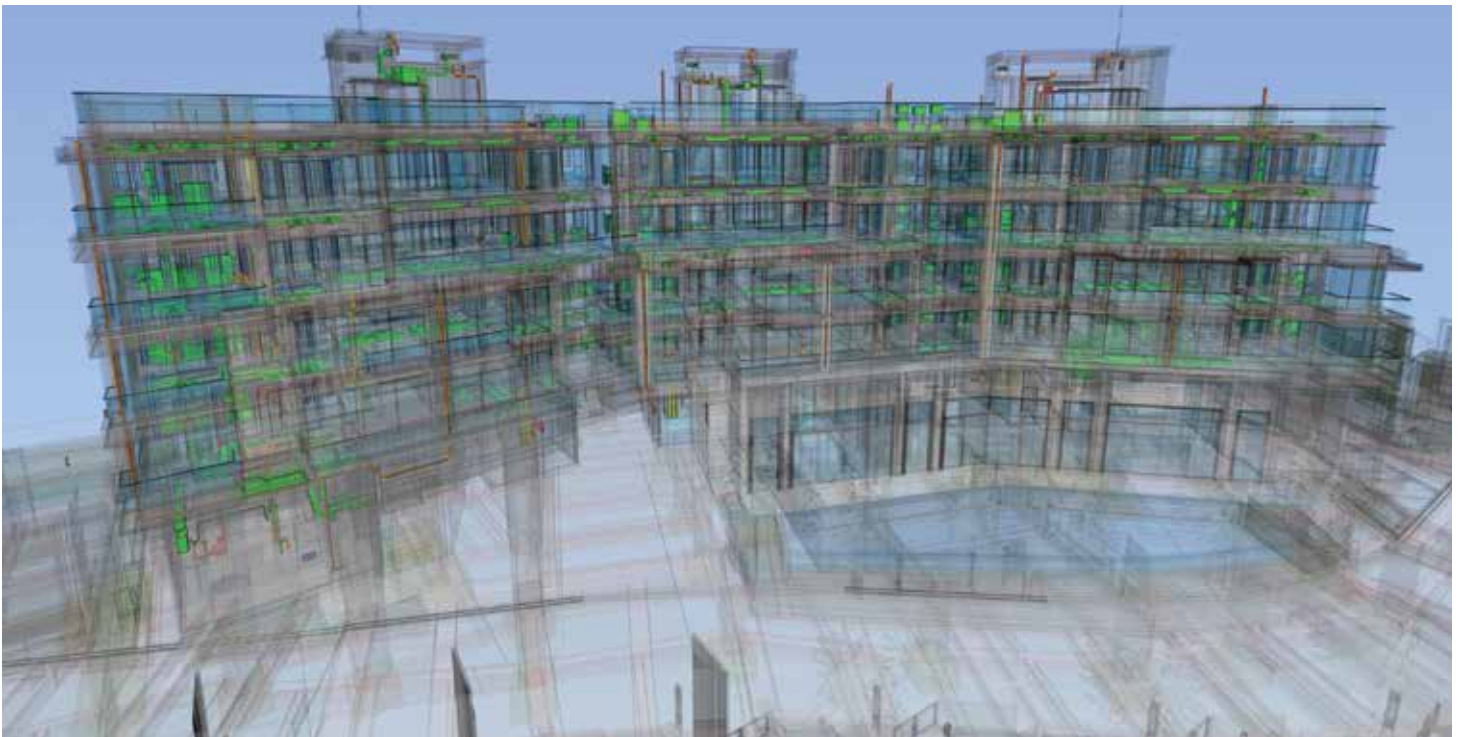
CCTV simulation for security system design: The BIM consultant proposed using the CCTV manufacturer's Revit family file with add-in tool to make a CCTV simulation in the project's BIM file. This provided 3D views for design reviews and immediate adjustments. We obtained a good experience from performing these simulations, learning that BIM models can be used in different areas, and with good visualisation experiences for designers and engineers.

Better with BIM

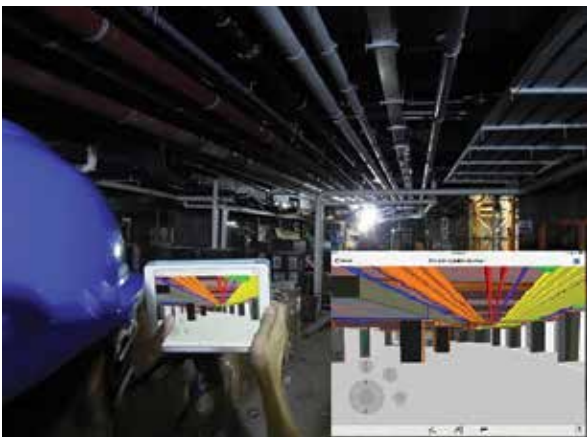
The BIM technology was not only a tool. It could be a data centre, a collaborator, even a connector, enabling communications between multi-disciplinary stakeholders. We aim to elevate BIM to a higher level.



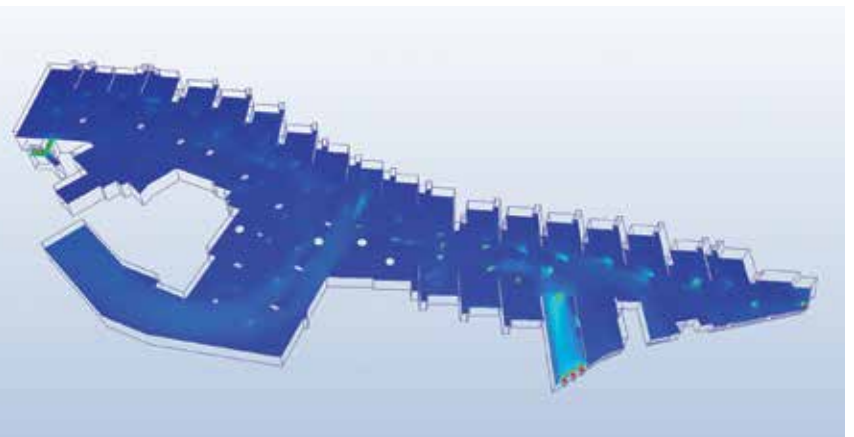
Bird's-eye view
Image courtesy of Sun Hung Kai Real Estate Agency Limited



Combine BIM Model for coordination
Image courtesy of Sun Hung Kai Real Estate Agency Limited



BIM 360 Glue in iPad for site review
Image courtesy of Sun Hung Kai Real Estate Agency Limited



CFD for Jet Fan Air Flow analysis
Image courtesy of Sun Hung Kai Real Estate Agency Limited

COMPANY

Sun Hung Kai Real Estate Agency Limited

PROJECT

Proposed Residential Development at T.M.T.L No.515, King Sau Lane, Tuen Mun

LOCATION

T.M.T.L. No.515, King Sau Lane, Tuen Mun, New Territories, Hong Kong

TYPE

Residential

SCHEDULED TIME OF COMPLETION

Q1 2019

Single Model Approach Builds Better Homes



BIM PARTNERS INVOLVED

Sun Hung Kai Architects & Engineers Limited
 Archiplus International Limited
 Teamfield Building Contractors Limited
 Vircon Limited

About Sun Hung Kai Real Estate Agency Limited

Sun Hung Kai Properties Limited ("SHKP") was publicly listed in 1972 and is now one of the largest property companies in Hong Kong. It specializes in developing premium-quality residential projects, offices and shopping centres. The Group employs about 37,000 people.

Sun Hung Kai Properties puts its long-standing belief in 'Building Homes with Heart' into practice, on the one hand by developing residences of the finest quality and offering first-class service to its customers, and also by contributing to the good of the community to make Hong Kong a better home for everyone.

The Group understands that buying a home is one of the biggest decisions people make in their lives, and so it spares no effort to deliver the very best. Vertical integration from planning, material sourcing and construction through to project monitoring and property management ensures high standards in every aspect of a development.

The Group's seasoned management team follows prudent strategies for long-term business development and the company's philosophy includes a strong sense of corporate social responsibility, both to its customers and to the public. The Group works for the benefit of the community with wide-ranging initiatives to protect the environment, care for the less fortunate and foster educational development.

Sun Hung Kai Properties – We're 'Building Homes with Heart'.

The Project

In current trade practices, design models must be remodelled in construction stages. To help resolve this challenge, Sun Hung Kai (SHK) adopted the Integrated Project Delivery (IPD) approach for the "Proposed Residential Development at T.M.T.L No.515, King Sau Lane, Tuen Mun" project from the beginning, and will continue this through the whole project: using one model all the way through the project life cycle. The model and workflow are well organised to meet the purpose of design as well as a construction study.

The Challenges

As SHK always puts the customer first and offers quality products for customers, BIM models are used to provide the best end-user experience.

Under the tight schedule and site constraints, project matters like detail design, construction method, schedule and cost etc. are hardly optimised. For example, the value of property has to be estimated after acquiring the land. The ELS and foundation construction sequence are complex, in addition to a tight schedule. One of the project constraints is that a village footpath must be maintained throughout project construction.

The Solution

An Integrated Project Delivery (IPD) approach was used from the beginning.

The integrated project team for design and construction maximises the value of BIM models. With the construction team involved in the project at a very early stage, they can use the BIM model to advise the project team on how design changes affect the construction schedule, cost and buildability. The program can be compacted as well, allowing the design team to have more time and more information to optimise the design and better plan for construction.

The Benefits

In the initial project design stage, the 3D terrain model from the Lands Department was used to study the value of the property and visual impact assessment. The design team can refine the building layout design to improve the views of customers.

Sections and captures generated from BIM models are submitted as supporting documents for GBP submission, to assist the Buildings Department to understand the relationship between the existing slope profile and two semi-sunken carpark design schemes.

Construction sequences as well as ELS design are well studied through 4D BIM. The project team can review the method and coordinate the sequence for village footpath diversion.

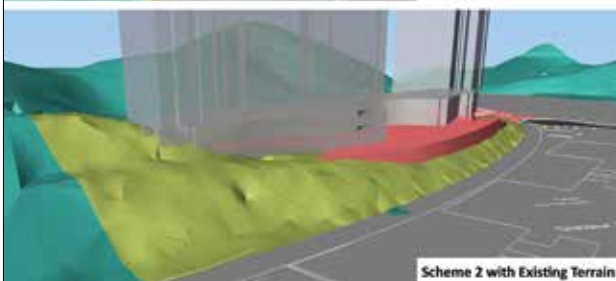
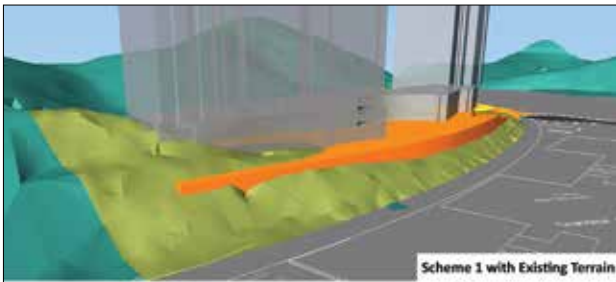
Better with BIM

To allow the senior management level to access the model without difficulties, the 3D BIM models can be converted to a VRML model and displayed in a web browser. In addition, the end-user's view can be studied through the immersive walkthrough with VR glass, when BIM is integrated with VR technology.

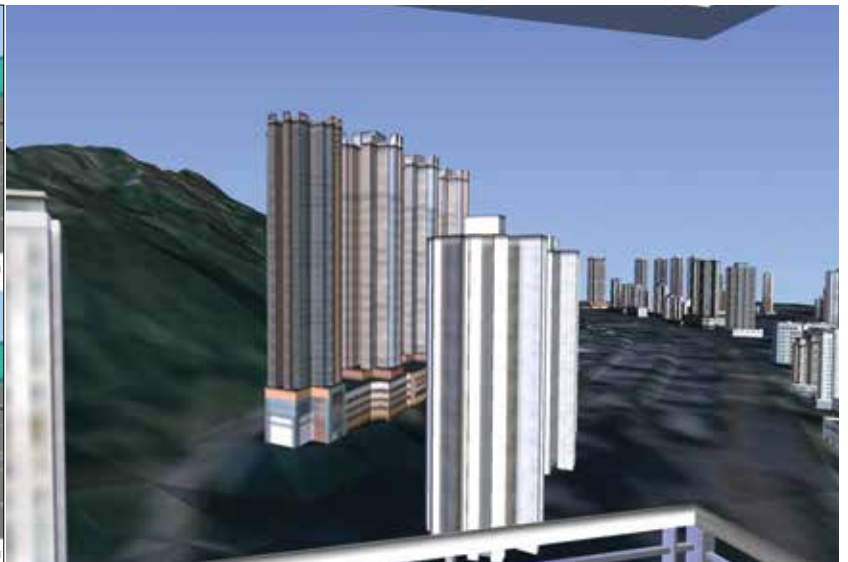
For the future development of BIM in Projects/Enterprises, SHK integrated some handy software to let project members easily access the BIM models and simulations via email, such as cloud and mobile applications for BIM life-cycle usage. Our criteria include ease of use and information security.



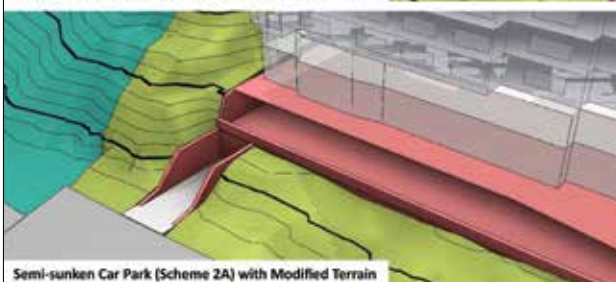
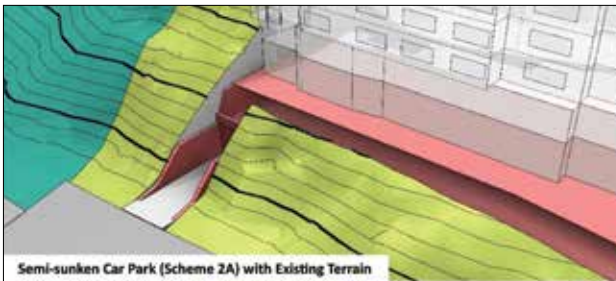
Integrating GIS data with BIM can allow the Design Team to estimate the value of property after acquiring the land
Image courtesy of Sun Hung Kai Real Estate Agency Limited



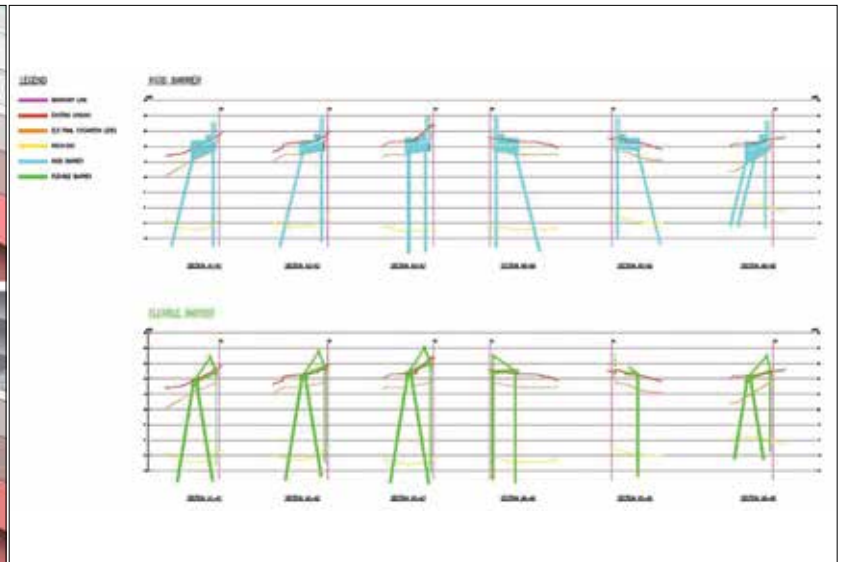
BIM allows Buildings Department to review and compare the overall development impact for different schemes with existing terrain
Image courtesy of Sun Hung Kai Real Estate Agency Limited



Visual impact assessment sample support the Design Team to refine building layout and improve sight view for customer
Image courtesy of Sun Hung Kai Real Estate Agency Limited



BIM allows Buildings Department quickly understanding the topographical relationship between the semi-sunken car park and modified terrain
Image courtesy of Sun Hung Kai Real Estate Agency Limited



Sections generated from BIM helps to study the topographical profile and support for understanding the impact before construction
Image courtesy of Sun Hung Kai Real Estate Agency Limited

COMPANY

SUNeVision Holdings Limited

PROJECT

MEGA Plus

LOCATION

299 Wan Po Road, (Tseung Kwan O Town Lot No. 122, Area 85), Tseung Kwan O, New Territories

TYPE

High-tier Data Centre Development

SCHEDULED TIME OF COMPLETION

Mid – 2017

BIM-centric Project Enables Smarter Design for Intelligent Building



BIM PARTNERS INVOLVED

Sun Hung Kai Real Estate Agency Limited

Sun Hung Kai Architects & Engineers Limited

Sanfield Engineering Construction Limited

Forida Limited

About SUNeVision Holdings Limited

SUNeVision (SEHK: 8008) harnesses the strengths of Sun Hung Kai Properties' principal technology assets including iAdvantage, Super e-Technology, Super e-Network and venture capital investments. SUNeVision has a strong financial position, and its portfolio of data infrastructure and service businesses positions it well for sustained profitability and growth.

iAdvantage is one of the major operators of carrier-neutral data centre services in Hong Kong, iAdvantage offers quality services to meet stringent requirements of its customers.

Super e-Technology engages in the installation and maintenance of its satellite distribution network, state-of-the-art fibre-optic cable, networking and security surveillance systems; and is one of the major players in the industry in Hong Kong.

Super e-Network provides professional design-and-build consultancy service for wireless and broadband network projects, it is a pioneer in intelligent-building networks.

The Project

MEGA Plus is a Tier 4 ready greenfield data centre in Tsung Kwan O. With the characteristics of low-latency and high availability, MEGA Plus is equipped with fully configurable infrastructure with world-class facilities, and is ideal for multinational enterprises, cloud and IT service providers, telecommunications carriers and financial institutions.

The Challenges

A sophisticated data centre of this kind requires a large scale MEP network which is carefully designed, coordinated and constructed in order to provide fast broadband access, high fault-tolerance and minimal down-time as well as precise indoor environmental control. Also, to meet the market demand for high-tier data centres as swiftly as possible, MEGA Plus is to be constructed within around 24 months, by mid-2017. To achieve the aims, vast amounts of design and construction information must be rapidly retrievable and efficiently coordinated among the Project Team anytime and anywhere.

The Solution

Together with BIM data, on-site construction and inspection information are centralised on the web, to provide a one-stop platform enabling the Project Team to be promptly updated of the latest site progress and facilitate decision making regarding future works planning. On-site information such as site photos and inspection details can be recorded in real-time into the centralised database, and associated with BIM model geometries that can be viewed simultaneously through a web-based BIM model viewer.

The Benefits

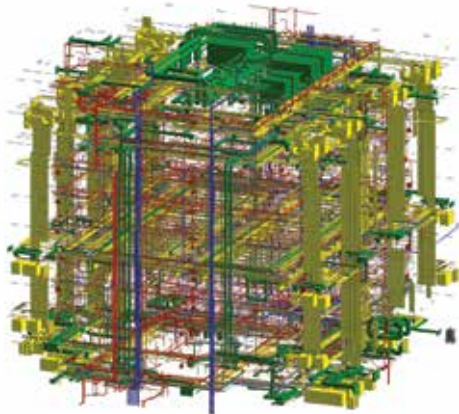
BIM-centric submissions and inspections enable better and efficient coordination in the Project Team. The team is better informed regarding the site progress, and therefore can make quicker response to amendments to the construction programme. Also, less manpower was used to process huge amounts of inspection details and reports, freeing resources for even better coordination of designs and ideas. Inspection details are inputted at the inspection scene, which minimises time-lags for information and progress sharing between parties.

Better with BIM

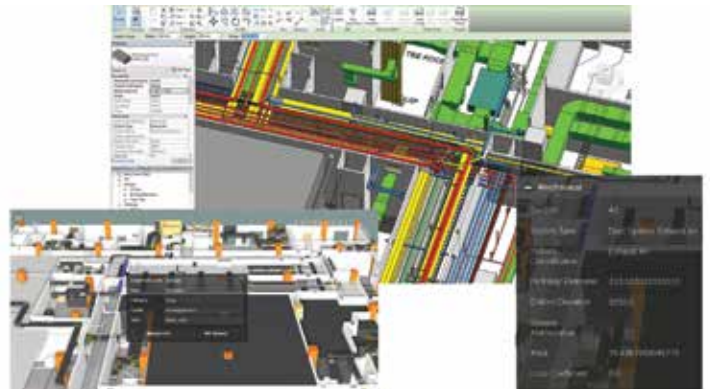
The project has become greener with a lower carbon footprint, since all inspections are coordinated and recorded on a centralised platform, and all relevant documents can be attached electronically. This reduces the amount of printed materials. BIM also makes the project more organised and manageable, with less paperwork and physical folders. All information is organised on Day 1 when input into the BIM platform. This allows easy retrieval of information, and limits wrong decisions arising from incorrect or insufficient information due to errors in document handling.



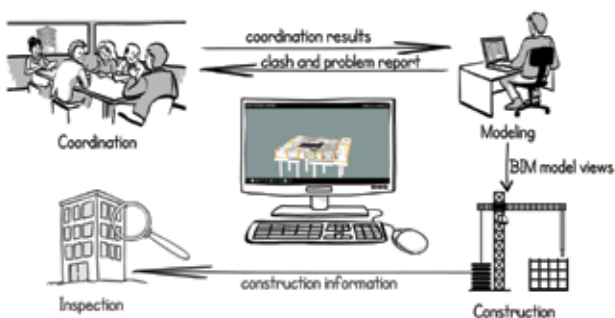
MEGA Plus
Image courtesy of SUNeVision Holdings Limited



Vast and extensive MEP network to serve MEGA Plus
Image courtesy of SUNeVision Holdings Limited



Make use of BIM data for post-construction inspection
Image courtesy of SUNeVision Holdings Limited



Outline of BIM Involvement in Design and Construction stages
Image courtesy of SUNeVision Holdings Limited



Inspection with BIM data and Model Viewer on mobile device
Image courtesy of SUNeVision Holdings Limited

COMPANY

Water Supplies Department, HKSAR Government

PROJECT

Improvement of water supply to Sheung Shui and Fanling

LOCATION

Sheung Shui and Fanling, New Territories, Hong Kong

TYPE

Water Supply

SCHEDULED TIME OF COMPLETION

2020

BIM Helps New Reservoir Blend With the Landscape



水務署

Water Supplies Department

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, the WSD supplied 973 million cubic metres (Mm³) of fresh water. In the same year, WSD supplied 274 Mm³ of seawater for flushing. As of March 2016, WSD administered 2.91 million water accounts.

The Project

In order to cope with the increasing water demand within the Sheung Shui and Fanling supply zone and to enhance the reliability of water supply to the areas, a new service reservoir with a storage capacity of 24 000 cubic metres and associated water mains must be constructed. The proposed works also require laying about 4.2 Kilometres of fresh water mains, with the diameter ranging from 100 millimetres (mm) to 700mm. The project is our first in-house project adopting BIM workflow without any assistance from BIM consultants.

The Challenges

In Hong Kong, designing alignments of large-diameter water mains to fit in the limited underground space available without conflicting with the existing facilities is always a big challenge. Traditionally, we only prepare 2D alignment plans and longitudinal profiles for the water mains. We have difficulties in identifying clashes with congested and unorganised utilities, especially at the chambers, by making reference to just lines and levels.

The proposed service reservoir is in the vicinity of burial grounds. During a public consultation, local villagers and District Council members raised their concerns regarding fung shui and visual impact arising from the proposed service reservoir.

The Solution

In designing the proposed water mains, we used Civil3D to build BIM models for the existing utilities, including water mains. Through adopting Civil3D and Navisworks in this project, we migrated from 2D into the more reliable 3D design, which helps identify clashes that are not easily visualised in the 2D environment.

In the proposed service reservoir design, we can easily present the advantages of our proposed option over the alternatives by using Civil3D. Together with the powerful functions of InfraWorks and 3ds Max in 3D visualisation and presentation, we have successfully convinced stakeholders that the proposed landscaping works can make the service reservoir blend in with the terrain, resulting in insignificant fung shui impact.

The Benefits

We note time savings during the design stage in the following:

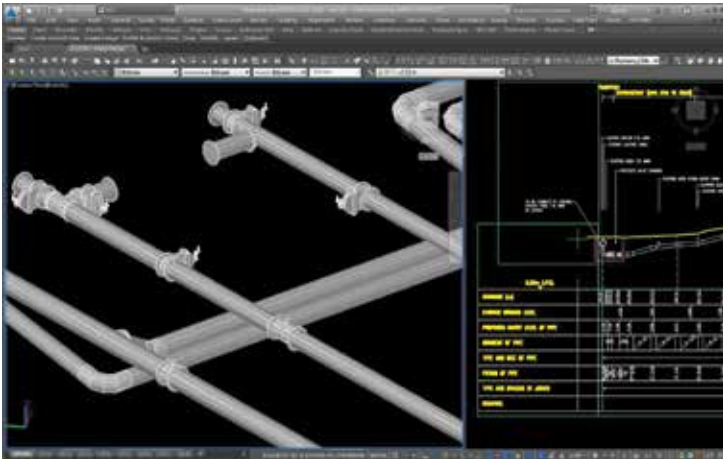
- (a) Parametric model of the proposed service reservoir enables rapid evaluation of different options;
- (b) Automatic updating of the 2D drawings (contract drawings) for any changes in the 3D model;
- (c) Errors or clashes can be easily identified via 3D visualisation, thereby saving time in case of design changes and the time wasted for abortive works or re-works during construction;
- (d) 3D simulation for project presentation enables prompt achievement of public consensus;
- (e) Effective communication and collaboration between various stakeholders expedites problem solving; and
- (f) Automatic regeneration of longitudinal profiles and update of chainage for any changes in the alignments of water mains.

Better with BIM

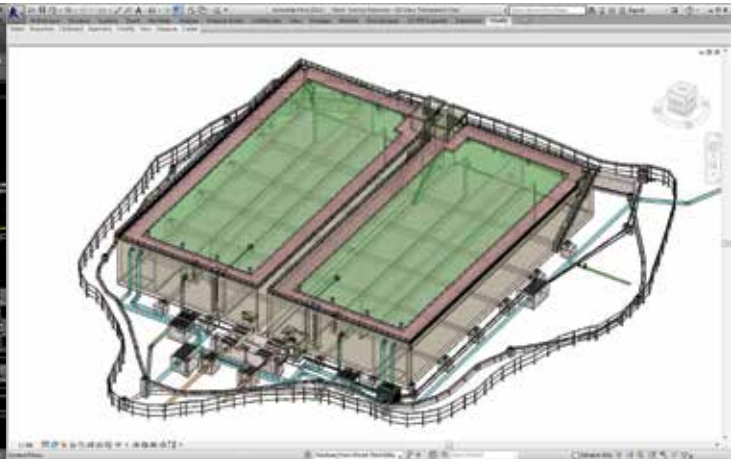
We are exploring options for automating the design process, for shorter processing times and reduction of errors for each design change. For example, we are examining the feasibility of exporting the BIM model for structural analysis, and software for taking off and preparation of bills of quantities. Our ultimate goal is to create a workflow in which the structural analysis, taking off and bills of quantities can be automatically updated in response to any changes in the BIM model.



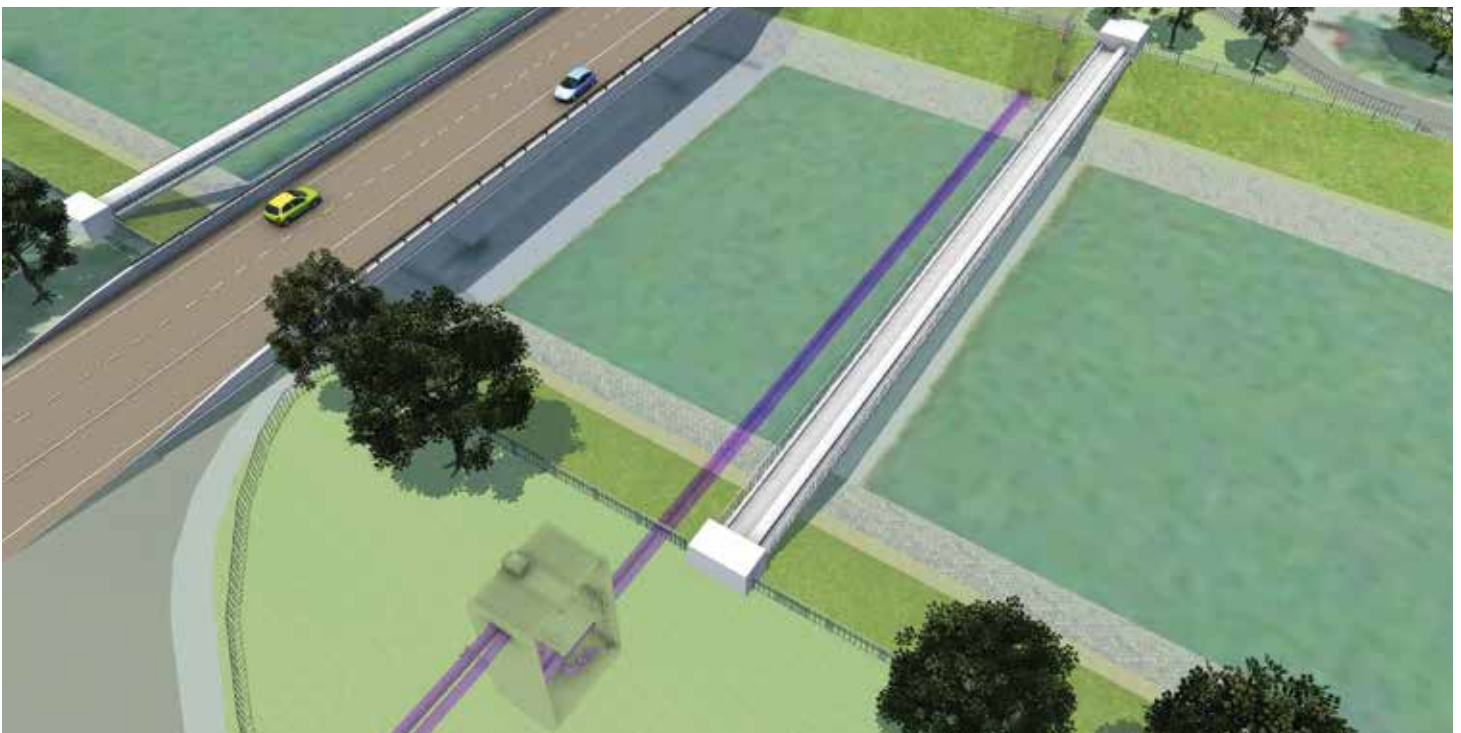
Proposed Table Hill No.2 Fresh Water Service Reservoir
Image courtesy of Water Supplies Department, HKSAR Government



Longitudinal Profile of Proposed Water Mains
Image courtesy of Water Supplies Department, HKSAR Government



Proposed Table No.2 Fresh Water Service Reservoir
Image courtesy of Water Supplies Department, HKSAR Government



Proposed Pipe Jacking across Ng Tung River
Image courtesy of Water Supplies Department, HKSAR Government

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

- Autodesk Industry Advisory Board
- buildingSMART Hong Kong
- Chartered Institute of Architectural Technologists, Hong Kong Centre
- Hong Kong Institute of Project Management
- Hong Kong Revit User Group
- The Chartered Institute of Building (Hong Kong)
- The Chartered Institution of Civil Engineering Surveyors (Hong Kong Region)
- The Hong Kong Institute of Building Information Modelling
- The Hong Kong Institution of Engineers (IT division)

Advisory Panel - Award Winners



AECOM Asia Company Limited Drainage Services Department, HKSAR Government

Shek Wu Hui Sewage Treatment Works - Further Expansion Phases 1A and 1B - Design and Construction

This is the first large-scale sewage treatment works in Hong Kong to follow a BIM approach. The team has to upgrade and expand the existing plant, which are not easy tasks. Laser scanning has been applied to review the existing site environment and further design works are built on top of this point cloud reference. Consider the model usage in the facility management stage: the model hierarchy and attributes in Revit families and Plant 3D objects are carefully planned to ensure they will work properly throughout the building lifecycle of the plants.



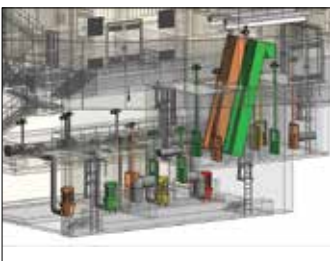
Architectural Services Department, HKSAR Government Eastern District Cultural Square

With the assistance of BIM, the visualisation of this complex design has been far better during the design process than would be possible with 2D drawings. The team maximises the value of BIM by utilising the Revit model to conduct building performance analyses in various disciplines, such as interior shadow and lighting analysis, sound performance analysis, maintenance plan, etc. Accurate cost estimation is possible through calculations involving Dynamo and Revit data, for the irregular prefabricated aluminium panels. This practice demonstrates that risk control, along with material and cost saving, are achievable by adopting BIM in the early stage of a project.



CLP Power Hong Kong Limited Refurbishment of External Façade at CLP Shatin Centre

This is not a traditional BIM project. It is about repairing the external wall of a high rise building, and 120m high scaffolding must be erected for workers to perform inspections and work on. Four Access Facilities options were considered: gondola, metal scaffold, bamboo scaffold and hybrid system, and all were modelled in Revit. The safety and cost concerns of stakeholders and construction sequence were simulated and the quantity take-off of scaffolding materials such as bamboo and metal joints for the selected hybrid system were generated from the model.



Drainage Services Department, HKSAR Government

Adoption of Knowledge-based Building Information Modeling for E&M Asset Management Supplemented with Mobile Technology - A Case Study in Public Sewage Pumping Facilities

This project focuses on BIM-AM (Asset Management) adoption, selecting part of the E&M systems for a pilot study. Beyond the basic inputs of facilities management, a system named "asset health index" has been created by the team, to identify the health condition of the facilities in the model, aiming to provide an early warning to the operational staff in order to prevent unnecessary system failure. With this automated process, time and procedures for regular on-site inspection could be reduced.



Hip Hing Joint Venture

Design and Construction of West Kowloon Government Offices in Yau Ma Tei

For a contractor in Hong Kong, adopting the full BIM process to design and build two office buildings could be very challenging in terms of tight schedule and discipline coordination. This project explores BIM applications for Excavation & Lateral Support temporary works, CSD and ISD workflows, site logistics study, site progress monitoring, and 3D scan data to Revit model, etc. All these applications of BIM would completely change the business culture and operations –revealing the management's confidence and determination in adopting BIM.

Advisory Panel - Honorable Mentions



Architectural Services Department, HKSAR Government Fishermen Cultural Centre

This signature project in southern district has successfully completed the statutory submissions by using 2D drawings generated from Revit, including General Building Plan, Structural Plan and submission to Fire Services Department.



Electrical and Mechanical Services Department, HKSAR Government Lifecycle Building Information Modelling - Asset Management (BIM-AM) System for Buildings Operation and Maintenance

This project demonstrates a seamless integration between BIM to AM (Asset Management). Synergy can be obtained in running the O&M stage of the building lifecycle.



P&T Architects & Engineers Limited Malvern College Hong Kong

A customised Revit Ecosystem has been created for this pilot BIM project. Revit acts as a major coordination platform for Architectural, Structural and MEP disciplines throughout the project design period.



Sun Hung Kai Real Agency Estate Limited Proposed Residential Development at Sha Tin Town Lot No. 566

This residential project embraces new BIM technologies: CFD simulation, CCTV simulation, lighting simulation and using a cloud-based BIM platform for project coordination.



Sun Hung Kai Real Agency Estate Limited Proposed Residential Development at T.M.T.L No. 515, King Sau Lane, Tuen Mun

This residential project utilises BIM to explore the surrounding environment and Excavation & Lateral Support design.



SUNeVision Holdings Limited MEGA Plus

This high-tier data centre benefits from BIM in both design and construction stages, especially for the complicated E&M works.



Water Supplies Department, HKSAR Government Improvement of water supply to Sheung Shui and Fanling

This civil project introduces BIM in the design stage, and will further develop the BIM content in the construction stage. With the aid of InfraWorks 360, 3D visualisation of the civil project is now possible.

Dr. Calvin Kam

Overview

The 2016 Hong Kong BIM Awards witness a diversity of projects that champion a great variety of creative, yet cost-effective, BIM applications. My Strategic Building Innovation team has applied our bimSCORE evaluation framework and benchmarked the 5 winners between “Typical” and “Advanced” Practices against 200+ global projects from 16 countries. The winners—3 new construction projects, 1 renovation project, and 1 operations & maintenance project—are further analyzed with respect to the 4 bimSCORE evaluation areas of Planning, Adoption, Technology, and Performance.

The following figures illustrate the Overall bimSCORE of the 5 winning projects.



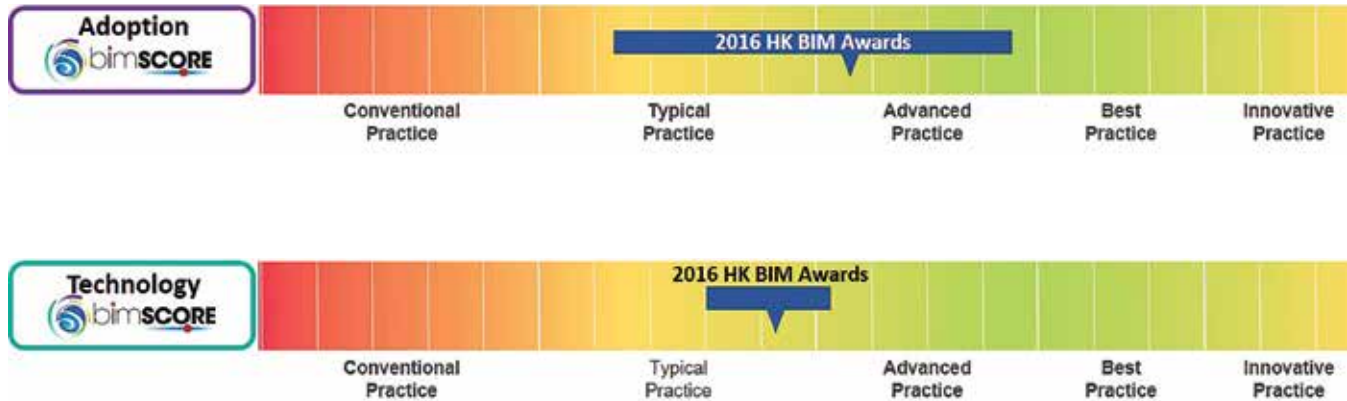
Planning & Performance



The award winners recognize the importance of establishing and tracking target objectives throughout the project lifecycle. Hip Hing Joint Venture overcame a congested and restrictive project site by engaging multiple stakeholders to deliberate upon optimized construction methods and site logistics in the early stage of the project, while continuous reporting of planned and actual progress ensures the project stays on course throughout its lifecycle. AECOM Asia Company Ltd & Drainage Services Department executed a successful in-situ site expansion project without interrupting the intricate site operations through coordinating construction sequences and managing equipment data with BIM.

While the effort that our winners have committed towards objective setting and tracking should be lauded, more quantitative objectives would help project teams pinpoint their progress. We also encourage the winners to carry through their evaluations past the completion of their projects, so that accurate ROI measurements can form much-needed benchmarks for future projects. The average Planning bimSCORE of the 5 winning projects falls between “Typical” and “Advanced” Practices, while the Performance bimSCORE averages at “Typical” Practice.

Adoption & Technology



We are delighted to see some practical and innovative use cases of BIM among this year's awardees. CLP harnessed the power of "5D" BIM to yield accurate cost planning and early risk identifications for their façade renovation. The Drainage Services Department piloted an extremely cost-effective programme with a very controlled budget, where they established an asset management pipeline that bridges frontline asset observations and backend calculations for asset pre-failure alerts. Meanwhile, the Eastern District Cultural Square leveraged BIM to minimize the noise propagation of the amphitheatre design while ensuring a quality acoustic performance within the site.

These innovative adoption of BIM place the awardees in the "Typical" to upper "Advanced" Practices in the Adoption bimSCORE and between "Typical" and "Advanced" Practice in the Technology bimSCORE.



Dr. Calvin Kam

PhD, AIA, PE, LEED AP

Founder, Strategic Building
Innovation • bimSCORE

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

Since 2008, Calvin has been the Vice President for Strategic Innovation with Optima—an award-winning integrated real estate developer. Since 2009, Calvin has been advising the U.S. General Services Administration as a Senior Program Expert advising its National BIM Program that he co-founded in 2003. 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.

A recipient of various honors/awards including ENR's "20 under 40", Calvin is a Registered Architect, Professional Engineer, and LEED AP in USA with Ph.D. from Stanford University. Dr. Kam has presented at 100+ industry events/universities across 12+ countries and published a number of book chapters and journal publications. Calvin has served as an Expert Advisor of the Hong Kong AIAB BIM Awards since 2008.



Yim Tak On

INSTITUTION

Chu Hai College of Higher Education

PROJECT NAME

Waste Recycling & Design Centre - Alternative Waste Management & Recycled Material Application

PROJECT LOCATION

Kowloon Bay, Kowloon, Hong Kong

TYPE

Culture & Environment Facilities



A Waste Recycle Centre in Kowloon Bay with urban connection & public access

Recycling Centre Design Gets Green Light with BIM

Project Background

Hong Kong Social Issue - Waste Management. Waste is a common problem of affluent societies. Hong Kong is no exception to this. An alternative solution is full coverage recycling waste planning. The design is for redeveloping and enlarging the existing waste recycling centre. Using an alternative way to operate the centre with a comprehensive sustainable green living concept. Working together with the facility, all waste materials can be effectively used to recycle, reuse, and reproduce and resell. The centre provides a workshop and studio to rent to designers and skilled workers.

Challenges and Solutions

Collaborating with six disciplines in the project: Architectural, Structural, Building Services, Civil, Landscape, User (recycle process management). Using Navisworks to integrate and combine the BIM model for generating the clash analysis, and to coordinate and collaborate throughout the project. For example, including the carpark, recycling plant room, machine room and stage lighting equipment. The innovative structural design needs structural loading testing, for three types of structural systems in three zones. A green façade structure is formed with recycled material. Waste steel sheet piles from construction sites are used for the main structural frame. The structure combines planting, solar panel, wooden panel and glass. This façade system is also a shading device to reduce heat gain. Depending on the direction faced, the façade has different combinations of patterns for sun shading, diffusing sunlight, absorbing heat and generating renewable energy. Moreover, the façade is porous, and the floor layout allows wind to blow from south to north.

How BIM Helps

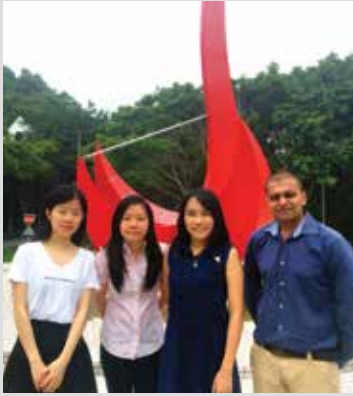
For space planning and zoning in 3-dimension space, to consider recyclable waste import area, designer production process and public access path. Producing a site model in BIM can help to perform solar analysis and air ventilation analysis, based on sun path and wind flow, to design site orientation and building massing.

To reduce errors, re-working or delays in design process. Building operation needs to reduce energy use and collect solar power from the roof. To export the information



Green façade structure formation by recycled material, planting & PV panel

from the BIM model to carry out Computer Fluid Dynamics simulations and analyses of air flow and temperature, to understand condensation indoors, in summer and winter scenarios. With the help of BIM, the project team designed a solar responsive façade; shading panels are above the windows, and tilted downwards, so the building provides shade whilst views remain expansive. BIM can use the sustainability concept to shape the building.



Keung Wun Ting, Iris

Mangal Mohit

Wang Ming Zhu, Annie

Wong Wing Man

INSTITUTION

The Hong Kong University of
Science and Technology

PROJECT NAME

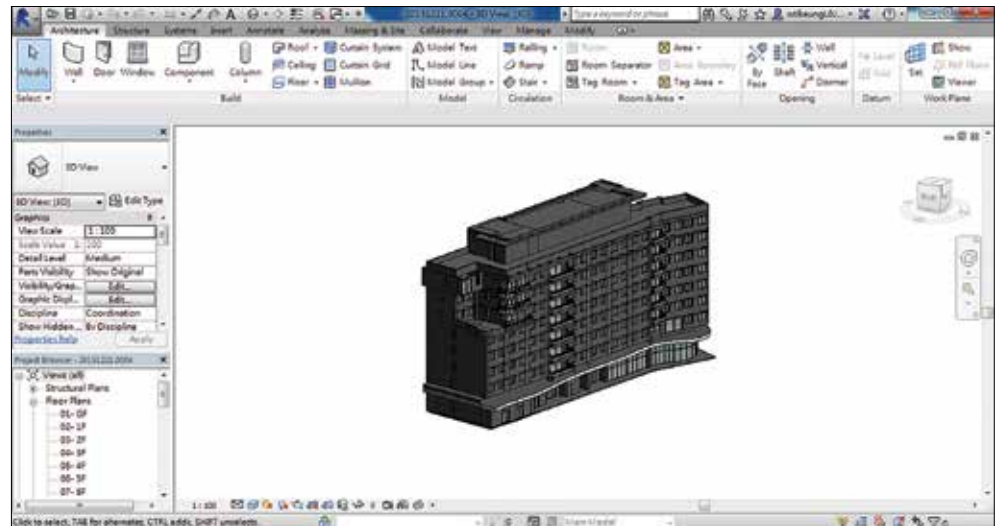
**Achieving Zero Energy Building by
Evaluating Green Building Features
Using Building Information Modelling**

PROJECT LOCATION

The Hong Kong University of Science
and Technology, Clear Water Bay,
Kowloon, Hong Kong

TYPE

Residential Hall



BIM model of Residential Hall 8 in HKUST

BIM Powers Progress Towards Zero Energy Building

Project Background

UG Residential Hall 8 on the HKUST campus is selected for evaluation. The solar panels all over the Hall 8 roof can be effectively employed for electricity production, thus providing some of the power needed for Hall 8. Waste cooking oil generated in the campus can also be utilised to provide the remaining power needed for Hall 8. The BIM-based computer simulation analysis of the residential hall focuses on achieving a zero energy building.

Challenges and Solutions

There were several challenges: To create a BIM model of an existing residential building, in order to simulate and analyse the energy consumption and potential energy generation using a range of BIM-based simulation software applications; to solve the interoperability issues between various BIM-based simulation applications; to analyse the BIM model using a variety of software according to the project needs; and to provide green energy sources that will meet the building's energy needs by installing solar panels and utilising biofuel.

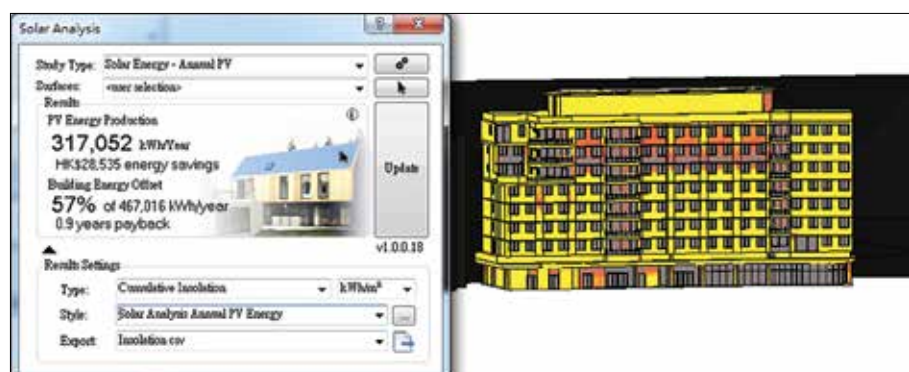
The project not only studies the energy consumption, but also explores the possibility of achieving a zero energy building.

How BIM Helps

A BIM model was created using Autodesk Revit to achieve interoperability across a variety of analysis software, based on numerous 2D CAD drawings obtained from the Facility Management Office of HKUST.

The BIM model comprises a range of information on the residential building, which is essential for energy analyses and estimations, such as geometric information (vacant roof area), building location and weather information (sunlight duration).

BIM allows information on the building to be smoothly transferred into Autodesk Green Building Studio and Autodesk Insight360, the energy analysis programs, which estimate energy consumption and analyse alternative green energy sources (solar panels and waste cooking oil), to achieve a zero energy building.



Solar analysis of Residential Hall 8 through Autodesk Insight360



Chen Keyu

Chen Weiwei

Li Kang

Tang Chung Hin

INSTITUTION

The Hong Kong University of Science and Technology

PROJECT NAME

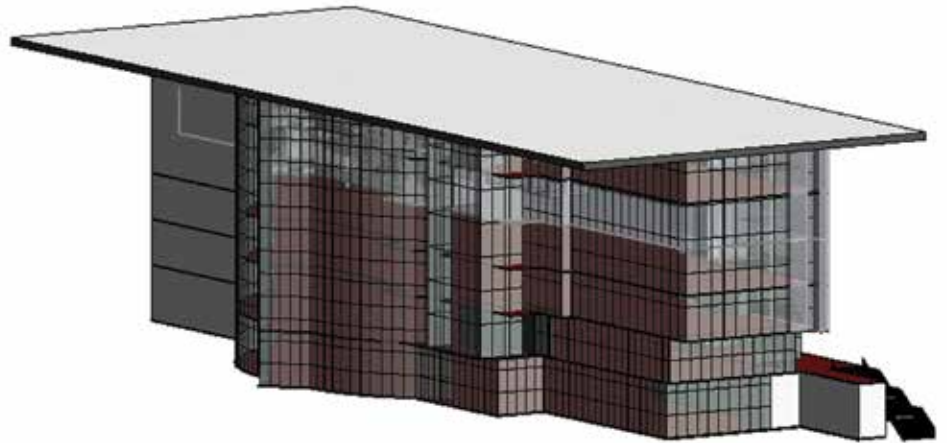
Development of a Building Information Modelling Framework for Building Facility Management

PROJECT LOCATION

The Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong

TYPE

Campus Building



Library Model

Facility Management More User-friendly and Efficient with BIM

Project Background

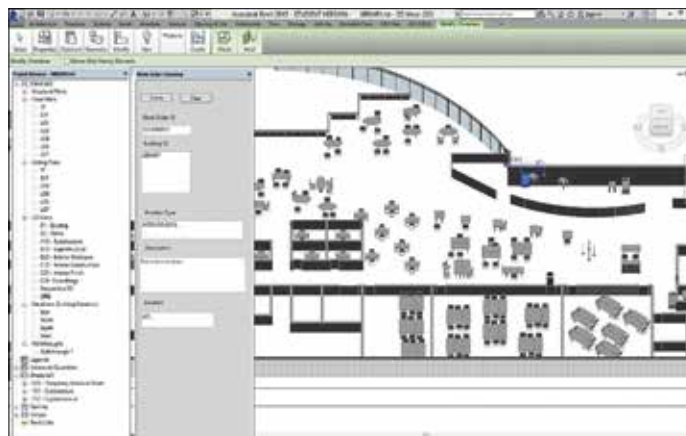
The HKUST library is a five-storey building with 12,350 square metres of floor space. With a strong focus on technology and network access, the Library building contains various facilities and equipment for computing, digital applications, enhanced information retrieval, and wireless network connectivity. However, the library had 1,064 maintenance tasks in 2014/15 alone. It is currently managed in the reactive manner, using solely 2D floor plans, an online reporting system and (paper-based) inspection data. This project aims to use 3D BIM and integrate BIM with FM software (Archibus in this project) for facility management of the HKUST library.

Challenges and Solutions

To improve the current facility management method of the Facility Management Office (FMO); to achieve integration between BIM and FM software; to connect BIM database with FM database; and to enable Autodesk Revit to utilise some functions of Archibus.

How BIM Helps

A BIM-based facility management platform for operation and maintenance was developed, and is more user-friendly and efficient than traditional methods.



Revit Plugin

The proposed platform can integrate the BIM database with FM database to make the FM data and information accessible in BIM software.

A Revit plug-in, which can access the Archibus database, was developed to achieve real-time connection between Revit and Archibus.

AIAB

Autodesk Industry Advisory Board



About AIAB

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

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 bi-directional 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?



<http://www.aiab.org>



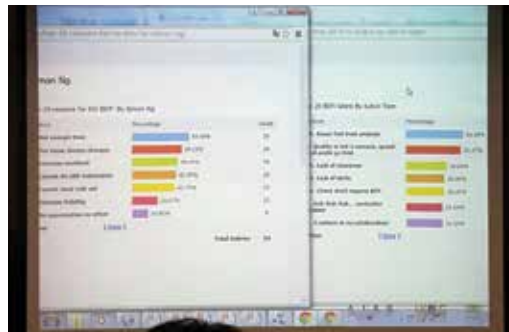
Simon Ng
Chairman of AIAB

Simon Ng, chairman of AIAB is the Associate Director and the leader of WSP | PB Greater China BIM team consisting of over 45 staffs. The team has an unique nature of doing independent BIM consultancy and internal support for BIM enabled engineering design. Being awarded as the 'Young BIMer of the Year 2014' award by the Construction Industry Council (CIC) of Hong Kong, Simon has extensive experience in BIM management such as modeling standard, execution plan, template, family database, skills development, training, etc. Simon is a Mechanical Engineer and had a wide range of experience in engineering design, project management and application of Information Technology in construction industry.



Top 10 BIM challenges

Recently AIAB has organized an extraordinary seminar, speakers delivered speeches on the following topics:



“Top 10 BIM challenges in HK, and how to overcome them”

Sounds negative, however, the purpose of the talk was not to discourage people from BIM nor to complain BIM, the objective was to show the “true picture” of implementing BIM, to analyze the challenge and obstacles we are facing, and more importantly, how we can overcome.

The seminar was an open forum format, audience were very keen to express

their opinion to this controversial topics after the presentation by speakers. There was also an instant voting by audience to vote for the “Top of the Top” challenges for BIM, the results are:

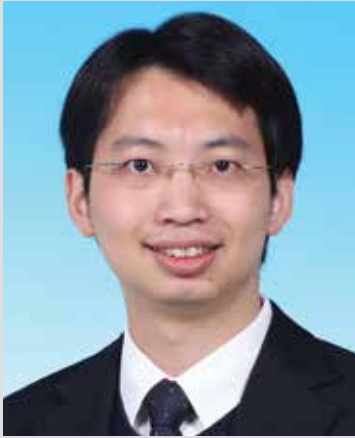
“Not enough time”, “Super fast track projects”

Unlike other western countries, Hong Kong property market pursuit fast and high financial return. The design-construction cycle is usually set to an aggressive schedule. Also, due to the ever-changing market situation, it is not uncommon to have last-minute changes in property usage and hence the design. The idea of BIM is to have a more detailed coordination in 3D before the real construction work. In Hong Kong, such aggressive project timeframe and massive design changes did not allow time for project team members to use BIM seriously to do detail coordination. Therefore project team members always suffer from the lack of time.

The mindset of stakeholders is the key to success. With the use of BIM, we need to abandon some traditional thinking, think out of the box, for example: We need to believe that it “plans longer but better” and allows longer design period with an expectation of shortened construction period due to reduced field changes. With smart implementation of LOD (Level of Development), elements are built in a logical sequence in terms of detail and accuracy, elements are coordinated to “workable” to LOD300 and further detailed and coordinated to LOD400 before actual site work. Another example is the use of BIM drawings, the representation of drawings may be slightly different from traditional way of presentation by 2D drawings, as long as it has a logical presentation, BIM drawings can present accurate and consistent information, are we open mind enough to adopt BIM generated drawings as formal design deliverables?

Congratulations to this year Award winners, I can really see they successfully overcome these obstacles and implemented BIM seriously. With a successful BIM model, it acts a “single source of truth” and provide accurate information for coordination, design analysis and documentation, the team enjoys the real benefits from BIM.

Please visit AIAB website www.aiab.org to download the presentation slides, and the voting results.



Dr. Jack C.P. Cheng

PhD MPhil BEng MHKIBIM MbSHK
MASCE CAP MAEE

Dr. Jack Cheng is currently an Associate Professor in the Department of Civil and Environmental Engineering at the Hong Kong University of Science and Technology (HKUST). He teaches BIM, Construction IT and Construction Management at HKUST. While studying at Stanford University for his PhD degree, he was involved in different projects in Virtual Design and Construction including BIM. His research areas include BIM, data mining, IoTs, construction management, green buildings, and sustainable construction. His research has been published in various international journals and conferences. He has also delivered seminars overseas. He is currently the Vice Chairman of Autodesk Industry Advisory Board (AIAB), committee member of the ASCE Technical Council on Computing and Information Technology (TCCIT), and the Treasurer and Director of ASCE Hong Kong Section.

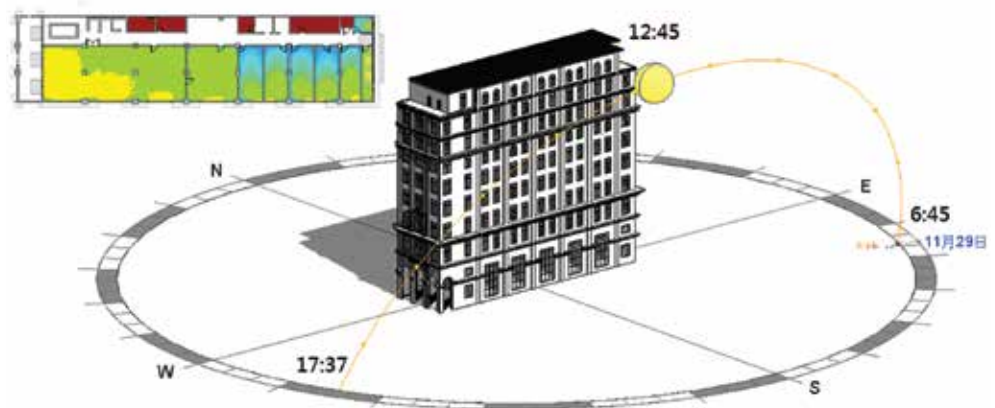


TRUE BIM, FULL BIM.

When I taught BIM at HKUST, many students were amazed by the capabilities of BIM: beautiful photorealistic rendering, drawings linked with different views of a building that are synchronized, energy analysis and daylighting simulation, clashes detected across multiple models of different disciplines, constructability analysis and planning using 4D/5D, etc. BIM is beyond visualization. There have been many discussions on what “true BIM” is. Basically, BIM is a novel approach based on 3D object-based information-rich digital models, to efficiently represent, manage, transfer and utilize various geometric and semantic information of building facilities, for enhanced design and communication. 3D visualization supported by BIM is important, but other applications like simulations, analyses, information sharing, and decision support leveraging information from BIM are also important.

In addition, to fully and successfully implement BIM, “full BIM” is also needed. A strong team is crucial in BIM projects. The team should not only be strong in understanding and experience in BIM, but also have strong support, involvement and commitment in BIM, as a whole team. While specific operations and tactics of BIM can be handled by a few project team members, we need “full-team BIM”. “Full-lifecycle BIM”, in which BIM is used as a means to facilitate and link different lifecycle stages, is beneficial for the full use of BIM capabilities as well.

The “true BIM” and “full BIM” concepts indeed affect education of BIM. BIM education shall be delivered to both industry practitioners and college students of various disciplines, at different levels of difficulty. With “full BIM”, BIM education would cover not only people in architecture, civil engineering and construction management disciplines, but also those in disciplines such as surveying, mechanical engineering and manufacturing. With “true BIM”, BIM education could cover a wide range of BIM-based applications. This makes BIM education challenging, yet fun.





Nelson Kwong

Building committee Leader of AIAB

Nelson Kwong, Building committee Leader of AIAB is the BIM Facilitator of real estate development company construction department managing BIM projects. He is a member of HKIBIM and buildingSmart. The team of nature doing supervise and manage outsourcing BIM Consultant companies for the BIM Projects. He also internal in charge BIM management such as modelling standard, family file, set up project template, research and development and internal BIM training etc. in Sun Hung Kai Properties construction department Project Team B. Being awarded BIM projects as the Autodesk BIM award 2015 and 2016 has been selected as Honorable Mention. Nelson has been working in the consultant engineering company for many years and acquired of experience in Hong Kong rail projects of Geotechnical, Civil, structure of drafting and BIM projects experience in Hong Kong included the T Park, residential estate projects, Singapore Marina Bay Sands Casino project etc.

The BIM is Technical Revolution



As early as 1452, Early Renaissance outstanding architect Leon Battista Albert once raised the essence of architectural is that architect deliver design intent. Freehand drawing blueprint technology is always the only option for the architect in the past six centuries. 21st century today, along with the fast development of computer technology and popularization of personal computers, CAD already becomes a useful tool for construction industry and greatly shortens the dull drawing process, and specially

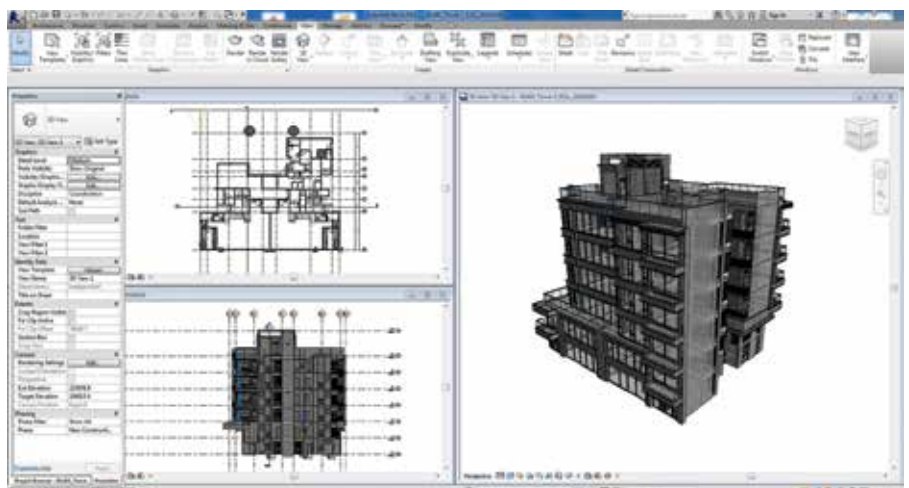
improves the efficiency of the drawings while also save time for clients. Clients also raise higher requirements towards the design system. Their expectations not only stay in the program of the two-dimensional or three-dimensional, but seek for more comprehensive, more revolutionary solutions. BIM emerges as a new technical mean. Although the concept of Building Information Modeling (BIM) is increasingly known among the design and construction industry, but in the field of traditional construction industry there are rarely exhaustive researches to explore the pros and cons between CAD and BIM. The BIM is a software application, a process for documenting and designing building information, a new approach to practice profession, implement new contracts and policies, and balance relationships amongst related project stakeholders.

The use of the BIM system challenges the traditional way of work in the construction industry. BIM can be used as a new approach in design, construction and facilities management. Leaders in architectural, engineering and construction firms in Hong Kong should take the lead to embrace BIM and enjoy the productivity gain and competitive advantages.

Implement BIM of challenges in Hong Kong

- All things start and complete with BIM
- Tight programme for construction
- Non – Stop Changes
- Design may not be able to supply mature design information
- Cannot compatible with Hong Kong CAD Standard
- BIMers of working knowledge varies
- Lack of comprehensive range and full portfolio of BIM training courses are available for Construction industry (e.g. Interactive Classroom or E-learning etc.)

I am pleased to see the fast development of BIM in past few years. Most of people were still thinking of BIM as a tool for producing 2D drawings and 3D visualization 10 years ago. Today, most of the BIM projects can make full use of BIM in 4D construction planning, collaboration, data exchange, 5D quantitative taking-off, safety, 6D facilities management and 7D engineer analysis. Although it is still a long way to fully exploit the benefit of BIM, we should work together to promote BIM to modernize the construction industry in Hong Kong.





Thomson Lai

Director of Technology Support Unit, AECOM

Thomson is the Director of Technology Support Unit in AECOM. He is currently leading the unit to integrate different technologies including BIM, GIS, data capture solutions (Drone, Laser scanning and Mobile APPs) and IT technology for AECOM and clients to strive for excellent project deliveries.

As a Chartered Land Surveyor with over 18 years of experience in the Geospatial industry, Thomson is knowledgeable in a wide variety of BIM/GIS/ CAD, AM/FM, spatial RDBMS software and competent in applying technology to formulate innovative solution for Geospatial projects.

Experienced in managing sizable projects and fully understand the challenges and requirements of clients from Government and Commercial sectors.

BIM – Dynamic Solution for Consultant Industry



AECOM Technology Support Unit

There are various technologies emerge these years and most of them can be integrated with BIM for design, planning and construction. However, these technologies are applied separately and the benefits from them could not be maximized. AECOM, as the pioneer of innovation in the industry, is taking lead to integrate

different technologies for infrastructure Projects in Hong Kong and a dedicated division, Technology Support Unit (TSU), is established for this purpose.

TSU is a team of caliber who leverages the latest and advance technology to deliver innovative and inspiring solution to both AECOM and our clients in the region. Building Information Modelling (BIM) is one of the core information leveraged and integrated with different technologies such as Geographic Information System (GIS), Mobile Application, Unmanned Aerial Vehicle (UAV) Solution and Immersive Technology – Virtual Reality (VR) & Augmented Reality (AR). We aim at selecting the latest and most appropriate technology available in the market and integrate with BIM as an end to end solution to our clients.

Benefit of BIM Integration

Common Data Environment – AECOM has established a Project Hub as the Common Data Environment (CDE) for collaborative engineering information management. This promotes a collaborative approach to information management and supports our ability to deliver high quality projects and share work on a global scale.

The BIM data and other spatial data collected from different technologies such as site information collected by mobile devices, UAV or laser scanning are stored and shared by Project Hub. It offers a comprehensive platform to facilitate the information retrieval and analysis. The shared information can also be integrated into the BIM authoring tool to facilitate design and review as well.

Advance Design Authoring – With reference to the integrated BIM information from the CDE, BIM as a sophisticated authoring, review and collaboration tools facilitates the engineers across industries to improve the accuracy and efficiency of the design process. The automatic clash detection capability facilitates the engineer to identify the design problem and potential clash during design and construction. It avoids the repetitive cycle for design revisions. This further saves the cost and able to deliver a practical design to address the requirement of the project.

First Person Experience of the Engineering Design – The design in BIM can further be enabled to provide first person viewing experience by VR and AR. VR and AR can combine both the design elements and existing environment for designers to ‘Go in’ the 1:1 model to appreciate the quality of space and review the design detail from the BIM model. VR and AR presents the engineering design with realistic view, sounds and other sensations to replicate a real environment to enable the other audience, such as the owners, to interact with the design proposed by the engineers.

End to End Solution – Technology is emerging every day, different technologies are designed to address particular requirement. However, it never can achieve a complete solution without integration, TSU of AECOM is integrating technologies and make it the key to success to deliver excellent projects to our clients.





Erica Lam

BAppSc(ArchSc), MHKIBIM, MbSHK

Erica is an Assistant Manager (BIM) at New World Construction Co., Ltd. Over the last nine years in the profession of construction, her main work process from BIM modelling to BIM management. BIM projects include complex roof geometry of a railways terminus, airport midfield concourse, universities, cargo terminal, commercial building, and residential village. Erica is the award winner of 'Young BIMer of the Year 2014' by the Construction Industry Council (CIC) of Hong Kong. She is also a part-time BIM lecturer and trainer in various institutes.



BIM – To Building Information Management

Further to the advancement of construction technologies, Building Information Modeling (BIM) has become an importance tool to coordinate different issues so as to improve the productivity of the industries. In the last nine years, I witnessed a drastic increase in popularity of BIM. These days, it has become part of the process of various projects such as preparation of design, government submission, and tender drawings during the stages of detail design, contract documents, and construction period. Incorporating the best from BIM and the traditional method is now the newest way of processing and a new management style. Our BIM team has been participating in the development of BIM workflow and standard. In the industry, we are leading in research and design of new and better ways to explore and maximize the effectiveness and efficiency of BIM in the areas of design coordination review and quality control in the combine service drawing.



As the same time, we are exploring BIM Models in Virtual Reality (VR). The premise of BIM model platform is to design buildings, and then see exactly how they might look like upon completion of construction. By using VR in BIM models, users will be able to immerse themselves in a building model before its construction. Again following by pre-construction simulation, BIM Quantity take-off can be done in the earliest stage of projects such that BIM models give out cost information for budget planning. With the planned programme, 4D and 5D BIM can be worked out for the use by project teams. With BIM anyone can get simulated and predictable results at any stage of the project.





Can Leung

Senior Manager, BIM
Technology Support Unit, AECOM

Can Leung has 27 years' experience in virtual design and construction service (VDC), information system development and security management. She is currently the Senior BIM Manager, Technology Support Unit of AECOM, providing VDC, BIM solutions and construction simulations for civil, infrastructure and building projects.

Can has been involved in BIM works for numbers of mega size civil and infrastructure project. She is currently the Deputy Project Leader of the BIM Consultancy Service for Three Runway System (3RS) of Hong Kong International Airport, establishing the BIM strategy and standard for the entire 3RS design service. She is also actively participating in other infrastructure projects including Anderson Road Quarry Site, Shek Wu Hui Sewage Treatment Work, Relocation of Shatin Sewage Treatment Works to Cavern, Hang Seng Management College Site F and MTR C902 – SIL Hong Kong Park Ventilation Building.



BIM for Civil Engineering Use

Conventionally, BIM is used in the design coordination of building works, especially the building services disciplines. AECOM, as the leaders of the design industry, found that BIM can bring significant benefits to civil and geotechnical disciplines. Tunnel and Site formation design are good example where civil and geotechnical engineers can use BIM technology as a tool for design, project management and construction management. Several AECOM projects are able to benefit from BIM by accurate 3D BIM models and information in different stages of the study process.

Applying BIM is critical to civil project, it helps in developing 3D BIM layouts of the site formation, and in deriving quantities of rock and soil. This significantly improves the accuracy and efficiency of the estimation process.

Evaluation of Proposed Options for Design & Construction by BIM

During the design stage of a civil project, BIM model is constructed. This BIM model is particularly useful for the alignment design, site formation and tunneling works, especially when it has a complicated geometry and site constraints. Complicated geometry such as slip roads in form of via-duct, at-grade road, footbridge or other tunnel associated facilities are always required to fit in compact area and these can be simulated in BIM for design assistance and option evaluation.

To obtain more accurate result during the design option evaluation process, different geotechnical data, such as volumes of soil, rock excavation, and surface area of newly formed slopes are calculated through the BIM models. BIM also helps visualizing the existing site structures or constraints and facilitates the comparison of different road layouts in Lam Tin Tunnel. The design can be optimized by quick and easy adjustment of alignment, slope angle and berm width of newly formed slopes.

BIM Strategy for Civil Design

For alignment, site formation and tunnel design, BIM is proven to be an effective tool to provide information on quantities of the ground model, enhance the design efficiency and ensure the quality of the deliverables. The BIM models can also be utilized across civil design projects to maximize the benefits.

BIM models and the planned construction programme can be integrated to generate the 4D model. The 4D model can illustrate the construction progress in an intuitive way and facilitate the engineers to visualize the construction sequence and avoid the potential problems during the construction stage.

Photo-realistic animation and fly through video can also be rendered from the 4D BIM and allow clear visualization. It can be further used for community engagement to explain the vicinity of the development.

BIM can also be extended to the construction management stage of a civil project, the BIM models can be used as a starting point for safety planning and communication. The utilization of BIM technology can result in improved occupational safety by connecting the safety issues more closely to the construction planning, providing more illustrative site layout, site status information, safety plans as well as supporting safety communication in various situations, such as simulation training on site safety.



Ken Mao

BSc, BEng, MBA, MCIQB, MHKIE,
MHKIBIM, MbSHK

Ken is currently a 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 for 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.



Leverage the Power of BIM

It is observed that BIM development in construction industry is not merely focusing on design, drawing production, clash detection, 4D simulation and quantity measurement. It has already extended its arm to various technologies such as photogrammetry, laser scanning, virtual reality, augmented reality, 3D printing, etc. which can leverage the power of BIM to a new level.

It seems to be a perfect case for every business investors that 80% of traditional manpower cost could be saved by investing extra 20% of the cost on the technology. Back to reality, the benefit of BIM may not be easily quantified in such a way. The value of using BIM technology depends on how efficient the end users get benefit from it in their daily workflow.

Apart from those normal BIM workflows such as clash analysis, drawing production and work sequencing, BIM may provide a good piece of clear and impartial information which helps the construction team members to justify their decision making and substantiate their submissions to the Clients. Here are some examples:

1. With proper parameters embedded in BIM model, construction materials can be properly filtered and measured which form a very important piece of supporting information to the assessment process for variation orders and re-measurement items. BIM may help the quantity surveyors to have detailed breakdown on material quantities and clear drawing illustrations.
2. For those construction materials to be formed in complex geometry and require long lead time for ordering, BIM may assist the quantity surveyors to check the exact quantities to be used for each batch of orders.
3. BIM may also perform quality check on the sub-contractors' 2D shop drawings. Taking a wavy shaped structural steel roof as an example, the project engineers are able to systematically identify any missing connection details or anything not compiling to the design and BIM models.
4. It is more convincing to have 3D print of BIM model for visualizing outdoor design when compared to the visualization via a flat screen. For example, a colored 3D print of a public park may allow the client and the government authority to easily feel the sense of space and also visualize all the design elements including hard landscape, floor finishes, park facilities, pedestrian access, elderly equipment, etc. in one go. Such 3D print may indirectly facilitate the inspection and handover process of the public park. Of course, effort has to be made for transforming the BIM models to the 3D printable objects.



With the better integration between BIM and new technology, the construction industry may have more opportunity to improve its daily workflow and make our life easier.



**Introduction to BIM with ArchiCAD
(6 hours)**

- Introducing the global BIM concept
- BIM solution with ArchiCAD
- Working with ArchiCAD
- Managing model data, collaboration
- Fee: \$900

**BIM Certified Expert Level I Basic Training Course
(8 hours)**

- Introduction to BIM
- Setting up a new drawing and BIM modelling environment
- Parametric BIM modelling
- Definition and editing of BIM properties
- Creation of drawing sheets and bill of materials
- Managing model files
- Fee: \$1,650

**BIM Certified Expert Level II MEP Training Course
(32 hours)**

- Starting a Revit project
- Revit Electrical
- Revit Mechanical
- Revit Plumbing
- Revit Fire Protection
- Revit Workflow
- Project delivery
- Fee: \$5,900

**BIM Certified Expert Level II Structure Training Course
(32 hours)**

- Creating and working with an Architectural Underlay
- Linking Revit Project
- Adding columns, walls, foundations, structural reinforcement, beams, framing systems, brace frames, floors, shafts and stairs
- Working with annotation, detailing, scheduling, sheets and revisions
- Project delivery
- Fee: \$6,400

Enquiries 查詢

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**BIM Certified Expert Level II Architecture
Training Course
(32 hours)**

- Creating a new Project from a template
- Accessing multiuser work sharing projects
- Configuring project settings
- Adding levels, grids, columns, walls, dimensions, doors, windows, plumbing fixtures and other components
- Using snaps, modifying tools, constraints, Autodesk Seek, linking, importing and grouping
- Working with Sketch-based modelling components, stairs, complex walls, visibility and graphic controls
- Manipulating rooms, schedules, tags, annotation and details, basics of families, sheets, plotting and publishing and project delivery
- Fee: \$5,900

**BIM Certified Expert Level I Examination*
(2 hours)**

- CE I Basic (ArchiCAD) or
- CE I Basic (Revit)
- Fee: \$600

**BIM Certified Expert Level II Examination*
(3 hours)**

- CEII Architecture (ArchiCAD);
- CEII Architecture (Revit);
- CEII Structure (Revit);
- CEII MEP (Revit); or
- CEII Revit Families
- Fee: \$1,200

*Recognized by the Hong Kong Institute of Building Information Modelling (HKIBIM)

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Documentor in Construction Stage

- Attach images to inspection forms
- Show elements to be inspected in BIM Model
- Upload supporting documents
- Data centralization



Link BIM with FM in Operation Stage

- Show 3D Model in FM solution
- Elements with FM data in BIM Model
- Show work orders in BIM Model
- Locate elements
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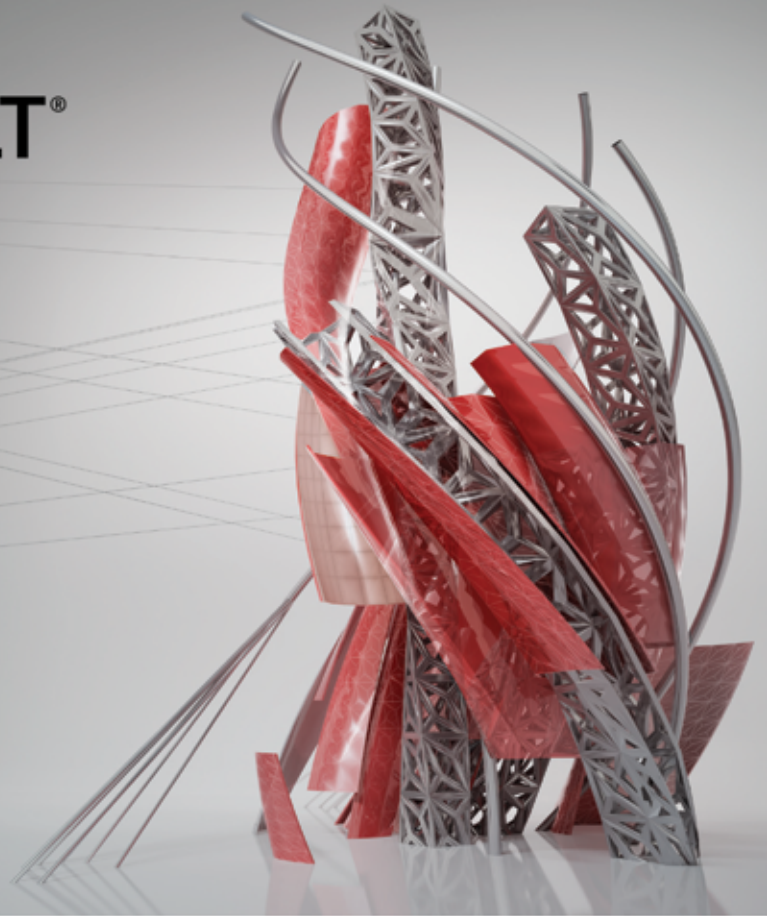
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