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Autodesk Hong Kong BIM Awards 2013

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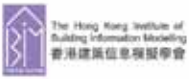

Acknowledgement
Sincere thanks to the six awarded organisations, Chinachem Group, Henderson Land Development Company Limited, Hong Kong Housing Authority, Mott MacDonald – Arup, MTR Corporation Limited and Hopewell Property and Facility Management Limited, in providing such valuable information and pictures of their projects. Besides, we are extremely grateful for the contributions of AIAB Chariman Prof. Marc Aurel Schnabel, Vice Chairlady Ms. Erica Lam and the AIAB committee / members, Ms. Argoon Chuang, Mr. Elvis Li, Dr. Jack Cheng, Mr. Neil Carruthers and Mr. Vincent Wong who are profiled in this booklet.

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Patrick Williams

Creating Better Buildings

The first ever Autodesk Hong Kong BIM Awards were presented in 2007. In the awards booklet, Building Information Modeling (BIM) was described as "an innovative new approach to building design, construction and management". At that time, four projects received awards – one in Dubai, one in Beijing, and two in Hong Kong.

These projects benefited from BIM in ways including clash detection, designing complex geometry, quantity surveying, and coordination between project teams.

More benefits are evident in the six projects receiving awards, and one with an honourable mention, this year. And there are also aspects of these projects that reflect the progress with BIM, as the construction industry continues experiencing a paradigm shift from 2D to 3D computer design.

Today, clash detection is seen as a fundamental benefit of BIM and nearly all BIM projects would do coordination works by making use of the model. It also opens up opportunities for a project team to explore more usage of BIM in their projects such as construction sequence, cost planning etc.. In tandem with this, BIM is achieving broader acceptance, such as through consultants opting to take BIM models and develop them further.

Notions of 4D BIM are more standard, for applications such as consequences; and there's even 5D BIM, to include time and money along with spatial dimensions. BIM can be used for a wide range of projects, whether huge and complex civil works, or relatively small scale housing in which BIM models help to optimise views and other aspects that improve quality, make apartments more liveable.

This last point also reflects the fact that it is impossible to really quantify BIM's financial benefits – which would require testing identical projects constructed with and without BIM! But it is increasingly adopted for the wide range of ways it can help create better buildings.

That range of applications is growing, thanks in no small part to the ingenuity of BIM users, many of whom are pioneers in this global transition to 3D building design. Hong Kong is playing a key role in the transition, as reflected by the outstanding projects that have won BIM awards this year.

I would like to thank and congratulate this year's award winners; Chinachem Group; Henderson Land Development Company Ltd.; Hong Kong Housing Authority; Mott MacDonald and Arup joint venture; the MTR Corporation Ltd. together with honourable mention winner Hopewell Property and Facility Management Ltd.

Patrick Williams
Senior Vice President, APAC and Emerging Markets
Autodesk

Preface
Wendy Lee

Enhancing Quality of Life

Growing up in Hong Kong, I found the skyline thrilling, and was often fascinated by seeing gleaming new buildings arise. It made me proud to be from this ultra-modern city.

Now, I am proud to be playing a small role in helping the designers and builders who continue ensuring Hong Kong has phenomenal buildings and infrastructure.

As reflected in the seven years of BIM awards, there are now places where people can live in and look forward to living in apartments that are more spacious than might have been possible using traditional design techniques. They may enjoy better views, whilst buildings look better.

Below ground, there are railway stations where people may enter and leave more easily thanks to prior testing with BIM. Futuristic new stations are being built, there are highly efficient logistics centres. Buildings have been constructed more swiftly and smoothly thanks to deploying the power of BIM.

Elsewhere, too, the expertise of Hong Kong based BIM teams has helped create gleaming new high-rises and other buildings, sometimes with remarkably complex designs. Even baggage handling systems in airports are built with minimal clashes and maximum functionality, as they are designed in 3D.

Just as Hong Kong city buildings fired my imagination as a child, BIM can unleash the creativity of architects and enable engineers to achieve more efficiencies. As more people become familiar with BIM and its applications, its impact on our society will grow, helping boost quality of life throughout Hong Kong.

On behalf of everyone in Autodesk's Hong Kong team, I would like to congratulate this year's award winners; Chinachem Group; Henderson Land Development Company Ltd.; Hong Kong Housing Authority; Mott MacDonald and Arup joint venture; the MTR Corporation Ltd. together with honourable mention winner Hopewell Property and Facility Management Ltd. Thank you, for playing such inspirational roles in advancing the use of BIM in Hong Kong!

Wendy Lee
Branch Manager, Hong Kong and Macau
Senior Manager, Business Development – Designed in, AEC China
Autodesk

Autodesk HK BIM Awards 2013

Award Winners:

Chinachem Group
Project: The University Heights Redevelopment

Henderson Land Development Company Limited
Project: High Park Grand

Hong Kong Housing Authority
Projects: Construction of Home Ownership Scheme projects at Hin Tin Street, Sha Tin Area 31 and Wang Yip Street West, Yuen Long, Hong Kong

Construction of Public Rental Housing Development at Tung Tau Cottage Area East, Kowloon City, Hong Kong

Mott MacDonald – Arup Joint Venture
Project: Midfiled Development Design Consultancy Services

MTR Corporation Limited
Project: Shatin to Central Link – Hung Hom Station & Approach Tunnels

Honorable Mention:

Hopewell Property and Facility Management Limited
Project: EMAX Phase II

Chinachem Group

Project:
The University Heights Redevelopment

Location:
No.42-44, Kotewall Road, Mid-levels West, Hong Kong

Type:
Luxury High-end Residential Development

Scheduled Time of Completion:
2017

BIM on Sloped Terrain: Model-Based Efficient Design and Quantitative Estimating

"The designs are very complicated... Without BIM, we would really have a headache with all the abortive work."

Ben Law,
Senior Project Manager,
Chinachem Group

Image courtesy of Chinachem Group

Chinachem Group is developing University Heights, featuring three 13-storey residential towers on a sloping site in Mid-levels. The design also includes a car park, a landscaped garden, a swimming pool and recreation facilities. BIM has helped designers, including with understanding the complex site topography, enhancing interior design, and even safeguarding trees.

BIM Partners Involved:

- Andrew Lee King Fun & Associates Architects Limited
- Far East Consulting Engineers Limited
- CM Wong & Associates Limited
- Rider Levett Bucknall Limited
- Atkins China Limited
- Construction Virtual Prototyping Limited

Image courtesy of Chinachem Group

Consolidating design information

"During the last two years, Chinachem Group has been trying BIM tools to develop architectural, interior, and building services designs," says Ben Law, Senior Project Manager, Chinachem Group. "We want to know if it is powerful for designing, as well as for costing, and engineering."

BIM is being employed for University Heights partly as there is unusual terrain, with a drop of 30 metres plus from the front of the site to the back. The slope is uneven, and unlike many sites, it is not possible to create a cut slope due to a Mid-level Moratorium and the location being in a Scheduled Area. Instead, numerous retaining walls will be needed to stabilise the site.

"BIM tools are powerful for handling the design," says Mr Law. "It is possible in 2D, but time consuming and you don't get a clear picture. In BIM, we see 100% coverage of the slope, interface with building foundation, and differences between levels.

The BIM model included the topography, retaining walls, and nullahs on two sides of the site, which helped the structural engineers determine where to put the foundations. And as there is a substantial drop of over metres from the main road, it also aided design of the access ramp for property access.

"I'm worried about clashes," Mr Law adds. "The architects, structural engineers, building services and landscape designers focus on their aspects of the project. I need someone to consolidate the information into a picture, so we can see what is what, in 3D or 4D." It might even better if the design team can create BIM model and coordinate themselves.

Clashes with trees, and interior designs

Initially, design work began in 2D. "With BIM

Image courtesy of Chinachem Group

on board, a lot of effort went into 3D," says Mr Law. "Before that, it is difficult to imagine the relationship between the proposed structures and the site, and existing trees."

Mr Lau Kan Fai, Senior BIM Project Manager of the project's BIM consultant, explains that information on sizes of existing tree trunks and canopies was included in the BIM model. Those information was used to check if there is any interference with the future buildings, and with the temporary working platforms.

Given this information, the design team can determine how to minimise impacts on trees, perhaps finding compromises, and minimising any cutting of branches.

"There were several studies to check views for interior design," says Mr Lau. These included the impacts of the design for the exterior glazed façade, notably its mullions and transoms. Photo montages were used to indicate scenes outside the building.

"Interior designers are sometimes not aware of mullions and transoms in 3D sense, so they may put dividing walls by mullions," says Mr Law. "When there were changes to the façade, interior designers had to see how they would impact design and how design improvement required, such as for drapery and interior furniture."

The BIM model revealed other features that would not be obvious from 2D drawings, such as high windows above horizontal transoms,

Image courtesy of Chinachem Group

Image courtesy of Chinachem Group

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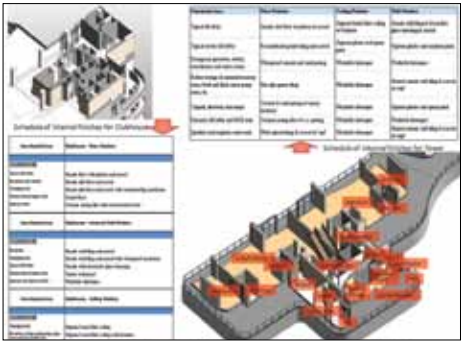

Image courtesy of Chinachem Group

and shading devices that were outside.

Avoiding disaster during construction

As the design proceeded, Mr Lau obtained native input including sketches; and updated the BIM model for use in coordination meetings. "We were trying to minimise the coordination life cycle," he says.

From the model, Mr Lau created a sequential animation, showing anticipated progress from the existing site, with old building demolished through site formation work, to piling and superstructure. The BIM was linked to a 5D software for exercise of building quantity take-off. The modeling methodology was standardized with aligning to HKSMM4, and the data like quantity, trade, specification, standard were linked and formulated in a customized cost plan template in the three-party software. Formulated schedules of trades including piling, RC structure, internal walls, glazed exterior wall, and finishings were exported in previous exercise to assist Project QS in preparing the cost plan. The automatic workflow minimise needs for manual measuring and data input.

The model helped with aesthetics, such as ensuring that the building façade is a window wall, without visible vertical risers for drainage and other building services.

"The building services are very complicated – like spaghetti!" says Mr Law. "If not well planned during the design development, there will be a disaster during construction. Without BIM, we would really have a headache with all the abortive work in terms of design and construction."

The BIM model helps partly as it includes actual sizes of pipes and ducts, and can show orientations of drainage pipes. Sunken slabs in bathrooms are among features that would be especially challenging in 2D, as they have services laying above them that cannot pass through beams.

Plus, the model serves as a central repository for information on coordination, with a clean list of revisions. "We identify clashes as early as possible, so there is more time for better designs," says Mr Lau.

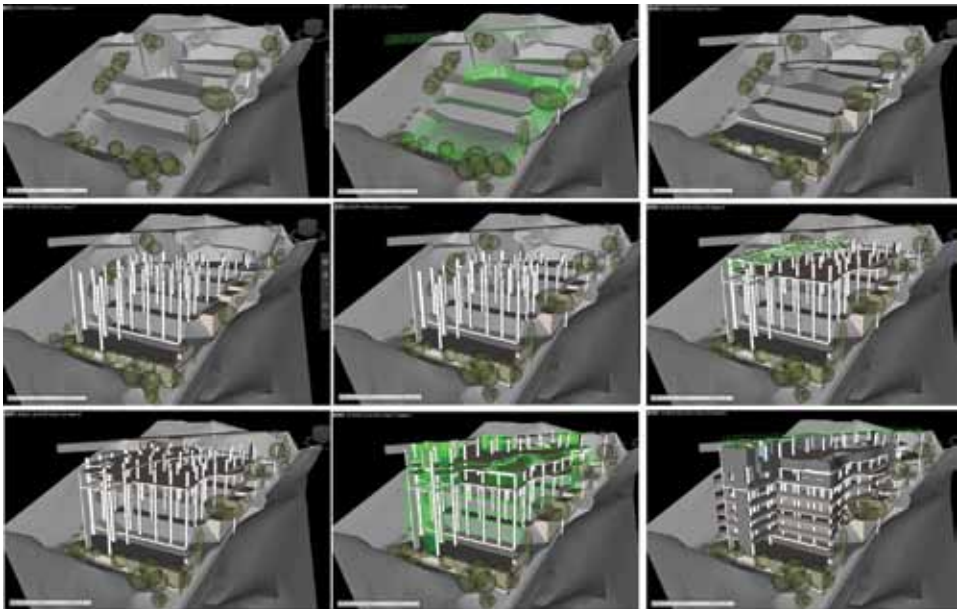

Image courtesy of Chinachem Group

"I expect around 80% of the coordination work were done before construction" says Mr Law. "The others can be easily resolved by the contractors."

Mr Law believes the BIM model will be used to the end of the project. Indeed, it was a requirement that the main contractor to use BIM, such as for programming site activities and site planning proposal.

"BIM is still new to our company, still in testing stage, and there are discussions about more use," says Mr Law. "For larger scale or complicated projects, I believe we will involve BIM. I feel that for University Heights, BIM has been helpful throughout the design process – now, we must see how it performs during construction."

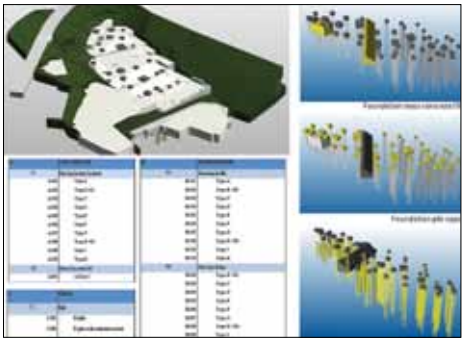

Image courtesy of Chinachem Group

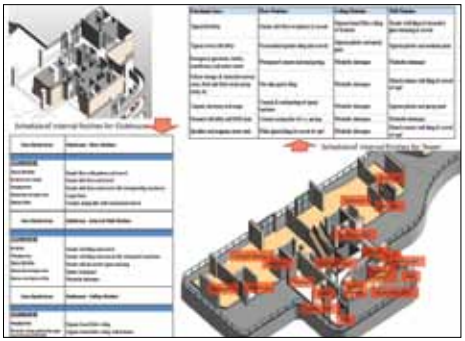

Image courtesy of Chinachem Group

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About Chinachem Group

The Chinachem Group ("Chinachem" or the "Group") is one of Hong Kong's best-known and most prolific property developers, with a successful corporate history of more than 40 years. Still the largest privately held group of its kind.

The early years of the company were dedicated to exploration of, and investment in, agricultural projects and chemicals, but in the 1960s, the Group was one of the first to see the future of property development in Hong Kong and shifted its focus to the development of the city. It has subsequently contributed tremendously to the city, working to meet the needs of its citizens.

By the mid-1970s, Chinachem had grown from a burgeoning company into one of Hong Kong's largest property developers. The group has consistently maintained its position as a forward-thinking pioneer in the industry, active in the development of new towns and districts in Hong Kong. Tsuen Wan, Kwai Chung and Shatin were all developed in large part due to the dedication and foresight of the Group.

Through their consistent efforts to improve Hong Kong, the Group continues to create private residences for elegant living for a wide range of Hong Kong's residents and families.

Today the Group boasts an impressive and diverse range of high-quality properties that span Hong Kong Island, Kowloon and the New Territories, with business interests including hotel ownership and operation, residential and commercial properties, as well as retail and industrial interests in a number of Hong Kong's best-known and most iconic buildings.

Chinachem has added to its portfolio of business interests on a global scale, investing in ventures related to its core businesses and associated industries, together with biochemistry, electronics, education and finance.

Henderson Land Development Company Limited

Project:
High Park Grand

Location:
No.68 Boundary Street, Mong Kok, Hong Kong

Type:
Residential Development

Scheduled Time of Completion:
Late 2014

BIM Empowers Value Driven Design

"Building construction is teamwork, and everyone has to know what is happening. This is the beauty of BIM: everyone can make a contribution."

Kevin Ng,
Deputy General Manager
Project Management (2) Department,
Henderson Land

Image courtesy of Henderson Land Development Company Limited

Henderson Land Development Company Limited is developing a residential building, High Park Grand, in north Kowloon. It's a relatively small urban renewal project, comprising 41 units, scheduled for completion in late 2014. Henderson Land is utilising BIM to maximise quality, including by making the most of views to north and south.

BIM Partners Involved:

- Hung Shun Investment Company Limited
- Andrew Lee King Fun & Associates Architects Limited
- The Oval Partnership Limited
- CL3 Architects Limited
- J. Roger Preston Limited
- Stephen Cheng Consulting Engineers Limited
- Heng Lai Construction Company Limited

Image courtesy of Henderson Land Development Company Limited

Making apartments as liveable as possible

"High Park Grand is at Boundary Street, between a densely populated area to the south, and a more open and green landscape to the north," says Kevin Ng, Deputy General Manager – Project Management (2) Department, Henderson Land. "We are using BIM for more than its basic function of clash identification, by refining and optimising the design, such as massing disposition, external view checking and interior spatial enhancement."

The project will become part of Henderson Land's "H Collection" (urban redevelopment boutique residences) notes Mr Ng, adding that Henderson Land views the use of BIM as part of the quality driven decision making process: "We think the quality of a building really important – and it involves far more than decorations such as stonework. We try to make apartments as liveable as possible."

Everyone can contribute

"We have used BIM from the beginning of this project," says Ernest Wong, Project Manager – Project Management (2) Department, Henderson Land. "Architects, structural engineers, and electrical and mechanical engineers have all used the BIM model to refine the details."

Though the team produced 2D designs on paper, BIM helped with aspects such as optimising massing disposition, reducing clashes, and increasing ceiling height to make rooms more spacious. "Using 2D would have been more time consuming for this, relying on experience and judgement," says Mr Wong.

"BIM enables us to visualise the project before we go to the site, and make early decisions," says Mr Ng. "Building construction is teamwork, and everyone has to know what is happening –

Image courtesy of Henderson Land Development Company Limited

so if there are problems or opportunities, they can give support and input. This is the beauty of BIM: everyone can make a contribution."

Views from without and within

The design team made special use of BIM in optimising views of and from the building. "We put all building services at the back of the building, facing south," says Mr Ng. "But there are stunning views to Tsim Sha Tsui at the back, so we wanted to know how we could create big picture windows."

The team changed routing of pipes for gas supplies and water supplies, to maximise window areas, and incorporate ventilation louvres into windows. They also hide the pipes as much as possible, effectively opening up the exterior. "Now, the back of the building is no longer typical; to people outside it will appear like the front," says Mr Ng.

As the BIM model included simple representations of surrounding buildings, it also provided opportunities for checking views from within apartments – such as checking whether

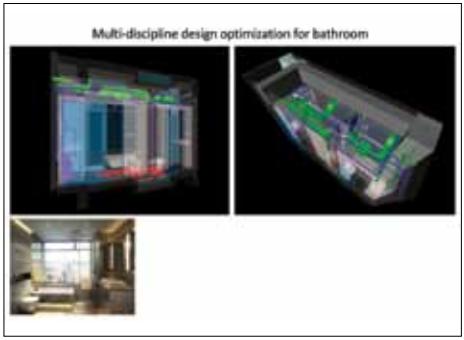

Image courtesy of Henderson Land Development Company Limited

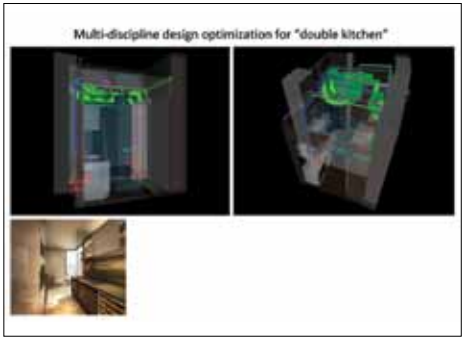

Image courtesy of Henderson Land Development Company Limited

Image courtesy of Henderson Land Development Company Limited

the view from a 10th floor apartment was blocked by a neighbouring building.

Faster decisions

"By making decisions based on the BIM model, we achieved faster response times in the design process," says Mr Wong. "For instance, we had a lot of curtain walls, and precast facades, requiring very precise information." A visualisation of the building façade helped the designers to formulate and rationalize the complicated podium glass wall design.

The 3D model was a far better way of showing aspects of design such as predetermined holes through the precast concrete wall panels where service ducts would penetrate walls, which would be difficult to show in 2D. This was important as the building design is compact, with no space for large ducts, and significant potential for clashes.

The BIM model also facilitated interactions between different teams. "For example, we modelled services through common areas, and checked whether there may be long term maintenance issues," says Mr Ng. "This helped make decisions involving stakeholders who might be unfamiliar with 2D drawings. In the past, this would have required a lot of talking, with several illustrations, to explain internal alignments. BIM is 'reader friendly', so the model can be understood by laymen."

Quality boosted with BIM

The BIM model may later help with facilities management for High Park Grand. Although Henderson Land finds BIM is powerful and versatile, Mr Ng says there are some issues,

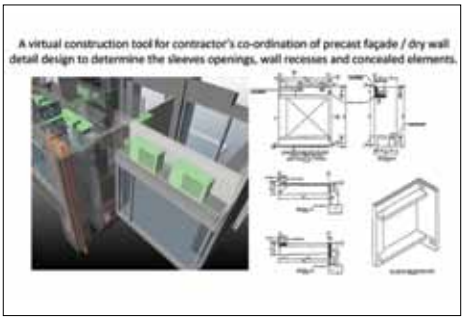

Image courtesy of Henderson Land Development Company Limited

Image courtesy of Henderson Land Development Company Limited

such as not all consultants are sufficiently versatile to use BIM.

Henderson Land has also held some training courses for consultants, so they learned how to use a BIM. "It's part of a process to enhance quality." says Mr Ng. Henderson Land will expand use of BIM, such as for producing drawings while designing office developments. There is an extra cost for using BIM compared to 2D drawings alone, but this is not overwhelming, and there are significant benefits too. "In the past, the decision-making process tended to be cost driven," reflects Mr Ng. "But we are now shifting to value driven decisions – such as with High Park Grand, where we have achieved light, airy interiors, together with a liveable external area."

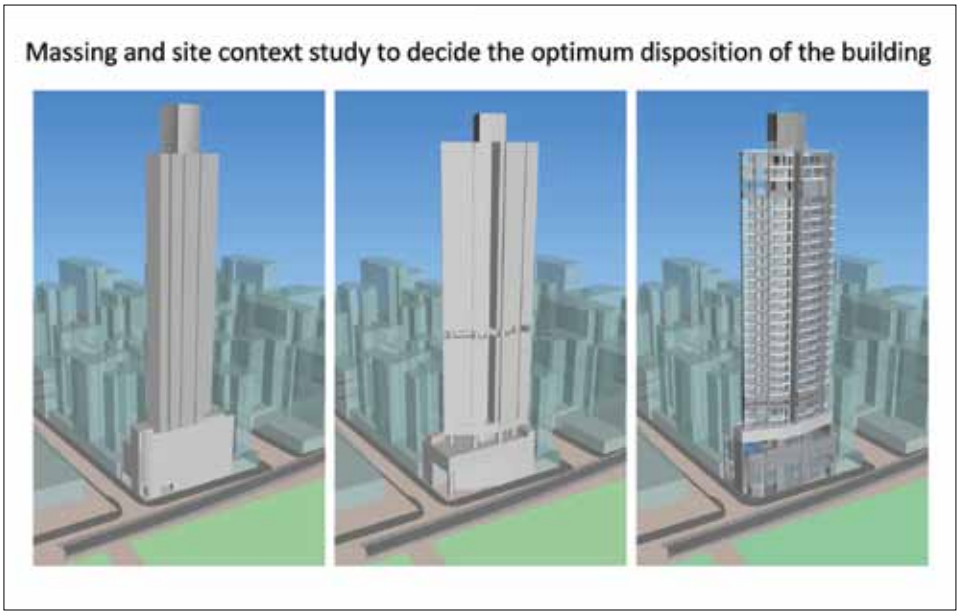

Image courtesy of Henderson Land Development Company Limited

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HENDERSON LAND GROUP

About Henderson Land Group

Founded in 1976 by its Chairman, Dr The Honourable Lee Shau Kee, GBM, Henderson Land Development Company Limited is a leading property group with a focus on Hong Kong and mainland China. Its core businesses comprise property development and property investment. In addition, it has direct equity interests in a listed subsidiary, Henderson Investment Limited, and three listed associates, The Hong Kong and China Gas Company Limited (which in turn has equity stakes in a listed subsidiary, Towngas China Company Limited), Hong Kong Ferry (Holdings) Company Limited and Miramar Hotel and Investment Company, Limited.

Henderson Land has been listed in Hong Kong since 1981 where it is one of the largest property groups. As at 31 December 2012, Henderson Land had market capitalization of HK$132 billion and the combined market capitalization of the Company, its subsidiaries and associates was HK$342 billion.

With sustainability as a core consideration, The Group is conscientious in its approach to deliver attractive and efficient properties in unrivalled locations that contribute positively to their context. The Group has received numerous awards and accreditations recognizing its effort in sustainability. The Group's recent development Double Cove has won Hong Kong Green Building Award (Merit Award), and Best Innovative Green Building Award (Bronze Prize) in the International MIPIM Asia 2012 Awards. Double Cove and The Gloucester have both achieved 3-star top rating of Green Building Design Label granted by the China Green Building (Hong Kong) Council. Furthermore, five of the Group's latest projects including Double Cove, The Gloucester, High Park, High Park Grand and Mira Moon are bestowed Five Stars Awards in the International Property Award 2013.

Hong Kong Housing Authority

Projects 1&2:
Construction of Home Ownership Scheme projects at Hin Tin Street, Sha Tin Area 31 and Wang Yip Street West, Yuen Long, Hong Kong

Project 3
Construction of Public Rental Housing Development at Tung Tau Cottage Area East, Kowloon City, Hong Kong

Type:
Public Housing

Scheduled Time of Completion:
Project 1: Early 2018
Project 2: End of 2016
Project 3: Mid of 2014

BIM Benefits Soar from Underground to Tower Cranes

"Before BIM, we sorted out a lot of clashing of elements on site. BIM has helped us much by minimising abortive works."

Frankie Fung Chi-fai,
Architect
Housing Department

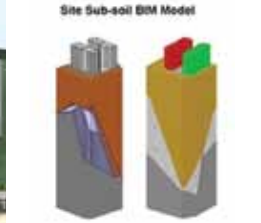


Image courtesy of Hong Kong Housing Authority

Hong Kong Housing Authority continues to expand its use of BIM, overseen by a BIM Project Steering Committee. BIM models are helping to fast track the Home Ownership Scheme projects such as Wang Yip Street West, Yuen Long and Hin Tin Street, Sha Tin. BIM has also enhanced the site works in the Public Rental Housing development in Tung Tau Cottage Area East. The applications of BIM technology are spanned subsurface geology, value management, and deploying tower cranes.

BIM Partners Involved:

- isBIM Limited
- Able Engineering Company Limited
- Majestic Engineering Co Ltd
- Pyrofoe Engineers Limited
- Hitachi Elevator Engineering Company (Hong Kong) Limited
- The Hong Kong Polytechnic University

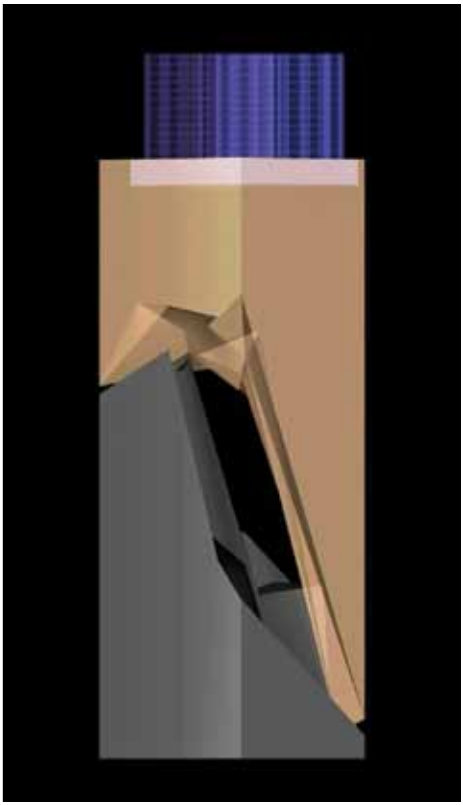


Image courtesy of Hong Kong Housing Authority

Visualisation of Complex Geological Condition

"Our site at Wang Yip Street West, in Yuen Long, was underlain by impure marble with cavity infill," says Ir Clement KM Fung, Structural Engineer, Housing Department. "It's in the Scheduled Area No. 2 as defined according to the Buildings Ordinance, for which we have to fulfil the requirement on the stress limit on the marble cavities."

The project team conducted ground investigations, sinking totally 43 numbers of boreholes, of which some even extended down to 200m below existing ground. On basis of the information, 2D geological drawings (plans and sections), showing the alluvium and marble bedrock, together with the overlying marble with cavity infill, were prepared.

Relatively shallower marble bedrock platform was revealed mainly in the west corner of the site. Based on the 2D drawings, the project team originally proposed to build a 35-storey building, with large diameter bored piles founding on the marble bedrock. Another lower block was also proposed in the same site, which was to be supported by shallower foundation that would have the overall stress within the stipulated limit of the marble with cavity infill stratum.

As more borehole data was obtained, and with the BIM techniques, the team set up a 3D BIM model with a view to visualizing the complex subsurface geological settings. In addition, a 3D printed model was produced, with different colours representing marble bedrock, marble with cavity infill and alluvium – which could physically be disassembled like pieces of jigsaw to allow clearer apprehension of the rock strata. With the printed model, layers of steeply inclined bedrock overlaid by marble with cavity infill across the site were clearly visualized. "We found that such geology would render installation of end-bearing piles extremely costly and difficult, if not impossible," says Ir Fung. "We realised it was prudent to explore other foundation options to avoid such construction risk, and, in collaboration with the project Architect, we tried to massage the building layout to keep the extra stress on the marble cavity within the allowable limit, while maximizing the development potential."

The 3D models, in particular, the BIM video, had persuaded both the Architect and the Management of the need to substantially revise the design. Now, the Housing Authority is going to build two medium-rise domestic wings supported on shallow raft foundation on the eastern part of the site, away from the areas

affected by marble with cavity infill stratum.

Apart from the above, the BIM model has also been proved to be useful in other ways - a 4D BIM simulation – including time – has facilitated the project team in construction planning, in particular for works with deep excavation, in a more efficient manner than the traditional way.

"I think the time spending on preparation of the 3D model is comparable to that for the 2D drawings, but the result so derived is much more significant and advantageous," says Ir Fung.

BIM as a Value Management Tool

A project for the construction of the Home Ownership Scheme Development at Hin Tin Street in Sha Tin faces great site challenges, including a very congested, long and narrow site adjoined with an extensive slope and sensitive residential developments, plus a hospital nearby.

"It's a small but very delicate project, with very difficult geotechnical issues and site constraints," said Alexander Yau Siu-fai, Senior Architect, Housing Department. "There will be around 240 flats, and we need the best value solution to optimise quality, construction time and lifetime costs, disregarding all the site constraints."

"The project includes a large scale bore pile wall that will be more than 100 metres long surrounding the peripheral of the site. It was difficult to incorporate the wall into the narrow site as this would impose a major constraint to the disposition and configuration of the domestic block. To find the best solution, we used BIM models to verify the 2 options. First option is a wall of 2m bore piles, and the second option is a combination of 1m and 2m piles. BIM model is used to test the buildability, cost and construction time of these 2 options,"

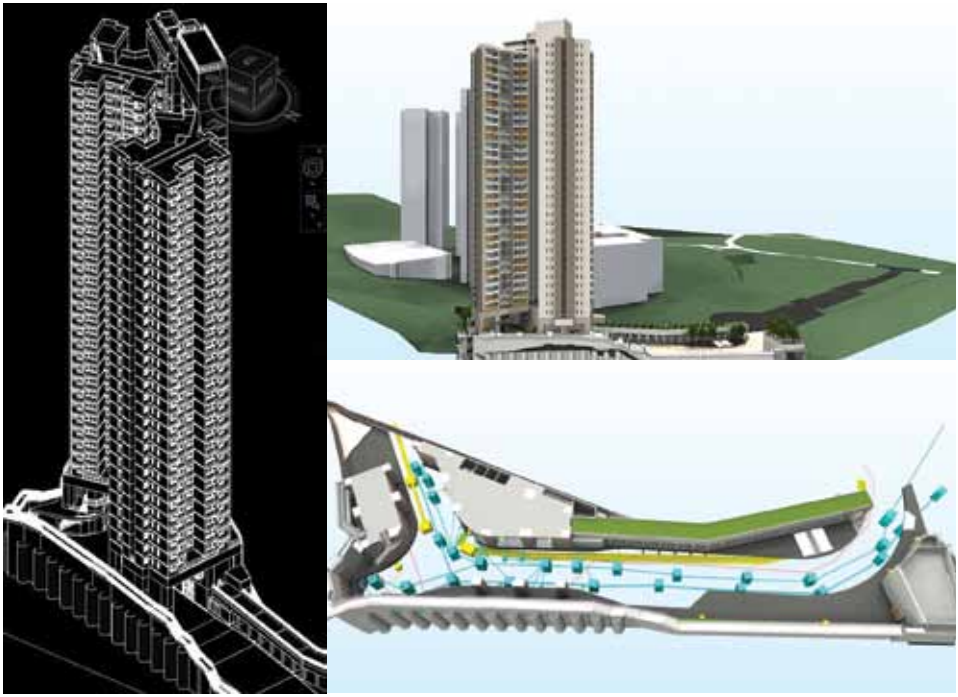


Image courtesy of Hong Kong Housing Authority

Image courtesy of Hong Kong Housing Authority

Image courtesy of Hong Kong Housing Authority

said Mr Yau. The comparison led to the team choosing the option with 2m bore piles, as this would take less time and cost to construct while the domestic block can still be accommodated within the remaining area of the site.

Choices, Choices

The domestic block of Hin Tin Street project includes a transfer structure at the first floor level above the driveway. The space underneath the transfer structure provides the manoeuvring space required for the fire appliance under the domestic block. "We have considered two options for this transfer structure," said Mr Yau. "One with a transfer plate, and the other with transfer deep beams."

Though the transfer plate would be simpler to construct, it would require more materials and be more costly. Again, BIM was employed for comparison - proving to be especially useful for assessing quantities of concrete and steel, which would take lots of efforts to estimate just by using 2D drawings. Quantitative analysis for the 2 options can be easily worked out through the BIM models. The team finally adopted the transfer plate system for more efficient construction and shorter construction time.

Another study on the use of BIM was the decision of flat numbers in each typical floor layouts – 6 or 8 flats per floor. "These options would have implications including cost, time

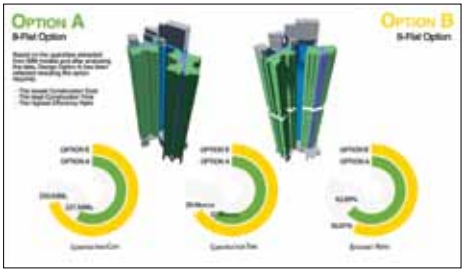


Image courtesy of Hong Kong Housing Authority

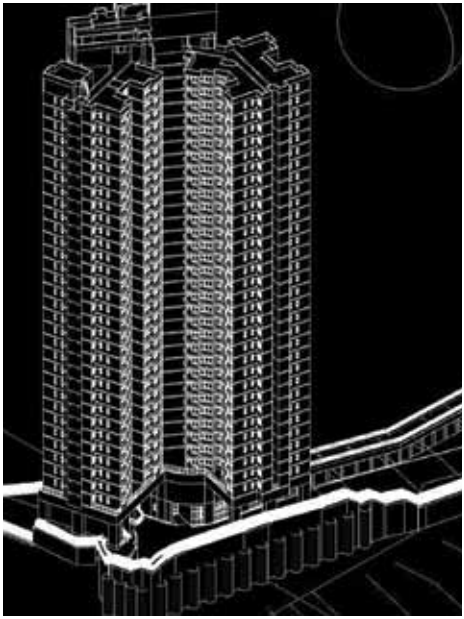


Image courtesy of Hong Kong Housing Authority

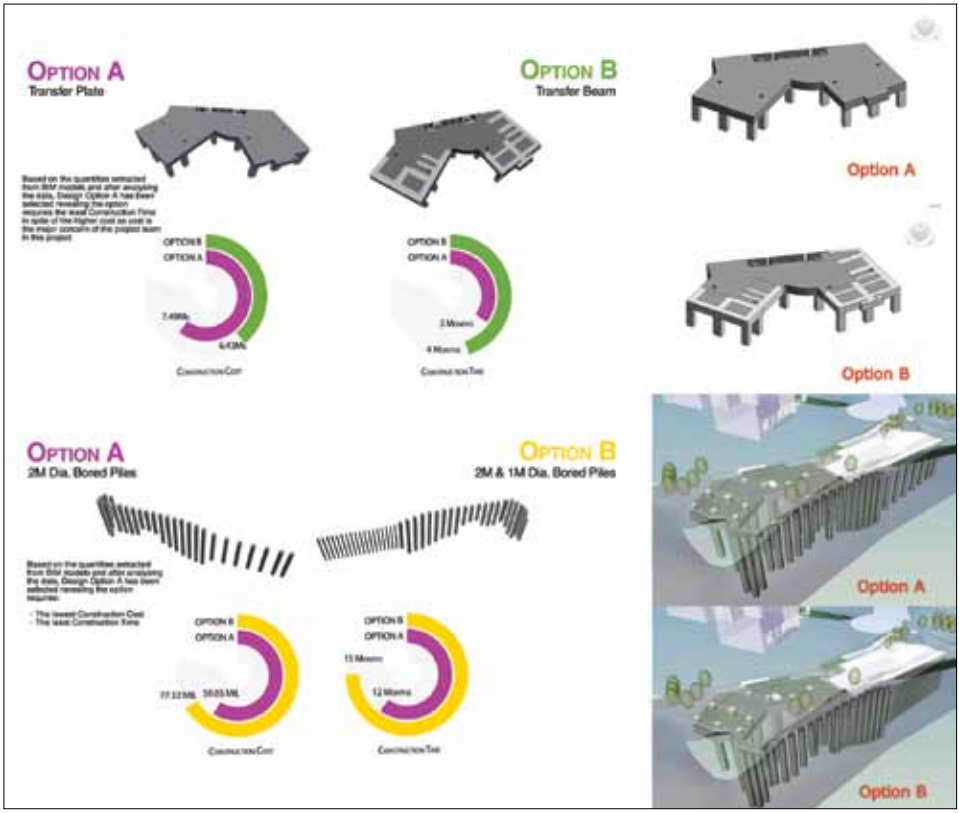


Image courtesy of Hong Kong Housing Authority

and the overall efficiency. We have also taken the building height and visual impact on the surrounding development into consideration," said Mr Yau. Again, BIM was used as a decision analysis tool to facilitate comparison of all these factors. The design team has chosen 8 flats per floor to keep the low block less visual impact to the neighbourhood. Other benefits include shorter construction time, less cost and higher efficiency ratio.

As the project progresses, the project team aims to use 5D BIM – with spatial dimensions plus time and cost. The Housing Authority has previously used 5D BIM in the construction stage of another project. We now have advanced it to the feasibility/design stage.

Integrated Design

BIM is also being employed in another Public Rental Housing development at Tung Tau Cottage Area East in Kowloon City by the main contractor, Able Engineering Company Limited. Though there will be only one domestic block with 32 domestic storeys, the building takes a large footprint with a maximum of 33 flats per typical floor.

"It sits on a hillside, so detailed site planning is required," explained Mr Frankie Fung Chi-fai, Architect, Housing Department. "There are 3 wings, each located on a different platform, and with three emergency vehicle access roads." The scope of the main contract includes site formation work with retaining walls.

Image courtesy of Hong Kong Housing Authority

The drainage there with slopes is relatively complicated. Given the size, constraints and topography, it is very important to plan the sequence of work ahead carefully.

A BIM model has been employed in simulating different construction scenarios, to identify the best construction sequence. "Using only 2D drawings, it would be difficult for the contractor to understand this sequence," says Dr Neo KY Chan, the project's BIM manager.

The BIM model also helps determining how best to deploy and use the 2-tower cranes in order to avoid clashing during operation.

As there are many "concealed" services in the building, Mr Fung wants to use the BIM model

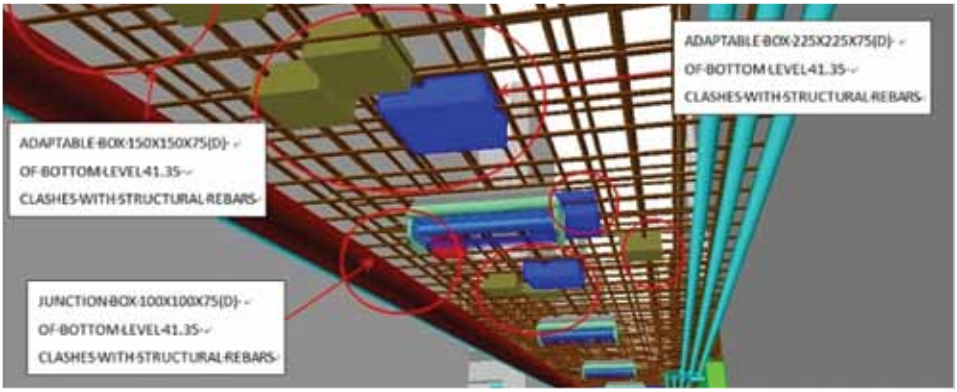


Image courtesy of Hong Kong Housing Authority

Image courtesy of Hong Kong Housing Authority

to coordinate them. "With 33 flats per floor, comparing to other 18-20 flats per floor domestic blocks, we have many more services running along the corridor with which its width is about the same," he said. "Before BIM, we often sorted out the coordination between such as, junction boxes and steel reinforcement bars on site. BIM has helped us a lot by minimising abortive works and clashing of elements on site."

The model also includes the external areas around the building, helping to check for clashes with manholes, drainage and other services, as well as enabling Mr Fung to optimise aesthetics.

Way Forward

As BIM technology is more mature and practical to use in housing projects, Hong Kong Housing Authority has confidence to move ahead for adopting BIM to all our new development projects by 2014/15. It views that the architectural, construction and engineering (AEC) industry need to carry out a more thorough exploration of the potential applications of BIM with the aim to build a better living environment to our citizens.

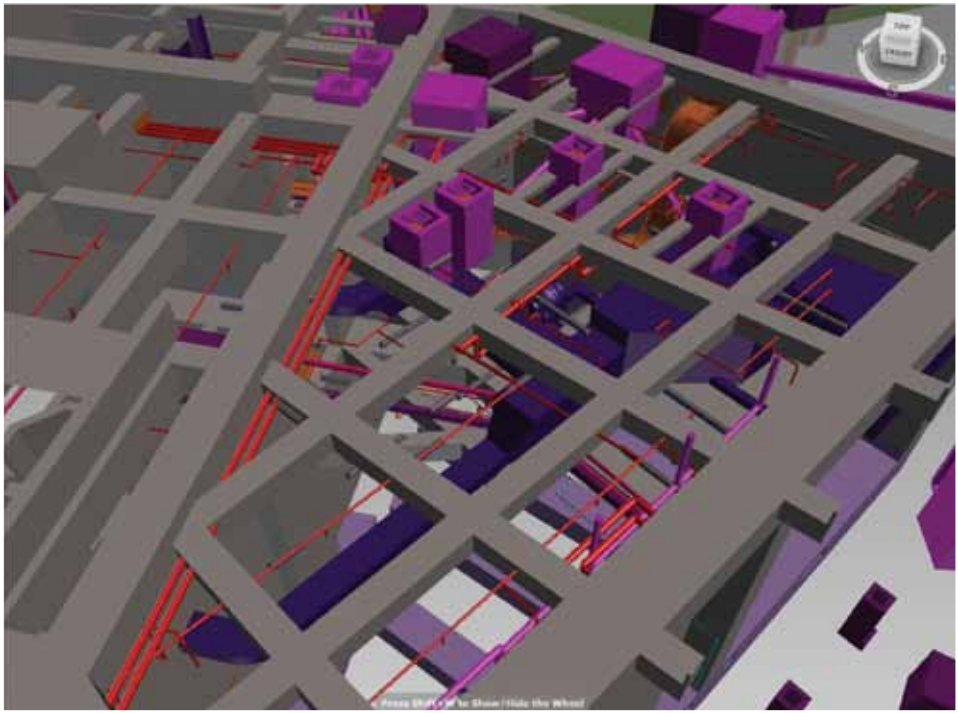
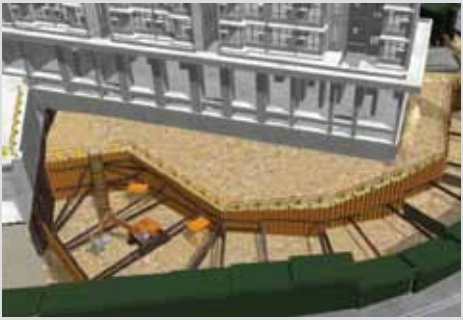


Image courtesy of Hong Kong Housing Authority

Hong Kong Housing Authority



About Hong Kong Housing Authority

The Hong Kong Housing Authority (HA) is a statutory body established to develop and implement Hong Kong's public housing programme. Its mandate is to help low-income families in need gain access to affordable housing. Approximately 30% of the Hong Kong population is now living in public rental housing units.

The HA plans, builds, manages and maintains different types of public housing, including rental housing estates, interim housing estates, and transit centres. In addition, the HA owns and operates some flatted factories and ancillary commercial and other non-domestic facilities. Also, with the resumption of Home Ownership Scheme, HA builds 17,000 new HOS flats for four years from 2016/17 to 2019/20 and thereafter 5,000 new HOS flats a year.

The Housing Department acts as the executive arm of the HA to help the Government achieve its policy objective on public housing.

Mott MacDonald and Arup

Project:
Midfield Development Design Consultancy Services

Location:
Hong Kong International Airport

Type:
Infrastructure

Scheduled Time of Completion:
Q3, 2015

Flying Through an Airport Building

"Using BIM was about the only way we could have done this job."

David Mepham,
Divisional Director,
Hong Kong, Mott MacDonald

Image courtesy of Mott MacDonald and Arup

A joint venture between Mott MacDonald and Arup is providing full design consultancy and construction support services for a Midfield Concourse to be built at Hong Kong International Airport. With an area of 100,000 square metres, this will provide an additional 20 aircraft parking stands, together with passenger facilities including an extension of an automatic people move system, and a baggage handling area. This is the first Hong Kong Airport Authority project to deploy BIM.

BIM Partners Involved:

- Airport Authority Hong Kong
- Aedas Limited
- OTC Limited
- Atkins China Limited
- Bo Steiber Lighting Design

Deciding to use BIM "full-on"

"During our bid for the project, we thought long and hard about using BIM," says the project manager Mr David Mepham, Divisional Director – Hong Kong, Mott MacDonald. "It was not specifically called for in the terms of reference, though the Airport Authority had asked for a computerised 3D model for clash resolution. We made a conscious decision to use BIM full-on."

This was the first time BIM would be deployed on a Hong Kong Airport Authority project, and Mr Mepham explains that it would prove beneficial as in the project cycle, it saves money, through helping with more quickly understanding designs. "You can iron out issues before you get to site," he adds. "During the construction phase is the wrong time for this. With BIM, you work on problems when you are most able to solve them."

Image courtesy of Mott MacDonald and Arup

The project team used a variety of 3D design software, including Revit when it was the best tool for the job, such as for reinforced concrete, and mechanical, engineering and plumbing. Autodesk Navisworks was then used as a common platform for showing and assessing information in 3D, pulling together all the pieces from the designers.

Image courtesy of Mott MacDonald and Arup

Limiting detail ensures workable model

Once they had agreed to use BIM, Mr Mepham says, "We sat down as a team, and made a big decision: to limit the amount of detail in the model." Team members from both Mott MacDonald and Arup could make this decision based on past experience with using BIM.

"There is still a focus on 2D contract documentation, but people are seeing how adding 3D data makes things easier," says Ir Ian Taylor, Director of Infrastructure, Arup. "There are some things, such as baggage systems, we now design from the beginning in 3D as they involve three-dimensional problems concerning moving through buildings."

In addition to a baggage system, the Midfield Concourse design includes a curvaceous roof with complex 3D geometry. The architectural roof model was the basis for the roof steelwork model, and Navisworks helped with advancing the design, as well as identifying clashes. "We used the BIM model and analysis tool hand in hand," says Ir Taylor.

Resolve densely packed services

"We solve the design in BIM, which proved quite powerful," says Mr Mepham.

The designers faced many constraints, with the very tight site. For instance, floors could not be too high, as passengers must be able to access aircraft. Although floor to floor heights were very constrained, plans called for spaciousness. Plus, the overall site would be as tight and compact as possible.

"There are a lot of services, such as fail safe systems and communication systems, that are

Image courtesy of Mott MacDonald and Arup

Image courtesy of Mott MacDonald and Arup

not in regular buildings," says Mr Mepham. "So we were trying to cram in a massive amount services. Using BIM was about the only way we could have done this job. In 2D, we could never have understood the issues."

"In virtual reality, nothing is physically fixed," adds Mr Mepham. "This is a much more pragmatic and sensible way of resolving the design."

During weekly review sessions, team members viewed a combined 3D model on screen – quite unlike the traditional practice in which big drawings are spread across a large table.

Flying through the virtual concourse

In addition, design team members could look for potential problems by examining the BIM model on screen. "It's as if you can fly through the building, using a mouse," says Mr Mepham. This helped find, for instance, some issues with sprinklers that were poorly positioned.

A BIM simulation likewise assisted end users with identifying potential operational constraints, and establishing access requirements.

The BIM model includes attributes of information on a range of passenger aircraft. These help with checking sight lines for an air traffic controller, such as to see whether planes taxiing by the new concourse can be seen: in some cases, the model showed that part only of the aircraft, such as its tail will be visible.

For each aircraft parking stand, there will be a moving bridge for passengers to access the

Image courtesy of Mott MacDonald and Arup

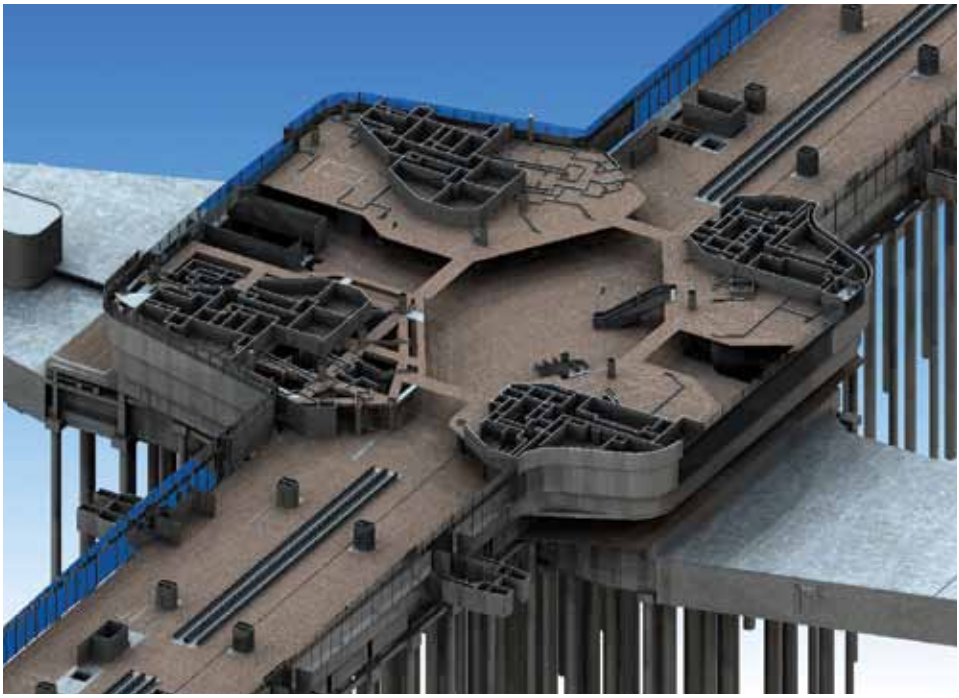


Image courtesy of Mott MacDonald and Arup

plane. "The bridge has a restricted reach, and getting it to meet with the fixed part of the building and taking account of the geometry of the various types of aircraft is quite complex – it needs to tilt and turn to meet the aircraft," says Mr Mepham. "In the 3D BIM model, we can set up the bridge with the various parameters and test this dynamically."

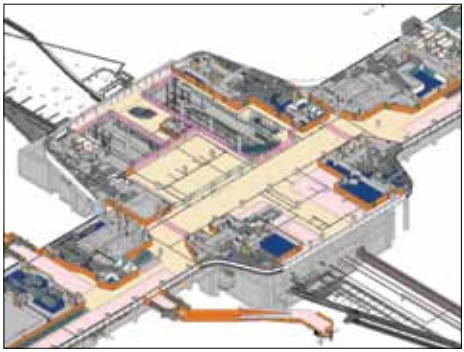


Image courtesy of Mott MacDonald and Arup

Saving time and resources

"Using BIM encourages contractors to engage with a project, so it is more likely to be successful," says Ir Taylor. With it, the team can transfer their design intent and knowledge to the contractor. In turn, the contractor has invested in developing the model further.

"I think that at the time you are creating the design, using BIM is a bit of a hassle," reflects Ir Taylor. "But given the benefit of getting the design right first time, you are glad to be using BIM. I look back at some projects, and think that if we had used BIM in the design, it would have saved us a lot of time and resources later on."

Mott MacDonald ARUP

About Mott MacDonald

The Mott MacDonald Group is a diverse management, engineering and development consultancy delivering solutions for public and private clients world-wide.

Mott MacDonald's uniquely diverse £1 billion global consultancy works across 12 core business areas. As of the world's largest employee-owned companies with over 14,000 staff, they have principal offices in nearly 50 countries and projects in 140.

Their breadth of skills, services and global reach across all markets makes them uniquely places to bring their customers:

- Holistic, innovative thinking
- Global experience with local insight
- World-expert practitioners
- Multi-sector perspective

About ARUP

Founded in 1946 with an initial focus on structural engineering, Arup first came to the world's attention with the structural design of the Sydney Opera House, followed by its work on the Centre Pompidou in Paris. Arup has since grown into a truly multidisciplinary organisation. Most recently, its work for the 2008 Olympics in Beijing has reaffirmed its reputation for delivering innovative and sustainable designs that reinvent the built environment.

Arup brings together broad-minded individuals from a wide range of disciplines and encourages them to look beyond the constraints of their own specialisms.

This unconventional approach to design springs in part from Arup's ownership structure. The firm is owned in trust on behalf of its staff. The result is an independence of spirit that is reflected in the firm's work, and in its dedicated pursuit of technical excellence.

MTR Corporation Limited

Project:
Hung Hom Station & Approach Tunnels

Location:
Hung Hom, Hong Kong

Type:
Civil Infrastructure

Scheduled Time of Completion:
2018

Railway Model Aids Designers and Tenderers

"If we had done this the traditional way, it might have required 1000 drawings, and contractors would need 1 or 2 weeks to understand them. Instead, we could show them a 3-minute video from the BIM model."

Kevin Yip,
Design Management Engineer,
MTR Corporation Limited

Image courtesy of MTR Corporation Limited

The Shatin to Central Link (SCL) comprises two railway corridors – East West Corridor and North South Corridor. The two rail corridors meet at Hung Hom, where works include new platforms beneath the existing station and railway facilities, together with approach tunnels and open trough structures. The Hung Hom section is one of the most challenging parts of the SCL project, and BIM is being extensively deployed to conveying information to tenderers.

This may be the first time that BIM has been so extensively used at the tendering stage for civil works of this nature.

BIM Partners Involved:

- Aedas Limited
- Parsons Brinckerhoff
- Atkins
- Sweett Limited
- InteliBuild
- Leighton Contractor (Asia) Limited
- Gammon Kaden Joint Venture

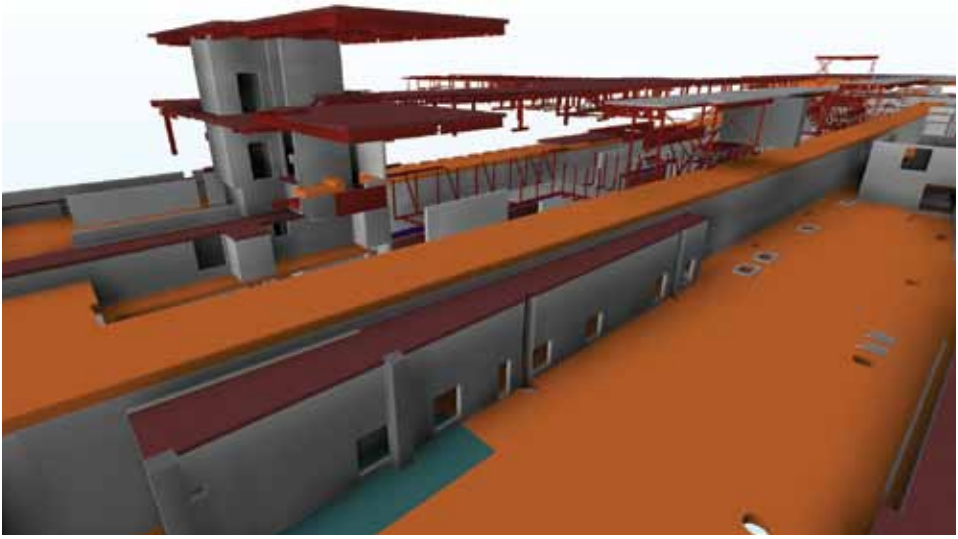


Image courtesy of MTR Corporation Limited

Modeling the existing station

"The Corporation has included BIM as a requirement in the Shatin to Central Link during its tendering," says Ir Kevin Yip, Design Management Engineer, MTR Corporation.

The works are complex partly as they are adding new facilities to a busy network in a congested area. Existing lines will still need to be in operation, even as new platforms are built under the Hung Hom podium. The concourse will be shared by the existing and new platforms.

"Hung Hom station is very old, and has a lot of renovations and new structures, along with the West Rail Line," says Ir Yip. "So we thought it is appropriate and useful to create a BIM model with renovation details, so contractors can understand the reasoning behind our designs."

The BIM model of the existing station was built from information extracted from a wide range of materials, spanning computer designs for recent renovations to hard copy prints that have been gathering dust. "The model really helped in the design stage, to understand the constraints," says Ir Yip. It then became part of the larger model, built to include the two new projects.

Retained, Modified or Demolished

The project team started the designs in 2D. BIM then used to check clashes, such as with utilities and services, and during the construction sequence. The BIM model had successfully found many clashes for building services, which wouldn't otherwise be solved during the

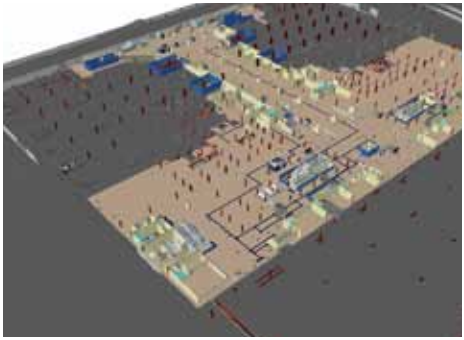


Image courtesy of MTR Corporation Limited

construction stage of a project. These included several critical issues.

"We have also found that some renovations of the existing station would affect the design intent of the new platforms," says Ir Yip. "We could quickly review and revise the design. As there was no need to wait till the construction stage, we saved time, money, and resources."

The BIM model includes a huge amount of information from some 10,000 drawings, for systems designed by over 250 engineers. It includes railway tunnels, architectural elements, new highways structures, major pipes, gas mains, and fibre optic cable troughs.

It's possible to select a specific area, and cut sections wherever required. Using traditional methods, Ir Yip says this would entail several levels of drawings, and different kinds of utilities: "To look at one corner of congestion, we might need to take 50 pages of drawings, and ask a draftsman to put the information on one page." But with the BIM model, the team can see the coordinated detail on a computer screen.

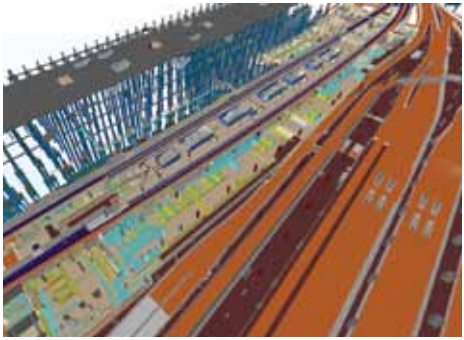


Image courtesy of MTR Corporation Limited

In addition, the model was used to check which building services would be retained, modified or demolished; verify delivery routes and operation headroom, and ensure adequate working space.

1000 drawings or 3 minutes video

To construct the new platforms, two diaphragm walls are built in the ground, and then excavating between them. "Normally, these walls are constructed in open space, where you can use huge plant, and cast the walls underground,"

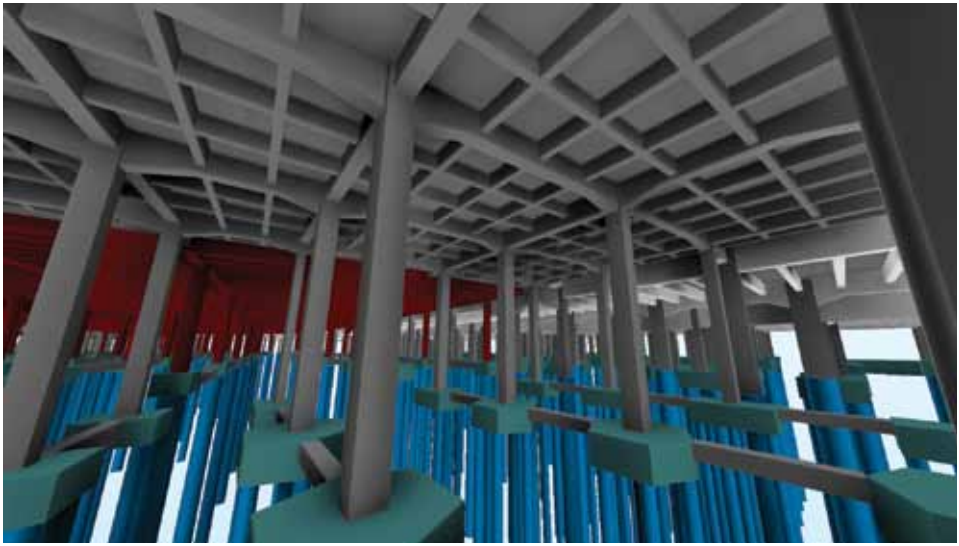


Image courtesy of MTR Corporation Limited

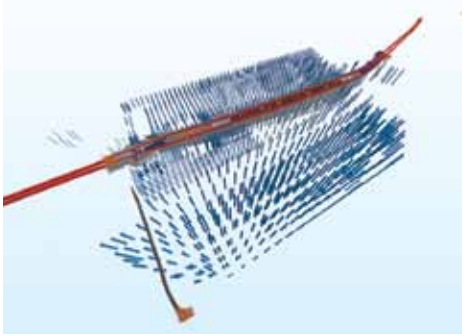


Image courtesy of MTR Corporation Limited

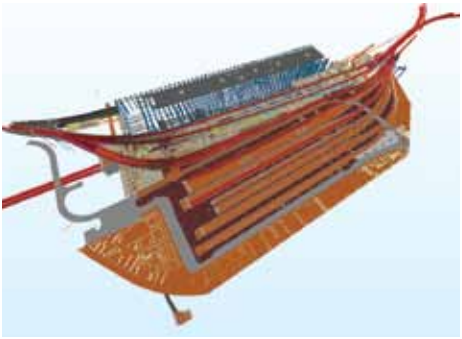


Image courtesy of MTR Corporation Limited

says Ir Yip. "But here, it will be very difficult to construct them under the podium with about 5 to 6 meters of headroom." Other space constraints include a nearby overpass, with no room underneath for the kinds of crane that might be normally employed.

To explain the issues to contractors interested in tendering for the diaphragm wall construction, the project team built a 4D model – featuring a video of the construction sequence in particular locations.

"This gave contractors a very quick understanding of the construction constraints, and helped them understand the kind of construction method we had chosen," says Ir Yip. "If we had done this the traditional way, it might have required 1000 drawings, and contractors would need 1 or 2 weeks to understand them, before meeting us for discussions. Instead, we could show them a three-minute video from the BIM model, so it saved us a lot of time."

Given that traditional tendering might allow only one or two months for preparing tenders, during which potential contractors have a lot of

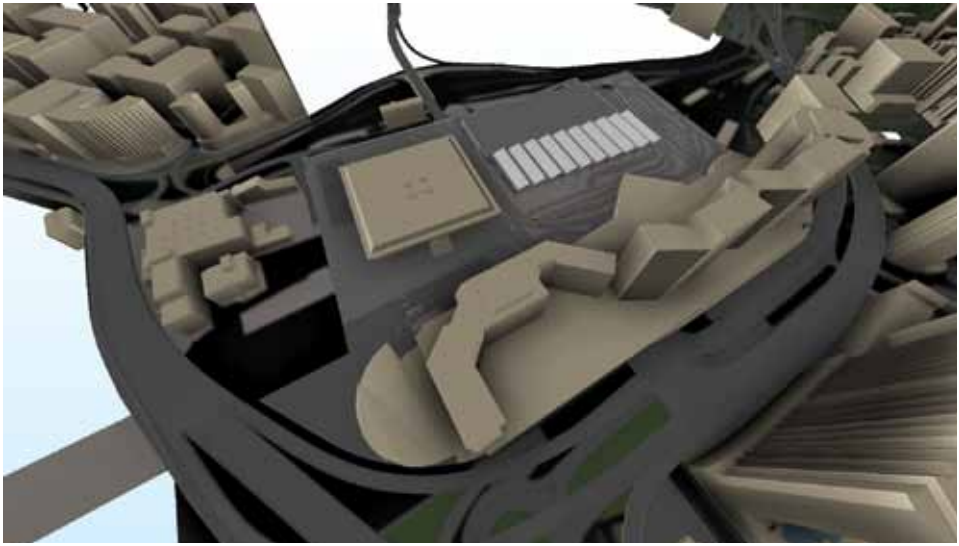


Image courtesy of MTR Corporation Limited

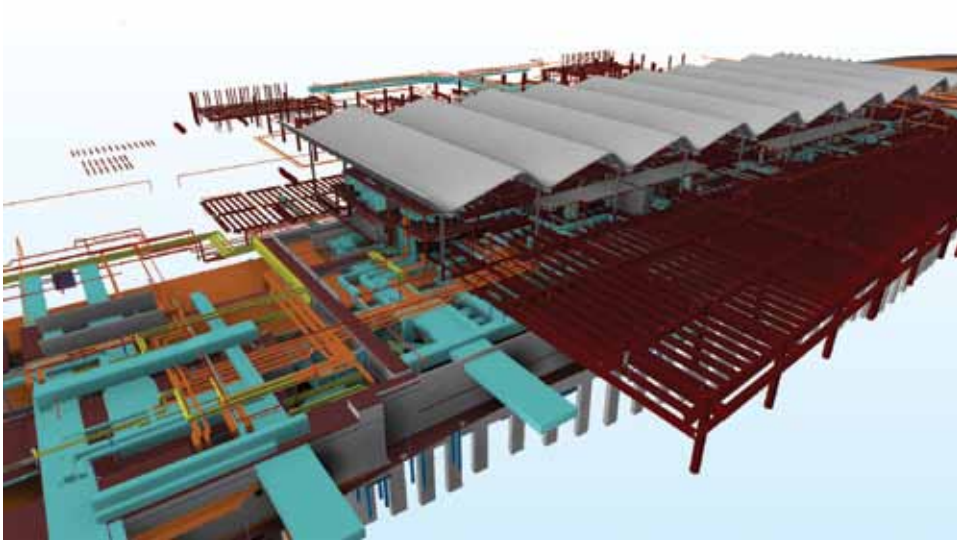


Image courtesy of MTR Corporation Limited

information to digest, use of BIM models in this way can both save time and ensure there is a clear understanding of the project.

From design intent to as-built model

As construction proceeds, the existing concourse area will need to transform into a new station concourse. All building services and system contractors who will work on the concourse modification works will design the system and building services, and should find the BIM model very helpful.

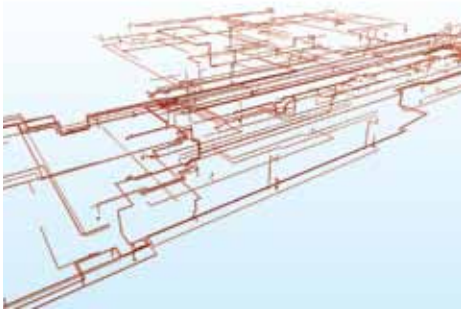


Image courtesy of MTR Corporation Limited

Already, the main project contractors are developing BIM modeling. Contractors can then make use of the BIM model, and construction engineers can update it. Eventually, operators will be able to use the as-built BIM model.

"If all construction projects are using BIM models," says Jacob Tam, Construction Engineer – Civil, MTR Corporation. "It can save a lot of time – as we can create a building in the computer and, ideally, build the same structure on site."

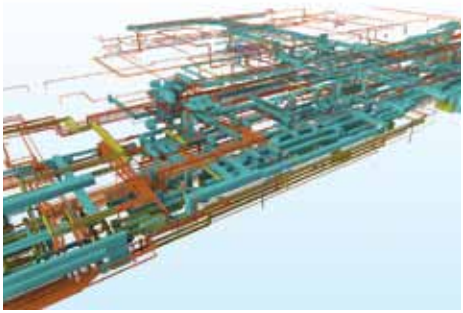


Image courtesy of MTR Corporation Limited

About MTR Corporation Limited

Carrying an average of 5.1 million passengers every weekday across all of our services, the MTR is regarded as one of the world's leading railways for safety, reliability, customer service and cost efficiency.

The MTR Corporation was established in 1975 as the Mass Transit Railway Corporation with a mission to construct and operate, under prudent commercial principles, an urban metro system to help meet Hong Kong's public transport requirements. The sole shareholder was the Hong Kong Government.

The Company was re-established as the MTR Corporation Limited in June 2000 after the Hong Kong Special Administrative Region Government sold 23% of its issued share capital to private investors in an Initial Public Offering. MTR Corporation shares were listed on the Stock Exchange of Hong Kong on 5 October 2000.

The Corporation marked another major milestone on 2 December 2007 when the operations of the other Government-owned rail operator, the Kowloon-Canton Railway Corporation, were merged into the MTR, heralding a new era in Hong Kong railway development.

Other than bringing more efficient and competitively-priced services to local rail passengers, the merger brought new growth opportunities to the MTR Corporation's businesses in and outside of Hong Kong.

The merged rail network comprises nine railway lines serving Hong Kong Island, Kowloon and the New Territories. In addition, a Light Rail network serves the local communities of Tuen Mun and Yuen Long in the New Territories while a fleet of buses provide convenient feeder services.

The Corporation also operates the Airport Express, a dedicated high-speed link providing the fastest connections to Hong Kong International Airport and the city's major exhibition and conference centre, AsiaWorld-Expo.

From Hong Kong, passengers can travel with ease to Guangdong Province, Beijing and Shanghai in the Mainland of China using the MTR's intercity railway services.

Hopewell Property and Facility Management Limited

Project:
EMAX Phase II

Location:
Kowloon Bay International Trade and Exhibition Centre (KITEC)

Type:
Trade Mart and Commercial Building

Scheduled Time of Completion:
Jan / Feb 2014

Optimising Cinema Design, Project Time and Costs

"It took one week to visualize everything, which can save two months in construction time. BIM helps keep risk to a minimum."

Eric Lam,
General Manager
(Project Management),
Hopewell Property and Facility Management Limited

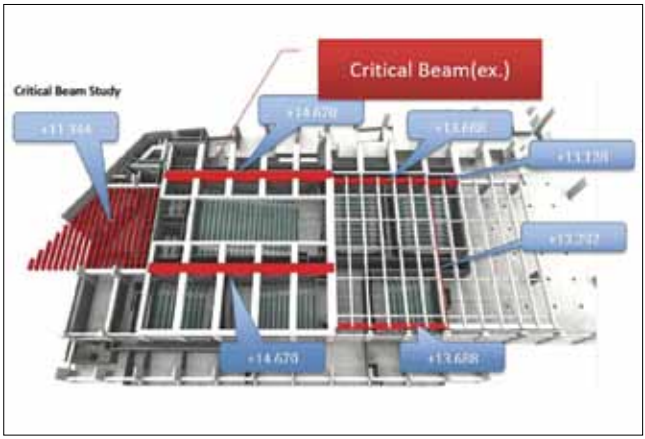


Image courtesy of Hopewell Property and Facility Management Limited

Hopewell Property and Facility Management Limited is converting a bowling alley into a 9-house cineplex, in Kowloon Bay International Trade and Exhibition Centre. This is a relatively challenging addition & alteration (A&A) project, and BIM is helping in ways including visualizing the spatial quality of cinema houses, optimizing sightlines, minimizing site coordination time required, and reducing costs for abortive design.

BIM Partners Involved:

- Adeas Limited
- Reynold (HK) Construction Consultants Limited
- JMK Consultant Engineers Limited
- Sweett Limited
- isBIM Limited

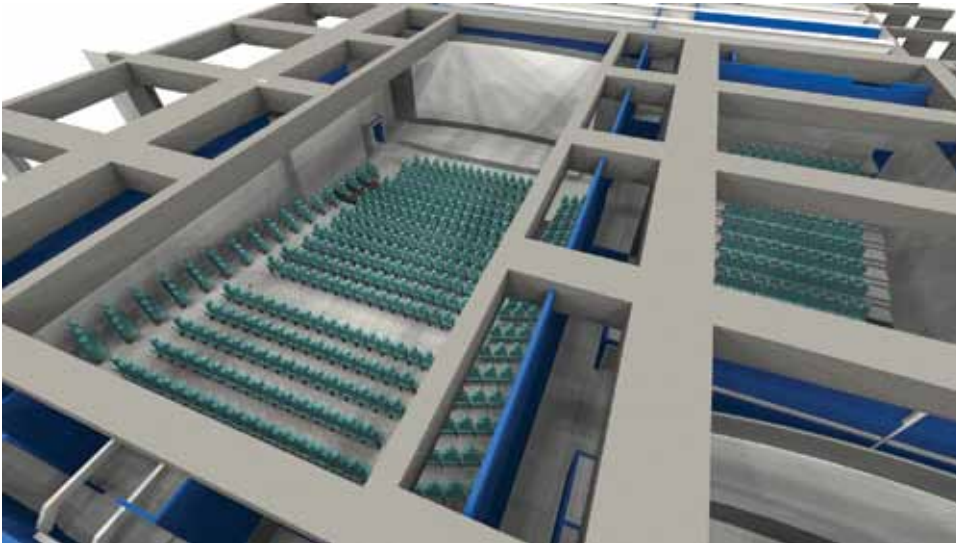


Image courtesy of Hopewell Property and Facility Management Limited

Audience-eye views

"This is a difficult project compared to ordinary A&A," says Mr Eric Lam, General Manager (Project Management), Hopewell Property and Facility Management Limited. "We are working in an existing building, with different existing structural systems and constraints, and the cinema space has a roof soffit varying in height from 6 to 12 metres." Mr Lam suggested deploying BIM, for the first time in a Hopewell project.

"As we are building 9 cinema houses with different sizes, we emphasised the spatial quality and visual corridors – to make sure that everyone in the audience, from the first row to the last, will have a good view," says Mr Lam. "We also wanted to maximize house and screen size within such a tight space." In the BIM model, the team built the visual space to assess the size of cinema houses, sightlines, including with silhouetted figures representing people seated in front.

Tight schedule, and tight spaces

The project schedule is very tight. "We have to complete the project in 5 months and so we need to plan to build it in a more efficient way," says Mr Lam. "To do so, we spent more time in the design stage through developing a BIM model. This was not so complicated – it took one week to visualise everything including E&M services, which can save two months in construction time. BIM helps keep risk and abortive works to a minimum."

The project team also used BIM to resolve the screens replacement matter, which have a working life of around 4 to 5 years. "We learned that some cinemas have trouble replacing screens, so stressed the use of BIM to make sure everything needed to be replaced can pass through the doors and passageways, in particular the silver screen," says Mr Lam.

Space is tight in projector rooms, where BIM revealed that initial designs lacked sufficient headroom, and helped figure out the tilt angles and levels for the projectors.

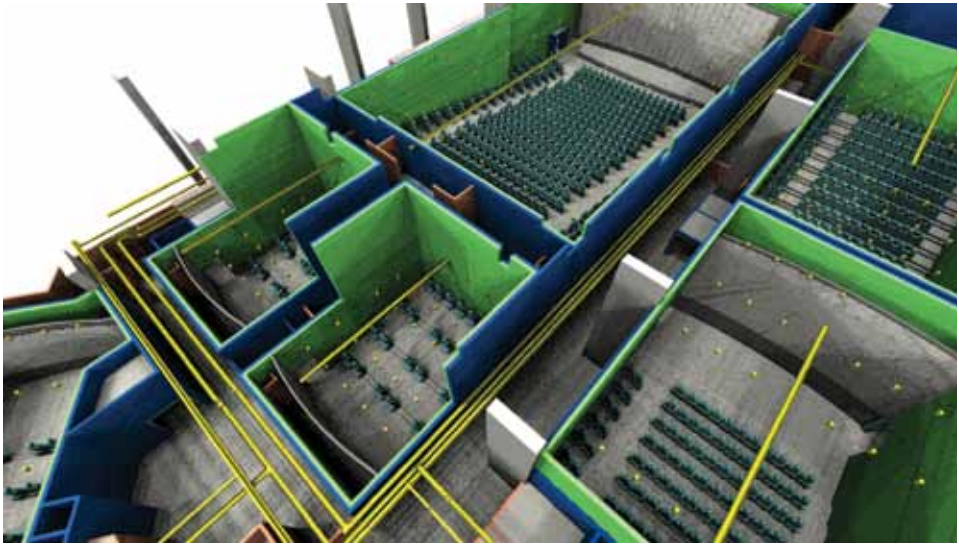


Image courtesy of Hopewell Property and Facility Management Limited

Space within ceiling void is tight, in contrast to maximizing the houses and screen sizes. E&M services were arranged with the assistance of BIM to work out a workable and feasible layout so that site coordination works for combined services could be minimised.

Win-win software

"We also have inside ceiling, Dolby Atmos overhead speakers, which could not be flush with the ceiling soffit," says Mr Lam. "BIM proved very useful for coordinating this system, helping us communicate with the acoustic engineers to ensure best audio quality in the cinemas, and ensuring we could have maximum screen sizes without being obstructed by the speakers."

Reflecting on use of BIM for coordination, Mr Lam says: "For professionals, we used to do it ourselves manually with cross reference amongst different disciplines but it takes times, though BIM is a smarter and more efficient way. Clients benefit from minimizing risk of future abortive works. So it's the win-win software for all parties."

The BIM model also helped save costs for effective design like installation arrangement of acoustic panels, each of which requires isolation brackets. The project team tried an alternative design with larger panel size. "Using BIM to produce detailed design for the wall panels, we found we could save 600 brackets," says Mr Lam. "We might have tested the design in traditional way, but it may have taken two or three days, while with BIM it took just a few hours. Using BIM in this way, we can maximize the design, and minimise wastage. Wish that more professionals can use BIM to produce design."

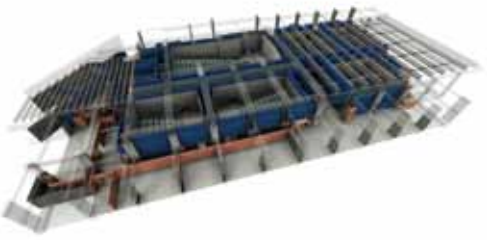
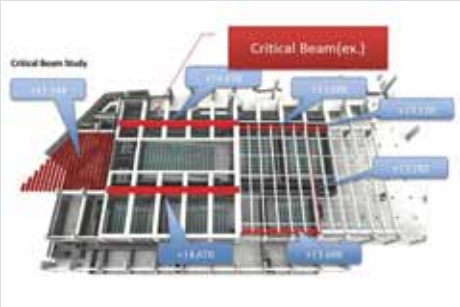


Image courtesy of Hopewell Property and Facility Management Limited

HOPEWELL HOLDINGS LIMITED
合 和 實 業 有 限 公 司



About Hopewell Holdings Limited

Hopewell Properties and Facilities Management Limited is a subsidiary company of Hopewell Holdings Limited for properties enhancement works.

The Group, with strong expertise in investment, development and engineering of major projects, focuses on Hong Kong and the Pearl River Delta region in the PRC and is founded on visionary strategic initiatives.

The involvement by the Group in the PRC projects can be traced back to the adoption of the Open Door Policy in the late 1970's. The Group's first project in the PRC was the 5-star hotel project in Guangzhou, the China Hotel. Since then, the Group invested in major power and transportation infrastructure projects in the Pearl River Delta region, initiating the trend of investment in such areas by Hong Kong enterprises, which included:

- The Shenzhen Railway Station Customs and Frontier Inspection Building in Lowu,
- The Huanggang Crossing Border Control Complex,
- The 122.80-km Guangzhou Shenzhen Superhighway,
- The 38-km Guangzhou East-South-West Ring Road,
- The 102-km Shunde Roads,
- The 40-km Shunde 105 Road,
- The Boca Tigris Bridge,
- The 15-km Guangzhou Zhuhai Superhighway (Phase I),
- The Shajiao 'B' and 'C' power station projects.

The strategy of the Group is to capitalize on the Pearl River Delta regional demand induced by continued economic growth in the PRC. Building on its existing presence, Hopewell maintains its position as a pre-eminent developer. Over the years, the Group developed many large-scale projects in Asia, playing a significant role in improving the economies in many communities and raising the living standards of their people.

Advisors' Comments

Introduction

This year, we are extremely honoured to receive the invaluable support from the local supporting organisations and overseas BIM advisors. 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 Information Technology Joint Council
- Hong Kong Institute of Project Management
- The Chartered Institute of Building, Hong Kong
- The Chartered Institution of Civil Engineering Surveyors
- The Hong Kong Institute of Architects
- The Hong Kong Institute of Building Information Modeling
- The Hong Kong Institute of Facility Management
- The Hong Kong Institute of Surveyors

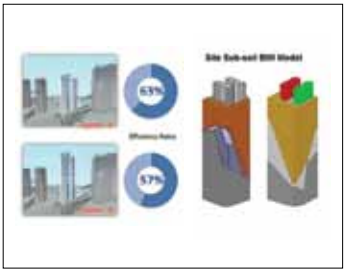
Advisors' Comments from
Supporting Organisations

Chinachem Group

Good demonstration of the BIM usage in design and coordinate quantity checking. It is an example of all round use of BIM usage in architectural and engineering design.

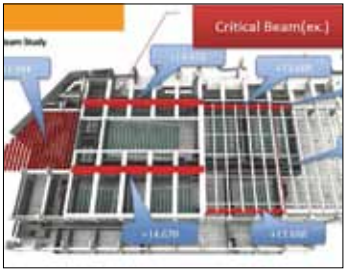
Henderson Land Development Company Limited

Good demonstration of the capability of BIM in improving design of buildings. The big room concept and the multi-dimensional workflow advocated are very much appreciated. Good illustration on how BIM enhance design workflow, environmental studies so that the project team can make decisions easier.



Hong Kong Housing Authority

HKHA has coordinated with the contractor to use BIM in construction process. Good demonstration and application of BIM methodology to improve design decision and construction speed but also helped in safety management. Good example of using information in BIM. Comparatively comprehensive use of BIM from schematic design to construction planning stages



Mott MacDonald - Arup Joint Venture

Demonstrated the use of BIM to coordinate the project through design stage to construction stage. Also, going to extend the use of BIM model in future assets management use. Yet would like to see how they continue the process from the design through to operation and maintenance. Good demonstration of BIM usage from design to construction and will be extended to operation stage.

MTR Corporation Limited

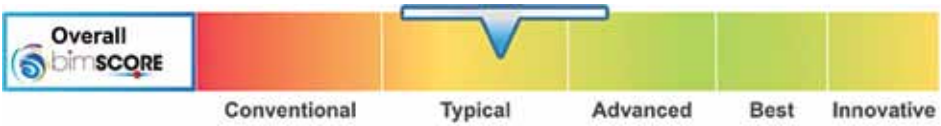
Good demonstration on BIM usage to design and finding of the solution for construction in such a complicated site condition. Good example of using BIM to help design decision, resolving coordination of design coordination, 4D planning for the construction such as the diaphragm walls and construction workflow.

Hopewell Property and Facility Management Limited

Good demonstration of BIM application in existing A&A projects which a rehearsal with BIM can help to reduce waste and disturbance as well as integration of new design with existing part of the project. Good example to extend the use of BIM in A&A works. Looking forward to having more use in BIM in other parts of the project.

Advisors' Comments
Dr. Calvin Kam

Overview
The 2013 Hong Kong AIAB winners are a testament to the power and adaptability of BIM-enabled virtual design, construction and operation. The winning projects have leveraged BIM to innovate and achieve successful results within a diverse range of project complexity—ranging from steeply sloping sites, to highly active transit areas, and to complex underground coordination. BIM-based innovation in this unique urban and geographical environment continues to drive the state of Hong Kong BIM practice to the forefront of international BIM progression.



** Projects evaluated at a low confidence level

The above graphical scale illustrates the overall bimSCORE of the 2013 Hong Kong BIM Awards projects, whose average falls in the upper range of "typical practice" in the global bimSCORE spectrum. The spread of the HK overall bimSCOREs ranges from typical practice to advanced practice, with respect to the bimSCORE knowledge base that comprises of over 100 case studies from 13 countries. In the following, we analyze the 2013 award winners in terms of the four bimSCORE areas: project planning, process and organisational adoption, application of technology, and demonstrated performance.

Planning

Complex projects require well-defined project targets and objectives, preparation, resources, and a strong BIM execution plan. Many of the 2013 award-winning projects – High Park Grand, EMAX phase II, and HKHA - Fast Track Development among them – undertook extensive planning to allow for smooth implementation of BIM in the design and construction stages. The University Heights Redevelopment project demonstrated strong planning, objectives and guidelines for simulating construction and controlling cost. Adoption of standardized element naming structures (HKSMM) allowed the design team to easily communicate quantities with the estimators through the BIM.

Adoption

Wide BIM adoption in terms of process and organisation are observed throughout this year's BIM Awards recipients. Projects such as HKHA Fast Track Development and MTR Shatin to Central Link

exhibited widespread BIM uptake in terms of stakeholder involvement, organisational structure and training. The HKHA Tung Tau Cottage Area East project went further, adopting BIM not only by the project design team, but also the general contractor and subcontractors. This sound adoption of BIM throughout project teams enabled effective coordination meetings where design issues were solved directly using the model, with input directly from BIM-enabled specialty subcontractors.

Technology

bimSCORE has witnessed more sophisticated use of the model in response to the challenges presented by the complexity of this year's award-winners. Projects such as the Shatin to Central Link, Midfield Development and High Park Grand incorporated a comprehensive range of project elements into the model, which allowed for various forms 3D coordination. Some projects were able to harness 4D or "5D" aspects of BIM, tying cost estimate and scheduling information to the model. bimSCORE advice for the projects is to begin looking at forms of automated quality assurance in the BIM, while adopting open standards to facilitate more complex exchanges between modeling platforms.

Performance

While we see many amazing case studies of BIM planning, adoption and technology amongst this year's award-winning projects, actual qualitative and quantitative performance is rarely documented on a regular basis. We encourage project teams to engage in frequent tracking of performance indicators to inform project progress and decision-making. Furthermore, strong documentation of project performance and success can be used to benefit future projects, and adopt specific BIM success cases across enterprise-level practice.

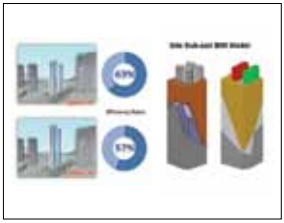
Dr. Calvin Kam *PhD, AIA, PE, LEED AP*
Founder, bimSCORE

Dr. Calvin Kam is the Founder of bimSCORE (USA, Hong Kong, and Singapore)—the "GPS Navigator" for any enterprise or project team charting a course for construction innovation. Dr. Kam is also the Director of Industry Programs at Stanford University's Center for Integrated Facility Engineering (CIFE), where he specializes in strategic innovation such as Building Information Modeling (BIM) and Virtual Design and Construction (VDC). He is a Co-founder of the National 3D-4D-BIM Program with GSA Public Buildings Service and is an appointed international BIM expert for the Singapore government's Building Construction Authority; China National BIM Union has appointed Calvin as the only international Honorary Director. Calvin is a Co-Principal Investigator with Disney Research China. He is on the Board Knowledge Committee of the American Institute of Architects, where he also serves as the National Co-Chairman of AIA Center for Integrated Practice, and the past National Chairman of AIA-TAP Knowledge Community.

Advisors' Comments
Phillip G. Bernstein

Chinachem Group
In this project, BIM had clear impact in decisions around structural design for a steeply sloped building site. 4D simulations using a Revit model and Navisworks were integral in explaining site constraints and the rationale for the selected design plan. In addition, Chinachem Group used BIM models to understand where existing trees and the building clashed so as to implement optimal tree preservation and pruning as required. Further sustainable design decisions were informed by models of the façade and window wall system which were used for energy consumption analysis. This project is targeted to achieve the 'Gold' level Hong Kong Green Buildings Certification Scheme award.

Henderson Land Development Company Limited
Henderson addressed the challenge of site context in a small scale urban renewal project by using interactive BIM tools to visualize design options and provide useful information for the designer's reference. The development is situated in the heart of the high density city, and Henderson used BIM visualisation tools to optimize views from each apartment, and to add the highest possible ceilings and largest possible windows to meet their objective of creating a state-of-the-art quality residential and commercial development.



Hong Kong Housing Authority
The Hong Kong Housing Authority was challenged with delivering housing for low and middle-income families as quickly as possible while also retaining quality and cost-effectiveness in locations that presented difficult site constraints. In these projects, the Hong Kong Housing Authority analyzed data extracted from the BIM model to select design options that carried the lowest construction cost, least construction time, and highest efficiency ratio in housing. They used the information in building information models to help them determine the best-value design options and to accurately analyze and validate buildability of various design options.

Mott MacDonald – Arup Joint Venture

This new building at the HK International Airport required extensive cross discipline coordination, and is a good example of the use of BIM in business collaboration transformation. With the architectural, structural, and MEP consultants each using different design software, the team collaborated using Autodesk Navisworks in a weekly workflow to conduct clash analysis via 3D visualisation.

MTR Corporation Limited

Part of a large infrastructure project, this station project highlights innovative use of the information in BIM at the contract Tendering Stage. MTRC developed BIM models for the existing station and surrounding infrastructure as well as the new elements of the station. 4D simulation provided to contract Tenderers enabled them to understand key issues and to test proposals against the project constraints. This is a good example of how helping contractors process complex information upfront facilitated the rapid development of detailed proposals. These models will be used by all teams involved in the project to coordinate their efforts, from clash detection to planning the construction sequence.

Hopewell Property and Facility Management Limited

This project is a good example of how BIM technology, used from design to operation, enabled Hopewell to work within the constraints of an existing structure. In this project, Hopewell converted an existing bowling alley into a nine-theater Cineplex. The use of spatial information in the 3D model informed optimal cinema layout and also ensured that the massive cinema equipment could be installed in the confined space.

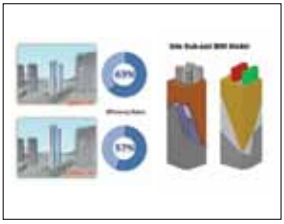
Phillip G. Bernstein *FAIA, RIBA, LEED AP*

Vice President, Industry Strategy and Relations, AEC Solutions, Autodesk, Inc.
Lecturer, School of Architecture, Yale University

Phil Bernstein is the Vice President of AEC Industry Strategy and Relations for Autodesk, Inc. With a Masters degree in architecture from Yale University, he is also an adjunct professor at the Yale School of Architecture. He was formerly an associate principal at Pelli Clarke Pelli Architect. He is a Fellow of the AIA (The American Institute of Architects) and a LEED (Leadership in Energy and Environmental Design) Accredited Professional.

Advisors' Comments

Dr. Huang Qiang



Ideal BIM and Practical BIM

Ideally, BIM can be used in the whole life span of a facility - from early design, construction, facility management and even demolition.

We are living in a three-dimensional world, so it is very excited to have digital 3D approach for making decisions on building lifecycle. We have demonstrated BIM can make a significant contribution to the construction industry. BIM's development has gone through more than ten years. Although it is not a very long period of time for a new technology and workflow, we are looking forward to have more AEC professionals especially construction and engineering professionals can be benefited from it.

It may be time for us to review our previous research of BIM implementation methods.

The winning organisations of Autodesk HK BIM Awards 2013 have achieved important results in virtual design prototyping and virtual construction.

To all the "information stakeholders", BIM provides a basis for decisions, there is no use of BIM if there is no "information stakeholders" can benefit from using it and not become a useful tool in reality.

China BIM Development Alliance aims to combine the specific needs of building design, construction engineering in mainland China projects, conducts researches seeking the best way for China to achieve the ideal BIM usage.

Although China begins BIM application later than Hong Kong, we are taking a lot of action and catching up rapidly. Currently the level of application of BIM technology in construction is still facing many challenges; this does not affect our desire to achieve the ideal BIM in reasonable time.

The initial goal of BIM usage in China is to make AEC professionals become more efficient. To achieve this, we propose and study the professional BIM (P-BIM) embodiment:

1. The use of existing engineering codes and building regulations as the prerequisite of BIM usage, ensures the correctness of BIM usage by AEC professionals.

2. BIM models are created by P-BIM accredited software, through the coordinated method to transfer massive BIM data. Filter the data into "necessary data" that can be used effectively by AEC professionals.

3. Develop "professional P-BIM information exchange standard" provides direct exchange of information between software; enhance interoperability and at the same time respect traditional working sequence.

BIM is a working method that can be applied in any workflow amount the whole building life cycle. It is critical to make a comprehensive plan in order to achieve best value from BIM.

Huang Qiang

Professor, Doctoral Tutor
Vice President, China Architectural Research
President, China BIM Development Alliance
Editor of the National Building Information Modeling Standard
Vice President, China Engineering Construction Standardization Association

Early in geotechnical engineering research work, published many geotechnical articles and national standards; engaged in business management in recent years, published enterprise management books such as "Grassroots Management". To facilitate Chinese BIM implementation, Professor Huang raised 20 million dollars from more than a dozen organisations and set up the Chinese BIM Development Alliance so that thousands of people are now contributed to the BIM development in China.

Outstanding Students' Projects

This year, we are excited to highlight three outstanding students from local universities and higher institutions. The students show the advanced BIM usage in their projects. Autodesk supports the local educational institutions on making the latest technology available to student training, to nurture the skills of a new generation of architects and engineers who will play key roles in Hong Kong's AEC industry. The sophisticated use of BIM in all three projects is highly encouraging regarding the local development of BIM - which will in turn lead to better designed, more sustainable buildings in Hong Kong and across the region.

The three awarded students are:

Chu Hoi Mei; Zhang Bo Sen; Chan Shun Tat; Chan Chiu Chun; Wong Wing Man

Department of Architecture
Chu Hai College of Higher Education

Tang Kin Fai, Kingsley

Department of Construction
– Architectural Design and Technology
Hong Kong Institute of Vocational Education
(Tsing Yi)

Au Chi Hang

School of Architecture
The Chinese University of Hong Kong

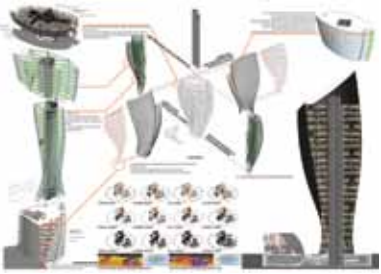
Outstanding Students' Projects

Name: Chu Hoi Mei; Zhang Bo Sen; Chan Shun Tat; Chan Chiu Chun; Wong Wing Man

Institution: Year 5, Department of Architecture, Chu Hai College of Higher Education

Project Name: Sustainable Intelligent Office Tower Development - S+ Sustainable Office Tower

Project Location: Sha Tin Galleria, 18-24 Shan Mei Street, Fo Tan, Hong Kong



Challenges:

- Demonstrate high rise building can also benefit from using environmental systems
- Reduce the reliance of unsustainable power used in building systems and performance
- Strike a balance between the commercial value and maximize the innovation

How BIM Helps:

- Cloud technology minimise the use of paper in designing and collaboration
- Performing solar and wind analysis to enhance the building performance
- Use of BIM and Cloud technologies to minimise design and co-ordination errors, increase efficiency and reduce construction waste
- Use BIM to help the design of sustainable features such as sun shading device, natural ventilation, and underground car park
- BIM is used for Landscape design

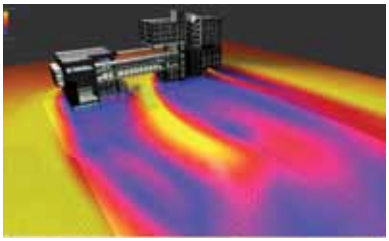
Outstanding Students' Projects

Name: Tang Kin Fai, Kingsley

Institution: Year 4, Construction – Architectural Design and Technology, Hong Kong Institute of Vocational Education (Tsing Yi)

Project Name: Project H&R - The complex building of Youth Hostel & Rental Housing

Project Location: Yi Pei Square, Tsuen Wan, Hong Kong



Challenges:

- Complicated spatial organisation between public areas and private areas
- Very tight design schedule
- Green design has been involved in the project; need an effective way to demonstrate the result
- Need an effective way to express architectural design and constructability

How BIM Helps:

- Effective production of 3D modeling, schematic design, precise drawings production with less time
- Convenient building material setting, structure analysis and E&M system design
- Effective tool to simulate and analyze environmental impacts and energy consumption base on the real data
- Consistent Information shared between different software like Ecotect and Navisworks etc. can help to give useful assessment
- BIM collaboration functions decrease the chance of misunderstanding and information lost between team members
- All information could be recorded systematically and available for analysis
- Immediate 3D presentation and parametric modeling make great contributions to spatial design
- Design change can be easily handled

Outstanding Students' Projects

Name: Au Chi Hang

Institution: Master of Architecture,
School of Architecture,
The Chinese University of Hong Kong

Project Name: Intertwining Art Space – Cultural X'change

Project Location: Museum Plus (M+) – West Kowloon Cultural District, Hong Kong

Challenges:

- To express the building form organically but spatially practical
- Complicated building geometries and spatial parameters
- Efficient communication to complicated design and design intention

How BIM Helps:

BIM saves my time in project design and production because of its all-in-one capability

- Uses of Massing function & components create quick building components
- Quick modeling update on surface and massing
- Adaptive component & Curtain wall panel provided greater flexibility to match with the 3D grid of non-rectilinear form parametrically
- Rapid-production of Architectural Drawings - Plans, elevations and sections were simultaneously generated without spending too much time on production of drawings
- Autodesk Cloud is a great invention, all renderings in this museum project were rendered with the highest quality in cloud
- Plug-in (STL Exporter for Revit) provided rapid transfer of rvt file to STL stereo lithography for 3D print

About AIAB

AIAB (Autodesk Industry Advisory Board) is formed by a group of experts who are willing to share their valuable experience in BIM (Building Information Modeling) to the public. We currently have members from Hong Kong and Macau regions.

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 CAD/CAE/BIM technology development
- Promote the development, usage and awareness of CAD/CAM/BIM design technology in HK, China and Macau
- Provide cross-border technology exchange/visit:
- Provide latest technology update (e.g. Building Information Management)

Want to know more about AIAB? Contact us now!

Michael Chan
Email: Michael.chan@autodesk.com
AIAB web site: http://www.aiab.org

AIAB Chairman

Prof. Marc Aurel Schnabel

Congratulations!

The Autodesk Industry Advisory Board (AIAB) congratulates the awardees of this year's Autodesk Hong Kong BIM Award 2013. Again the award recognizes the endeavors, novel applications, and professional workflow of BIM instruments in Hong Kong's construction industries.

This year's awards showcase the universal variety of BIM applications and how they benefit the overall processes. It is remarkable with which ease and proficiency the awardees have applied their expertise to all areas of the building industry.

For all stakeholders, BIM has established itself as working environment that allows to engage holistically in collaborative settings. Furthermore BIM is not only an instrument or an intelligent multidimensional model, but also increasingly a platform for process, social interaction, and communication. And exactly this interaction is crucial for the success of any building.

The AIAB offers exactly this social interaction and communication between stakeholders and within specific expert groups in conjunction with knowledge and intelligence. It allows to intersect and crossover larger interests and bodies of professional operation and share information benefiting and contributing the larger community.

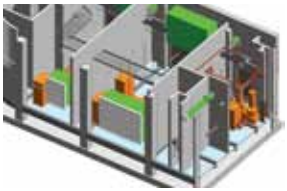
It is exciting for the AIAB to be an active partner in the journey of BIM, its implantation and further development: again congratulation to the success of the Autodesk Hong Kong BIM Awardees of 2013.

Prof. Marc Aurel Schnabel *Chair AIAB; Associate Professor CUHK*
PhD (HK); Dipl Ing (UdK); MEd (Syd); BAB; MHKIBIM; MHKDA; MHKIUD; MCAADRIA; W16

Prof. Marc Aurel Schnabel is teaching and researching at the School of Architecture, Chinese University of Hong Kong. He worked and taught at international architectural practices and Universities in Germany, Australia and Hong Kong for over twenty years. His expertise stretches from Computational Architectural Design, BIM, to Virtual & Augmented Environments, Design Learning & Generative Architecture. He publishes extensively in international journals about architectural parametric and BIM designing. He is a passionate educator and researcher who collaborates with emerging architects to communicate three-dimensional space using intelligent building information models

AIAB Vice Chairlady

Erica Lam



BIM – Grow to Incorporate

As an advanced technology, Building Information Modeling (BIM) is getting its status especially in places that are willing to accept and adopt new concepts and technologies like Hong Kong. The past six years, I witnessed the drastic increase in popularity of BIM as it became part of the process of various projects such as preparation of design drawings, government submissions and tender drawings during the stages of schematic design, contract documents and building construction.

When compares with the traditional method, BIM has many advantages, among those, efficiency and quality of coordination is surely a big plus. While using the traditional method that could lead to many overlooks and mistakes, BIM assists us to find more design mistakes and missing coordination before we proceed onto construction work. No doubt, in these days, all of the consultants and contractors have their own BIM teams.

As a part-time lecturer and trainer in various settings, I have chances to come across many students with strong traditional-method concept in their mind. The challenge from teaching and through looking things from various angle, all of these help me to be able to achieve a greater depth in understanding the usage and application of BIM in the building life cycle. Incorporating the best from BIM and the traditional method is becoming a new way of processing.

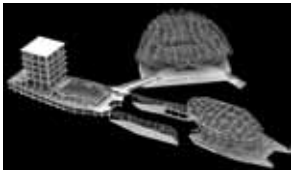
We have done lots of work in sharing and spreading BIM experience across our profession. I am proud to say that we did a good job. Cheers !

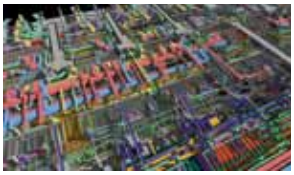
Erica Lam *BAppSc(ArchSc), MHKIBIM, MbSHK*

Erica is a Project Coordinator at Aedas Limited. Over the last six years in the profession, BIM has become her main work process. 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 Singapore's International BIM Competition 2011. She is also a part-time BIM lecturer and trainer in various institutes. Currently, she is a vice president of the Autodesk Industry Advisory Board (AIAB).

AIAB Members

Argoon Chuang





All images © Arup

BIM – an Empowering Means for Delivering Better Design

BIM is revolutionizing the engineering design and construction industry. At the heart of BIM are databases holding geometrical, spatial, specification and other data that can be manipulated and interrogated to deliver useful information at various stages of design, construction and operation. This opens up opportunities not only to inform design, guide procurement and aid construction, but also optimize building performance long after the project is completed.

As one of the world's leading design consultancies, Arup has an extensive track record in BIM, collaborating with local and international partners in including contractors and architects. When considering BIM for a project, the most critical question is "what are the most desirable benefits?". For example, a client might want to prioritise fast construction, cost savings, or smooth operations and maintenance. Based on the objectives, Arup recommends to the clients the most appropriate work process, and helps them decide what level of information to be incorporated into the model in order to achieve these goals.

By advancing BIM with exceptional rigour at Arup, we feel closer than ever to realizing the 'total design' of systems and structures where multiple disciplines and technologies are well integrated. We are making BIM a part of our daily design process and extending its linkages to design optimisation and integrated visualisation to create more values for our clients.

Arup is committed to our vision - "to shape a better world". BIM for us is an empowering and collaborative means to shape an even better world with our clients and the industry partners.

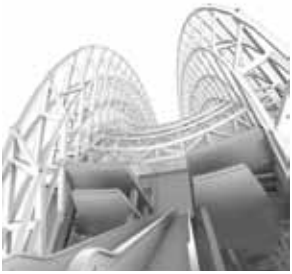
Argoon Chuang *BSc MSc FRGS APMP*

Argoon is the Built Environment Modeling (BEM) Manager of Arup East Asia region. She looks after the development strategy and resources coordination of all sorts of digital design related activities within the region.

BEM is Arup's strategic focus for delivering better design through the best practice of cross-disciplinary collaboration and multi-technologies integration. It covers a number of hot topics such as BIM, GIS, parametric modeling, virtual reality, automation and optimisation – literally everything relates to digital design.

Argoon by training is an experienced GIS specialist and software developer with solid background in Civil Engineering and integrated environmental management. Her unique combination of technologies know-how, programming skills, and cross-disciplinary experiences are geared to promote Arup's "total design" philosophy through enhancing the core values of our multidisciplinary teams.

Elvis Li



In BIM We Trust

It has been more than 10 years since I first met BIM. That is a time when 3D technology is more fancy than practical. Throughout the years, the more I work with the technology, the more I experienced the power of the infinite possibility lies in the true-scale 3D environment and also, the power of the data backbone behind the scene.

After years of hardworking, the demand for BIM service exploded. Every of our clients have started to realise the potential lies underneath the 3D BIM model.

That is when I founded isBIM, a one of a kind individual BIM consultancy. To my amazement, the 5 people team rapidly grows into a 200-employees corporation within three years, participated in a remarkable number of 200 BIM projects in total. BIM grows at such a high speed that many construction parties are having their eyes on the future development of such influential technology.

BIM should be something more than 3D. A question comes to everybody's mind. What actually comes next after 3D BIM modeling? Worldwide clients and partners eagerly move onto next stage: fully utilize extra information carried by the 3D environment to support business, project and operation cycles.

isBIM boldly march into the future and created the i5D BIM-based quantity take-off, the first ever industry-compatible solution specially designed for BIM quantity takeoff. Our clients are amazed by the idea as they can finally gain access to essential information that was previously not available for use, and generate on request all kinds of project cashflow, forecast and analysis based on the scientific quantities extracted from BIM.

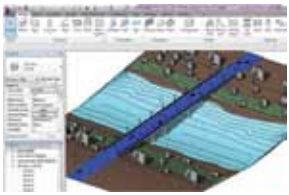
I sincerely believe one day, the well-structured, scientific BIM data will definitely exert significant effect on future business decisions. In BIM data we trust.

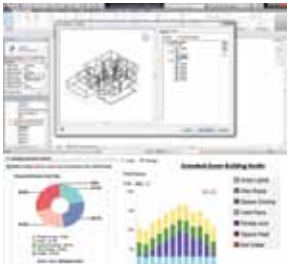
Elvis Li *MbSHK, MHKIBIM*

Mr. Elvis Li is the CEO of isBIM Limited, leading BIM consultancy headquartered in Hong Kong with branch offices in Singapore, Beijing, Taipei and 17 major cities in PRC. Elvis has been working on BIM projects since 2003. With more than nine years' experience in property development and over eleven years' experience in planning and implementing BIM and BLM project, Elvis integrated his experience and knowledge from various fields of the industry and successfully created and implemented a series of "BIM assisted" services for building and civil industry ranging from feasibility study, complex geometry modeling, design coordination, 4D simulation, i5D BIM-based quantity take-off to facility management solution for over 200 BIM projects in Hong Kong, Shanghai, Beijing, Tokyo, Seoul and Mumbai.

AIAB Members

Dr. Jack C.P. Cheng





Getting Prepared for BIM on Different Levels

BIM is changing the way that we work in the architecture, engineering and construction (AEC) industry. With BIM, we can visualize the building and predict the building performance in the design stage before the building facility is built. We can identify potential clashes, bottlenecks and overruns ahead of time so that we can have a better plan of the construction process and value chain. We can also store and manage various building information to support building operations and maintenance. BIM improves collaboration and benefits the whole lifecycle of building facilities.

Therefore, people in different positions of the AEC industry should embrace and get prepared for the BIM movement. BIM is affecting us from onsite workers to senior management, from clients and consultants to contractors and facility managers, from architectural design and structural engineering to material procurement, etc. Different areas and levels of BIM education should be provided to AEC people according to their specialties.

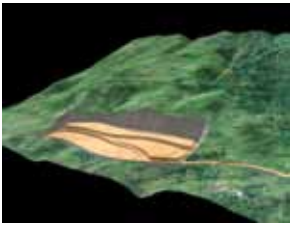
College students, who will be the next generation of the industry, should also understand the BIM technology and be able to apply BIM to solve real world problems. HKUST, like other institutions in Hong Kong, is aware of the importance of BIM training to college students and has included BIM in higher education. Hands-on exercises and class projects allow students to practice their BIM skills, stimulate creativity and appreciate the values of BIM. As a research institution, HKUST has also studied topics such as BIM interoperability and technology integration to facilitate BIM adoption and support a smarter and greener built environment.

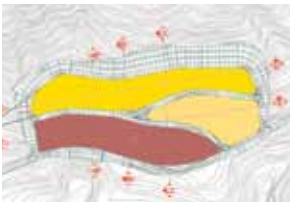
BIM is not only a technology, but also a paradigm shift in the AEC industry over the facility lifecycle. It supports the visualisation, sharing and integration of building information, and transforms the way building facilities are designed, constructed and managed. BIM is not a topic of a particular area or project stage anymore.

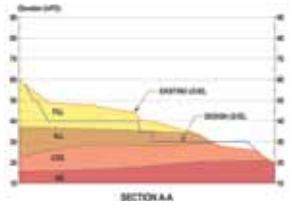
Dr. Jack C.P. Cheng *PhD; MPhil; BEng; MASCE; CAP; MbSHK*

Dr. Jack Cheng is an Assistant Professor in the Department of Civil and Environmental Engineering at the Hong Kong University of Science and Technology (HKUST). While studying at Stanford University for his PhD degree, he was involved in multiple research projects in Virtual Design and Construction and strengthened his knowledge in computer programming and technology. He has leveraged BIM for waste management and construction planning. He has also developed web service platforms for construction supply chain management and BIM collaboration. He teaches BIM and Construction IT at HKUST and has delivered seminars overseas. His research areas include BIM, data mining, information modeling and retrieval, supply chain management, green building, and sustainable construction. His research has been published in various international journals and conferences in countries such as the United States, Canada, United Kingdom, Finland, Russia, Japan, Taiwan and Mainland China.

Neil Carruthers







New tool for the trade - Geological Models Developed using Autodesk Civil 3D®

URS Corporation has been applying BIM technology software applications to our projects in an effort to provide cost-effective solutions and designs. One software application that we are increasingly using is Civil 3D® - specifically the BIM tools for civil engineering, which can model geological surfaces. When carrying out the design of large-scale ground engineering projects such as tunnels, reclamation works and site formation works, we need to quickly visualise the ground conditions to understand how the geology will interact and influence our designs.

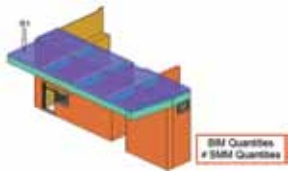
By using Civil 3D's® ability to create 3D surfaces from ground investigation data, we can quickly compile 3D ground models that might typically include surfaces, such as the engineering rockhead level, weathered rock surfaces, and groundwater tables. From these models we can calculate earthworks quantities and easily develop cross sections in any orientation, which can be used as a basis for developing detailed designs and the associated drawings. We can also use the contoured surfaces to speed up the development of geotechnical ground models in other specialist software such as Slope/W or Plaxis.

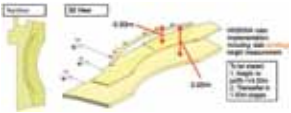
In applying this technology, each project or site has to first be evaluated on its own merits, as some may have insufficient ground investigation data or complex ground conditions not necessarily suitable to this type of modeling. Our team of engineering geologists therefore work very closely with the URS' BIM team to ensure that the resulting ground models are viable from a geological perspective. Utilising this technology has enabled us to pass on the savings – of both time and costs – to our clients.

Neil Carruthers *BSc, MSc, FGS, MIMMM, CEng, RPE(G)*

Neil is the Principal Engineering Geologist at URS and manages a team of Engineering Geologists working on local and international infrastructure and development projects and landslide hazard studies. Neil has been working closely with URS' BIM Team since 2011 to explore and develop applications to ground engineering.

Vincent Yeung





Workflow Integration with BIM

In recent years, while the Hong Kong government and the construction industry are evocating the use of BIM throughout the buildings' lifecycles, the actual market acceptance of BIM technology is limited to clash management, visualisation and 4D simulations.

Some of the major barriers in adapting BIM in construction cycle include the reluctance of change to existing processes/business model, the learning curve of the technology and uncertainty of the return of investment.

In the light of the successful stories of innovative companies like Apple Inc. and Google Inc., where they basically eliminated the users' learning curves in their products/services, the adaption of BIM in the industry can be greatly improved with a similar approach.

Instead of investing in training and changing the existing workflows in order to implement BIM in your company, one way to achieve this goal is via the customization of the off-the-shelf BIM software according to the existing workflows. For example, if the staffs are trained to process a document in a certain format, then a BIM middleware should be developed to extract the data from the BIM model and output to the corresponding format. One example is the automation of Quantity Take Off process according to Hong Kong measurement standard.

This approach can greatly improves the efficiency of processes and the certainty of the return of investment in BIM modeling. At the same time, it does not require any change in existing business model and eliminate the learning curve of BIM software.

Vincent Yeung

Mr. Vincent Yeung is the Innovation Leader of Gammon Construction Ltd. With over 15 years of experience of research and development in different fields and various countries, Vincent is specialized in development of BIM applications. The scope of development includes the development of BIM based Quantity Take-Off Engine based of HKSMM which facilities the preparation of Bill of Quantities and forecast reports for the Quantity Surveyors and Field Management System for Testing and Commissioning of MEP equipment which speeds up the process and reduces the consumption of paper in the process.

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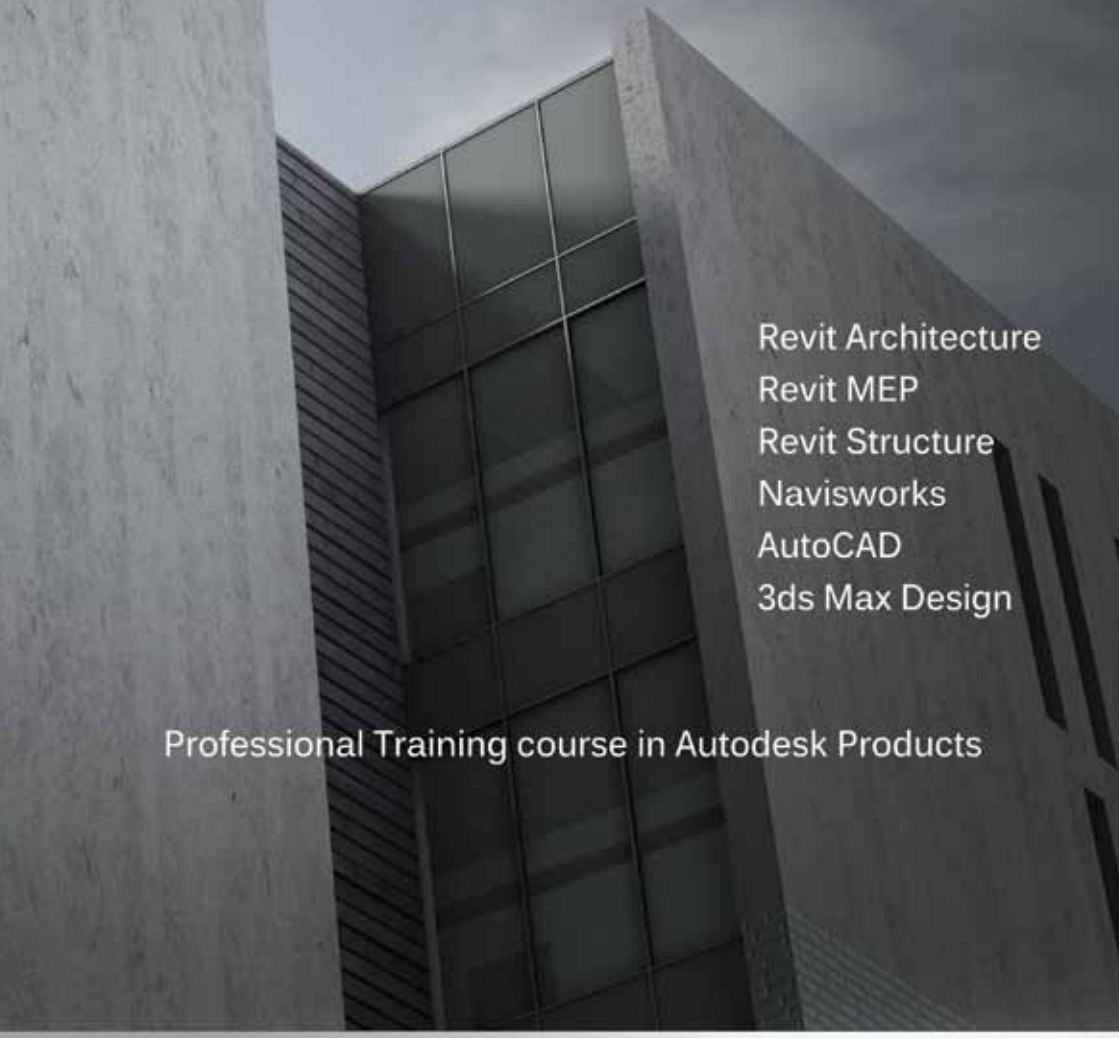

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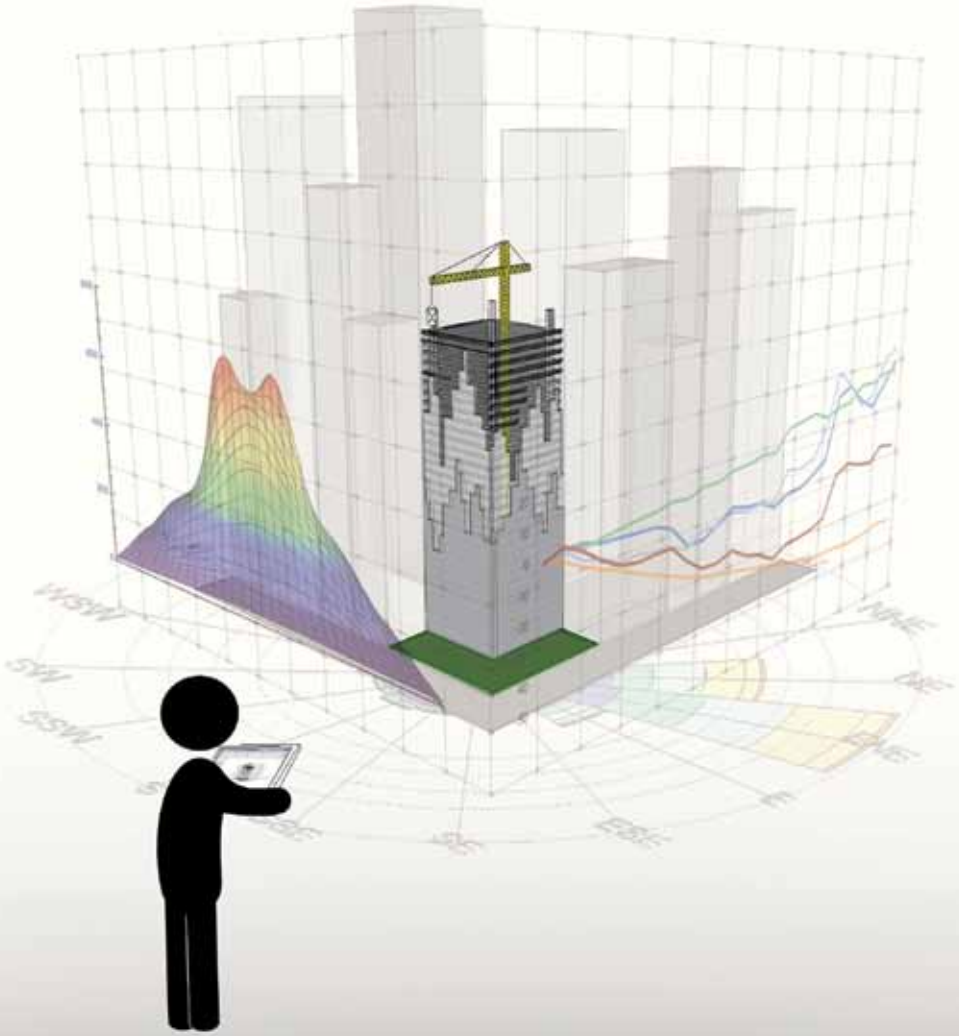

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