

Autodesk®

Lead the Way

**Autodesk Hong Kong  
BIM Awards 2012**





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### Acknowledgement

Sincere thanks to the eight awarded organisations, Atkins, Chinachem Group, Goldin Properties Holdings Limited, Hang Lung Properties Limited, Hong Kong Housing Authority, Hsin Chong Construction Group Limited, MTR Corporation Limited and Ronald Lu and Partners, in providing such valuable information and pictures of their projects. Besides, we are extremely grateful for the contributions of the AIAB committee and members, Mr. David Fung, Ms. Han Hsi Ho, Dr. Stefan Krakhofer, Mr. Kenneth Lau, Ir Sammy Ng and Ms. Christy Wong who are profiled in this booklet.

### Disclaimer

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# Preface



A decade ago, Autodesk acquired a technology company that had recently released the first versions of pioneering 3D modelling software, named Revit.

Since then, Autodesk introduced Building Information Modelling (BIM), which signalled a new era of AEC industry. This year we celebrated the 10th anniversary of Revit and BIM.

Much as Autodesk's AutoCAD, introduced in 1982, transformed ways buildings are designed, BIM is disruptive technology. It's new, it's evolving, and those who deploy it find a multitude of ways to use BIM software including Revit.

Ideally, a BIM model spans a building's entire life – from early designs, through construction, to facility management, and perhaps even helping with demolition. Yet as you will learn from winners of this year's Autodesk HK BIM Awards, BIM can be applied in only certain parts of a building's lifecycle, and still deliver important benefits.

As with any disruptive technology, companies – and government bodies – vary in their enthusiasm for embracing BIM. But as the winners show, even newcomers to BIM can find that rather than disrupting workflows, it swiftly delivers a wide range of benefits. And at Autodesk, we are working hard to help everyone with adopting and making ever better use of BIM. For just as we live in a 3D world, we are increasingly living in a world that is designed in 3D.

The Autodesk HK BIM Awards have become an important way of discovering and highlighting outstanding applications of BIM. The awards are now in their sixth year, and there are a record eight winners.

On behalf of the Autodesk team, I am delighted to congratulate all awardees: Atkins, Chinachem Group, Goldin Properties Holdings Limited, Hang Lung Properties Limited, Hong Kong Housing Authority, Hsin Chong Construction Group Limited, MTR Corporation Limited and Ronald Lu and Partners. Thank you for partnering with us in exploring the possibilities of BIM, and we look forward to continuing working with you in the exciting, BIM future.

A handwritten signature in black ink, appearing to read 'Patrick Williams'.

**Patrick Williams**

*Senior Vice President, APAC and Emerging Markets  
Autodesk*

# Preface



I always look forward to the Autodesk HK BIM Awards. Partly because it's a great opportunity to learn how BIM is being applied by companies and institutions based in Hong Kong and Macau – whether for designing building structures, discovering potential clashes involving building services, improving building facades, or preparing for highly efficient facilities management.

As Patrick noted, an ideal BIM model covers the entire lifecycle of a building. Yet in practice, BIM models may be created primarily for aspects such as clash detection. There are signs that the situation will change, as BIM is increasingly adopted, and more people become familiar with BIM, discovering how they can tap its power to improve buildings, whilst increasing efficiency, reducing costs, and boosting profitability.

I also look forwards to the awards as it is always a pleasure to meet so many people who are working with BIM. Some have discovered it for the first time, others are experts, sometimes helping take BIM in directions that even those of us in Autodesk had not fully anticipated.

Across Greater China, usage of BIM is growing fast, and Hong Kong and Macau are helping lead the way, thanks in no small part to the developers, architectural firms, building contractors, BIM consultants and government departments that have won Autodesk HK BIM Awards over the years. The awardees' stories are always inspiring.

Please join me in congratulating this year's eight awardees: Atkins, Chinachem Group, Goldin Properties Holdings Limited, Hang Lung Properties Limited, Hong Kong Housing Authority, Hsin Chong Construction Group Limited, MTR Corporation Limited and Ronald Lu and Partners. I hope you that as you read of their award winning projects, you will agree that they are indeed inspiring, helping us all discover more about the potential and power of BIM.

A stylized, handwritten signature in black ink, appearing to read '黃志強' (Huang Zhiqiang).

**Jim Huang**

*General Manager, Greater China Region  
Autodesk*

# Preface



For all of us in the Autodesk Hong Kong and Macau team, it is a great source of pride that these two regions are playing key roles in driving adoption of BIM across Greater China and, indeed, worldwide. This year we are glad to host the BIM Awards for the 6th consecutive year. The winners of the Autodesk HK BIM Awards are at the forefront of transforming ways the architecture, engineering and construction industry works – and, in turn – helping enhance urban living.

The benefits of BIM are permeating throughout Hong Kong. Not just in structures as varied as commercial and university buildings, housing blocks, an air cargo terminal and a logistics centre, but also in ways that people move through railway stations. Importantly, BIM is also delivering benefits in sustainability.

We are forging highly rewarding relationships with BIM practitioners in Hong Kong – who help show us the potential of BIM software solutions as well as advise us on worthwhile enhancements. We are also seeking to develop the skills of everyone using BIM, such as through masterclasses featuring expert speakers.

As well as celebrating the achievements of local BIM practitioners, the Autodesk BIM HK Awards serves as a masterclass in itself: for throughout the six years the awards have been held, the winning projects have always featured new, advanced uses of BIM.

As BIM usage increases in Hong Kong and Macau, the number and quality of submissions for the BIM awards continues to rise – prompting the judging panel to this year select a record number of eight awardees. On behalf of the Autodesk Hong Kong and Macau team, congratulations to Atkins, Chinachem Group, Goldin Properties Holdings Limited, Hang Lung Properties Limited, Hong Kong Housing Authority, Hsin Chong Construction Group Limited, MTR Corporation Limited and Ronald Lu and Partners. We look forward to seeing your projects completed, as shining examples of the use of BIM.

A handwritten signature in black ink, appearing to read 'Wendy Lee', with a long, sweeping flourish extending to the right.

## **Wendy Lee**

*Branch Manager, Hong Kong and Macau*

*Senior Manager, Business Development – Designed in, AEC China*

*Autodesk*



## Atkins

**Project:**

China Huarong Tower

**Location:**

Hengqinzhèn, Xiàngzhōu,  
Zhūhǎi, Guǎngdōng, PRC

**Type:**

Mixed-use Development

**Scheduled Time of**

**Completion:**

Total Completion is scheduled  
for December 2014

# Rapid Design Development and Integrated Collaboration



Atkins has been announced to design the China Huarong Tower. After winning the one-month competition, the project was set on a “fast-track”, reducing design development time to only two months for delivering the final scheme design. In order to fully embrace the rapid design development, the BIM workflow, centred on Revit has been adopted. Revit also enabled integrated collaboration with structural and environmental engineers by sharing one 3D design model.



## An auspicious design

The Hong Kong architecture studio of Atkins was invited to compete for the design of the China Huarong Tower, a mixed-use development in Zhuhai. After winning the competition, the design team was informed that the final design would be needed in just two months. Dr Stefan Krakhofer, associate

of Atkins Architecture and Urban Design has developed the winning design applying 3D BIM modelling, as it accelerates the design process and increases quality control, leading to a viable design.

During the initial two weeks optioneering stage, nine viable designs were proposed and the client chose 3 favourites. In the following two weeks, the final winning design was presented – which featured an office tower and a hotel tower, sharing a retail Galleria. The architectural language is sculptural, resembling the “Shuang Yu – the symbol of the double fish leaping out of the pond”; an auspicious design, befitting the site located on Zhuhai’s waterfront, facing the Cotai Strip of Macau.

This design presents another successful BIM project by Atkins. The chosen BIM platform is Autodesk Revit, partly as Atkins is pushing BIM globally, and will soon

introduce a global BIM standard to ease communication between disciplines, within Atkins, and with clients and governments. For the team – including Dr Krakhofer, who had previously specialized in parametric design and programming in other 3D design software – the project would prove a learning experience.

## BIM helps assess sustainability

“The multidisciplinary environment of Atkins enables an integrated design approach,” says Dr Krakhofer. “Early on architects and engineers team up to achieve a sustainable design solution. We analyse the client’s brief, the local environmental situation and start optioneering. Using BIM, we can not only model everything in 3D, but also automatically retrieve area schedules, component lists, and 2D representations.”

Importantly to Dr Krakhofer, Revit BIM enables collaboration between different software tools that improves the feedback loop between design and analysis; creating a sustainable design workflow. During the design development of the China Huarong Tower, the 3D model was often exchanged (export / import) between Revit, and Project Vasari for rapidly assessing sustainable factors, such as the solar and wind performance.

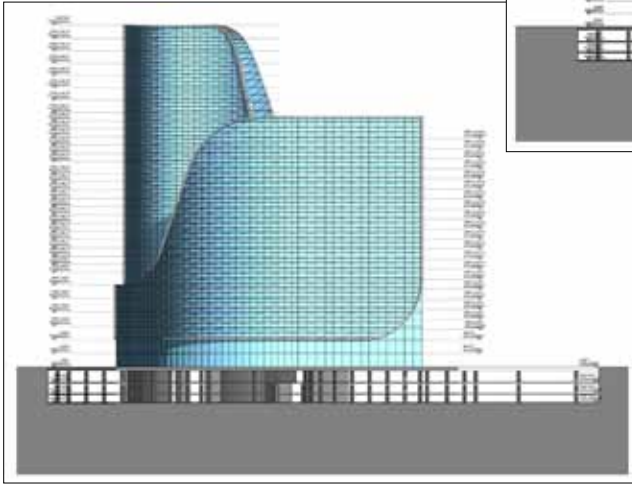
Additionally to the optimized analysis feedback, the 3D Revit model, containing material definitions can be naturally rendered in 3ds max, and exported to build high-class physical models. Importing the Revit model to Navisworks, and using the walkthrough functionality improves tremendously with collaborative design decisions. The Atkins team is also looking into parametric design using Revit’s “Dynamo” plug-in and design automation

using python scripting, allowing more time to be spent on designing.

## Constraints Driven Design

“Identifying the constraints (Regulations, cost, climate, structure, MEP, BMU, visual performance, ...) of a project allows you to drive the design more effectively,” says Dr Krakhofer. “The use of 3D BIM helps to address each aspect explicitly and improves quality control – it constructs confidence.”





BIM allows for rapid fine-tuning of the final design. One example during design development was, to adjust the outline of the office tower to accommodate a larger ballroom, requested by the Hotel operator. In the Revit model, the floor area table is updated automatically and the new model could be rapidly analysed for its solar performance. The Atkins team also used BIM for the curtain wall design to ensure efficient panelization with high degree of repetition.

To evaluate the spatial performance of the design, Navisworks' walk-through functionality has been used. "In Navisworks spatial constraints exist, so that one cannot walk through objects (walls) and can navigate up and down stairs," says Dr Krakhofer. "You can

walk your client through the design in the virtual environment." During one of the virtual investigations, the design team encountered an incongruous column configuration. "Let's resolve this!" was the immediate response – together with the structural engineers the columns have been adjusted – the spatial quality has been enhanced.

### BIM shifting focus

Reflecting on the project to date, Dr Krakhofer says BIM requires more investment of resources in the beginning, but the process is LEAN overall, with more time designing, less time producing plans. "We might be able to design three projects with the new approach, in the time it would take for two with

traditional methods. Also, the design experience for colleagues working on a 3D object instead of 2D CAD is more exciting and tangible - which is why I moved into 3D.”

The constructive and explicit nature of BIM demands a strong decision making process along with the design. This results – unlike with freeform methods – in a closer reality that is perhaps 95% identical to the completed building. As part of the BIM strategy, Atkins has introduced cross-disciplinary BIM managers that are responsible for maintaining and quality assurance of the 3D BIM models throughout the project lifetimes.

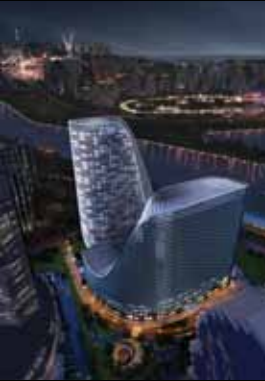
Reflecting on the increasing capability and also acceptance of BIM, Dr Krakhofer says, “Observing the building industry we are finding that many professionals are eager to adopt BIM - ‘Let’s do it in BIM!’.” Atkins has been using BIM successfully on more than 50 projects

worldwide with an estimated construction value exceeding \$1 billion. In the long run, Atkins is expanding 3D BIM to 4D and beyond. “It’s a more integrated approach,” notes Dr Krakhofer.

*\* All images in this article are provided by Atkins*



# ATKINS



## ABOUT ATKINS

Atkins is one of the world's leading design consultancies. We have the breadth and depth of expertise to respond to the most technically challenging and time-critical projects and to facilitate the urgent transition to a low carbon economy. Our vision is to be the world's best design consultant.

Whether it's the architectural concept for a new super-tall tower, the upgrade of a rail network, master planning a new city or the improvement of a management process, we plan, design and enable solutions.

With 75 years of history, 17,700 employees and over 200 offices worldwide, Atkins is the world's 13th largest global design firm (ENR 2011), the largest global architecture firm, the largest multidisciplinary consultancy in Europe and UK's largest engineering consultancy for the last 14 years. Atkins is listed on the London Stock Exchange and is a constituent of the FTSE 250 Index.

In 1994 Atkins established its first Asian office in Hong Kong followed by Singapore in 1996. Today we also have offices in Hong Kong, Beijing, Shanghai, Chengdu, Chongqing and Ho Chi Minh and Sydney, all part of an integrated network that delivers innovative multidisciplinary projects and employs approximately 1,000 staff across the region from China to South East Asia and Australia.

## Chinachem Group

**Project:**  
Asian House

**Location:**  
1 Hennessy Road, Wanchai,  
Hong Kong

**Type:**  
Office

**Scheduled Time of  
Completion:**  
November 2016

# BIM a Star for Big Screens



Chinachem Group is deploying BIM for a landmark project in Wanchai. The Revit model is proving invaluable, particularly for assessing the final appearance of four large, concave LED screens. The comprehensive BIM model will be used throughout design and construction phases, and facility management.

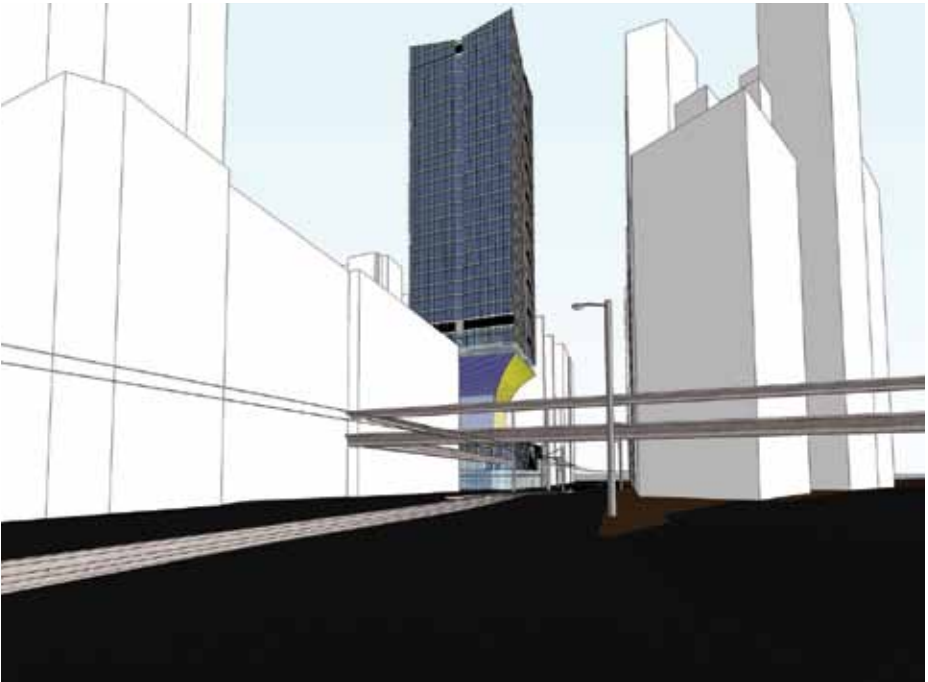
## Landmark project for Chinachem Group

Chinachem Group is developing Asian House, in a redevelopment project involving construction of a 31-storey commercial building at the entrance of Wanchai district from Admiralty. With its prominent location, and design featuring a podium and a “neck” with expensive LED screens, it is set to become another landmark of the group.

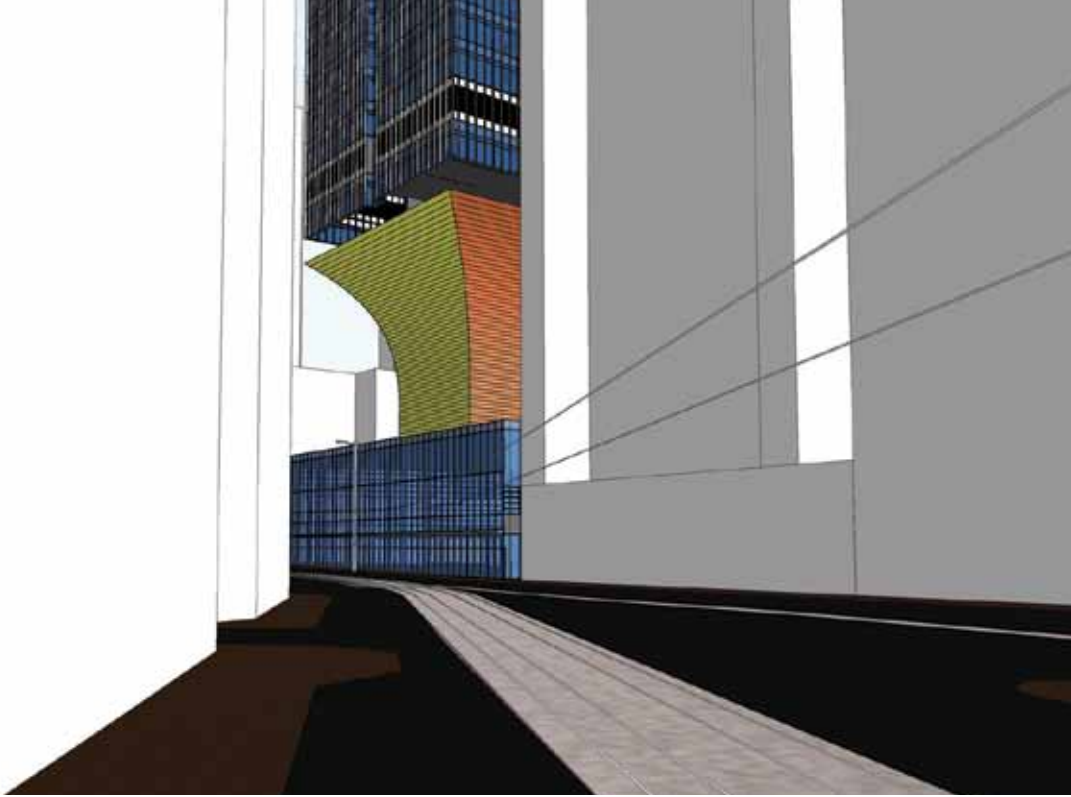
“We saw the benefits of using BIM as a design tool by the design consultant in our Bisney Road Project which is one of the award winning projects in the last year BIM award. To release the full power and gain the most benefits, we decide to initiate and implement BIM by ourselves to extend its application in all aspects of our projects.”

“We are using BIM for the project to ensure quality, and control costs,” says Mr. Anthony Tam, Quantity Surveyor, Chinachem Group. This is the first time Chinachem has deployed BIM in full-scale, which will allow many different studies, with a range of uses including planning layouts and construction timing, and assessing spaces and headroom.

The project’s BIM consultant is WSP Hong Kong, and Ir Francis Leung, WSP Hong Kong’s Director and Head of BIM, explains that project design teams may provide hand sketches, CAD drawings or 3D models to develop the BIM model. The centralised BIM model then serves as a platform for design teams to study, boosting the efficiency of the design process and leading to an enhanced design.







“With BIM, it’s easy to see the end product,” says Ir Leung. “There may be places that are hard to visualise from 2D drawings, but 3D shows which part of a design doesn’t work. Changes can be made based on models, and final decisions can be made more quickly.”

## BIM proves a boon for LED screens

A key feature of Asian House where the design was especially challenging is the “neck”, which has four concave surfaces, where designers aimed to locate three or four large LED screens. The visual effect and appearance of the displays could not be simply presented on 2D drawings. Plus, as the surfaces were curved, calculating each LED display area would not be straightforward, particularly with a need to optimise the shape and height of each display

in order to attain the best and most cost-effective arrangement.

Ir Leung outlines several of the questions that the team hoped to answer using the BIM model: “Should there be screens on all four sides – or with one side facing an adjacent building, shall we take away a screen? Will the podium block views of the LED screens? How will it look with four different videos on four sides – or with only images?”

The “neck” was modelled in Revit, producing a BIM model that generated areas of the LED displays, which were automatically updated as the designers changed the screen shape and height. Screen resolution is another key consideration, particularly as high definition screens are far more expensive than those of lower resolution. Ir Leung learned of LED

screen characteristics, and devised a means of indicating on computer screens how different resolutions would appear in reality.

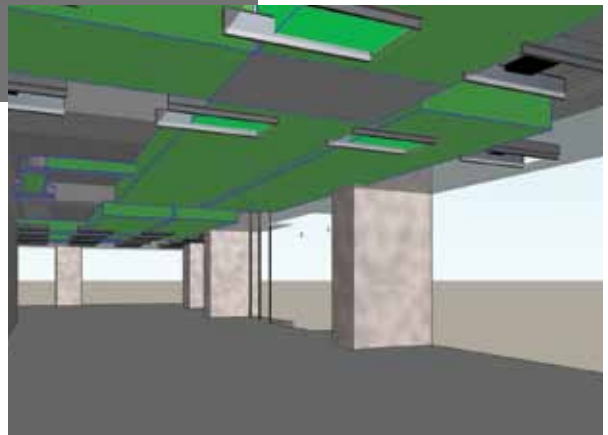
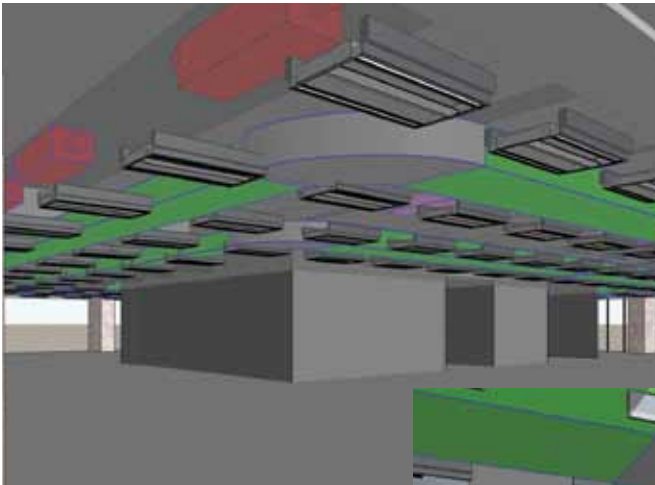
Data from the BIM model was then used to create 3D animations, which showed the views for pedestrians on Hennessy Road and Lockhart Road. “With the BIM model, we could see views from Johnston Road that showed the screen on the fourth side was visible, rather than blocked by the adjacent building,” says Ir Leung. “Previously, there was no way of studying this.”

As well as helping optimise the LED screen

design and resolution – whilst ensuring they are within budget - the BIM model can aid in positioning advertisements for maximum effectiveness. In future, it should even be possible to insert videos into the animation, so potential advertisers can see how they will appear.

## Comprehensive deployment of BIM

Another example of the BIM model helping the design is assessing an existing footbridge. “We can judge from the model whether we should modify the footbridge, or just add a new exit,”



says Ir Leung. “Also, the existing building has support for a cable for the tram – the model can answer what will happen with this.”

With Chinachem Group supporting comprehensive use of BIM from project inception onwards, the model is innovative as Electrical & Mechanical designs can be included from an early stage – allowing 3D modelling of the combined services layout, showing critical items and minimising clashes.

## Chinachem making further use of BIM

Though the Asian House project is in its early stages, the results of BIM modelling have already encouraged Chinachem to adopt BIM for forthcoming projects, all involving luxury housing.

For one project, to build five blocks of residences; BIM has helped conduct a feasibility study, such as by assessing and conducting a solar and micro-climate study to discover which building orientations will maximise residents’ comfort. The other two projects are both single block residences, helping Chinachem assess the effectiveness of BIM in diverse situations.

“With BIM, we can make better presentation in project meetings, helping show colleagues and senior management that BIM can do many things,” says Mr. Tam. “In the long-term, we will integrate the use of BIM for the whole building life cycle including facility management.”

*\*All images in this article are provided by Chinachem Group*



# 華懋集團

## Chinachem Group



### ABOUT CHINACHEM

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.

# Goldin Properties Holdings Limited

**Project:**

Tianjin Goldin Metropolitan –  
Central Business District (CBD)  
Phase 1

**Location:**

Tianjin CBD, PRC

**Type:**

Office/Hotel/  
Service Apartment/  
Entertainment

**Scheduled Time of  
Completion:**

End 2015

# Mastering a Complex Project



As Goldin Properties began a complex project, featuring a 117-storey building topped by a diamond structure, they deployed BIM to help make the design process smoother. After proving a boon in early design work, the BIM model looks destined for use throughout the lifetime of the buildings.



## Major complex features landmark building

Goldin Properties is developing the “Tianjin Goldin Metropolitan”, a complex combining a Central Business District and community development, together with an international polo ground. At its heart is a building dubbed 117 – which with a planned 117 floors will have a height of 597 metres, making it a landmark for Tianjin. “This will be the tallest building in north China, and would today rank as the world’s ninth highest building,” says Ir Raymond Chan, Senior Project Manager of Goldin Properties.

A six-star hotel will occupy floors 94-116 of the building; floors 7 to 93 will be for offices. “Below, there will be a podium and a 30-metre high lobby, along with a four-level basement,” says Ir Chan. “117 will have a diamond shaped structure on top, with a club inside – an observation floor will provide magnificent views of the surroundings.” Tianjin Goldin Metropolitan will also feature a theatre, serviced apartments, and two 50-storey towers.

## BIM for understanding the design

This is the first time Goldin Group has deployed BIM, and Ir Chan and colleagues learned of ways it could help them through



Central Business District, as the multiple elements make it especially complex. Even though the project is still in a relatively early stage, BIM is already proving helpful.

“We have held many coordination meetings between consultants, and the BIM model has helped reveal conflicts among different elements,” says Ir Chan. “The engineering and mechanical consultants find it especially useful for understanding and fine-tuning the design.”

### Creative use of BIM

One location the BIM model has proven its worth is the basement car park. The goal was for headroom of at least 2.8 metres. The structural consultant originally believed they had met this requirement, yet they learned otherwise after their data was used to create the BIM model – which revealed many clashes, with headroom often only 2.5 metres.

“The headroom study employed BIM in innovative way, using an imaginary ceiling at the height of the headroom,” says Ir Chan. The BIM team created a Reflected Ceiling Plan, with a false ceiling indicated by a thin band of colour. Any Mechanical & Electrical and

their BIM consultant WSP. “We were shown many advantages of BIM, and we’re using BIM for Tianjin Goldin Metropolitan as it’s a very complicated project with many elements,” says Ir Chan. “BIM can help everyone in project teams to make sense of the design, and ensure everything is in position. Plus, BIM can boost efficiency and improve control of project management.”

Without BIM, the project team would have to rely on traditional 2D drawings, and no one could really master and manage all information. The project would proceed with many uncertainties. For Tianjin Golden Metropolitan, use of BIM focuses on the



Structural elements appearing on the coloured ceiling area showed where the headroom was insufficient – making it easy to see where there were potential clashes.

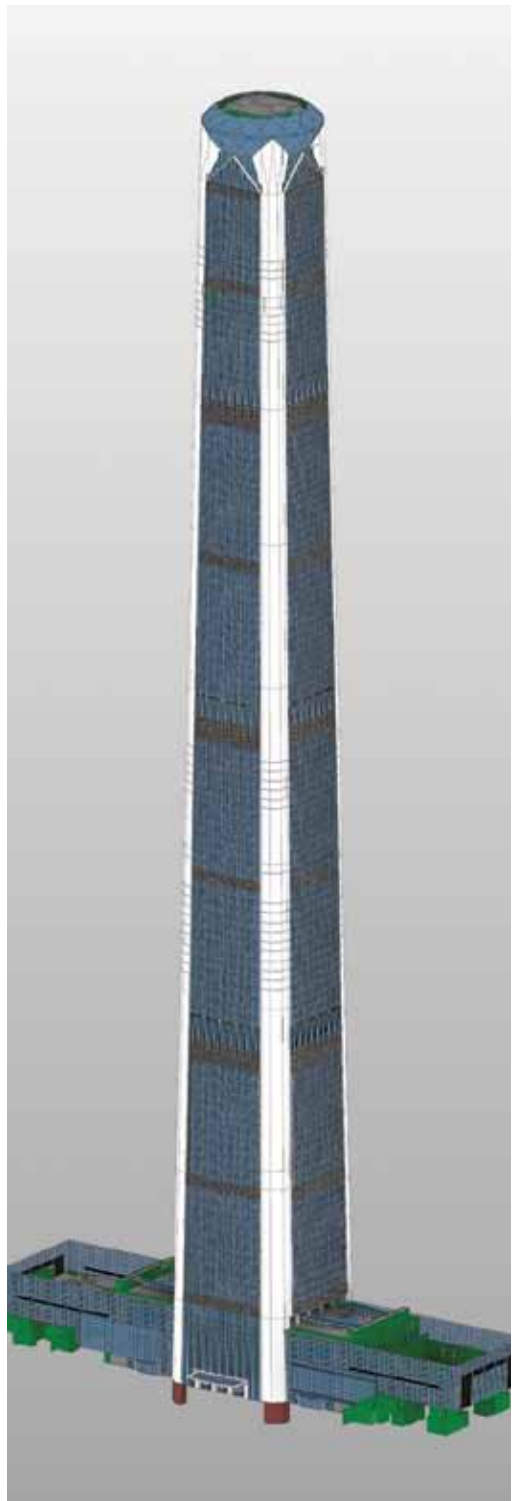
The team members could then review the BIM model, concentrating on assessing clashes in critical locations. They then agreed on the most realistic achievable headroom, and revised the design, such as by instructing the consultant to raise beams or lower air ducts in some places.

### 3D model for the life of the buildings

“Usually when we are working on coordination, and design modelling, it’s hard to visualise the whole picture,” says Elvis So, Project Manager, Goldin Properties. “Yet BIM generates this overall picture easily on a computer – making the design process smoother.”

The BIM model is proving its worth above ground, too, such as in coordinating elements of the extensive podium that will interconnect 117 with much of the Central Business District. Landscape designers who otherwise don’t know structure and Electrical & Mechanical can see the BIM model, and so understand how the site will appear, enabling them to create optimal landscape features.

The whole team, comprising members from disciplines ranging from structural to landscaping, is working closely together – achieving the goal of modern coordinated design, which was previously impossible with “sequential” design development. “BIM helps us find locations where construction won’t meet the design intent – giving us a chance to make modifications before construction,” says Ir So.







Though BIM was initially introduced to detect potential conflicts, the Goldin project team now considers it will prove powerful from the design stage to completion, and the whole BIM system can be passed to future operations.

“If the contractor wants, they can apply BIM to construction – so they can visualise the construction process,” notes Edmond Ting, Executive Director, Goldin Properties. “We will also use the BIM model for safety and property management. If a tenant moves out, the new owner can input their amended layout to the BIM model, which can be maintained for the life of the buildings.”





## ABOUT GOLDIN PROPERTIES HOLDINGS LIMITED

Goldin Properties Holdings Limited “Goldin” (formerly known as Matsunichi Communication Holdings Limited) is a premier property developer specialising in Mainland property market. It is listed on the main board of the Stock Exchange of Hong Kong Limited (HKEX) (Stock code: 00283). The Group’s headquarter is in Hong Kong.

Goldin commenced property development business since 2007. To align with the robust growth of the Chinese economy, the Group has been focusing on the high-end properties market. As a premier developer of quality properties, Goldin is currently developing a world class metropolis in Tianjin.

Apart from actively pursuing the development of this mega project in Tianjin, Goldin is always looking for suitable sites in other mainland cities with good development potentials to increase for its land bank. The economic growth potential of various cities is the Group’s prime consideration in formulating its plan to develop property projects in China.

In return, this offers tremendous driving force for Goldin to build the most suitable accommodation to meet with the clients’ expectation.

# Hang Lung Properties Limited

**Project:**

Blue Pool Road Residential Development

**Location:**

I.L.5747, Nos. 11-39 Blue Pool Road, Hong Kong

**Type:**

Low Rise Residential Development

**Tentative Time of Completion:**

2013

# Holistic Design for Luxury Townhouses



BIM is helping a project team to design a luxury housing development for Hang Lung Properties Limited, including arranging building services in a confined space under a road and within the low-rise buildings.

## Low-rise buildings yet significant challenges

Blue Pool Road Residential Development is a luxury townhouse project of Hang Lung Properties Limited. Set on a narrow site on a slope at Happy Valley, it will feature nine blocks of three-storey houses.

“As it’s a low-rise project, some may think using BIM is not worthwhile,” says Jeff Cheung, Contracts Manager of the main contractor, Tysan Building Construction Co. Ltd. “Yet there are challenges, including landscaping the hillside slope, designing a retaining wall, and arranging building services in the densely packed site.”

This is the first time Hang Lung Properties Limited has used BIM. With BIM, it would be possible to see conflicts before actual construction and thereby mitigate the abortive works.

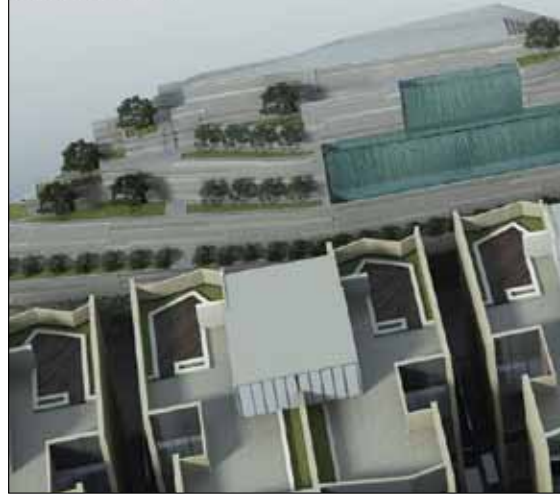
## Streamlined design reduces costs

The BIM model was created by Ray Lau, BIM Engineer, Forida Limited, by combining designs from the architect, engineers and landscape architect. “All components in the BIM model have genuine dimensions,” he says. “We included the various building services in the small area, and modelled the retaining wall.”

Hang Lung Properties Limited aimed to minimise reworking of the existing slope, and Ray used survey data to create a slope profile in the BIM model to achieve this end. The design team, main contractor and consultants held many meetings in which they discussed the model, and worked on the design for the slope work and retaining wall.



Front view of House 1



The retaining wall comprises 24 roughly L-shaped structures, rather like a linear jigsaw puzzle. “Without BIM we couldn’t have an accurate design of the L-shaped wall,” says Tommy Lee, Senior Project Manager, Tysan Building Construction Co. Ltd. There was also a planter wall, as a landscape feature.

After the BIM model was first built, Ray used it to help to project the costs of the materials for the planter walls. The resulting figure



With BIM, our team works efficiently with landscape architect during the design process. BIM visualizes the design and extracts 3D geometry data to assist the decision making concerning aesthetic, function and cost.

Through the collaboration, BIM successfully helps to maintain the design principle while optimizing the structural design to reduce significantly the concrete volume and in turn the construction cost.

BIM helps not only to visualize but also facilitate the design, saving time and cost ultimately.



was significantly over budget. The project team worked to streamline the design in the BIM model, and within a month achieved a 40% reduction in the concrete volume and formwork needed.

“In the early stages of the project, the BIM model also showed the team the whole drainage system, which led to major changes,” says Nelson Wong, Building Services Manager, Tysan Building Construction Co. Ltd. Many

clashes that had gone unnoticed on 2D drawings were revealed in the 3D model, such as drains running along the emergency vehicle access (EVA).

### Arranging services below road and over ceilings

The BIM model was also used to check access to building services laid under the emergency vehicle access (EVA) running behind the

houses. The manhole covers had to be precisely positioned, to fit into the pattern of paving stones.

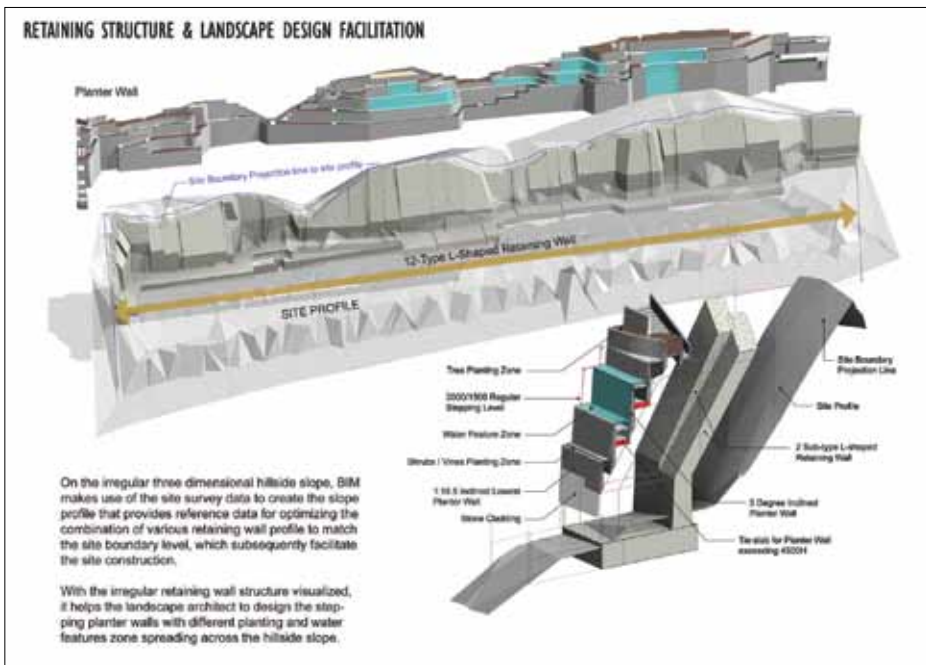
Around 13 types of utilities had to be laid under the EVA, within a strip around six metres wide and a little less than 2 metre deep. The main utilities here are drainage for the slope, the emergency vehicle access, planters, featured pools and the houses; others include electrical power supply, security, surveillance, telephone lines, broadband fibres, gas, as well as water supplies for potable, flushing, irrigation and featured pools on the slope. Adding to the complexity, some of the pipes needed to be of specific gradients.

“BIM helped us a lot,” says Tommy Lee, Senior Project Manager, Tysan Building Construction Co. Ltd. “It gave us a very early impression of how things would look under the EVA, so we

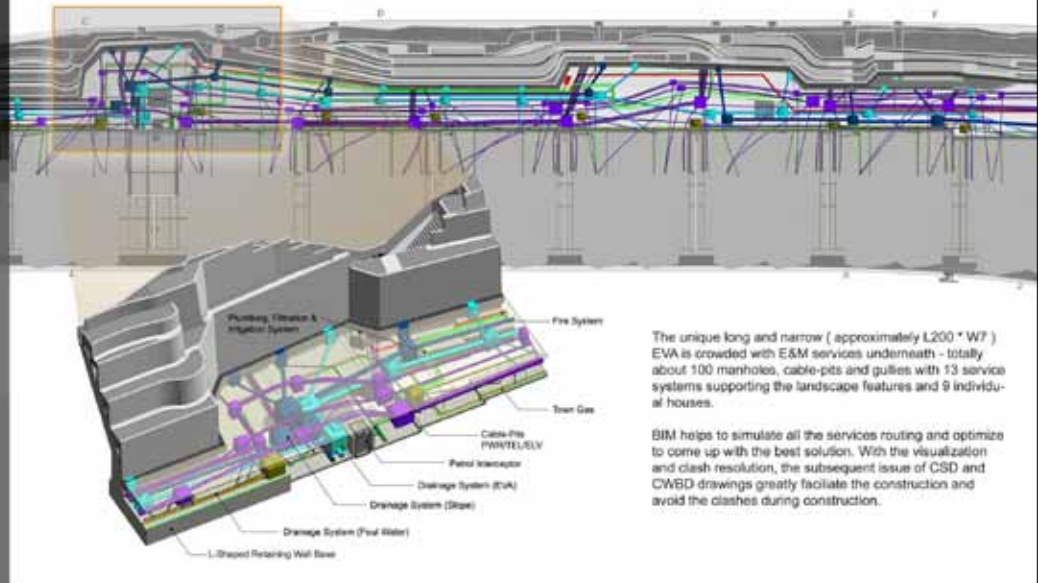
could understand the whole system under this area.” Working with the BIM model, the building services team minimised the clashes between all services and the sub-structure.

Though the townhouses are only three-storey buildings, Nelson explains that they presented challenges for designers, “They are luxury houses in the middle of the city, with a lot of services. For instance, they have motorised blinds built into the curtain walls and within the double-glazing.”

The most challenging aspect of designing the houses was achieving maximum headroom to ensure spacious rooms for users. This task was complicated by the automation system requiring double of the wiring of traditional houses. To account for this and maximise living space, services were concentrated above areas such as corridors.



## EVA UNDERGROUND SERVICES CLASH RESOLUTION



Using the BIM model, the main project team and the sub-contractors arranged the building services in much the same way as under the EVA: creating and refining a design with the services fitting into a small space, with access for maintenance, but without detectable clashes.

### Impressive benefits of BIM

The project team is impressed by the ways in which the BIM model has performed, and delivered impressive results. "BIM is a very good platform," says Tommy Lee. "You can have a holistic view of a design, without which everyone would have 2D drawings of their own systems, which you would have to combine. Working with a BIM model, the E&M team can coordinate between themselves, and devise the best options for a project."

Ray Lau demonstrated a "walkthrough" animation he created from the BIM model,

showing how the completed project will look. It resembles a guided tour, with an appearance recalling a realistic computer game: you enter from Blue Pool Road, and pass the retaining wall with a water feature and greenery, before coming to a stop beside one of the houses. This is the first time Tysan has been involved in creating such a video.

*\* All images in this article are provided by Hang Lung Properties Limited*



## ABOUT HANG LUNG PROPERTIES LIMITED

Hang Lung Properties Limited, a constituent stock of the Hang Seng Index and Hang Seng Corporate Sustainability Indices in Hong Kong, is a leading real estate developer in Hong Kong and mainland China. Boasting a diversified portfolio of investment properties in Hong Kong, the Company has progressively branched out into the Mainland since the 1990s, building, owning and managing world-class commercial complexes in key cities that have earned international acclaim for their exceptional quality of architectural design, services and sustainable features.

Riding on the immense success of its two landmark properties in Shanghai, Plaza 66 and Grand Gateway 66, the Company's footprint has expanded to Shenyang, Jinan, Wuxi, Tianjin, Dalian, and now Kunming following the successful acquisition of a prime site in that city in September 2011. Subsequent to the grand openings of Palace 66 in Shenyang in 2010 and Parc 66 in Jinan the following year, the next world-class investment property to come on stream will be Forum 66 in Shenyang.

As Hang Lung's business continues to grow with soaring perspectives, the Company is set to develop into the most admired mega national enterprise in the market.



# Hong Kong Housing Authority

**Project:**

Construction of Public Rental  
Housing at Sha Tin Area 52  
Phase 1 (known as Shui Chuen  
O Ph 1)

**Location:**

Sha Tin, Hong Kong

**Type:**

Public Housing

**Scheduled Time of****Completion:**

February 2014

# Pioneering BIM for Quantity Surveying



The Housing Authority is implementing probably the Greater China Region's first project for obtaining detailed quantities data from a BIM model. The "5D" model – with three physical dimensions plus time and cost data – generates data far more quickly than traditional QS methods. The standardised approach and guidelines developed in the project may extend the use of BIM in the construction industry.

## Pioneering research and design project

In 2006 the Hong Kong Housing Authority first adopted BIM, and has made remarkable achievements in sustainable construction and strengthening site safety through applying BIM technology in design and site planning. Now, the Housing Authority aims for all new projects from 2014/15 onwards to use BIM.

The success and future plans prompted the Housing Authority's Quantity Surveying Section to investigate how to tap BIM's potential for helping to generate data such as quantities and costs of construction projects. This could lead to several advantages over current practices. Traditionally, design intent and cost data are often separated and isolated in different digital environments – making it extremely difficult and time consuming to extract data for planning and controlling construction project finance and risk issues.

The Housing Authority decided to undertake a research in a housing project under construction, in partnership with the contractor China State Construction Engineering (Hong Kong) Ltd. and the BIM consultant isBIM Limited. As there is no previous example of BIM being applied to generate detailed quantities based on isBIM's



approach in the Greater China Region, this project could be said the first in the Region.

## BIM in parallel with traditional QS methods

The project covers a new public rental housing development in Shui Chuen O Phase 1 in Shatin of Hong Kong. This HK\$1.3 billion development involves construction of five blocks with 3,039 domestic flats. The research spans four work trades which are Piling, Excavation, Concrete Works and Underground Drainage, which together account for around HK\$301 million of the project cost.

Quantity surveyors are still applying



isBIM Limited. The model currently has over 85,000 objects.

Using this model, team members developed a systematic approach for quantity takeoff process, costs management and cash flow simulation linking the BIM database with a Cost database. This approach was dubbed Quantity Surveying Building Information Modelling (QSBIM). QSBIM aims to provide quantity surveyors an effective way to transfer, extract and verify the cost related information from BIM modelling elements to a BQ database.

conventional practices, taking manual measurement from drawings and transferring dimensions to sheets or spreadsheets to carry out cost estimates or interim payment assessments. The research runs in parallel with this work, seeking a new way to use BIM information to boost efficiency and productivity by automated quantification, increase accuracy by reducing data variability, and facilitate sharing of data among stakeholders.

## Standardised approach and guidelines

“At first, there was no BIM model – we created one from 2D drawings,” says Elvis Li, CEO of

“One of the challenges in extracting quantities is the requirement to follow the measurement rules in the Hong Kong Standard Method of Measurement of Building Works (HKSM),” says Sunny Choi, Senior Quantity Surveyor of the Housing Authority. “Another challenge is different methods of building up BIM models will give out different quantities.”

isBIM drafted a standard approach of modelling for the four work trades, coupled with standardised guidelines based on the HKSM, to assist quantity surveyors to extract quantities data from BIM models.

## Over 200,000 measurement records generated directly from BIM model

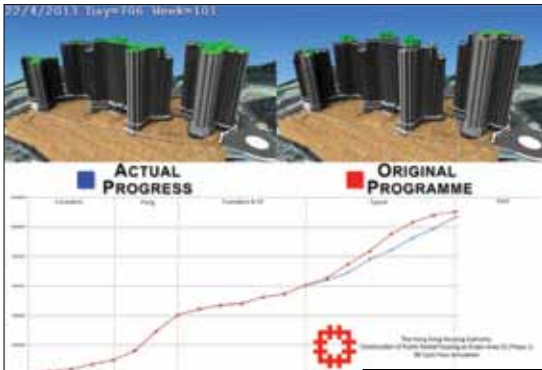
Through integrating extracted quantities from BIM model, construction programme and cost information, the research team has created 5D [i.e. 3D models plus time (the 4th dimension) and cost (the 5th dimension)] cash flow simulations, which help revealing actual and predicted cash flow of the project. “So far, we have generated over 200,000 measurement records directly from the BIM model,” says Mr Li. “There will be many more in future.”

The research spans April to November this year, and the results will help to have a better understanding on project cash flow. Mr Li

demonstrates one way of showing the results, in which it is possible to select a time and date, and instantly show a 3D image of the partly built housing blocks together with a graph and figures indicating project costs.

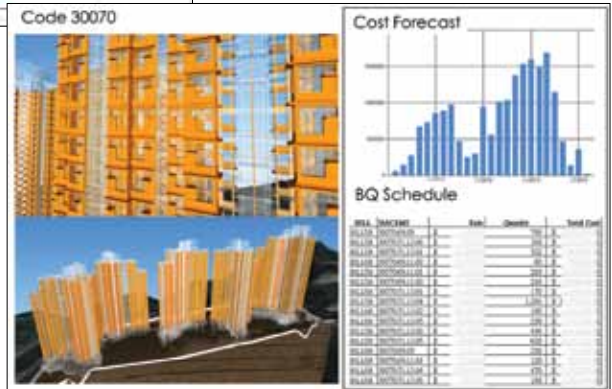
“Extracting quantities from BIM models is very fast compared to manual measurements and calculation for interim payment assessments,” says Mr Choi. “For the traditional practice, we need to head back to the office after visiting the site, and assess the amount of works completed, which may take one to two weeks.” Comparing the quantities obtained through the QSBIM and from traditional quantity surveying practice, the difference is within 10%; the discrepancies will decrease as the new method is fine-tuned.





## May extend the use of BIM in construction industry

“If this method indeed works as expected, we can introduce it to contractors,” says Mr Choi. “If we find a constant difference between QSBIM and traditional methods or the gap be minimised we may try to use QSBIM to speed up interim payment assessment, which will be a win-win situation for both the Housing Authority and contractors.”



Though the research primarily focuses on cash flow forecast and payment assessment, the gradual development of standard approach of modelling and measurement guidelines allow QSBIM be extended to other quantity surveying functions, such as preparing Bills of Quantities for BIM models. And it may be employed far more widely within Hong Kong.

*\* All images in this article are provided by Hong Kong Housing Authority*



## **ABOUT HONG KONG HOUSING AUTHORITY**

The Hong Kong Housing Authority (HA) develops and implements a public housing programme which seeks to achieve the Government's policy objective of meeting the housing needs of people who cannot afford private rental 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. The HA also supports the Government's policy in providing subsidised home ownership flats to qualified persons.

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

# Hsin Chong Construction Group Limited

**Project:**

28 Hennessy Road Commercial  
Development Project

**Location:**

28 Hennessy Road, Hong Kong

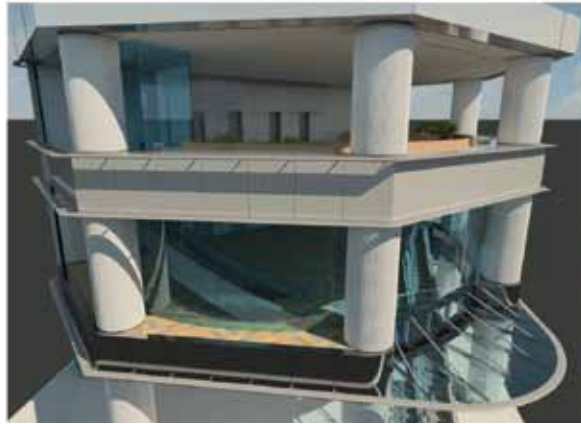
**Type:**

Grade A Office

**Scheduled Time of****Completion:**

End June 2012

## 3D Designs All Can See



The BIM model for a Swire Properties development shows all project members the 3D appearance that would otherwise be only a mental image in the minds of one or two engineers. The model has helped to finalise the design, avoid clashes, and ensure smooth progress with construction in a small space accessed from a narrow, busy road.

## PROJECT OVERVIEW



THIS PROJECT IS A 28-STORY COMMERCIAL TOWER FEATURING 24 LEVELS OF GRADE A OFFICE SPACE. BUILDING IS IN OCTAGONAL SHAPE, WITH CURTAIN WALL TO CREATE A CONTEMPORARY LOOK, THE PROJECT ALSO OFFERS A UNIQUELY DESIGNED 'SKY' GARDEN ON THE SECOND FLOOR, WHICH IS AN INSPIRING, RARE-TO-BE-SEEN FACILITY IN THE HUSTLE-AND-BUSTLE OF HONG KONG.

### From 2D to 3D

Swire Properties is developing 28 Hennessy Road, an octagonal 28-storey commercial tower, with a curtain wall plus a “sky” garden on the second floor. Though the architect’s initial design was entered in a BIM model, the major use of BIM was by contractor Hsin Chong Construction Group Limited, as the project entered the construction stage.

“We developed a detailed Revit BIM model based on 2D coordinated drawings, to help with coordination and construction planning,” says C.M. Kwok, Chief Building Services Engineer, Hsin Chong. “We focused on items where there was high risk of problems, mainly for engineering, E&M services and spatial coordination.”

Kwok and P.S. Lau, Building Services Manager, Hsin Chong, were confident that with their experience, most of clashes will be resolved

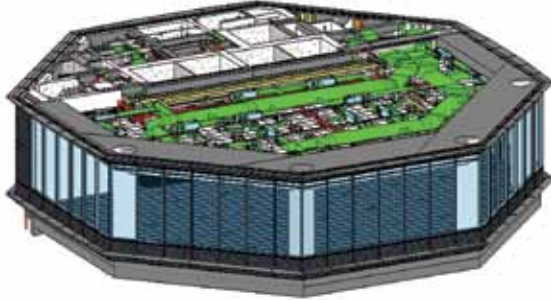
after work on the 2D CSID. Yet combined services drawings are highly complex in 2D, with many lines representing walls, pipes, ducts and so forth – and maybe only experienced engineers have a 3D mental image of how everything will look once built. “BIM is helpful,” says Lau. “It’s easier to demonstrate what will happen to the client, so they can understand spatial information. When using AutoCAD for coordination, it can be difficult to convince the client that there will be minimal clashes.”

### Curtain wall and plant room

One part of the building where BIM proved especially useful was the curtain wall, partly as there were concerns that rainwater might leak into the building through the mullions and transoms. “We used the BIM model to explain the system, and show that the curtain wall would discharge water to outside whilst



## APPLICATION OF BIM



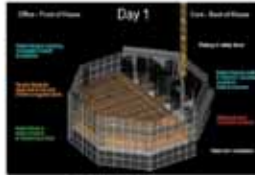
E&M, ARCHITECTURE, STRUCTURE COMBINED MODEL



CLASH ANALYSIS



WALKTHROUGH



4D SIMULATION



FIT-OUT

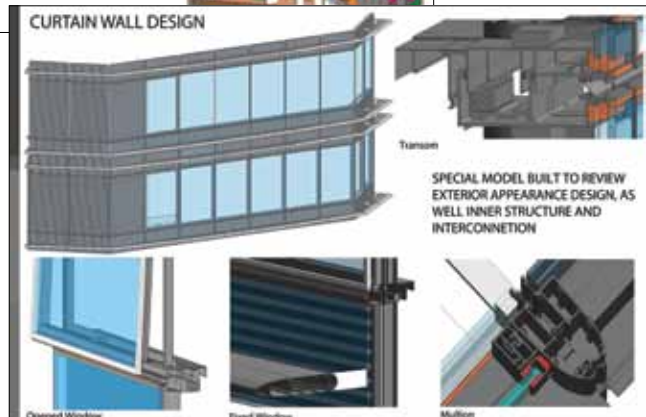
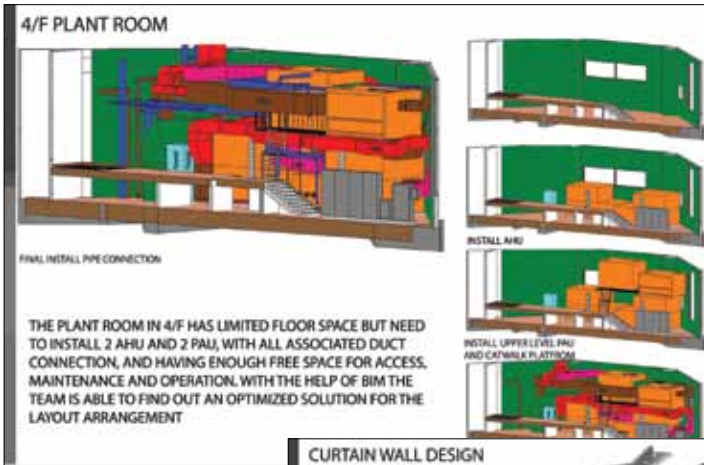
preventing leaks,” says Lau.

The team created a special BIM model for the curtain wall, to also assess the exterior design, as well the inner structure and interconnections. This was used for finalising the design of the curtain wall – and ensuring it would fit with the building structure.

BIM also proved invaluable for coordinating the plant room, which will be densely packed with equipment. A colour coded BIM model helped Kwok and his team discuss the plant room arrangement with Swire Properties and consultants. In regular BIM review meetings, they viewed walkthroughs, and shared their point of view on equipment arrangement so it will be more efficient to carry out operation and maintenance. All available space was fully utilised, with the layout separated into upper and lower zones, and access routes with sufficient room for operators and maintenance staff.

## Max headroom in mechanical plant rooms and the sky garden

Though different MEP systems were coordinated once in 2D, the 3D BIM model did reveal issues with the combined services within the roof level. Working with the BIM model, the project team optimised the layout of building service elements, such as by reducing sizes of some ducts, and rerouting pipes. Clashes were eliminated, and headroom was increased from 1.5 metres to 2.2 metres, which exceeded the 2.1 metres access requirement. Lower in the building, the sky garden above the lobby did not present challenges regarding service elements, as the space is relatively open. But BIM did deliver a benefit, as all project team members could see how the garden will look, and finalise the design.



## Modelling into the fourth dimension

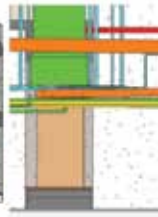
The project site has only one access, from a narrow, busy one-way street. “We were concerned about access and truck parking that would hinder the construction program, so we used a 4D BIM model to demonstrate the time related traffic flow and construction sequence from the basement to typical floors,” says Kwok.

The model revealed ways for creating a temporary platform where trucks could park, as well as construction of the basement, and then

building the ground floor and taking down the platform. It included material and equipment storage, and changed over time – the fourth dimension.

The 4D model was built up to the 5th floor, to help with devising the four-day construction cycle for typical floors. “We showed construction works sequencing and how to fill the concrete areas portion by portion, and presented the model to the client,” says Kwok. Once work was underway, Kwok found it satisfying to see that actual construction was perhaps 80% as in to the model. Also, the scheduling for vehicle access devised in

## BUILDING SERVICE LAYOUT OPTIMIZATION IN ROOF LEVEL



HEAD ROOM 1.5M



HEAD ROOM 2.2M

THE TEAM MADE USE OF THE BIM MODEL IN OPTIMIZING THE BUILDING SERVICE LAYOUT ARRANGEMENT IN ROOF LEVEL, GREATLY IMPROVED THE HEAD ROOM FROM 1.5M TO 2.2M.

the BIM model worked well in practice, with no traffic jams due to material loading and unloading, and space requirements fulfilled.

### Changes in design stage not after building

Reflecting on using BIM for the project, Kwok says it was especially important for giving the client an understanding of the actual situation, so changes such as moving an exhaust outlet or a length of piping could be made in the design stage – rather than after construction as typical when using 2D drawings.

Though creating the BIM model initially demanded manpower – together with assistance from BIM consultant Forida Limited – it did help reduce clashes; and overall, manpower needed was reduced by perhaps 10%. The experience gained through the project will help with using BIM in future, with sufficient time at the project commencement

stage, when Hsin Chong may first create 3D models, and then output coordinated 2D drawings for front line people use.

“You can have a lot of engineering data in a BIM model, which everyone can read,” says Lau. “This is also good for facilities management, with data on equipment that can be used for maintenance.” Swire will indeed incorporate the BIM model for 28 Hennessy Road within the facilities management software, which should mean the model remains useful for years to come.

*\* All images in this article are provided by Hsin Chong Construction Group Limited*



## **ABOUT HSIN CHONG CONSTRUCTION GROUP LIMITED**

Founded in 1939, Hsin Chong Construction Group (Hsin Chong) (Stock Code: 0404.HK) is one of the leading construction groups in Asia. Hsin Chong's scope of services has grown to cover the entire spectrum of building construction, civil engineering, electrical and mechanical engineering, project and construction management, interiors and special projects, property development and asset management services. Hsin Chong is on the HKSAR Government – approved list of contractor for public works (Group C - for contracts of any value).

Hsin Chong has also expanded its territorial coverage. From its firm foundation in Hong Kong, Hsin Chong has successfully applied its proven expertise to Macau, Chinese Mainland and overseas regions with solid results.

In Hsin Chong, we promise to do our utmost to ensure total customer satisfaction. In face of today's challenging economic situation and intensely competitive market, we are constantly in search of ways to improve our work efficiency and quality. At the same time, we are allocating more resources towards promoting the use of new technology to enhance industrial safety and environmental protection.

## MTR Corporation Limited

### Project:

Express Rail Link – West Kowloon Terminus Building

### Location:

West Kowloon District, Hong Kong

### Type:

Infrastructure – Railway Terminus

### Scheduled Time of Completion:

2015

# Mega Station Builders Deploy Mighty BIM



The MTR Corporation is making extensive use of BIM during the construction of the West Kowloon Terminus, by far the largest railway station in Hong Kong. The massive, detailed BIM model was originally deployed for modelling the Terminus structure ahead of construction to identify spatial clashes and construction co-ordination issues, its uses have expanded through collaboration with the project teams within MTR Corporation and its contractors. The project team plans to leave a legacy in the form of an ‘as built’ model in addition to the usual as built drawings to the terminus operator.



## Huge rail terminus

The MTR Corporation is building the West Kowloon Terminus, as the terminus and immigration border crossing for the Hong Kong section of the Express Rail Link connecting Hong Kong with Guangzhou and various Major cities in the Mainland. This will be by far the largest station in Hong Kong, with 4 basement levels and 15 platforms at lowest basement level, 30 metres below ground; the platforms which accommodate shuttles and long-haul trains are 216m and 432m long respectively. The terminus box is up to 600m long and 250m wide, providing a gross floor area of around 400,000 square metres, compared to around 500,000 square metres for Hong Kong International Airport Terminal. There will be immigration and customs facilities underground, and 2 major underpass structures passing through the basements. North of the

terminus will be a public transport interchange.

“The station has an architecturally inspired roof which will be one of the most complex in Asia – and will be one of its kinds,” says Terry Martin, Senior Construction Engineer – Civil, MTR Corporation. “It has curvilinear free form steel trusses up to 175m in length and 50,000m<sup>2</sup> of complex curtain walling and cladding comprising individually shaped panels. It also provides an accessible open public area on top with panoramic views across to Hong Kong Island.”

## De-risking the structure

In the project’s early stages due to complex geometry, 3D modelling was used for designing the roof structure, including its curtain walling and cladding. As the project neared

construction, there were discussions within the MTR Corporation project team regarding potential application of BIM to model the entire design of the terminus.

“We have a challenging construction process for the whole project with multiple interfaces of many disciplines; we thought of using BIM to interrogate our designs – with the intention of ensuring delivery of a robust design to our contractors, says Terry Martin. “We wanted to de-risk the structure, ensuring it was adequately coordinated.” allowing the contractors to build using the 2D construction drawings with minimal delays due to co-ordination or clash issues.

The MTR Corporation team also decided the right way to proceed would be to own and manage the development of the BIM model. They would start with civil and architectural aspects, progressing to incorporating building services, and allow provision for updating the model during the life cycle of the project, making it useful for operation and maintenance. “We wanted to leave a legacy behind – a fully coordinated model which could be given to the operator of the Terminus,” says Terry Martin.

After reviewing other projects that have used BIM, assessing BIM consultant’s capabilities and resources, and issuing a competitive tender for a BIM consultancy, the Corporation appointed Intellibuild. Initially, the main goal was for them to take 2D drawings, and model what the contractors would build.

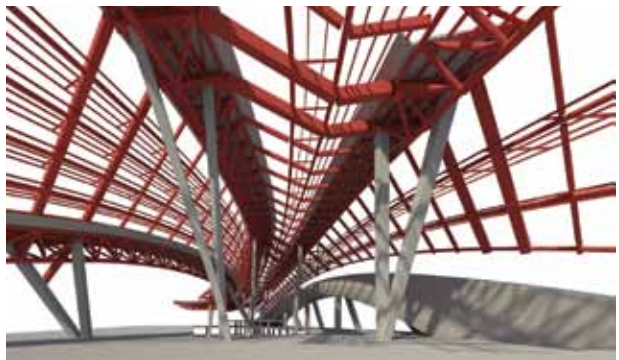
## Massive, detailed BIM model

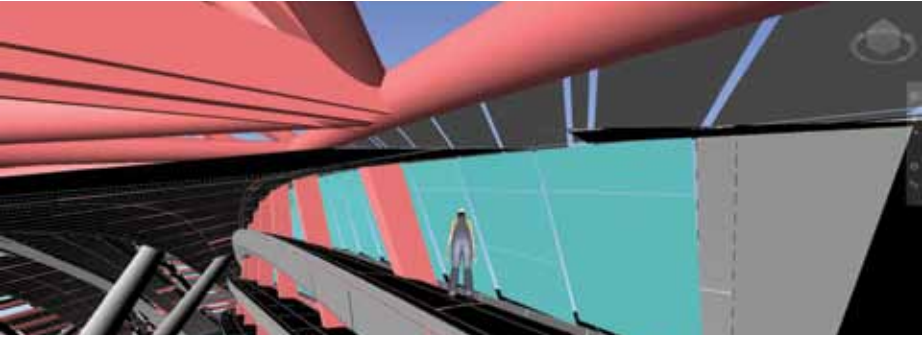
The MTR Corporation issued 15,000 drawings to Intellibuild, together with the roof designer’s BIM model for information. Intellibuild created a model that includes all aspects of the structure and finishes and now has building services being incorporated to allow spatial checks with the reinforced concrete frame and architectural finishes. Building services as small as 50 millimetres in diameter will be modelled. “We’re including anything that has spatial consideration,” says Ir Andrew Wong, Senior Construction Engineer – XRL Terminus, MTR Corporation.

The model now has around 90% of the building completed; it shall be updated with contractor designed elements at a later stage. The BIM model is a massive file which has had to be spilt into discreet manageable files and provides a visualisation of the working documents,” notes Ir Wong.

## Extremely effective communication tool

While creating the terminus in virtual reality, the Intellibuild team have collaboratively worked with the Corporation and contractors





to provide solutions to construction issues through 3D visualisation of the design. This has led to early resolution to construction issues at an appropriate time that may have manifested during construction.

“The BIM model is an extremely effective communication tool,” says Terry Martin. “We have held collaboration workshops with design consultants and our design managers, visualisation of problems from 2D drawings alone was not always possible. We displayed the model on a screen, and worked out solution to issues. It became very clear to all just how powerful BIM is.”

The model will be used for communication with the project contractors and other stakeholders. For instance, the project team will carry out

walk through visualisations of key areas of the terminus such as passenger flow through the immigration facilities and on to the departure platforms.

### Other benefits

Use of Navisworks software has allowed people without intimate knowledge of BIM to understand design and construction in the 3D world, significant people development and new skillsets have been achieved opening a new mind set of what can be achieved by new technology and developing ideas for its application and use.

Some maintenance issues are also being addressed using the BIM model. For instance, a walk through helped show operation and maintenance staff how maintenance access





doors in the roof will help gain access to Building Services within the roof space.

“There is always opportunity evolving from the BIM model,” says Terry Martin. “For example, we are looking at methods of getting railway tracks down to basement four – using BIM for flow path analysis which will depict the spatial constraints of this important part of the project.”

Later, a walkthrough in Navisworks will be used to provide 3D visualisation and a walk through of the vast quantity of signage.

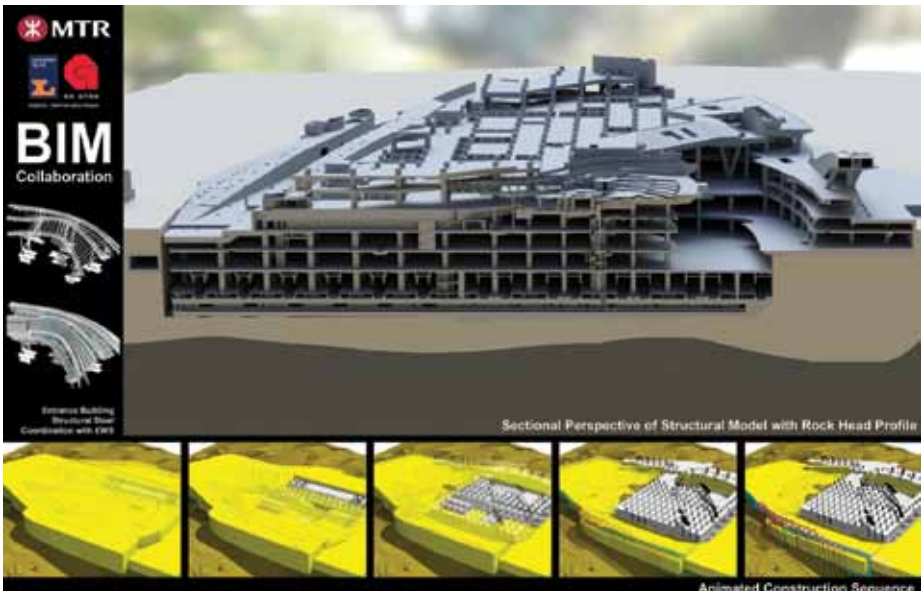
## Terminus project enhanced by BIM

The terminus BIM model began with a small core of people within the MTR Corporation project team, and has since grown and continues growing. “We are sharing the model with contractors,” says Terry Martin. Contractors can use the model in their construction planning and provide their staff

with 3D previews of the constructions works, development of method statements and to enhance understanding of construction safety issues that may arise. There are possibilities for them to look at the models in 4D – including time, and perhaps to use BIM in assessing quantities, helping to minimise wastage and enhance productivity.

“The true value of BIM is difficult to quantify, however consideration to the potential time saved and avoidance of abortive works is paramount,” reflects Terry Martin. “We know the project is much better with BIM than without it.” As well as delivering benefits such as minimising clashes and abortive works, the terminus BIM project is providing on-the-job training in 3D technology for both MTR Corporation and the contractors’ construction project staff– and helping the MTR Corporation move towards increasing deployment of BIM.

*\* All images in this article are provided by MTR Corporation Limited*





## ABOUT MTR CORPORATION LIMITED

Carrying an average of 4 million passengers every weekday, 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 brings 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 newest 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.

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 newest exhibition and conference centre, AsiaWorld-Expo.

## Ronald Lu & Partners

**Project:**

CIC Zero Carbon Building

**Location:**

Kowloon Bay, Hong Kong

**Type:**

Community

**Scheduled Time of**

**Completion:**

June 2012

# Fast-Tracking Design Process for an Energy-Plus and Climate-Responsive Building



Faced with the challenge of fast-tracking the design process of Hong Kong's first zero carbon building, Ronald Lu & Partners deployed BIM modelling—which, in a timely manner, helped resolve challenges ranging from optimum siting of the building and enhancing landscape aesthetics, to designing and building maximizing natural daylight.

## BIM Shapes ZCB

BIM helps shape the first zero carbon building in Hong Kong.



RONALD LU & PARTNERS

BIM Project: ZCB

### HK's First Zero Carbon Building

With its low profile, and curved roof packed with photovoltaic panels, ZCB, Hong Kong's first zero carbon building, looks futuristic, almost like a splendid home in a science fiction movie. The building is designed to be energy-plus: i.e. producing more renewable energy than it consumes on an annual basis. It is also aspired to harmonize with the urban environment and enhance the micro-climate of the site and its immediate surrounding.

Created for the Construction Industry Council, ZCB is indeed meant to show the way to a more sustainable future, showcasing technologies to reduce energy use, and slash carbon dioxide emissions. After it opens in August this year, building professionals and the general public can visit to explore exhibits, an

office and a demonstration eco-home.

ZCB was designed using BIM, which was particularly vital given there was a very tight time frame: the architect Ronald Lu & Partners received the commission in April last year, with building completion due a year later. "We needed very close collaboration between everyone involved from design to construction," says Tony Ip, Senior Architect, Ronald Lu & Partners.

### Locating the building with BIM

ZCB is on a 1.4-hectare site, and a simplified BIM model was used to optimise the building's location and orientation. Information on the massing – the main building form – was extracted from the model, and passed to the engineering consultant for finite element

analysis covering aspects such as amounts of sunlight received, and winds.

This helped with positioning the building so it could receive optimum wind flow, whilst minimising solar heating.

“We also used the BIM model to design the building envelope in order to minimise energy use,” says Mr. Ip. “For example, we had windows at a certain elevation, and the environmental consultant recommended we change their size. We went back to the BIM model, revised the windows, and the consultant then performed another analysis to see if there was an improvement.”

The design evolved to optimise window and wall ratios, with larger windows facing north, and some shading to the south.

## Enhancing aesthetics of the site

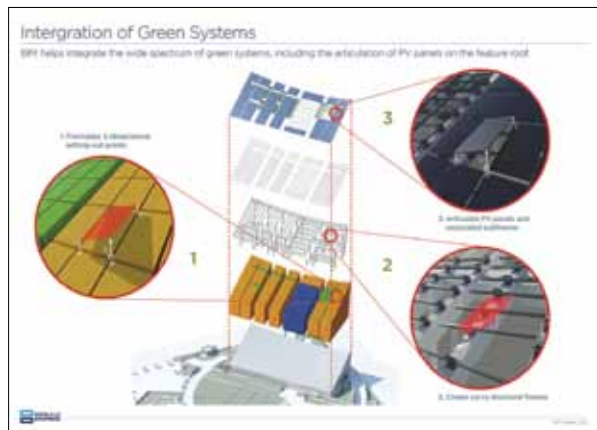
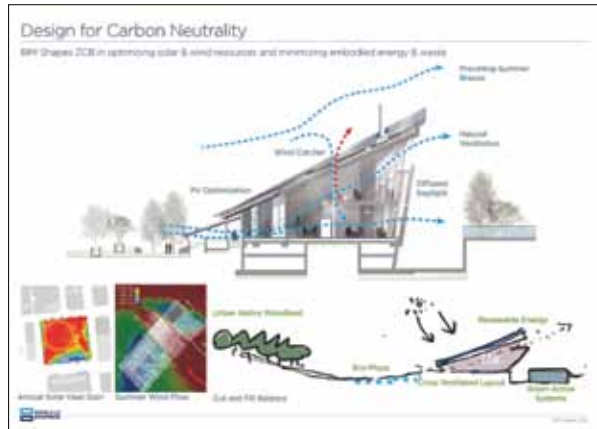
“Also during the design, we minimised cut and fill volume of the soil,” says Mr. Ip. “BIM really helped us to visualise this in a 3D way, as we assessed how much material to dig out for the basement, and ways to distribute this to form a ring path.”

With the BIM model, Mr. Ip and colleagues ensured that the pedestrian access routes would not be too steep. Aesthetics were considered, too. Plans called for trees to be planted,

partly to help purify the air and serve as a natural noise barrier, and these were included in the BIM model. “We used a 3D walkthrough to visualise the sense of arrival, including the best siting of the main entrance and a viewing platform,” says Mr. Ip.

## Curvilinear roof impossible without BIM

“BIM can really help us do 3D design,” adds Mr. Ip. “For the first design workshop, most consultants came to our office, and we used the 3D model to show the design intent. They



all gave input, and could easily understand the design.”

A key feature of ZCB is the curvilinear roof, which Mr. Ip says could not be created without 3D modelling: it would not be possible to simply give engineers drawings of cross sections. Virtual reality proved really useful in showing the roof design, such as through screen prints from the BIM model, which could be emailed to engineers.

Making the roof presented challenges. “This was made of reinforced concrete, and the contractor had to determine how to cast this in a curved form,” says Mr. Ip. “We did BIM for 3D coordination, and transferred this to

the contractor.” Aided by the 3D model, the contractor created the roof whilst using the minimum amount of formwork.

The BIM model likewise helped with installing the roof’s array of photovoltaic panels, each of which has unique setting out points to ensure optimum orientation.

## BIM proves its worth for interior too

At the rear of the building, the curving roof meets a glass wall, and the window works contractor used the 3D model to realise the complex design.

### Facilitation of Fast Track Project

BIM expedites the collaborative design process and construction coordination.



BIM MODEL



ON SITE

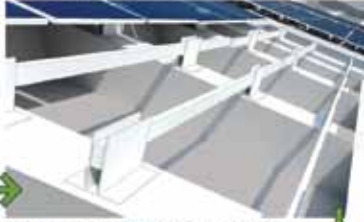


## Coordination of Complex Construction

BIM connects innovative & sustainable design with shop drawing production and subsequent site works.



Consolidate climate responsive form and green systems in BIM.



Deliberate installation details of PV systems via BIM.



Overview site progress of roof construction.



Assemble PV panels on curvy roof on site.



© 2012 Ronald Lu & Partners

Inside, too, the BIM model proved its worth. The environmental consultant used it to perform solar path analyses, to optimise internal daylighting. Air flows were enhanced to minimise need for air conditioning, including by featuring centrally located “wind catchers”. Key exhibits – which will showcase environmentally friendly design – were included in the BIM model, to check for conflicts, and review spatial sequences.

The model helped to refine some of the MEP (mechanical, electrical and plumbing) design, such as eliminating clashes between large high-volume-low-speed ceiling fans and hanging exhibits, and specifying the exact setting out for concealed electrical conduits in the ceiling.

## Complex building designed faster with BIM

Ronald Lu & Partners is still in at the early stage of using BIM, though found it highly useful for the complex ZCB project, which could not have been built so quickly using traditional design methods.

“We have been using BIM for around five years,” says Vincent Chau, BIM Coordinator, Ronald Lu & Partners. “We have a support team, for training colleagues and helping project team in their BIM process and set up BIM standard and procedure.”

*\* All images in this article are provided by Ronald Lu and Partners*



## **ABOUT RONALD LU & PARTNERS**

Ronald Lu and Partners is an award-winning architecture and interior design practice dedicated to the delivery of world-class projects and green built environments across the globe.

Founded over 35 years ago, we have consistently pioneered sustainable architecture and are recognised as industry leaders. We have over 500 staff across our Hong Kong headquarters and four mainland China offices, and more than 70% of our accredited professionals have achieved BEAM Pro or equivalent international standard, which drives sustainability throughout our firm. We embrace a holistic approach and are committed to excellence in design and construction, as well as maximising opportunities for greater social, economic and environmental benefits for communities.

Our expertise in sustainability is integrated with our broad spectrum of design services including master planning, new build, interior design, urban regeneration and architectural research. We are delivering projects ranging from BEAM Plus assessment standard (and national/international equivalents), up to the state-of-the-art Zero Carbon building.



# 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.

### Supporting Organisations

- Chartered Institute of Architectural Technologists, Hong Kong Centre (CIAT)
- Hong Kong Information Technology Joint Council (HKITJC)
- Institution of Civil Engineers, Hong Kong (ICEHK)
- The Chartered Institute of Building, Hong Kong (CIOB)
- The Chartered Institution of Civil Engineering Surveyors (ICES)
- The Hong Kong Institute of Architects (HKIA)
- The Hong Kong Institute of Building Information Modelling (HKIBIM)
- The Hong Kong Institute of Clerks of Works (HKICW)
- The Hong Kong Institute of Facility Management (HKIFM)
- Autodesk Industry Advisory Board (AIAB)

# Advisory Panel

## -Representatives of Supporting Organisations



**Mr. Hermann FONG,**  
*Chairman,  
Chartered Institute of Architectural  
Technologists,  
Hong Kong Centre*



**Ms. SO Ching,**  
*Chair, Board of Practices,  
The Hong Kong Institute of Architects*



**Mr. Ricky WAN,**  
*Member of Executive Committee,  
Hong Kong Information Technology  
Joint Council*



**Ir. Dr. Stewart WAN,**  
*The Hong Kong Institute of Building  
Information Modelling*



**Mr. Josiah KY LEUNG,**  
*Chairman,  
Institution of Civil Engineers,  
Hong Kong*



**Mr. Dick LI,**  
*Chairman of CPD and Promotion  
Committee  
The Hong Kong Institute of Clerks of  
Works*



**Dr. LEE Fook Pui Billy,**  
*President,  
The Chartered Institute of Building,  
Hong Kong*



**Ms. Celine PC TAM,**  
*President,  
The Hong Kong Institute of Facility  
Management*



**Mr. Honby CHAN,**  
*Chairman,  
The Chartered Institution of Civil  
Engineering Surveyors,  
Hong Kong Region*



**Mr. David YAU,**  
*Chairman,  
Autodesk Industry Advisory Board*

# Advisors' Comments from Supporting Organisations



## Atkins

This case demonstrated good use of BIM and sustainable design in the early stage of project conception. With BIM and supported by different software, the design team quickly developed and compared different design options, selected the best one with the best sustainability performance without compromising architectural appearance and client's requirements.



## Chinachem Group

BIM was used to coordinate a complex shape and optimize the LED placement. In this case, BIM enabled the design of a spherical curved screen on a complex structure, and helped to optimize the balance of price and quality by making different design options available quickly, to compare and finalize the result. BIM was used in presentation to different parties and authorities. This case also demonstrated BIM as a tool for design decision making.



## Goldin Properties Holdings Limited

Good use of BIM for coordination of E&M and structural systems. The developer adopted BIM usage which has now become a basic requirement of many of the construction projects. The project demonstrated effective use of BIM technology in system coordinating, by setting up the BIM model properly and intelligently, the design team could easily cross check the design requirements with the model. Thus, saving time for the design team from doing coordination works and reducing construction wastage.



## Hang Lung Properties Limited

This project adopted the use of Civil BIM in underground systems design which is in a congested utility area to ensure no major disruptions to the neighbourhood. The benefit to the developer was to avoid messy complaints and possible delays from damage to utilities. This case also demonstrated good use in helping retaining wall coordination and integration to the rest of the project.



### Hong Kong Housing Authority

New adoption of BIM application for cost control. The BIM model was embedded with quantity and cost information, which in return, could be a very effective tool to check the actual work done for progress payment and cost control, so that the team could easily compare the scheduled and actual programme. This case is a very good demonstration of BIM usage by Quantity Surveyor for scheme financial control and forecast and provided a good case to demonstrate business practice transformation.



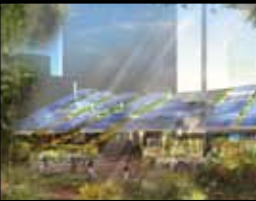
### Hsin Chong Construction Group Limited

BIM was used to optimize the clear headroom which enabled the client to maximize GFA usage. The plant room design could help to increase efficiency and full use of the overhead space. This case provided a good demonstration of detailed curtain wall design using BIM, and early coordination of construction details which could help the manufacturer produce detailed design in a cost effective way. The project provided a good case to demonstrate business practice transformation.



### MTR Corporation Limited

The BIM served as a platform for communication amongst the project team and different stakeholders. It was hard to understand the building completely with traditional 2D documentation. We appreciate that MTR has set up a comprehensive workflow on the management process of BIM which in return can benefit to cost saving and minimize the risk of the construction. It was one of the most comprehensive usages of BIM during construction stage.



### Ronald Lu and Partners

The use of BIM assisted in the design optimization for a sustainable design project; proving better planning could reduce construction wastage; alignment of solar panels for maximizing energy production whilst keeping it as an architectural feature; and balance soil from cut and fill to minimize soil disposal and transportation. The presentation was very clear which helped to demonstrate outstanding sustainable design.

# Advisors' Comments

Dr. Calvin Kam

## Overview

Ranging from early design analyses, to construction monitoring and cost management, to incorporating end-user considerations for facility management, the projects in the 2012 Hong Kong BIM Awards illustrate the increased productivity, cost savings, and improved quality made possible through BIM-enabled design and construction. The wide variety of projects and stakeholders represented is a testament to BIM's value and its diffusion within the Hong Kong design and construction community, bringing its state of practice to the forefront of industry progression.



### Atkins – Informed Early Design

Working under a fast-tracked schedule, the design team used Revit and Vasari to perform wind and solar exposure analyses during early project phases to communicate the design intent to project partners and ensure a sustainable design. BIM supported collaborative input from the project team and model-based analyses to properly inform early design decisions.



### Chinachem Group – Design Visualization

Asian House project demonstrates the power of enhanced visualization enabled by BIM. The team used high-resolution renderings to explore and select the best design and arrangement for a large LED display incorporated into the building facade.



### Goldin Properties Limited – Complex MEP Coordination

Strict ceiling height requirements prompted clash detection and the production of reflected ceiling plans to identify low-hanging MEP components and re-route them to reduce conflicts and delays during the construction process. BIM facilitated the collaboration of multiple trades to find the best routing solutions and show them within the model.



### Hang Lung Properties Limited – Design Optimization

A challenging hillside site required a unique retaining wall and landscape design accommodating the irregular three-dimensional slope. BIM was used to model existing site conditions, streamline the initial retaining wall design while reducing concrete volume by 40%, and capture the retaining wall data to assist construction efforts.



### Hong Kong Housing Authority – Quantity and Cost Control

This team developed Quantity Surveying Building Information Modeling (QSBIM) to reduce the time to generate cost estimates, and increase accuracy. This approach systemizes the quantity takeoff process, links BIM to cost databases, and combines quantities extracted from BIM with cost information and the project schedule to produce cash flow simulations. The innovative QSBIM system greatly improved estimation productivity, and resulted in more accurate, informed decisions related to project finances and budgeting.



### **Hsin Chong Construction Group Limited – Facility Operations**

Facility management was a key consideration throughout the BIM-enabled design process. The model was used to optimize equipment layout, provide safe and functional access paths for efficient operations and maintenance, and manage building information to assist end users in future facility management.



### **MTR Corporation Limited – Process Benefits**

Using BIM to identify design and construction issues reduced project risk, avoided abortive works, minimized material waste, and increased overall cost savings. This was largely accomplished through leveraging the 3D model for enhanced visualization, and using it as a common platform for mutual understanding of the design intent among multiple stakeholders.



### **Ronald Lu and Partners – BIM for Sustainability**

Optimizing solar and wind resources was one of the chief goals of the Zero Carbon Building, and this was achieved by varying the building orientation and curved exterior shape within the BIM and model-based analyses. The result was maximized solar exposure and natural ventilation, which optimized day lighting, reduced solar heat gain, and improved PV array energy collection.

## **Outlook**

After reviewing this showcase of exemplary projects I would encourage Hong Kong's BIM authorities and leaders to raise their standard of practice through:

- Increasing the maturity of model uses, moving from visualization to the automation and optimization of design and construction tasks.
- Establishing and tracking BIM-based objectives through the project lifecycle, and benchmarking performance to fuel continuous improvements.
- Increasing the level of integration between various project stakeholders in order to establish BIM as a tool for enhanced collaboration and optimized project value.
- Creating Key Performance Indicators (KPI) and metrics and then monitoring them throughout the life of the projects to provide an accurate picture of BIM adoption performance and its Return on Investment (ROI).
- Documenting standards and best practices, and providing continuous feedback mechanisms to create a BIM knowledgebase for guiding implementation in new projects and across the Hong Kong design and construction industry.



### **Dr. Calvin Kam**

*PhD, AIA, PE, LEED AP*

Dr. Calvin Kam is the Founder and CEO of bimSCORE—the “GPS Navigator” for any enterprise or project team charting a course for Building Information Modeling. Dr. Kam is the Director of Industry Programs and a Consulting Assistant Professor at Stanford University's Center for Integrated Facility Engineering (CIFE), where he specializes in strategic innovation such as Building Information Modeling (BIM), Virtual Design and Construction (VDC) and Sustainable Developments. He is a Co-founder and the Senior Program Expert of the National 3D-4D-BIM Program with GSA Public Buildings Service. Singapore government's Building Construction Authority has appointed Calvin as an international expert to advise its 2015 construction productivity and BIM roadmap. He serves as the 2010 & 2011 National Chair of the American Institute of Architects (AIA) Technology in Architectural Practice (TAP) National Knowledge Community, and the 2011 & 2012 National Co-Chair of AIA Center for Integrated Practice.

# Advisors' Comments

Mr. Phillip G. Bernstein



## Atkins

This project is an impressive demonstration of Atkins' commitment to BIM-enabled sustainable design practices, while maintaining a fast-track design schedule. Atkins was able to achieve a more energy efficient design by taking advantage of integrated analysis tools in Revit, 3ds Max Design for lighting analysis, as well as Project Vasari for wind analysis and solar analysis. By incorporate sustainable design decision making during the earliest stages of design, Atkins was able to achieve an optimal design faster.



## Chinachem Group

This project illustrates the value of model-based design for faster, more effective design decision-making. The LED is a significant feature of Chinachem Group's design. Therefore, understanding the ideal shape of the LED "neck" of the building is important to the overall effect of the building. By modelling the neck in Revit, Chinachem was able to accurately visualize the effect of the LED panels, and optimize the design for the ideal LED resolution. Visualizations created in 3ds Max using the Revit model helped Chinachem communicate design intent to the client more clearly, supporting the decision-making process.



## Goldin Properties Holdings Limited

The Tianjin Goldin Metropolitan project is a good example of collaboration among MEP engineers and structural engineers to solve a design challenge. In this case, the project team used a creative approach to identify issues in the design of the project's basement. The team worked together to reach a solution for a design challenge, demonstrating the effectiveness of multidisciplinary coordination in speeding project work.



## Hang Lung Properties Limited

Hang Lung Properties Limited used BIM to design a unique retaining wall with interesting landscape design features as part of their Blue Pool Road Residential Development project. BIM supported the firm's collaboration with the landscape architect, to find design solutions that were both structurally sound and aesthetically appealing. BIM helped the project team reduce concrete volume of the retaining wall by 40 percent, helping to reduce construction and labor costs.



### **Hong Kong Housing Authority**

This project demonstrates the value that BIM can provide for 5D management of project costs and cash flow. Hong Kong Housing Authority leads China in adopting a system to use the information in building models to automate quantification, increase accuracy of quantity data and costs, and share data among project stakeholders.



### **Hsin Chong Construction Group Limited**

This project is a good example of the collaboration benefits that BIM extends to the construction process. Hsin Chong Construction Group Limited was able to use the model to minimize clashes in the plant room design and expand the head room in the roof level of the building. The model was also used for 4D construction planning, which facilitated improved communication among the developer, consultants, and sub-contractors.



### **MTR Corporation Limited**

In this project, MTR Corporation Limited took advantage of the benefits of BIM for collaboration and communication with project stakeholders to identify design issues ahead of construction. Through this project, MTR expanded the use of BIM among several of the firm's building and civil teams, helping to advance the firm's use of BIM for business practice transformation.



### **Ronald Lu and Partners**

ZCB is designed to be Hong Kong's first carbon-neutral building, an impressive achievement. Ronald Lu and Partners used BIM to achieve their ambitious design goals. Specifically, BIM helped the project team determine the articulation of solar panels to maximize solar reception, while minimizing solar heat gain. BIM also enabled the team to strategically locate innovative green features of the building, and speed the design and construction process.



### **Mr. Phillip G. Bernstein**

*FAIA, RIBA, LEED AP*

Phil is a Vice President for Strategic Industry Relations at Autodesk where he is responsible for the company's future vision and strategy for technology with particular focus on the building industry as well as cultivating and sustaining the firm's relationships with strategic industry leaders and associations. Formerly a principal with Pelli Clarke Pelli Architects, he teaches Professional Practice at Yale where he received both his B.A. and his M.Arch. He is co-editor of *Building (In) The Future: Recasting Labor in Architecture and BIM In Academia*, a Senior Fellow of the Design Futures Council and former Chair of the AIA National Contract Documents Committee.



# Advisors' Comments

Dr. Li Yun Gui

## BIM closes gap between construction and manufacturing

Construction has many similarities with manufacturing. Their working modes may differ, but we can see a trend in the construction process becoming more akin to a manufacturing process. In a way, both industries produce merchandise. A multitude of merchandise impacts our daily lives, yet the product of the construction industry is relatively simple: living space.

The two industries' production processes are radically different: a factory production line has a fixed location, with products in various stages of completion moving along a line. The construction process combines factory manufacturing and in-situ installation, so the construction industry can benefit if more work can be done in factories, minimising in-situ production work.

Long before being deployed in construction, information technology was employed in manufacturing industry production processes, inventory management, and channels and sales processes. We can see it resulted in increased efficiency of manufacturing processes, and led to substantial reductions in production costs, one of the reasons being the implementation of the product data management concept. The construction industry is still in the era of CAD – computer aided drafting; blueprints are yet to become history. We can now see that adopting BIM has become the direction the construction industry must follow to enhance its workflow.

BIM's role is to make construction project information more accessible to the project team, in planning, surveying, construction, supervision, operation and maintenance. All decisions throughout the life of a building – from concept to demolition – can rely on information as the basis for decision-making. BIM can directly apply digital technology in the construction field, describing problems to help resolve issues in digital construction projects. Designers, engineers and technicians can make the correct responses to a variety of building information, ensuring a sound basis for a project deploying BIM.

BIM is a methodology, applicable to the whole project life cycle, supporting an integrated management environment for construction projects, significantly improving efficiency and reducing risk throughout the construction process. The development of new BIM technology is becoming both a challenge to the traditional construction industry – which must determine whether it is willing to reform and innovate and become more efficient with less risk – and a challenge to the traditional industry patterns of behaviour and management styles.

There are three main aspects to the role of BIM: "Numbers", "People" and "Action". "Numbers" refers to digital information. BIM's core role is solving data issues by using information sharing in the construction

process. Autodesk BIM software is widely used around the world to provide effective tools and technical support.

“People” refers to communications between different people in the construction process: how can we collaborate, whilst retaining personalisation? An entire construction project – from project planning, design and construction, to operation, maintenance, and even demolition – requires the involvement of different personnel, and throughout the process involves communications, decision-making, and collaboration. There are various traditional and commonplace practices of different industries in different countries; these must be reflected in the ways BIM is applied and adopted.

“Action” refers to the actual construction. This is our mission, and will not change no matter whether we apply BIM or not. We are promoting the application of BIM in construction projects to enable better results, reduce errors, reduce waste, improve quality, increase efficiency, and support sustainable development.

The award-winning projects demonstrate successful uses of the technology, such as for design collaboration, clash checking, decision-making, construction project management and visualisation. China has a huge number of construction projects; according to 2010 statistics, up to 700,000 projects were under construction, with total construction area of 2.6 billion square metres, and project investment of up to 10 trillion dollars. BIM can be widely used, and we expect BIM to play a greater role in many projects.



### **Dr. Li Yun Gui**

*China Academy of Building Research*

Dr. Li Yun Gui has been a researcher for many years, engaged in high-rise building structural analysis and design, IT application in the construction field and the application of theoretical research and application development. He is responsible for the development of high-rise building structure finite element analysis and the design software SATWE, which has become a primary software for China's high-rise buildings structure. This software has been promoted to Singapore, Vietnam, Hong Kong etc.

Dr. Li has won a number of awards in China. He currently is the Vice General Engineer of China Academy of Building Research.

# 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:



**Yim Tak On**  
Department of Architecture  
Chu Hai College of Higher Education



**Lam Ka Chun**  
Department of Construction  
Hong Kong Institute of Vocational Training Council  
(Tsing Yi)



**Kwok Wing Ho, Matthew**  
Department of Architecture  
The University of Hong Kong



**Institution:** Chu Hai College of Higher Education  
**Name:** Yim Tak On  
**Department:** Architecture  
**Course:** Architectural Design & Theory

**Project Name:** Youth Eco-Housing @ Anderson Road EX-Quarry

#### Challenges and Solutions:

The project is about reuse the EX-Quarry as new type of land resource and explore the following design strategy:

- Deep slope stabilization – self-support structure & green ramp
- Accessibility at slope – low carbon footprint & carbon emission
- Reactive the network & space of platform, slope & peak
- South-west facing quarry face/elevation – sun shading device
- Construction – modular & prefabrication

#### How BIM Helps:

Building Information Modelling was used to help understand the deep slope condition & climate of quarry; test out the usage of space in quarry and demonstrate the open space on the slope is accessible & green. Also the technology was used to demonstrate the GFA was used efficiently, better day light control and maximize of the green area.



**Institution:** Hong Kong Institute of Vocational Education (Tsing Yi)

**Name:** Lam Ka Chun

**Department:** Construction

**Course:** Architectural Design & Technology

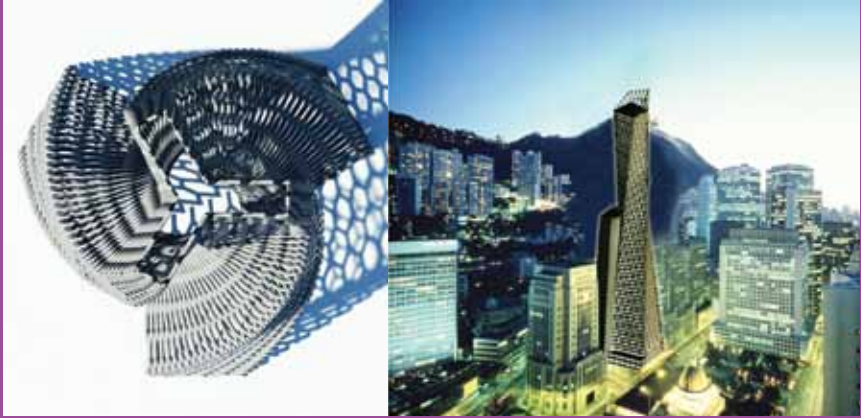
**Project Name:** School of contemporary dance cum performance theatre

**Challenges and Solutions:**

It is very difficult to build up the form of my design. I have to use lots of time to finish the modeling.

**How BIM Helps:**

- It can draw and display the structure system easily. It helps to visualize the final form of the building.
- With the help of the wall manage system, the material of the walls can be changed at any time.
- By drawing the plan of the building, it automatically creates the 3D views of the building. It is faster to analyze the spatial arrangement and the quality of the planning.



**Institution:** The University of Hong Kong  
**Name:** Kwok Wing Ho, Matthew  
**Department:** Architecture  
**Course:** Architectural Design & Theory

**Project Name 1:** Parametric Mass Family

**Challenges and Solutions:**

Design a parametric mass family in Revit Conceptual Design Environment and design a form in Revit project environment with a number of instances of this family, which will differ from one another only by changing values of their parameters.

**How BIM Helps:**

The function Parametric Families and Adaptive Components has offered the project with fast and accurate control to its geometry.

**Project Name 2:** Office Tower in Central

**Challenges and Solutions:**

To design a concept of an office tower optimized with Conceptual Energy Analysis tools available in Revit to achieve minimum operational cost and environmental impact of the building within the given requirements.

**How BIM Helps:**

Apply Conceptual Energy Analysis that was generated from Revit and Vasari has assisted to improve the design through comparison of building's energy performance. This has provided the opportunities to preview the relationship of the design and its surrounding context.

# 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 Modelling) 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?

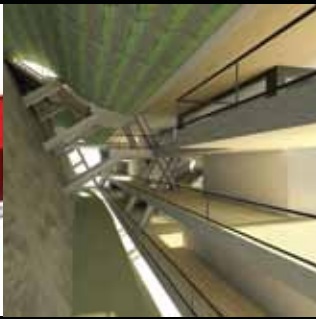
### Contact us now!

Eric Tang, AIAB Supervisor

Email: [eric\\_tang@cn.synnex-grp.com](mailto:eric_tang@cn.synnex-grp.com)

AIAB web site: <http://www.aiab.org>





## BIM in Education

While BIM is a process throughout the whole building life cycle, it involves every participant in the field. To gear up the brains and hands for such wide spectrum of professionals, it all starts with BIM education.

BIM education has been around in Hong Kong for quite some time already. Tertiary students from universities, community colleges and Institute of Vocational Education provide BIM literates to meet the market needs. Recently the BIM concept is even propagated through the secondary students. The urge for BIM application in projects further gravitates the thirst for BIM knowledge - thus courses for already-professionals are also tailored made.

BIM courses ranges from technical and operational need from the industry, to more high level strategic BIM planning and implementation. As the industrial BIM application is becoming more popular, there are many more real life

examples and techniques to be taught in BIM courses. The popularity of on-line learning such as Youtube provides an alternative but valuable source of BIM learning, especially when in an open information access area like Hong Kong. Advanced techniques are shared among super-users.

More post-graduate academic research papers attempt to explore the boundaries of BIM applications. Issues like BIM standards, BIM competency measures and BIM, on-line collaborative BIM are the result of these research areas.

Along with BIM's growing popularity, so is BIM education. Thanks to the effort from all BIM educators to consolidate the experience and extend the boundary with the new generation.



### Mr. David Fung

*B. Arch. (Hons) M. Proj.Mgmt. HKIA, Registered Architect. MHKIBIM. Associate Professor, Department of Architecture, Chu Hai College. Adjunct Lecture, HKUSPACE*

David is a Hong Kong Registered Architect. BIM has been the main design and documentation for his professional work for over 14 years. The BIM projects include residential towers, houses, offices, shopping centres, churches, universities, logistic centre and train stations. He had won the Hong Kong BIM and International Revit Experience Award in 2007; and won the Best Design Award in Singapore's International BIM Competition in 2011. He teaches BIM technology in different universities in HK, China and overseas such as Chu Hai College, HKU, PolyU, HKUSPACE, Tsinghua University and Shenzhen University. David was also the speaker fro various BIM forums and conferences to different professional institutions in HK, Shenzhen, Guangzhou, Shanghai, Beijing, Tianjin, Tokyo and Seoul. He was the immediate past Chairman of AIAB and active Board member of HK Institute of BIM aiming at promoting BIM technology and developing the HK BIM standard.





## A Year of Sharing and Learning from the Hong Kong BIM Community

For me, the highlight of my BIM experience in the past year was the opportunity to share and interact with the BIM community here in Asia, especially in Hong Kong. Starting four years ago, as a Senior Urban Designer at HOK St. Louis, I collaborated with firmwide BIM experts to implement coordinated and expedite workflows on large-scale planning projects. While we had shared some of our results at event such as Autodesk University Las Vegas, it wasn't until 2011 when I had the opportunity to share our project examples at AIAB Conference Hong Kong and AU Beijing. I also shared more specific processes and best practices at AIAB Master Class, in which I demonstrated how projects from 10 to 4,000+ hectares can benefit from the BIM workflow. I also had the privilege to write an article for AT Magazine about the same subject matter.

As Lee Miller, my mentor at HOK, always advocated, industry-wide and cross-disciplinary sharing are instrumental in pushing forward technological advancements and improvements in design and documentation standards. My experiences conducting the lectures and workshops have confirmed that such interactions in the design community are critical in reinforcing technology's purpose of serving design processes, and that multidisciplinary innovation within the AEC industry can create cross-amplifying positive synergies.

I look forward to further learning and interactions with this great community, as I transition my career into a management-focused role at AECOM Hong Kong in 2012.

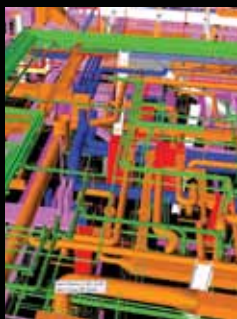


### Ms. Han Hsi Ho

*Associate at AECOM, LEED AP, MBA*

Han Hsi is an Associate at AECOM. As a tireless promoter of "Big BIM" (BIM for large scale urban design and planning), Han Hsi is committed to a design-delivery process that is coordinated, efficient and encourages collaboration. She invests in knowledge sharing as a Lecturer of Building Information Modeling and Technology at Washington University of St. Louis, Co-presenter of Revit for Urban Design at AU2009, Presenter for AIAB Conference and Master Class in Hong Kong, and speaker at Pecha Kucha St. Louis.

Han Hsi has a Bachelor of Architecture from the Cooper Union and Master of Architecture in Urban Design degree from Harvard GSD, and is currently pursuing her MBA at Hong Kong University of Science and Technology.



## LEAN BIM – Plan, Design, Enable Solutions

The ability to effectively deliver innovative design has become a hallmark of the successful client-driven design industry. This is especially true in the Asian market where radically shortened design times and drastically increased design performance distinguishes the best performing companies from the industry as a whole.

LEAN BIM development maximizes effectiveness of sustainable strategies in both, the design artifact and the design process. Design performance can benefit significantly from constantly improved BIM tools, strategies and methods. While each architectural design is clearly striving for uniqueness, the work performed across projects is similar and can benefit from a LEAN BIM workflow. This is true for early optioneering, and especially for update cycles during design development.

Atkins, as one of the world's leading design consultancies is being strategically proactive in the exploitation of BIM and its implementation on our client's projects. We recognize that BIM represents the future of our industry. In the past year alone, Atkins has been involved in more than 50 projects around the world with an estimated construction value exceeding \$1 billion where BIM has been successfully applied. Many of these projects were delivered through a design-build process, with BIM proving invaluable to the project right from the start of the design phase and through the project's construction. Atkins is currently evolving its previously published global BIM standards to enhance our worldwide interdisciplinary capabilities and continue increasing value for our clients. Our focus now is to develop collaborative working using BIM across all project stakeholders – with our clients and across the supply chain.

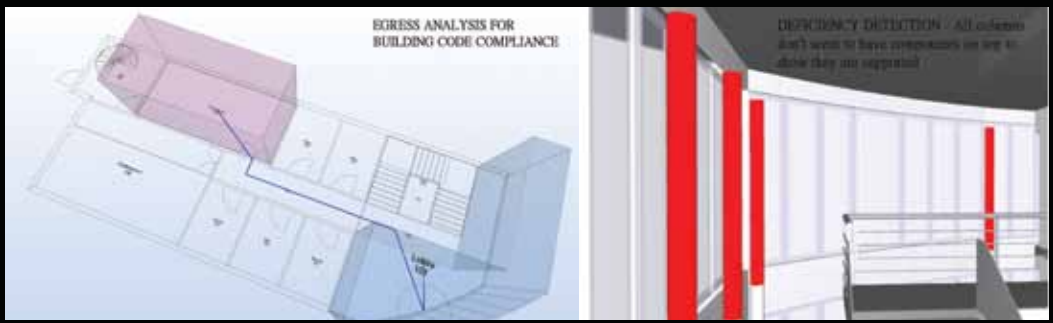


### Dr. Stefan Krakhofer

*Dr. Techn.(PhD) Dipl.Ing. (PEng) MSc(Hon)  
Arch ARB RIBA EURING HKIBIM(PM)*

Dr Stefan Krakhofer is an architect with a passion for science and technology. While studying in Vienna, Delft and London, he has deepened his know-how in computer programming. He has co-developed a multi-player design game, and a virtual campus for algorithmic-design education. Dr Krakhofer has co-hosted workshops, taught computational and parametric design techniques. His research and design has been widely published and exhibited in Milan, Vienna, London and the Venice Architecture Biennale.

Dr Krakhofer has put his research into practice at Foster and Partners' Specialist Modeling Group. For Atkins Architecture, he has designed a high-rise mixed-use development that recently broke ground in Zhuhai. Beside design, he also has set up a BIM Team and supports the Atkins Global BIM standard.



## BIM – Model Validation

Nowadays more and more projects are adopting BIM technology throughout the whole project life cycle, from design stage, tendering, construction and to facility management. The growing trend is encouraging. BIM technology is playing a more significant role in bottom line contribution.

BIM model need to be enriched with necessary and sufficient data before it can be used for further application. For a data rich BIM model, information integrity would be one of the most essential elements to success. Clash analysis can ensure the basic quality, other checking like validation for components and construction type, deficiency detection, pre-check for quantity take off, area calculation and energy analysis, etc, are also important processes in quality assurance.

Thanks to the non-stop evolution of computer hardware and software which continuously enhances the process capability and efficiency, now we can have automated solution in BIM model validation. User can customize sets of comprehensive rule for checking and analyzing

their models for consistency and accuracy relative to their own established guidelines, which in turn setup a quality assurance program for check out BIM models before delivery. It can be further extended to more advance checking like egress analysis, or building code compliance. User can save much time in using the automatic rule based checker and hence further improve the process efficiency, as well the quality.



### Mr. Kenneth Lau

Mr. Kenneth Lau is the General Manager of Forida Limited, BIM Consultant and AFM Limited, FM Consultant. With over 15 years' CAD, FM and project management experience including key roles in managing BIM projects in public housing and private development, Mr. Lau is involved in multi-disciplinary BIM projects.



## Simplify is the Best to Access

As planners, designers and engineers, maximum efficiency can be achieved through design simplification and cycles of reuse. The next generation of buildings will be more complex, sustainable, rely less on external infrastructure and optimize the use of resources. Simplification of our design process is the best way to maximize our efficiency and realize a more cost effective solution. BIM becomes one of the key design tools to drive our operations at AECOM.

Our goal and the great challenge in this century will be to help make the transition from our industry being a place where concrete was delivered in a wheelbarrow, to a place where we are delivering results through smart technology, including the implementation of BIM in our design process. The aim is to turn the construction site into an assembly line delivering projects in less time while lowering cost and improving both quality and safety. The good news is that AECOM and its collaborators are uniquely positioned to deliver this goal.

AECOM production processes are geared towards the delivery of intelligent, three dimensional data in the form of a Building Information Modelling (BIM). Our structural analysis, design and structural drawings will be generated using BIM together with CADD. This will be the basis of our efforts to fully coordinate our design

with other members of the delivery team. To accelerate structural analysis & design together with the drawing production process, our team integrates Revit with the structural computational programmes that cover all major structural elements in both analysis and design. This integrated BIM approach has proved to be much faster than the traditional design process. The incorporation of BIM in the design process will help us to efficiently deliver better solutions in a shorter time and with reduced cost to the mutual benefit of all interested parties.

BIM is not only applied to our structural and M&E engineering design. BIM is also utilized by our Access Consulting group who specialize in the integration of universal access principles for both new and existing structures. Access Consultants work with Architects, Urban Designers, Building Managers and Developers to achieve Accessible Environments. Multiple Countries have confirmed their commitment to universal and dignified access for all through their adoption of the UN charter on universal access. Buildings must be designed to facilitate unassisted access for all, including people with disabilities and the elderly. Consequently, "Access" will be a key trend in Hong Kong and other Markets. Our specialist access group aims to use BIM to implement best practice access into the buildings that we design to achieve a simple, convenient and healthy lifestyle for all.



### Ir Sammy Ng

Ir Sammy Ng is an Executive Director with AECOM Asia Company Limited's Building Engineering Business Line. Sammy has over 17 years of practical experience in the design, construction and supervision on a wide variety of projects including over five years of BIM experience. Recently, he has become the head of the BIM Working Group Committee for the Building Engineering Business Services Line in AECOM's Hong Kong office and a practice sector leader within Asia. He has proactively driven the application of BIM on several recent projects. He has also played the leading role in integrating BIM in to design production within our daily operations both locally and in AECOM's other Asian offices.



## IVE BIM Education

Mr. Clement Chui, student from the Higher Diploma in Architectural Design and Technology at the Hong Kong Institute of Vocational Education (IVE), had received the HK BIM Award 2011 just not long ago. The good news continues. IVE BIM teaching team also won “The Hong Kong ICT Awards (HKICTA) 2012: Best Professional Development (Other Professional) Silver Award” this year. This achievement is not only a great encouragement, also a motivation to our team in promotion of the BIM education development for the Hong Kong construction industry.

Additionally, we are very pleased to organise the summer attachment scheme with AIAB and Summit Technology Limited last year. Through the technical and practical training in last summer, our students learnt more on BIM project workflow and the coordination between disciplines. One of the most valuable experiences is student can be more competent in using this tool whereby enhancing their soft skills in the industry.

IVE Students also shared their appreciation on learning BIM, particularly they understood that well equipped with BIM knowledge would become an important criteria for the future employment. In the coming up New Higher Diploma (NHD) program, more and more students will join the industrial attachment scheme and BIM skills will keep them more competitive in the market. In order to drive the sustainable BIM education, IVE keeps working together with industry practitioners and academia to train more energetic BIM users.



### Ms. Christy Wong

*Lecturer, Department of Construction, IVE  
MPhil. MHKIBIM*

Christy, as a member of the IVE professional teaching team, has effectively developed her career and professional training on construction education, particularly in BIM, CAD and computer 3D modelling, computer visualization, and project management. She is one of the Committee of Autodesk Industry Advisory Board (AIAB), aiming to enhance the communication platform, experience sharing on architectural design and construction planning between students and different segments in the industry.



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**Class Venue**

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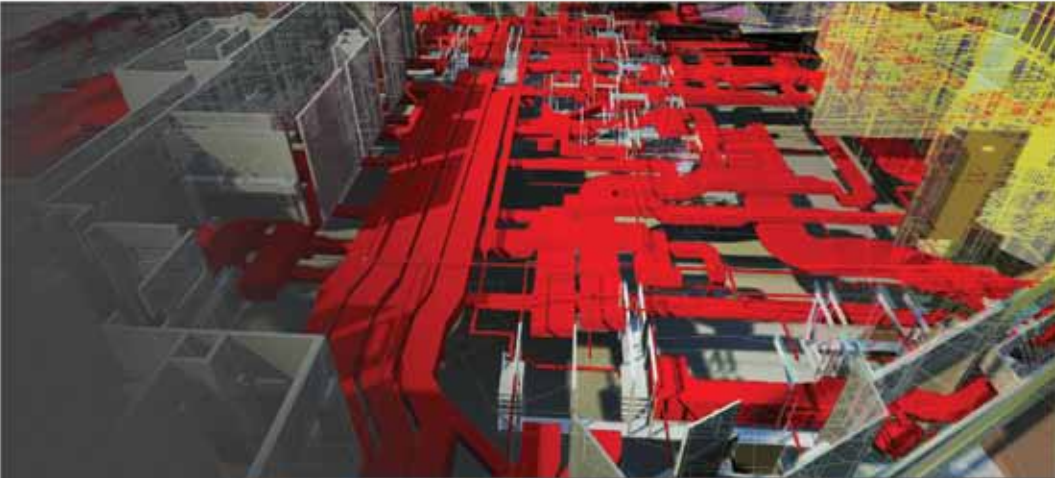


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Autodesk Hong Kong office has been established since 1992.

For more information about Autodesk, please visit [www.autodesk.com.hk](http://www.autodesk.com.hk)

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