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.

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.

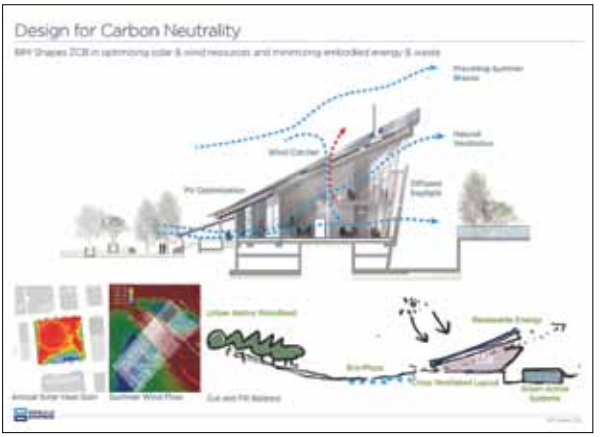
Enhancing aesthetics of the site

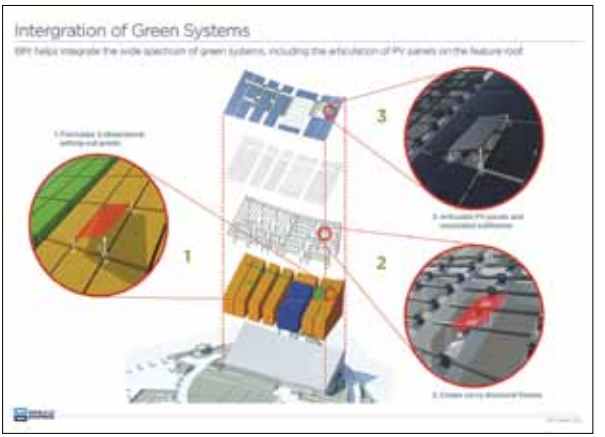
"Also during the design, we minimised cut and fill volume of the soil," says Mr. Ip. "BIM really helped us to visualise this in a 3D way, as we assessed how much material to dig out for the basement, and ways to distribute this to form a ring path."

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.

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*

RONALD LU
& 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.