

**Project:**

Express Rail Link- West  
Kowloon Terminus  
Building

**Location:**

West Kowloon District,  
Hong Kong

**Type:**

Railway/ Commercial

**Scheduled Time of  
Completion:**

2015

# With BIM Everything Possible



The state-of-art WKT entrance building design.

Linking up Hong Kong, Shenzhen and Guangzhou, the express rail (XRL) is going to shorten the journey time between Hong Kong and Guangzhou significantly from about 100 minutes to 48 minutes. As the southern terminus of the XRL and the only station in the Hong Kong section, the West Kowloon Terminus (WKT) will be the world's largest underground station at a depth of over 20m with a total of 9 long hauls, 6 shuttle platforms and 15 tracks. The two terminus entrances will be provided at various levels to match with adjacent developments. Its strategic location at the north of the West Kowloon Cultural District (WKCD), between the Airport Railway Kowloon Station on the West and the West Rail Austin Station (AUS) on the East had heightened the public and political attention to the project.

As the connection between Hong Kong and China becomes more and more lucid, it is obvious that the West Kowloon Terminus of the XRL will function as an important exchange gateway into China and Hong Kong. Andrew Bromberg, the chief designer of the project, has visualized West Kowloon Terminus (WKT) to function more like an international airport that channels large amount of population flow between Hong Kong and China rather than a regular station. The facility needs to have both customs and immigration controls for departing and arriving passengers. Contrasted to how immigration typically works in an international airport, what is highly unusual about this facility is that WKT will have immigration domain for both Hong Kong and China in the same facility.

### An Unconventional Underground Station

While working on this 430,000 square meters facility, Bromberg designed with civic demand in mind. Traditional underground rail stations always give people the similar feeling of enclosure and being under the surface. The WKT, however, is different from any conventional underground train station. “I don’t want passengers to feel that they are underground when they arrive. They should feel like they are in Hong Kong when they get to the station,” said Bromberg. Making use of the BIM technology, significant space had been introduced inside the terminus design. That allows natural daylight into the interior as well as improves the way-finding for the passengers.



“Park in the sky” design concept.

## Attention to the Detail: Improving the Flow of Traffic

The underground terminus composes of 4 floor levels which accommodates Customs facilities, Immigration and Quarantine (CIQ) facilities, underground track area and platforms, passenger arrival and departure halls, shops and loading facilities. To withstand a high volume of travelers, the Aedas team decided to put both HK and PRC immigration arrivals facilities on the same floor and all departure facilities on another.

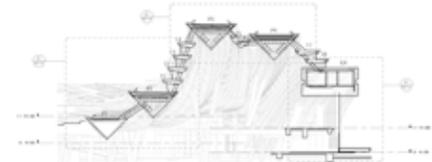
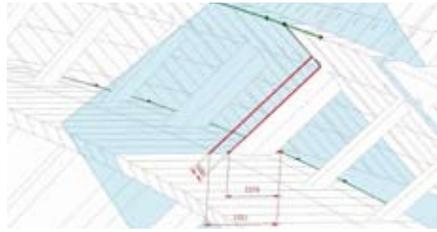
Outside, the pedestrian flow can access almost the entire roof top which is a vegetated sculpture garden. The idea behind that is to build “a park in the sky” where every user is entitled to the amazing harbor view of Hong Kong. All these magnificent design sketches are done via the BIM platform.

### BIM Application in the Design

Renowned for his state-of-art curvilinear designs, Bromberg’s sensually shaped WKT building design has an extremely complex structure. With the complexity of the architectural design and a tight timeframe, Aedas turned to digital modelling. The modelling process was divided into a few different stages. This included conceptual modelling in Rhino, optimizing the cladding panels and glazing sizes by an external program, modelling in Revit and finally scheduling the cladding panels. Several methods and measures were incorporated to escalate the result in these five main stages.

#### i. Optimizing the Design

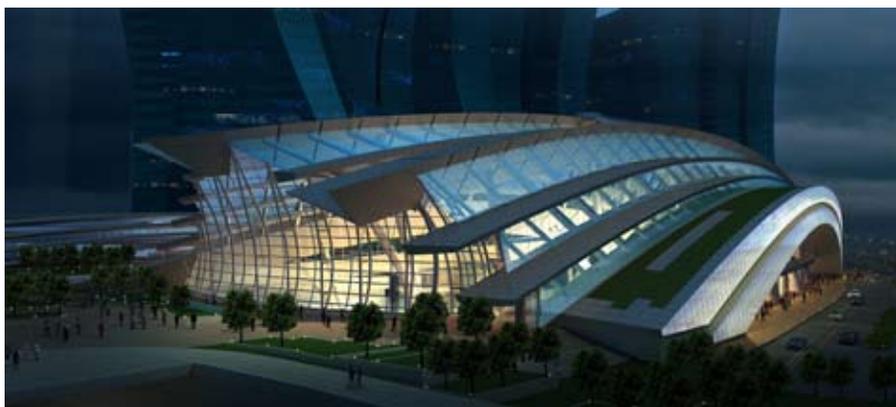
In the first stage, the architectural team from Aedas and structural teams from Buro Happold coordinated to create sets of



**“Revit is a powerful and amazing product; it handles a vast database that is not seen in other software.”**

geometrical rules to control the modelling of the roof elements. Geometrical rules were then applied to a Rhino model. From Rhino the cladding panels were exported as coordinates and optimized by an external, custom written program. The complex geometry of the roof was then transferred to Revit with help of Revit API interface so that the cladding panels could be calculated and placed precisely in virtual space.

For this purpose, a parametric family was developed to read the sizing and location information of every panel. After that, all the cladding panels were created in Revit automatically with accurate dimension and location. The time to recalculate the geometry of the roof and resize all the panels is reduced. “BIM makes things possible in an organic design”, said Marcin Klocek, the senior project manager of the WKT project. With curves running freely in space seen everywhere in the design, Revit made modelling the mega structure feasible. Curved splines could be divided into standardized pieces so the cost



“–A breakthrough project.”

of materials was lowered. The Architectural team could locate panels with cutouts as well as find out precise shapes of the cutouts by intersecting those panels with the steel and concrete structures coordinated with the Structural team. All these things would be virtually impossible without Revit. The project moved swiftly into the last stage, where tabular schedules of cladding panels were directly from Revit.

### ii. Increasing Productivity

Aedas was no stranger to Autodesk Building Information Modelling technology. Bromberg's team had already started to employ BIM in their 2006 Dubai project. That included the 310m Ocean Heights One tower, the 460m Damac Heights and a 238m tower for Empire Holdings. BIM was helping to shape the Dubai skyline in one of the most dramatic urban transformations ever undertaken. But it wasn't until the WKT project that BIM was so extensively used. “The WKT project is definitely a breakthrough project”, said Bromberg. Drawings, images, schedules and coordination reports were produced directly from the BIM and dispatched to other parties.

The results showed that Autodesk Revit Architecture suite could increase productivity by up to 50 per cent, and also ensure that data remained accurate and reliable throughout the design phase of the projects.

### iii. Improving Coordination and Reducing Waste

“We not only aimed to build beautifully, careful studies are done beforehand to assess the environmental impact,” said Sam Cho, the main parametric modeler of the project. Throughout the design process, 2D and 3D information were combined to reduce rework and double handling of design data. Coordination between different E&M sub-contractors was enhanced and the constructability issues were identified in advance to avoid abortive works, hence reducing construction waste. In the WKT's case, 30,000 panel types were cut down to 3,000 types with the help of BIM. This reduction was enormous. To Bromberg and his team members, sustainability has always been a part of their design, “it has never been a trend to me; a building should be designed to last in time.”

#### iv. Gaining Client's Satisfaction

Cutting down extra material not only benefited the environment, but also decreased cost significantly. The BIM helped to enhance a safer and neater construction site, while the quality of the final project was boosted at the same time. In addition to a decreased cost, a concise 4D construction simulation boosted the client's confidence. The Request for Information process (RFI) was greatly enhanced, conflicts and constructability issues could be resolved effortlessly.

Bromberg, Cho and Klocek all agreed that BIM has a huge potential to grow. Cho said, "I still remembered that 2D drawings were used in my first year at school and I am for sure seeing the changes in technology within the decade."

At the moment, a huge portion of industry had already started using 3D computer models and the trend has no sign of deterioration. As compared to Europe and the U.S., Bromberg thinks that Asia is moving at a much faster pace. Thus, he predicted a quick spread of BIM usage in Asia. "I wouldn't be surprised to see 1:1 3D digital model projected at the construction site in the coming future. BIM is for sure the way to go and it is bringing possibility to the next level", suggested Klocek, putting a nice conclusion to the future of BIM.



"BIM is taking things to the next level." said Klocek



## ABOUT AEDAS LIMITED

Aedas was established in 2002 with the partnership of LPT Architects in Hong Kong and Abbey Holford Rowe in the UK to become Aedas LPT and Aedas AHR respectively. Following a merger with TCN Architects of Birmingham in 2003, the name Aedas was adopted for all areas of the practice with the LPT and AHR being dropped from the Hong Kong and UK practice names later in 2003. In 2006, Davis Brody Bond became owners in Aedas, it is an award-winning American architectural firm with headquarters in New York. In 2008, Aedas set up its new offices in Karachi with Aedas Ali Naqvi, and in Turin through a partnership with Marco Visconti, chief designer of a number of Fiat and Ferrari buildings in Italy.

The Aedas global network provides consultancy services in architecture, interior design, masterplanning, landscape, urban design and building consultancy in Asia, the Middle East, Europe and the Americas with over 38 offices around the globe. Aedas employs over 1,000 staff in the Asia region. Hong Kong is the largest centre in the Aedas Group and leads the practice's Asia offices. Aedas Asia is reputed for its masterplanning and mega-scale mixed-use designs, particularly in Singapore and the People's Republic of China. Their Hong Kong office have just celebrated the opening of the North Satellite Concourse of the HK International Airport while the rail teams are working on a number of new station designs with MTRC which includes the West Kowloon Terminus of the Express Rail Link.

Employing a skilled team of architects, urban planners, landscape designers and interior designers, Aedas provides international expertise with innate knowledge and understanding of local cultures. The Company has established a reputation for its cutting-edge designs in numerous market sectors including civic, cultural and community, commercial and mixed-use, residential, retail, education, hospitality and leisure, sports, technology and labs, transportation and healthcare. Their designers have a holistic approach to sustainability which shows our care not only for the built environment but also for the people they work with and the societies we live and work within.