

Hong Kong Housing Authority

Projects:

- Tai Pak Tin Street Public Housing Development
- Redevelopment of Lower Ngau Tau Kok Estate
- Redevelopment of So Uk Estate

Location:

- Tai Pak Tin Street
- Lower Ngau Tau Kok Estate
- So Uk Estate

Type:

Public Housing

Versatile BIM / What You See is What You Can Do



The Hong Kong Housing Department, executive arm of the Hong Kong Housing Authority, is among the pioneers in the use of BIM in Hong Kong. Having worked on projects with BIM used in standard ways – such as reducing clashes during construction the Department has recently progressed to helping accelerate a construction project in Tai Pak Tin Street, and even demolished old buildings using BIM in Lower Ngau Tau Kok and So Uk.



Not as Easy as ABC! – Redevelopment of So Uk Estate

In Hong Kong, blasting is restricted for demolition, which instead involves manpower and machinery. This can present special challenges, particularly when buildings are non-standard and a unique 3D demolition method is presented in 2D drawings.

Philip Sham, Senior Structural Engineer, Housing Department, indicates the challenges arising in demolishing five 15- to 17-floor residential blocks in So Uk. The buildings had Y-shaped layouts, with four flats in each of the two narrow wings. “On top of the space constraints, the cantilevered corridors in each of the wings further restrict the operation of demolition equipment,” says Ir Sham.

Ir Sham produces a black and white 2D drawing, to demonstrate that using only this, even experienced crews find it tough to grasp the demolition instructions looking at only a 2D drawing.

What You See is What You Can Do – Redevelopment of So Uk Estate

Then, Ir Sham shows the BIM model, rendered in Navisworks, on a computer screen. With 3D images and colour, the instructions make perfect sense. “The 3D sequence helps contractors to comprehend work details and the engineers’ intent,” he says. “It’s a whole new demolition method yet we can still optimize work efficiency and enhance cost estimates.”

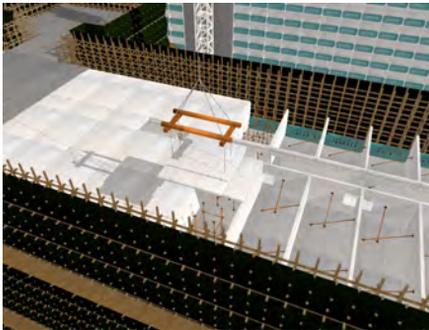
The model shows the entire building block, which can be rotated by 360 degrees. It is possible to zoom in, to enter a flat and head along a cantilevered corridor. A 4D animation shows demolition proceeding over time. “This is a real simulation – ‘What you see is what you can do,’” says Ir Sham.

In briefing seminars, the demolition crews were impressed by the animation. Though the project had initially looked precarious and time consuming, the BIM model ensured it proceeded safely, and at around the same speed as for conventional demolition projects.



Safe and Effective Demolition – Redevelopment of Lower Ngau Tau Kok Estate

Different challenges arose with demolition of five 16-storey buildings in Lower Ngau Tau Kok Estate. These dated from the 1960s. “We have no as-built records of how they were built, no drawings – just a photo taken in about 1967 showing Lower Ngau Tau Kok Estate under construction,” says Nandi Ip Kwong-fat, Structural Engineer, Housing Department. “We have no experience in demolishing precast buildings. The risk can be very high as any

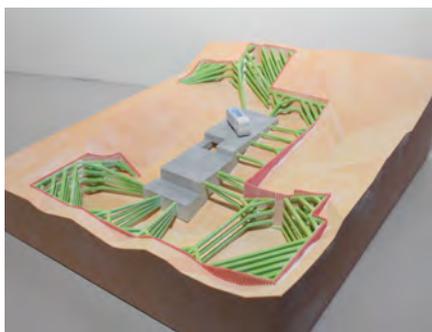


accidental fall of a pre-cast unit may trigger progressive collapse of the whole building.”

With 2D plans, Ir Ip and his team could only imagine the developed demolition process in their minds. Instead, they opted to create a BIM model, for simulating the entire demolition process as well as the required safety measures.

From the model, the Housing Department project team developed a 10-minute video, with an animation showing the demolition sequence and safety measures. “The video was very useful – we could optimise this brand new approach to demolition. Both management and staff know what the demolition involved,” says Ir Ip. “The contractors also found the video really helpful. Their workers could familiarise themselves with the demolition details.”

The demolition work proceeded smoothly, with no accidents, or complaints of nuisance.



Efficient Excavation and Shoring Works – Tai Pak Tin Street Public Housing Development

Site and time constraints led to use of BIM for construction of a 40-storey non-standard housing block on Tai Pak Tin Street, Kwai Chung. Danny Chung Kwok-chuen, Senior Structural Engineer, Housing Department, explains that the site is very congested, with undulating terrain and bedrock profile, steep slopes on two sides and a busy road on a third.

Substantial excavation and shoring works were required, and would take place in five stages.

“The contractor had submitted 2D drawings, and cut many sections in an endeavour to show the works at various stages, including five layers of supporting struts,” says Ir Chung. Yet even with the multitude of sections, it was hard to visualise, plan and monitor the work. A BIM model seemed a promising solution: it would allow creation of an infinite number of sections, show progress at every stage, and facilitate easy updating.

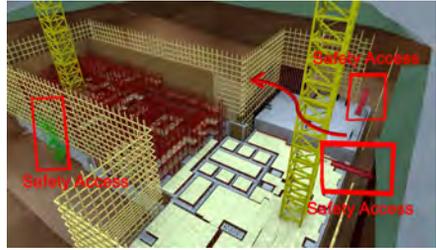
The BIM model led to creation of a 4D model – showing the works developing over time. Moreover, the Housing Department project team made 3D prototype models of the excavated site complete with struts, and even a dump truck. One of these was displayed in the construction site office, helping the contractor to fine-tune the work sequence, and efficiently carry out the excavation and shoring works.



Better Planned, Swifter Construction – Tai Pak Tin Street Public Housing Development

“We asked the Building Contractor to use BIM for more efficient planning and mitigate delay in the work,” says Chimmy Chu Wai-ming, Senior Architect, Housing Department. The model indeed enhanced overall site planning, streamlined some work sequences, and accelerated work. Aided by a BIM simulation showing top-down construction would be most efficient, the contractor finished building the Lower Ground to Upper Ground floors four weeks earlier than originally planned.

Subsequent floors are likewise being constructed according to a BIM model. The construction schedule has been carefully planned in a 4D model, and BIM has been adopted for quantity take-off, which helps to monitor progress on site and provide more accurate materials orders. By virtue of a model walkthrough, site safety issues were identified upfront, and safety precautions were improved. The BIM model even enabled tower crane operators to optimise locations for CCTV cameras that will help them to safely lift precast façade panels.



“Using BIM, we have shortened the learning curve of the builders, and construction is proceeding exactly as planned in the BIM; and more importantly the BIM model helps to deliver a safer and healthier work plan that benefits all workers on site,” says Ms Chu.

Note:

Tai Pak Tin Street –

The project consists of the construction of one 40-storey non-standard domestic block on a one-storey car-park / services podium including foundations, a multi-purpose hall and two pedestrian footbridges connecting to the adjacent On Yam and Shek Lei Estates.

Lower Ngau Tau Kok –

The project comprises the demolition of all existing structures of the estate including 7 nos. 16-storey domestic blocks and 5 of which were of precast construction, construction of a new road, and foundation to a footbridge and 33-storey domestic block.

So Uk –

The project requires the demolition of some existing reinforced concrete domestic blocks built in the 1960s.

** All images in this article provided by HK 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 Housing Department (HD) acts as the executive arm of the HA to help the Government achieve its policy objective on public housing.