

COMPANY

Hip Hing Construction Company Limited

PROJECT

Main Contract Works for the Proposed Development at Tung Chung Town Lot No. 2 and 11

LOCATION

Tung Chung Town Lot No. 2 and 11

TYPE

Private Retail and Hotel Development

SCHEDULED TIME OF COMPLETION

2019

3D Scans to BIM Create Value for Renovation Project

“The construction industry is adapting to new technologies for better construction planning and management. I believe this is not only a trend, but also improves the common practices and maximises the effectiveness of general applications.”

— Mr. Froky Wong Yuen-hung

Manager (BIM),
Hip Hing Construction Company Limited

BIM PARTNERS

AECOM Asia Company Limited

LWK & Partners (HK) Limited

Ove Arup & Partners Hong Kong Limited

Newfoundworld Project Management Limited

WT Partnership (HK) Limited

AUTODESK PRODUCTS USED

A360

Navisworks

Recap Pro

Revit



Project Overall View
Image courtesy of Hip Hing Construction Company Limited

In 2016, Hip Hing was awarded a main contract for a private retail and hotel development at Tung Chung Town Lot (TCTL) Nos 2 and 11. The project comprises structural alterations to the shopping arcade and cinema at TCTL No 2, and construction of new facilities at TCTL No 11. The work must not interfere with normal operations of the public transport terminal underneath and existing shopping mall adjacent to TCTL No 2.

3D scanning survey during early stage

At the beginning of project development, 3D scanning was conducted at Lot No 2, with both exterior and interior surveys for project planning and execution – as we lacked drawings and had insufficient data for A&A works design. The 3D scanning model could provide the project team with accurate coordinate system data on the existing building and identify the critical zone for demolition, which helps to reduce planning time and safety hazards.

For example, the Level 2 food court area should be demolished, other than for inclined steel beams. However, there is no as-built drawing for the existing structure; the ceiling headroom is over

10 metres in the food court, and most of the steel beams are hidden by the ceiling. Meanwhile, the food court is still operating, and opening the ceiling for inspections was not permitted as we needed the data. Plus, it was difficult to obtain the coordinate system by traditional surveying, especially for the part within the ceiling, where setting control points would be dangerous.

Using a 3D laser scanner simplified field work procedures and execution. There was no need to set control points within the ceiling area, which provides a safer way to capture data on hidden beam parts. All features of the existing steel beams and surroundings are accessible in the point cloud model. After cleaning the noise by using Recap, the point cloud model can help provide a quick verification of the



Temporary Works Design with Scaffolding
Image courtesy of Hip Hing Construction Company Limited



VIEW '1'
(1-100)

location of steel beams and facilitate construction planning.

Another example is the demolition of Lot No 2, from Level 2 to the roof. Scaffoldings and catch fans should be constructed to facilitate the demolition work. However, there was not sufficient as-built data for the existing cantilever roof and overlapping roof area that would facilitate scaffolding design. Conducting traditional surveys could not satisfy the tight schedule for designing and planning temporary works.

The overall exterior of Lot 2 shopping mall was scanned with the help of a 3D scanner. Capturing data on the overall exterior proved 10 times faster than using traditional methods, and provided sufficient data for and facilitated earlier design of temporary works. Various



VIEW '1' (REALISTIC)

3D Laser Scanning of Exterior & Roof feature
Image courtesy of Hip Hing Construction Company Limited

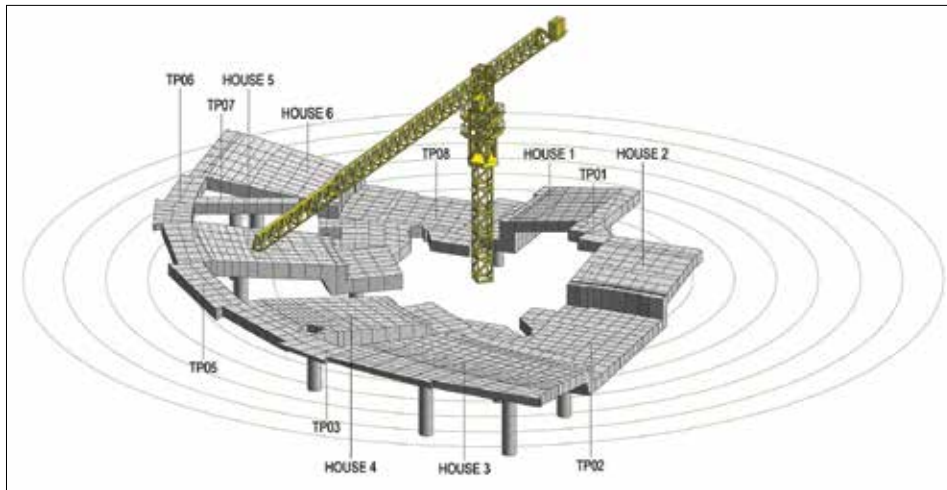
types of scaffolding were designed and simulated with the help of BIM, which improved site safety and efficiency.

BIM enables smooth logistics planning

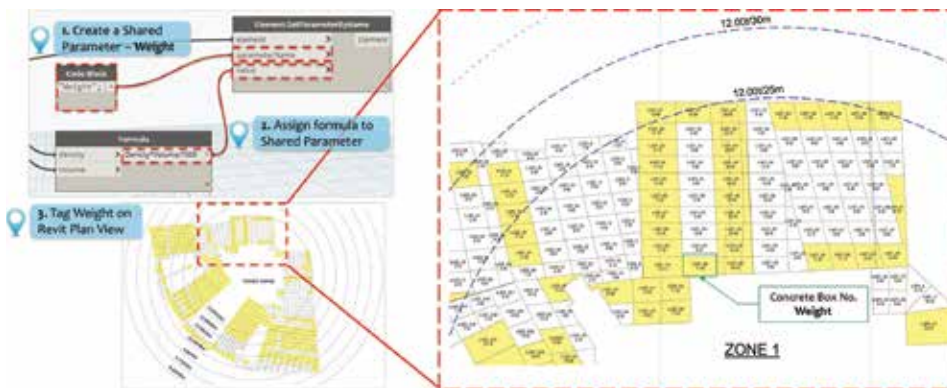
The overall project was complex, with a tight timeframe. New construction

and demolition work were carried out simultaneously at different lot numbers. Meanwhile, adjacent buildings and site surroundings affected logistics planning. Therefore, the delivery route was critical, and affected site progress.

The project's new construction, demolition and reconstruction work sequences were simulated with the help of BIM technology (4D BIM), which could assist in construction coordination and reviewing constructability. It also allowed understanding of how the process would proceed and how the resources would be consumed at any construction stage. Through 4D BIM visualisations, the project team, client, and other stakeholders could easily understand the project scheduling and progress. In addition, tower cranes, hoarding and temporary work structures were also simulated to facilitate understanding of the progress with the critical construction area, help plan material deliveries, and design equipment operation routes.



Simulation of Transfer Plate Cutting Zones
Image courtesy of Hip Hing Construction Company Limited



BIM-generated Transfer Plate Cutting Plan
Image courtesy of Hip Hing Construction Company Limited

Benefit of applying 3D laser scanning to BIM

In this project, transfer plates under Lot No.2 cinema would be cut into small concrete "boxes", for the demolition this. Before this, a cutting plan should be prepared. There were several concerns regarding the design of the cutting plan. On the one hand, in order to facilitate demolition, propping was constructed under a transfer plate to support each small box. Therefore, the cutting plan design had to take into account the fact the propping could not be cut. On the

other hand, the weight of each concrete box could not exceed the tower crane lifting capacity, and the boxes should be located within the tower crane working radius. Also, the weight of each concrete box should be close to the lifting capacity, in order to reduce the number of lifts needed.

With the help of 3D scanning, the project team could quickly obtain the point cloud model of propping, which was integrate with the transfer plate BIM model to facilitate the cutting plan design. The volume as well as weight of each concrete box could be easily calculated using BIM.

The integrated model helped to dynamically facilitate, verify and optimise the cutting plan. In addition, the BIM team utilised Dynamo to realise automatic generation of the cutting plan, with the weight marked for each concrete box. All these analyses were quickly conducted with the help of BIM, which ensured safe demolition of the transfer plates.

Enhance collaboration between different stakeholders

Various stakeholders (client, designers, sub-contractors and main contractor

site team) were working in different locations. Coordination meetings gathering all stakeholders were held twice a week. However, the number of problems coordinated and solved during coordination meeting was very limited.

Sharing discrepancies identified by BIM models in advance before a coordination meeting is a good way to improve efficiency. However, the file size of BIM deliverables is usually too large for sharing, as it is typically very time-consuming to upload and download models.

In addition, not all stakeholders can open BIM models on their own devices. They do not have the software license, or the computing power of clients and engineers is too weak to smoothly manipulate BIM models.

A360 is the solution for the above challenge, allowing synchronous and seamless collaboration among different stakeholders. All drawings and BIM deliverables were uploaded to A360 and seamlessly shared with others. Smooth multi-disciplinary communication and collaboration was achieved. The project team could view, share, and review models in the cloud (on the web browser) without downloading them into their own computers, which saved considerable time.

Minor discrepancies were solved within the platform, while major problems were reported to the team(s) responsible for them before the next coordination meeting, significantly improving coordination and communication efficiency. Hence, the project team could achieve faster response times during design coordination.



Planning of Temporary Propping via 3D Laser Scanning
Image courtesy of Hip Hing Construction Company Limited



Existing Structure Verification via 3D Laser Scanning
Image courtesy of Hip Hing Construction Company Limited



Project Overall View
Image courtesy of Hip Hing Construction Company Limited

About Hip Hing Construction Company Limited

Since being established in 1961, Hip Hing Construction Co., Ltd. (Hip Hing) has grown to become one of the leading contractors in Hong Kong. During the past 57 years, Hip Hing has been trusted by our clients to construct many of the landmark buildings which define Hong Kong. The expertise and capabilities we have developed allows us to provide comprehensive design, procurement, construction, testing and commissioning and handover solutions.

Hip Hing has been embracing advances in technology to provide professional construction services that meet our clients' needs. For example, Hip Hing has its own internal BIM team to leverage new technological advancements for operation efficiency. Apart from deployment Building Information Modelling (BIM), we also introduced Virtual Reality (VR), 3D Scanning, 3D printing, 3D holography, Drone for aerial photography/ videography and other applications to deliver innovative and sustainable solutions.

While we have rich experience and expertise, we also possess a positive working attitude, which is demonstrated by our commitment, proactiveness, integrity, teamwork and professionalism. We call these qualities the "Hip Hing Spirit", the winning behaviours shared by Hip Hing's staff.