

COMPANY

Hip Hing Construction Company Limited
Swire Properties Limited

PROJECT

Two Taikoo Place

LOCATION

Taikoo Place, 979 King's Road, Hong Kong

TYPE

Commercial Development

SCHEDULED TIME OF COMPLETION

2022

Two Taikoo Place Creative BIM Journey - Decarbonize Construction and Digitalize Facility Management

"BIM bridges the physical and digital worlds, leading the project team to stand in a safer environment to conduct the coordination among project stakeholders, which increases the productivity and reduce abortive works, achieve cost effectiveness and progress monitoring during the project lifecycle."

— Joseph Choy

Senior Manager, Projects
Swire Properties Limited

— OK Cheng

General Manager
Hip Hing Construction Company Limited

— Kelvin Lo

Senior Project Manager
Hip Hing Construction Company Limited

— Billy Wong

General Manager (BIM)
Hip Hing Construction Company Limited

BIM PARTNERS

Wong & Ouyang (HK) Limited

Ove Arup & Partners Hong Kong Limited

J. Roger Preston Limited

Rider Levett Bucknall Limited

NBBJ LP

Eckersley O'Callaghan Limited

Adrian L. Norman Limited

HS&A Limited

Gustafson Porter + Bowman LLP

Urbis Limited

Hugh Dutton Associates

Choi Comer Asia

Kingsfield Engineering Limited

AUTODESK PRODUCTS USED

Autodesk® AutoCAD®

Autodesk® BIM 360® Docs

Autodesk® BIM Interoperability Tools

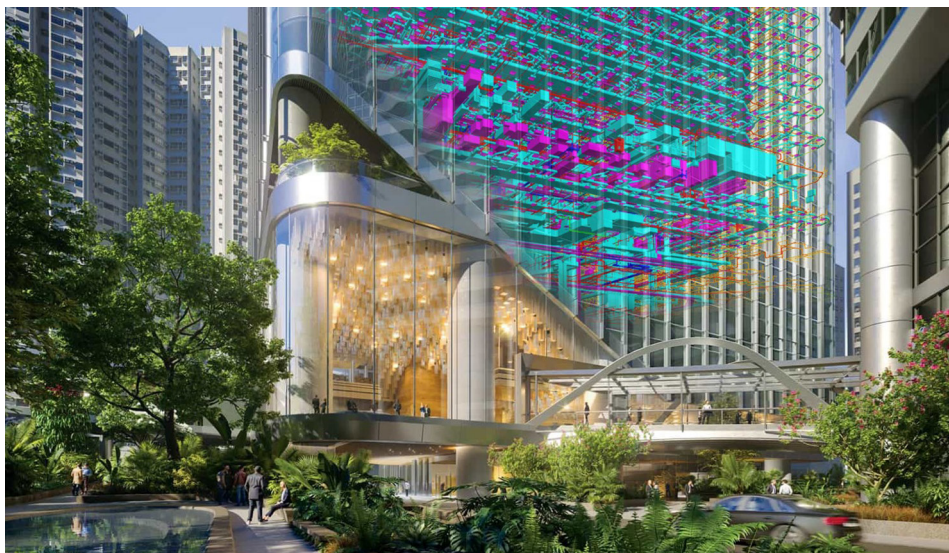
Autodesk® Dynamo

Autodesk® Navisworks®

Autodesk® Plangrid®

Autodesk® ReCap® Pro

Autodesk® Revit®



Two Taikoo Place External View

Image Courtesy of Hip Hing Construction Company Limited and Swire Properties Limited

Two Taikoo Place aims to cultivate a human-centric mixed-use community with a triple Grade A rated office tower. Adjacent landscape forming 70,000 sq. ft. of open space offers communal spaces with stunning water features, quiet pathways, and extensive green areas. An elevated walkway is designed and linked with nearby MTR station and facilities to enhance connectivity for the office community.

The vision for Two Taikoo Place is to set a new benchmark for innovative design. Emphasis was placed on adopting an

integrated design approach which incorporates BIM technology throughout the project lifecycle, including Design Reviews, Drawing Generation, Spatial Coordination, Existing Conditions Modelling, Phase Planning, Digital Fabrication, Construction Quality Management, As-built Modelling and Asset Information Modelling, etc. Therefore, different BIM platforms were adopted to optimize the design and resolve construction issues. This helped reduce material wastage and shorten the construction period.



Taikoo Square Overall View

Image Courtesy of Swire Properties Limited



Jumbo Glass Panels spanning up to 15 meters
Image Courtesy of Swire Properties Limited

Major Challenges and Site Constraints

Two Taikoo Place is a project with innovations in design and construction aspects. Located at business district, it is surrounded by a lot of buildings in the proximity and constrained by limited working space. There are some major challenges as below:

1. Jumbo Glass Panels spanning up to 15 meters
2. Full BIM implementation in complex walkway

Maximising Transparency Whilst Resisting Typhoon Loads

In this project, at the podium level, the 15m tall panels are laterally restrained by pre-stressed high-strength stainless steel rods, lying entirely within the glass panel build-up, composed of four 12mm thick plies and laminated with 1.52mm thick sheets of Sentryglas ionoplast interlayer.

Due to the juxtaposition of flat and curved glass panels at the façade corner angles and Hong Kong's high winds, movement joints between the rods were introduced to allow differential movements and avoid peak stresses in the glass panels. Hence, pre-tension system with tension rods, the first in Asia, was adopted in Two Taikoo Place project.

Drawing on our engineering and BIM technology expertise, our project team was able to visualise the installations, detect clashes and resolve potential conflicts between tension rods and glass panels prior to installation. The early virtual design review and simulation enhanced design certainty and accuracy and provided valuable insights for planning the efficient installation sequence of the works, and therefore mitigating the risk of glass panel crack and abortive works.

Interfacing for Design Optimization

Applying the BIM analysis technology, the accurate spatial information was provided for project team to review spatial relationships in each building components. With reliable information such as the critical clearance between the tension rods and glass panel and fly beam. Each potential issue could be easily identified by Navisworks for reviewing all geometry interfacing to enable design optimization in components, such as the walkway portal frame and tension rods. The risk management strategy was established for tolerance control and clash detection prior construction.

Fly Beam Position Control

To ensure constructability and smooth work sequence of jumbo glass panels, fly beam position must be controlled. This is challenging since the interfacing of tension rods and fly beam is sensitive with the allowable tolerance of 6mm. Therefore, we used the Revit to demonstrate the fly beam splice joint and coordination points for position control before installation. The use of BIM achieved our aim of enhancing the quality control and mitigating the misalignment of position during the installation.

Glass Panel Installation

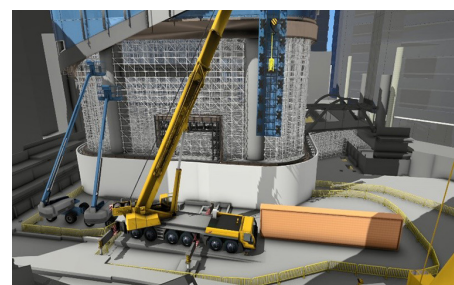
Adopting Virtual Design Construction (VDC), the project team conducted 4D construction sequence and method simulations for planning installation arrangement. The workflow of jumbo glass wall installation can be visualized for project team to review easily and closely on the proposed procedures to foresee potential risks before actual construction starts. This helped us eliminate unnecessary abortive changes & miscommunication for the design and planning. In particular, the risk of glass crack during installation was mitigated and safety was improved.

With BIM, the project team was able to provide the virtual mock up for installation sequence in a digital environment. As a result, the 15m tall panels were installed with zero accident.

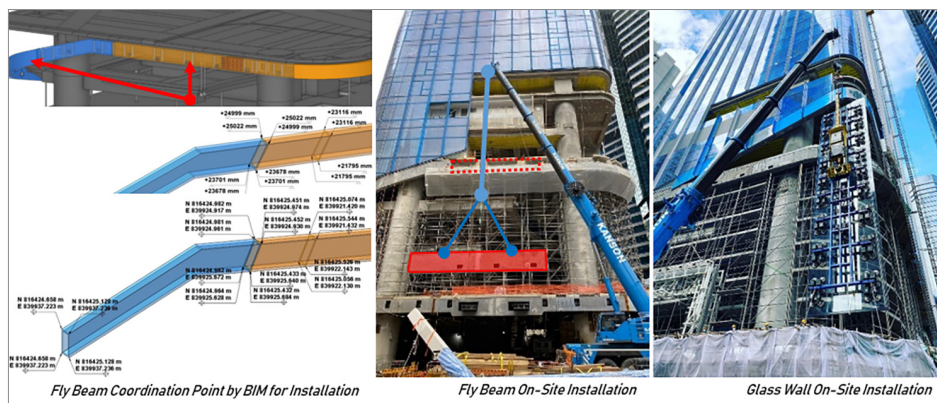
Full BIM Implementation in Complex Walkway

The walkway design is complex, and therefore it requires a higher level of information need model for real-time collaboration. "Centralization in One" is our project strategy which leads to adoption of openBIM approach in our BIM journey. Revit and Navisworks are compatible platforms to help us to handle the different file formats. Furthermore, all 3D geometry was incorporated into the 3D environment for coordination & design optimisation, which included the façade and MEP bracket.

High model maturity ensure the capability of coordinated model to facilitate the Design for Manufacture and Assembly (DFMA) approach for drawing generation and fabrication. The manufacturer will



Installation of Jumbo Glass Panels
Image Courtesy of Hip Hing Construction Company Limited

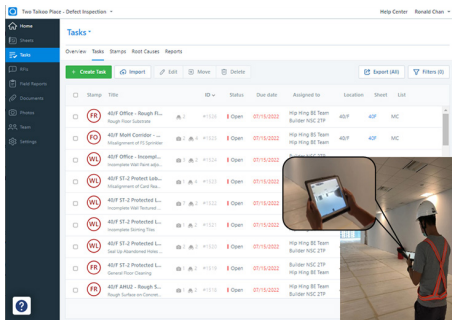


Fly Beam Coordination Point by BIM for Installation

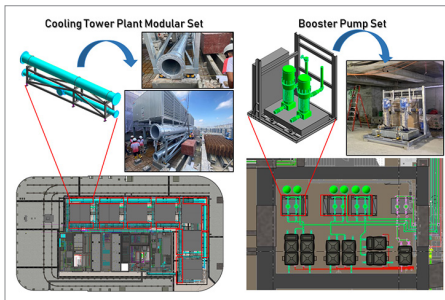
Fly Beam On-Site Installation

Glass Wall On-Site Installation

Installation of Jumbo Glass Panels Overall View
Image Courtesy of Hip Hing Construction Company Limited and Swire Properties Limited



Defect Logging and Dash Board
Image Courtesy of Hip Hing Construction Company Limited and Swire Properties Limited



Multi-Trade Integrated MEP (MiMEP)
Image Courtesy of Hip Hing Construction Company Limited

BIM Live Collaboration

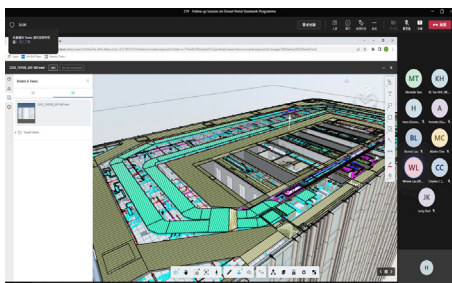
Despite social distancing and quarantine due to coronavirus outbreak, BIM collaboration and document exchange were seamlessly continues as all the models are shared on the cloud based BIM 360 Docs. Information, comments, and changes to the BIM models were efficiently exchanged digitally even stakeholders are at different physical locations. As a result, the team is still able to accomplish all coordination targets on schedule against all odds.



Mixed Reality (MR) Simulation
Image Courtesy of Hip Hing Construction Company Limited and Swire Properties Limited

photo was used for site verification for the as-built modelling. Asset management information is progressively integrated into BIM model in the exchange format required by operation team.

Realising the unmatched visualisation capability of MR in future operation and maintenance, the project team actively coordinates with client operation team to integrate MR and BIM implementation. For example, MR virtual tours lead to early identification of the assets installation readiness and therefore brings huge saving in terms of cost and time.



BIM Live Collaboration
Image Courtesy of Hip Hing Construction Company Limited and Swire Properties Limited

Digital Fabrication

Multi-Trade Integrated MEP (MiMEP) for MEP Modularization was adopted in various building services systems that were fabricated before delivery to the construction area. Fabrication modules were modelled and coordinated before being fabricated in factory. For the cooling tower plant modular set and booster pump set, the installation time was saved by 50% compared with the conventional approach. A digital MEP module was created for coordination with other systems, aiming to demonstrate the space required for installation. The coordinated model was then adopted by the sub-contractor to generate the shop drawing for MEP modules fabrication.

use the mature model to prepare the fabrication drawing for manufacturing and assembly, which minimises material wastage, production time and fabrication cost. Furthermore, site verification was conducted by 3D laser scanning for quality control to ensure the alignment of design, construction, manufacturing and assembly.

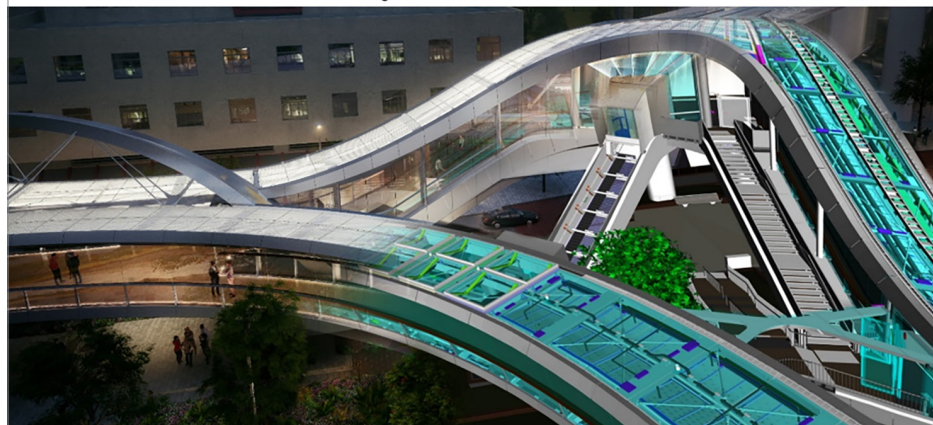
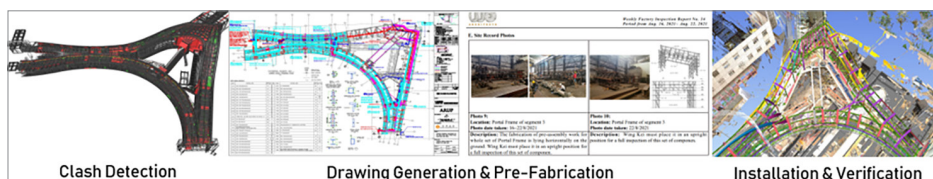
Construction Quality Management

To manage construction quality, we adopted Digital Works Supervision System (DWSS) throughout the contract period. One of the purposes of adopting this system is to record site defects spotted by site inspection team. The records will be dispatched to relevant parties for follow-up actions, and the status will be monitored until the defect is fixed.

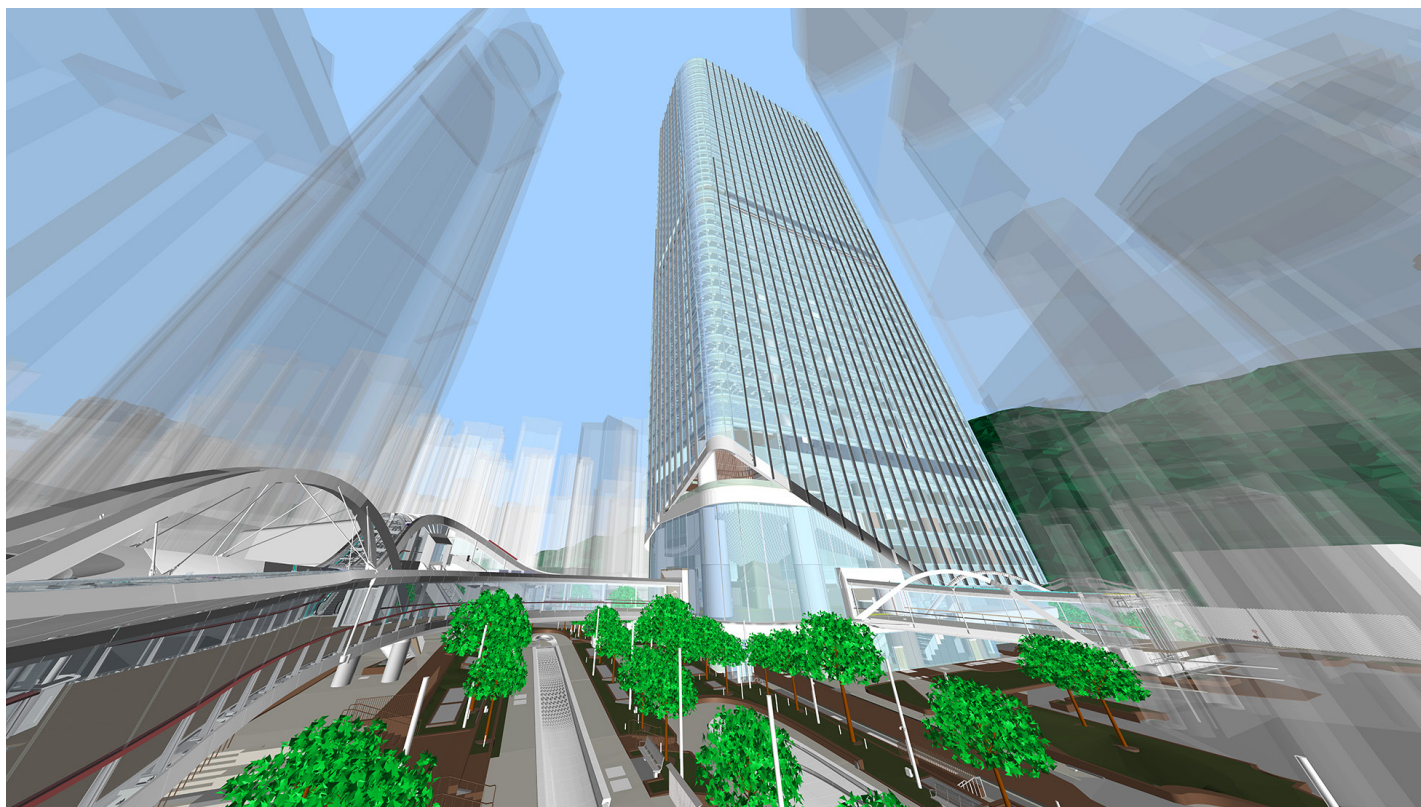
PlanGrid provides a streamlined commissioning and quality management workflow to help us to manage all discipline in defects ratification status through the centralized platform, which saved 40% of paper documents and 50% of the document processing time.

Intergradation with Asset Information Model (AIM) and Mixed Reality (MR)

To achieve the LOIN (Level of Information Need) required for AIM, 360 panorama



Full BIM Implementation in Complex Walkway
Image Courtesy of Hip Hing Construction Company Limited and Swire Properties Limited



Two Taikoo Place 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 this time we have been trusted by our clients to construct many of the landmark buildings which define Hong Kong. The construction services provided by Hip Hing Construction Group have contributed to the development of Hong Kong and its economy and have helped to shape a better living environment for people of Hong Kong. We have also been embracing advancing technologies to take our services to the next level, so as to meet our clients’ needs.

About Swire Properties Limited

Established in Hong Kong in 1972, we have investments across Hong Kong, the Chinese Mainland, Singapore and the US. Adhering to our core values of integrity, originality, long-term focus and quality, we aim to create sustained value by developing and managing large-scale mixed-use projects that serve as focal points of the surrounding urban areas. Swire Properties was listed on the Main Board of the Stock Exchange of Hong Kong in 2012 (Stock Code: 1972).