SOGO Kai Tak - BIM Enabled Virtual Environment for Better Collaboration and Decision Making

COMPANY
Hip Hing Construction Company Limited
Leader Bright Limited
ATAL Engineering Group
Vircon Limited

PROJECT
SOGO Kai Tak

LOCATION
Kai Tak Area 1E Site 2, Kai Tak, Kowloon

TYPE
Commercial

SCHEDULED TIME OF COMPLETION
End of 2023

"We have faced many challenges since the very beginning of the project. However, the client, consultants, our team and other construction partners work together to bring up ideas to mitigate the impacts. BIM allows us to examine our ideas in a virtual environment to resolve many of potential conflicts, and to make better decisions."

— **Jacky Leung**
Project Manager, Leader Bright Limited

— **Tony Za**
Deputy Head of Contracts Division,
Hip Hing Construction Company Limited

— **Larry Cheung**
Senior Project Manager (Contracts),
Hip Hing Construction Company Limited

— **Billy Wong**
General Manager (BIM),
Hip Hing Construction Company Limited

BIM PARTNERS
DLN Architects Limited
WSP Hong Kong Limited
WSP (Asia) Limited

AUTODESK PRODUCTS USED
Autodesk® 3ds Max®
Autodesk® AutoCAD®
Autodesk® BIM 360® Docs
Autodesk® Dynamo
Autodesk® Navisworks®
Autodesk® ReCap® Pro
Autodesk® Revit®

Twin Tower of SOGO Kai Tak
Image Courtesy of Hip Hing Construction Company Limited and Leader Bright Limited and ATAL Engineering Group and Vircon Limited

SOGO (Kai Tak)

"To capture the rising purchasing power in the East Kowloon area in Hong Kong, the Kai Tak Development Project commenced ground-breaking in December 2017, with the twin towers topping out in the second quarter of 2022. Upon completion, the twin towers will host a new SOGO department store along with complementary retailing, entertainment, dining, and lifestyle servicing facilities. The retail complex is expected to be in business by the end of 2023, tentatively, and is set to become a new landmark in East Kowloon, thereby further fortifying the Group's leading position in the Hong Kong retailing market. " ---- Leader Bright Limited

Site Constraints and Major Challenges

1. The Tuen-Ma Line MTR tunnel runs through below the project site, and there are other construction sites in close proximity. During the basement

Entrance Front View
Image Courtesy of Hip Hing Construction Company Limited and Leader Bright Limited and ATAL Engineering Group and Vircon Limited

View from Kai Tak Station Square
Image Courtesy of Hip Hing Construction Company Limited and Leader Bright Limited and ATAL Engineering Group and Vircon Limited

construction, our project team spotted that the monitoring data of MTR settlement was close to action level. To avoid the aggravation of settlement level, the stakeholders jointly decided to change the construction scheme for the basement structure. The revised scheme would retain all shoring which significantly increased the complexity of the site works and extended the construction period.

2. An extensive area of drainage reserve zone is located within the construction site. Therefore, extend and layout of foundation works is highly restricted. However, such constraint leads to one of the most iconic designs of this project. To meet the structural need, a mega truss system was designed to hang the 9 Storeys of structure beneath it and shift the loadings to the core.

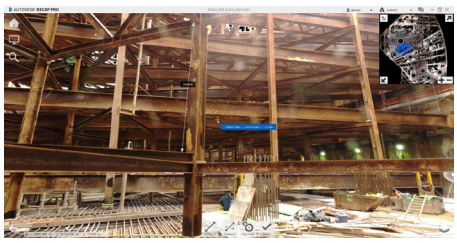
Design Review and Existing Condition Modelling

Hip Hing Construction Limited has established a company policy to mandate application of laser scan to all basement ELS (Excavation and Lateral Support) system since 2015. And the company policy also requires all Hip Hing projects to coordinate the clashes in BIM platform. In our project, the laser scan result was loaded into Autodesk Recap for federation and the point cloud model was imported into Autodesk Navisworks for further coordination. The project team was able to visualize the installations, detect clashes and resolve potential conflicts between existing ELS system and the basement structure. The early virtual design and construction enhanced design certainty and accuracy and provided valuable insights for planning the efficient construction to the works, and therefore mitigating the risk of abortive works. The early virtual review also assisted the team to shorten the basement construction period by a month.

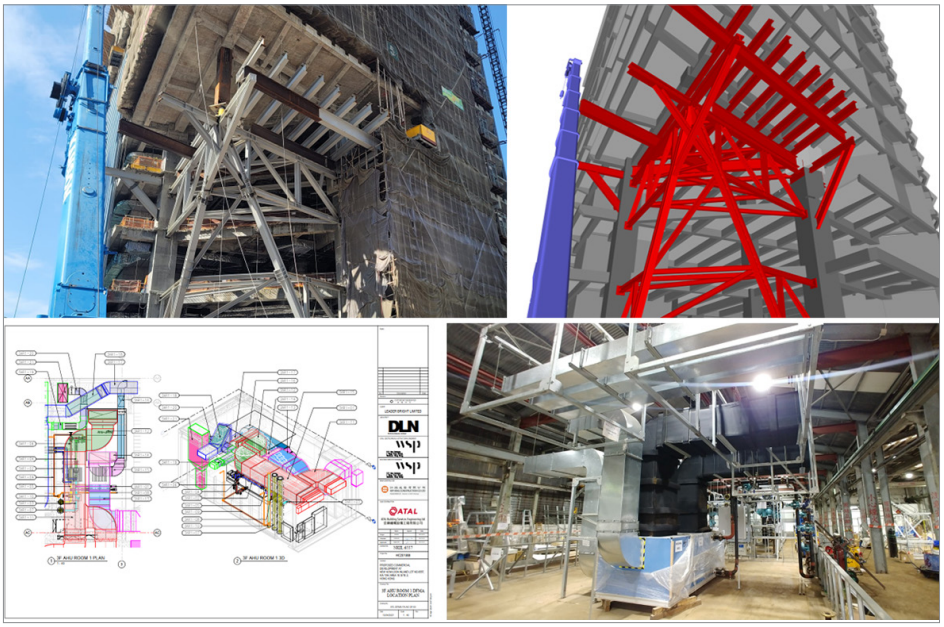
Compared to traditional 2D drawing context, BIM environment enables an extraordinary immersive approach to review the design of complex system. For example, the mega truss system weighed more than 1,000 tons and the parts of the system were pre-fabricated in a factory. To avoid the material wastage and abortive works on-site, the client, consultants, our team, and other construction partners collaboratively coordinated in the BIM enabled virtual environment. Eventually, we managed to identify and resolve all critical issues before the fabrication of the parts. In addition, the BIM platform enabled project team to consider the operational space requirement of the site condition, which prevented disruption to the construction sequence and ensured smooth construction in the future.

Construction Phase Planning and Site Utilization Planning

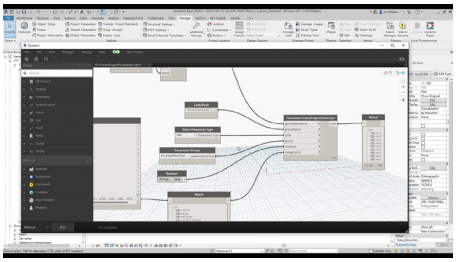
Construction phase planning allows the project team to have better control of the overall programme and prevents potential risks. In addition, the 4D simulations significantly increased the efficiency of communication between our team and other parties. For example, to ensure the construction duration of mega truss system and adjacent concrete structure falls within 2.5 months, our engineers and BIM specialists conducted multiple “trial and error” analysis in 4D environment to find out the most efficient DfMA sequence of installation. The project team also added the scaffolding arrangements and related safety measures into the simulation to ensure the effectiveness of the planning. And our BIM specialists used Dynamo to facilitate smooth data exchange process. Another example is the simulation of the dismantling sequence of the temporary truss system. Due to the limited operational area, 4D simulation was utilized not only for the works sequence, but also the best and safest position of the mobile crane.



Point Cloud Model of ELS System
Image Courtesy of Hip Hing Construction Company Limited and Leader Bright Limited and ATAL Engineering Group and Vircon Limited

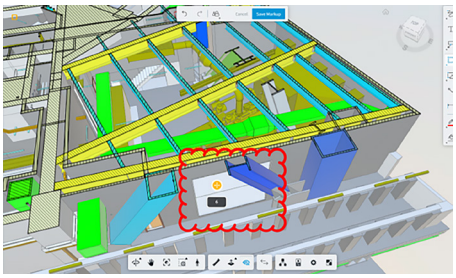


Steel Truss and MiMEP
Image Courtesy of Hip Hing Construction Company Limited and Leader Bright Limited and ATAL Engineering Group and Vircon Limited



Dynamo Script for Data Management
Image Courtesy of Hip Hing Construction Company Limited and Leader Bright Limited and ATAL Engineering Group and Vircon Limited

VR Simulation
Image Courtesy of Hip Hing Construction Company Limited and Leader Bright Limited and ATAL Engineering Group and Vircon Limited



Cloud Collaboration (BIM360)
Image Courtesy of Hip Hing Construction Company Limited and Leader Bright Limited and ATAL Engineering Group and Vircon Limited

Multi-Trade Integrated MEP (MiMEP) and Modular Integrated Construction (MiC)

To shorten the construction period, we deployed Multi-Trade integrated MEP (MiMEP) for E&M construction to reduce the potential risks for design, to minimize material consumption, production, on-site installation time and fabrication cost. The Modular Integrated Construction (MiC) method was adopted in lift machine room to take advantage of off-site fabrication. It helped achieve better quality and accelerate construction. To facilitate MiC and MiMEP, the BIM technology is an essential tool for the complete design and construction process. The BIM model maturity should meet the manufacture LOIN requirement without clash and discrepancy between each drawing sheet and each model component. As a result, the application of the MiMEP and MiC helped the team to shorten the construction period by 3 months.

Cloud Collaboration

Due to the COVID-19 pandemic and restrictions on face-to-face communications, the project team was confronted with the constraints of communication. However, the adoption of BIM virtual platform such as BIM 360 Docs helped resolve the issue and enhanced our communication and coordination significantly. Besides, BIM360, as the common data environment, allows all project stakeholders to access to the same secure, cloud-based information. Furthermore, collaborations, such as clash analysis and review can be performed to review the design of Architectural, Structural, and Building Services Design with other parties effectively. Assisted by the cloud collaboration method, the stakeholders together reviewed and resolved more than 1,500 design issues in weekly BIM coordination workshop before actual construction.

Sky Garden Simulation
Image Courtesy of Hip Hing Construction Company Limited and Leader Bright Limited and ATAL Engineering Group and Vircon Limited

BIM with Innovative Technology

The benefits of adopting BIM extended to the interior design. By adopting VR (Virtual Reality) simulation, the visualization tool provides a realistic demonstration of the design features to the stakeholders. It helped to design freeze and minimize abortive works. Furthermore, the virtual environment experience helps engineers to enhance their understanding of the complex structure and to get insights for safety measures planning.

A project-based Digital Works Supervision System (DWSS) is adopted for submission and acceptance of the request for inspection/survey check form as well as safety and environmental inspection checklist. The designated plug-in enables two-way exchange of information between the DWSS and Autodesk BIM360. Teams in the field can manage complex and custom processes and inspections with confidence in the latest model/drawing from BIM 360.

BIM for Facility Management

The application of BIM stimulated information exchange among various stages. To achieve the required LOD-G in the client's Exchange Information Requirement (EIR), we adopted mixed application of laser scan and 360-view photos as verification method. BIM for facility management workshops was kicked-off by the project team a year before acquiring occupation permit. The early involvement of client's facility management team helps the project team to re-examine the previously defined information requirement to avoid abortive works and rush modification in later stage. Thanks to Autodesk Revit's extensive interoperability functions, the project team can easily convert the native model into the required format and export COBie data sheet for the integration with client's facility management platform.

Construction of SOGO Kai Tak
Image Courtesy of Hip Hing Construction Company Limited and Leader Bright Limited and ATAL Engineering Group and Vircon Limited

協興 HIP HING
新創建集團成員
Member of NWS Holdings

Leader Bright Limited

ATAL

雲建 VIRCON

Corner Entrance
Image Courtesy of Hip Hing Construction Company Limited and Leader Bright Limited and ATAL Engineering Group and Vircon 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 the 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 Leader Bright Limited

Lifestyle International Holdings Limited (together with its subsidiaries, including Leader Bright Limited, the "Group") is a Hong Kong-based premier retail operator that specializes in the operation of mid to upper-end department stores in Hong Kong. The Group's two SOGO department stores in Hong Kong include the flagship store in Causeway Bay, the largest and leading department store in Hong Kong, as well as the Tsim Sha Tsui store. Characterized by the "one-stop shopping" concept with unparalleled brand equity, the Group's department stores offer a wide variety of goods ranging from daily necessities to luxury products as well as personal care services, such as beauty salons, in a comfortable shopping environment. To stay competitive in the ever-evolving retail landscape, the Group will continue to forge closer ties with consumers and keep abreast of market changes, leveraging on its omni-channel and upgraded system, with a view to offering seamless and compelling customer experiences with attentive care that stand out from the market.

About ATAL Engineering Group

Established in 1977, ATAL Engineering Group ("ATAL") is a leading electrical and mechanical ("E&M") engineering service provider headquartered in Hong Kong, with operations in Macau, Mainland China, the United States and the United Kingdom. Serving a wide spectrum of customers from public and private sectors, ATAL provides multidisciplinary and comprehensive E&M engineering and technology services in four major segments, including Building Services, Environmental Engineering, Information, Communications and Building Technologies ("ICBT") and Lifts &Escalators. ATAL's parent company, Analogue Holdings Limited, is listed on the Main Board of the Stock Exchange of Hong Kong (Stock Code: 1977).

About Vircon Limited

With over 20 years of experience, Vircon Limited is an ISO 19650 certified Hong Kong's premier Digital Twin & BIM solution provider. We have successfully implemented 300+ local and international projects. Vircon is dedicated to providing high quality services and products, customer satisfaction, and continual improvement of our processes. Our Digital Consultants and BIM Specialists help clients to improve safety, optimize production, reduce costs, and mitigate risk throughout the Building Life Cycle. We pride ourselves on supporting innovation, sustainability, and social impact.

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