COMPANY

Hip Hing Construction Company Limited Henderson Land Development Company Limited

PROJECT

The Henderson

LOCATION

2 Murray Road, Central, Hong Kong

TYPF Office & Commercial Tower

SCHEDULED TIME OF COMPLETION 2023

"The Henderson is set to become a world-class architectural landmark of Hong Kong, "an icon amongst icons". The new super Grade-A office tower will be a showcase for health, resilience, smart technology and sustainability. The Henderson echoes the organic beauty of the natural world, reinterpreting the structural forms and layering of a Bauhinia bud about to blossom."

-Kevin Ng

Senior Deputy General Manager, Project Management 2 Department, Henderson Land Development Company l imited

-Edward Chan

Deputy General Manager, Project Management 2 Department, Henderson Land Development Company Limited

— Michael Huen

Project Manager, Hip Hing Construction Company Limited

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

-King Wong Assistant Project BIM Manager, Hip Hing Construction Company Limited

BIM PARTNERS

Zaha Hadid Architects Ronald Lu & Partners (Hong Kong) Limited WSP (Asia) Limited Ove Arup & Partners (HK) Limited Sane Form Limited

AUTODESK PRODUCTS USED

Autodesk[®] 3ds Max[®] Autodesk[®] AutoCAD[®] Autodesk[®] Civil 3D[®] Autodesk[®] Dynamo Autodesk Forge® Autodesk[®] Navisworks[®] Autodesk[®] ReCap[®] Pro Autodesk[®] Revit[®]

The Henderson: Master of Curve Unleashed from BIM



Located in the heart of Hong Kong's CBD with sober architectural marvels nearby, The Henderson is targeted to create an "Office for the Future" and "Icon amongst the Icons", with her curvaceous glass façade designed by prestigious Londonbased Zaha Hadid Architects, that mimics layers of a blossoming Bauhinia bud. Erected with high-tensile steel structure, the Tower offers wide span column-free floor plans, providing maximum functional spaces to cater for ever-changing operational needs.

Adding with an all-rounded smart system, The Henderson is envisaged to be an exemplary Grade-A Office for the coming generation and beyond.



Main Entrance (Render by PixelFlakes) Image Courtesy of Hip Hing Construction Company Limited and Henderson Land Development Company Limited and Zaha Hadid Architects

Major Challenges

The high complexity of design gives rise to some unprecedented challenges:

- 1. Comprehensive information diversity (united with over 20 BIM parties from worldwide)
- 2. Massive pre-fabrication scale (over 16,000 tons of steel structure, and double-curved glass panels that is first of its kind in Hong Kong)
- 3. Steel-RC structural interfacings (including capping beams, pre-loaded struts, underslung and outriggers)
- 4. Challenging site constraints (in the world's busiest CBD, with three pairs of live MTR tunnels surrounding the site)



Double-laminated double-curved glass panels (Render by MIR) Image Courtesy of Hip Hing Construction Company Limited and Henderson Land Development Company Limited and Zaha Hadid Architects

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Systematic issue records via Navisworks add-in Image Courtesy of Hip Hing Construction Company Limited and Henderson Land Development Company Limited

Solution to Information Diversity – openBIM Approach

Autodesk-openBIM Interoperability To facilitate complicated design interfacing, the project team intensively adopts openBIM to retain maximal graphics and information originated from different design authoring tools. We are pleased that Autodesk products keep the same pace with openBIM advancement, which highly enhances the flexibility for multi-disciplinary collaboration.

BIM Coordination Meeting

Engaging with international stakeholders in this project, a digitization mind-set with cloud-based CDE has early been practiced since design stage. This elevates BIM capability and traceability when it comes to construction stage. With growing BIM maturity, BIM-based coordination has constituted a routine habit, that occupies over 50% of total meetings in construction. This capacity already excels contract requirement, but it in turn creates extra values for information administrations and technical analysis.

Design Review and optimization

Empowered by the insights brought by 4D coordination, the project team frequently collaborates to simulate construction plans ranging from basement excavation, E&M installation, master top-down construction sequence to equipment transportation. Besides, Revit schedules for 5D cost estimation are also configured to consolidate real-time material quantities.

Shop Drawing Production

After intensive coordination and quality checks, the model and data information are maintained in a standardized manner, to ensure a single source of truth for data exchange. Shop drawings such as CSD, CBWD are then consistently re-generated whenever the models are updated.

Solution to Pre-fabrication and Interfacings – DfMA and Site Verifications

Extensive DfMA for Precast Curb

In view of multi-faceted challenges and risks in relation to the construction of irregular façade curbs, the DfMA concept is implemented. The façade curbs are inclined in form and possess difficulty on related site works such as concrete formworks. Dynamo is adopted to analyse façade inclination factor, which is applied to modularize the façade curbs to enable pre-cast approach. Eventually, over 70% of façade curbs are modularized and 30% construction time were offset to off-site pre-fabrication factory, which enhances the flexibility of construction plans.

Precision Verification using Laser Scanning Tools

Laser scanning is performed for critical locations to extract as-built conditions accurately. The point clouds are stitched in Recap, and then incorporated with construction BIM models for analysis. The deviation levels are presented in table format for reports, and a colour-coded distribution map for illustration. This implementation effectively controls construction tolerance and keeps tracks on the structural performances of elements such as pre-cambered beams.

MEP Installation Planning using AR Tools

Steel-concrete hybrid framing system in atypical floor layouts creates considerable constraints on vertical clearance of MEP pipe ducts. Moreover, with tight headroom allowances, the MEP routing arrangement is particularly challenging. The project team actively resolves these challenges through walkthroughs, clash detections, and BIM coordination meetings in Navisworks, which has been found to be one of the most efficient viewing engine, in handling enormous model integrity with the least compromise of navigation fluency. After structural framing construction, AR technology is also adopted for MEP installation planning. Site staff can use their own handy smart phones, to overlay the BIM model with the as-built site background, providing them a new intuitive review of installation beyond 2D construction drawings. Due to active BIM contribution, 90% of MEP routings can be coordinated and deployed within the steel floor truss zone, which maximizes clear headroom spacing as per client requirements.

Solution to Site Constraints – Existing Conditions Modelling and Substructure Design Optimization

Existing Environment by 3D laser scanning

Apart from precision verification, 3D laser scanning can also re-create the existing environment in point-clouds, which can



Full BIM in coordination meetings Image Courtesy of Hip Hing Construction Company Limited and Henderson Land Development Company Limited



BIM collaboration process using Autodesk tools Image Courtesy of Hip Hing Construction Company Limited and Henderson Land Development Company Limited

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Image Courtesy of Hip Hing Construction Company Limited and Henderson Land Development Company Limited

integrate with BIM models, to convey the relationship between existing site surroundings and construction models including temporary works. It allows the construction team to visualize the design and construction in a macro perspective.

Vehicle Path Simulation

Located at the Central Business District, the site is compact and particularly sensitive to the traffic flow. Site logistics must be well planned to avoid stagnation of site vehicle and minimize interruption to existing traffic. Vehicle swept path analyses are preformed to ensure a feasible logistic path for site vehicles.

Optimized Design for Pre-Loaded Struts Being surrounded by three pairs of live

MTR tunnels, stability of ELS system and underground earth movement is one of the prime concern of the project team to ensure public safety. BIMenabled design review on the ELS and basement construction was actively adopted. Pre-loaded struts, with their position optimized, are adopted instead of conventional struts in the ELS design. As a result, the top-down construction proceeds smoothly, without warnings of land subsidence.

Keep Exploring, the Sky Is the Limit

The project team endeavors in expanding the value of BIM. For instance, the team leverages the outstanding rendering performances of 3ds Max, to create virtual mockups with a high degree of realism, which will then be exported to VR-enabled tools. As such, clients can get a firstperson perspective on the visual outcome of building views through this immersive experience. The team is also developing an intelligent flow of information among BIM models, Internet of Things sensors, and Facility Management portals, getting prepared for the soft landings towards operational phase, to realize the vision "Office for the Future" and "Icon amongst the Icons".



MEP installation planning using AR tool Image Courtesy of Hip Hing Construction Company Limited and Henderson Land Development Company Limited



Verify installation precision of steel beams between point clouds and BIN Image Courtesy of Hip Hing Construction Company Limited and Henderson Land Development Company Limited







HENDERSON LAND GROUP 恒基兆業地產集團



The Henderson (Bird's eye view, Render by Arqui9) Image Courtesy of Henderson Land Development Company Limited and Hip Hing Construction Company Limited and Zaha Hadid Architects.

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 Henderson Land Development Company Limited

Founded in 1976 and listed in Hong Kong since 1981, Henderson Land Development Company Limited (Stock code: 12) is a leading property group with a focus on Hong Kong and mainland China.

Henderson Land is carrying on its legacy into the future, curating a property portfolio that grows from strength to strength and encompasses award-winning landmark projects such as the International Finance Centre complex and The Henderson.

Henderson Land has a long-term commitment to sustainability and is a pioneer in green building and sustainable practices which harness innovation and technology to create new, smarter living. The Group is a strong advocate of social responsibility and invests in a broad range of community causes and initiatives. For more information, please visit www.hld.com.

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