

COMPANY

Paul Y. - CIMC - JEC Joint Venture
 Paul Y. - Chevalier Joint Venture
 Manly-Tech Engineering Limited

PROJECT

Automated Carpark A and B at HKBCF

LOCATION

Hong Kong Boundary Crossing Facilities

TYPE

Statutory Project

SCHEDULED TIME OF COMPLETION

2024/2025

Data-Driven Decisions Making in Project Management with BIM

“Data represents the future of our world, and BIM will serve as the crucial foundation for the next phase in the evolution of our building assets.”

— Marvin Lee

Design Manager, Paul Y. Engineering Limited

— Kelly Leung

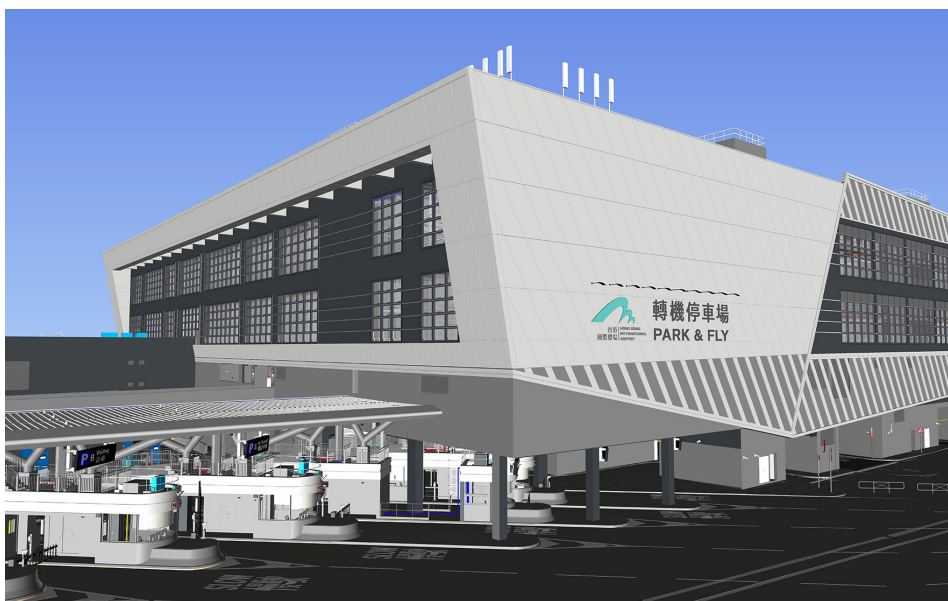
Design Manager, Paul Y. Engineering Limited

— Christopher Wong

BIM Manager, Manly-Tech Engineering Limited

AUTODESK PRODUCTS USED

Autodesk® AutoCAD®
 Autodesk® Civil 3D®
 Autodesk Construction Cloud®
 Autodesk® Dynamo
 Autodesk® Navisworks®
 Autodesk® ReCap®
 Autodesk® Revit®
 Autodesk® Vehicle Tracking



Automated Carpark A Overall View
 Image Courtesy of Paul Y. - CIMC - JEC Joint Venture

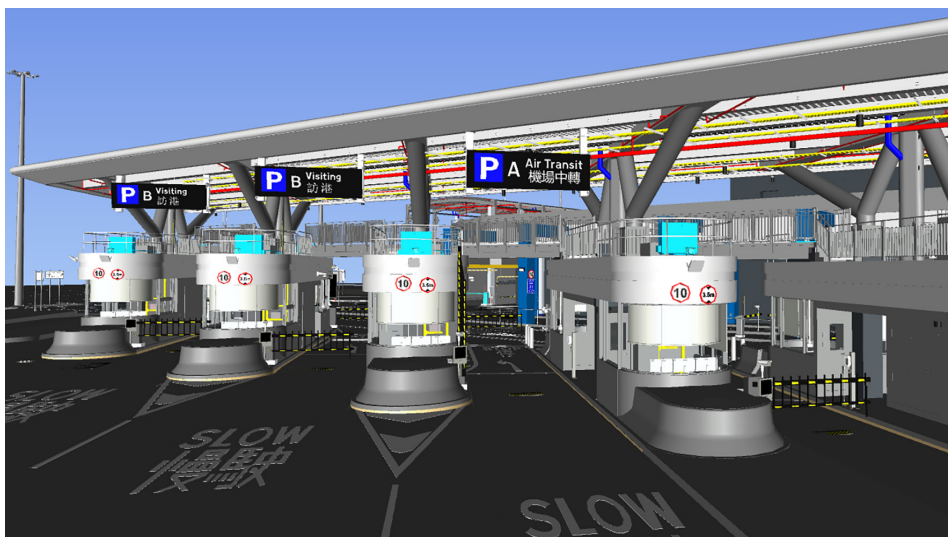
The Landmark Project

As mentioned in The Chief Executive's 2020 Policy Address, “The HKSAR will further leverage the HKIA's contribution in promoting Hong Kong's economic development by developing automated car parks on the Hong Kong Boundary Crossing Facilities (HKBCF) Island of the HZMB.” This landmark project has garnered significant media attention.

Under the design-build-operate (DBO)

contract, the JV has been appointed to design and build the automated car park and subsequently operate it for the first few years. This approach encourages us to prioritize the project's long-term performance from the outset, rather than focusing solely on the efficiency of its construction.

Consequently, we will consider factors such as energy efficiency, maintenance requirements, and lifecycle costs during the design and construction phases.



Automated Carpark A Kiosk
 Image Courtesy of Paul Y. - CIMC - JEC Joint Venture

This comprehensive approach can lead to more sustainable and cost-effective infrastructure in the long term.

Technology-Enabler

The successful implementation of a BIM workflow relies on the use of specialized software tools. For this project, the BIM team utilized a variety of applications to achieve their objectives.

Autodesk Revit and Civil 3D served as the primary design authoring software, enabling the team to create detailed models that accurately reflected the project's requirements. BIM Holoview was employed to conduct feasibility studies, while GAMMA AR was used for site inspections by integrating the models via the Revit plug-in, facilitating effective on-site coordination.

Realistic renderings of the design was then produced for stakeholders to understand the project more easily. Autodesk Recap Pro was used to manage point cloud data captured by laser scanners, ensuring the model accurately represented the physical site conditions.

To further streamline the process, Autodesk Navisworks was used to federate all models into a single environment, offering a comprehensive view of the project's progress. Finally, Autodesk Construction Cloud (ACC) were employed to maintain a single source of information, ensuring stakeholders always had access to the most up-to-date data.

By leveraging these software tools in an integrated manner, the team achieved a highly efficient and effective BIM workflow, resulting in a successful project outcome.

Synergy

Working on multiple teams across two mega projects presents



Automated Carpark B Overall View Rendering
Image Courtesy of Paul Y. - Chevalier Joint Venture

unique challenges. With different teams operating simultaneously, communication gaps, misunderstandings, and conflicting priorities can hinder progress. Establishing effective communication channels and protocols is critical to ensuring that teams can share information and coordinate their efforts efficiently. BIM plays an essential role in facilitating these channels. Regular joint meetings are often necessary to keep all team members up-to-date on project developments and to promptly identify and address issues or conflicts. Joint BIM walkthrough meetings help streamline communication efforts and clarify complex details.

To achieve synergy, it is beneficial for both project teams to adopt a similar approach to BIM management. This ensures that all teams work toward the same objectives using common tools and protocols, reducing the risk of misunderstandings or conflicting priorities.

The Automated Carpark A (ACPA) and Automated Carpark B (ACPB)

projects, located nearby, have many interdependencies. During the design phase, information must be exchanged with other parties for use as reference or background data to aid coordination. Coordination should progress in parallel with design development, addressing both geometric (e.g., spatial) and non-geometric (e.g., performance) aspects. Delays in sharing information can create a ripple effect across the project, impacting teams that depend on it.

To address this issue, the "bridge" function of ACC enables seamless information exchange through folder automation between the 2 projects. For example, project ACPB can retrieve updated and coordinated models from the ACC hub (the CDE) of project ACPA, and vice versa. Once information is deemed suitable for release, authors upload it to the ACC hub in the agreed delivery file format, following processes defined in the project's information production method and procedures. The gateway information check process is then initiated, followed by a review by the discipline task owner (coordinators, engineers, and managers).



Automated Carpark B Driveway Entrance Rendering
Image Courtesy of Paul Y. - Chevalier Joint Venture

To ensure the timely submission of model deliverables, strict adherence to the BIM production schedule is maintained. The model undergoes a series of workflows where it is reviewed by project leaders who either accept or reject it. To maintain consistency and prevent multiple versions of the model and deliverables, the model is sourced from a single source and uploaded to the CDE. Effective workflow management ensures the smooth transfer of the model within the platform and assigns appropriate metadata to the information container. This process not only enhances efficiency but also ensures the accuracy and reliability of the final deliverables.



Automated Carpark A Transfer Cabinets Rendering
Image Courtesy of Paul Y. - CIMC - JEC Joint Venture



Automated Carpark A Lay-by Area Rendering
Image Courtesy of Paul Y. - CIMC - JEC Joint Venture

A Blend of Physical and Digital Worlds

We integrated AR technology with BIM models to enhance site audits, inspections, and installation processes. Quality checks using AR technology were successfully implemented for structural works, architectural features, and the routing of first-fix building services. By overlaying digital models onto the physical environment, construction teams could verify the accuracy of installed building elements in terms of size and location.

Using AR devices, construction workers viewed digital models of building

components in real-time and compared them directly to the physical installation. This innovative approach allowed for the swift identification and resolution of any discrepancies, significantly reducing the risk of errors and delays.

By leveraging BIM models for field installation and inspections, we enhanced both the accuracy and efficiency of the construction process. This methodology minimized the potential for costly mistakes and rework, ultimately contributing to the successful delivery of the project.

An Accurate Representation of Facility Assets

As-built verification is a crucial step in construction projects to ensure that the completed work aligns precisely with the original drawings. To achieve this, we have developed an innovative workflow comprising several key steps.

The process begins with the generation of construction drawings from BIM models. Augmented Reality (AR) is

then employed to monitor both the site works and BIM models in real-time. This enables us to identify any deviations from the design and make immediate adjustments as needed.

Additionally, we utilize laser scanning technology to capture precise measurements and images of the construction site. These scans are compiled into a comprehensive verification report, which is reviewed and signed off by the project manager before submission.

By adopting this workflow, we ensure the creation of an accurate as-built model that meets all employer requirements, delivering a facility representation that aligns with the highest standards of precision and reliability.

Managing Multiple Sources of Information

Managing multiple sources of information is inherently challenging, often leading to inconsistencies, errors, delays, and unnecessary rework. To overcome these issues, we implemented a Common Data Environment (CDE) to centralize and streamline the management of project information.

The CDE allows us to track the source and status of all project data, ensuring transparency and traceability. Additionally, we established clear protocols for uploading, reviewing, and approving information. These protocols have significantly improved the accuracy and consistency of project data, reducing the risk of miscommunication and enabling more efficient project execution.



Automated Carpark A Driver Waiting Area Rendering
Image Courtesy of Paul Y. - CIMC - JEC Joint Venture



Automated Carpark A Segregated Area Rendering
Image Courtesy of Paul Y. - CIMC - JEC Joint Venture

About Paul Y. - CIMC - JEC Joint Venture

The Paul Y. - CIMC - JEC Joint Venture (JV) combines the strengths of three leading firms to effectively manage the Automated Car Park A Phase 1 project. Paul Y. Construction Company, Limited, a renowned local main contractor, leads JV and overseeing the design, build, and operation stages of the project. Shenzhen CIMC Autoparking System Co., Ltd. serves as the designer and fabricator of the automated parking system, while Jardine Engineering Corporation contributes essential technical expertise for key car park operational systems. Their collaborative efforts during the design phase, particularly through the integration of BIM technology, enhance efficiency at each stage of the project. This initiative will provide vital parking and check-in facilities for passengers arriving at the Hong Kong-Macau-Zhuhai Bridge Hong Kong Port for freight transfer to other locations.

About Paul Y. - Chevalier Joint Venture

The Paul Y. - Chevalier Joint Venture (JV) brings together the expertise of these two firms to effectively manage the Automated Car Park B Phase 1 project. Paul Y. Construction Company, Limited, a renowned local main contractor, leads the JV, overseeing the design, build, and operation phases of the project. Chevalier (E&M Contracting) Limited contributes its specialized skills to the initiative. Their collaborative efforts during the design phase, particularly through the integration of BIM technology, enhance efficiency at each stage of the project. This initiative will provide vital parking and check-in facilities for passengers arriving at the Hong Kong-Macau-Zhuhai Bridge Hong Kong Port as tourists.

About Manly-Tech Engineering Limited

Manly-Tech Group of companies is a global BIM consultancy for all construction disciplines and MEP product distribution company headquartered in Hong Kong, having completed many successful BIM projects across a myriad of construction disciplines and building types around the globe - including Hong Kong, China, Southeast Asia, Australia, Europe, the Middle East and Africa. Our numerous awards include the 2023 Hong Kong Most Innovative Enterprise Award, the 2023 Most Innovative Greater Bay Area Award and the 2024 Hong Kong Most Valuable Company Award. We also supported our valued client in achieving The Excellent Building Award of HKIE in 2023.