Rebar Detailing Design for MiC Modules to Facilitate Digital Fabrication and Generate Rebar Bending Schedule

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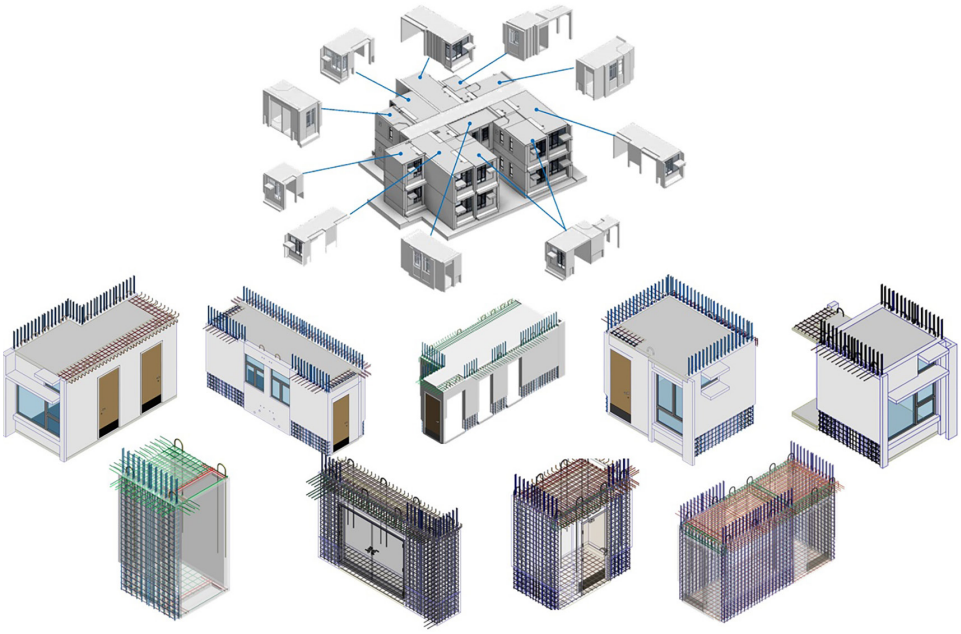
During Andrew's 3-year serving period for Dragages Hong Kong Limited, he utilized his extensive BIM management experience in setting up, nurturing, and supervising the project-specific BIM teams' daily operations, as well as designing and auditing the information exchange workflows, methods, and procedures across project stages in both building and mega infrastructure projects.

Andrew holds a Master of Science in Building Information Modelling Management and Integrated Project Delivery. He is the CIC-certified BIM Coordinator and a professional member of HKIBIM and HKICBIM. He is also a helper of the HKCA Young Members Society, aiming to promote BIM for future AEC industry pillars.

Introduction

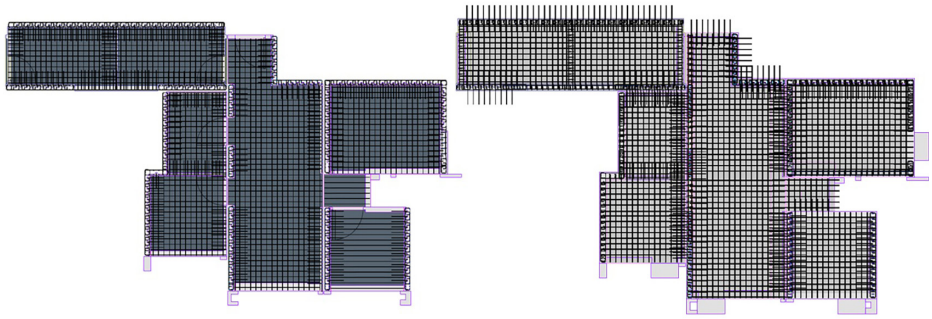
Dragages Hong Kong Limited (DHK) used Autodesk AEC Collection and Autodesk Construction Cloud in the design and construction of the Fire Station-cum-Ambulance Depot with Departmental Quarters and Facilities in Area 72, Tseung Kwan O (Contract No.: SS K506). The design and fabrication of the rebar arrangement of MiC modules were particularly challenging due to the complexity of rebar intersection amongst the interfacing MiC modules and between MiC modules and cast-in-situ elements. Given that few typical sections of rebar details were provided during tender stages, DHK design, methods, and BIM teams decided to prepare 3D geometrical MiC modules and interfacing cast-in-situ structural elements using Autodesk Revit for better visualizing the rebar connection details, identifying rebar clashes and eliminating unforeseen MiC installation interferences.



Individual MiC Modules' Rebar Modelling
Image Courtesy of Dragages Hong Kong Limited

Rebar Detailing

The rebar modeling process was better enhanced in terms of efficiency and proficiency after understanding the design intent from the structural engineers by deeply interpreting the notes, schedules, and other information relevant to rebar detailing, supplemented by Request for Information (RFI) for missing information and ambiguous situations. The BIM Manager was responsible for template configuration (rebar cover, general reinforcement settings, etc.) and parameters' and families' management, including sheet/view templates, rebar tagging, bar marks and numbering, partition and bar locations for paving the future needs of generating rebar detailing, methods and fabrication drawings. The 3D modeling know-how and DHK methods team's expectations were conveyed to BIM coordinators and modelers to facilitate modeling accuracy.

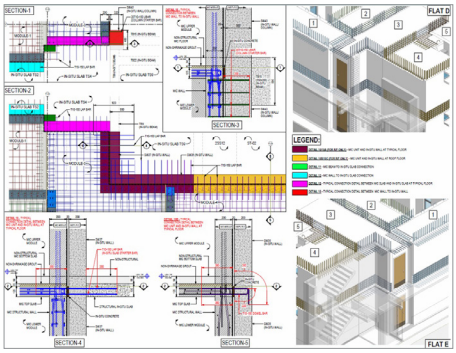


Rebar Intersections across MiC Modules
Image Courtesy of Dragages Hong Kong Limited

3D Rebar Visualization for Design and Construction Coordination

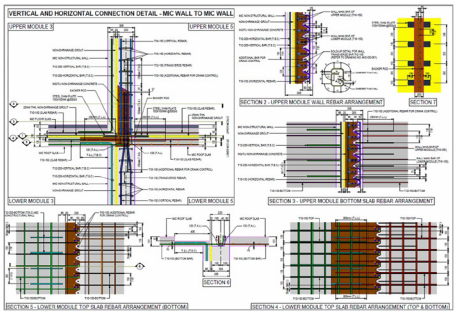
The individual MiC modules were virtually installed using the federated BIM model for design consultants, and the DHK methods team to optimize the design intent, as only reviewing plans, sections, and typical details was not sufficient for visualizing and decision marking. After subsequent BIM models' revisions, the DHK BIM team further generated rebar connection detail drawings with 3D models for stage approval.

Methods Drawings and Shop Drawings Production



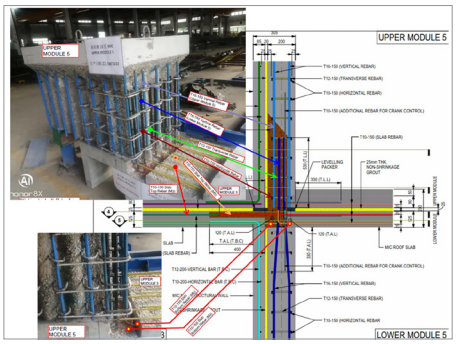
3D visualization of MiC Modules for Design and Construction Coordination
Image Courtesy of Dragages Hong Kong Limited

The rebar connection detail drawings were further developed into methods drawings, with the presentation styles preferred by the methods teams to prepare the methods statement to clearly explain the critical installation sequences to project stakeholders and future guidance for on-site construction workers to comply with.



BIM Methods Drawings for Vertical and Horizontal Connection Detailing
Image Courtesy of Dragages Hong Kong Limited

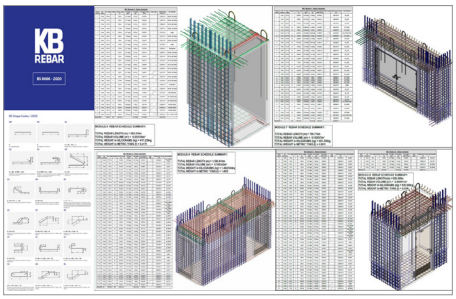
The DHK BIM team further produces individual MiC shop drawings for sub-contractors to fabricate on-site to ensure the quality of molding and concreting. Periodic communications with photos were adopted amongst project delivery teams to audit the MiC rebar arrangement and the BIM shop drawings for auditing the rebar arrangement.



MiC Modules' Shop Drawings for sub-contractor off-site Fabrication
Image Courtesy of Dragages Hong Kong Limited

Rebar Bending Schedule

From Quantity Surveyors' (QS) points of view, utilizing BIM for MiC modules' rebar quantity take-off would be ideal for a better cost-effective estimation. Besides assisting QS in estimating the weight of rebar required, the DHK BIM team further utilized the Revit Schedule to formulate rebar schedules using the confirmed data, including the cutting, bending, and placement of rebars. Complying with BS 8666-2000, the rebar bending schedule provided a detailed list of the size, shape code, and rebar-bending images for construction.



Rebar Bending Schedule and Quantity Take-Off for MiC Modules' Rebar Arrangement
Image Courtesy of Dragages Hong Kong Limited

Conclusion

Considering the captioned project is the first DHK MiC project with the Architectural Services Department (ASD), DHK pledges to fully utilize BIM for the design and fabrication of the MiC modules from project end to end, even the project team has encountered enormous technical challenges during the process. We believe being innovative is not only creating something wholly new and different. Instead, the corporate work culture is to preserve sustainable improvement by doing the things we do daily a little better. This Young BIMer of the Year Award is not considered an individual recognition but a massive compliment to the project team's efforts for the past year.

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