

COMPANY

CRBC-QH-REC-QTEC Joint Venture
 Binnies Hong Kong Limited
 Huadong Engineering (Shenzhen)
 Corporation Limited

PROJECT

The Phase 1 District Cooling System (DCS)
 At Kwu Tung North New Development Area
 (KTN NDA) Project

LOCATION

Kwu Tung North New Development Area

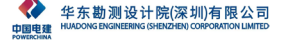
TYPE

District Cooling System

SCHEDULED TIME OF COMPLETION

2026

BIM Innovations in Intelligent Construction: DfMA and Energy Optimization for District Cooling Systems



“We are excited to embark on the Design-Build-Operate Contract for the Phase 1 District Cooling System at Kwu Tung North New Development Area. Collaborating with the Electrical and Mechanical Services Department (EMSD), we aim to leverage innovative BIM practices to enhance project efficiency and sustainability. Our dedicated team is committed to delivering this vital infrastructure within the targeted 27-month timeline, contributing to Hong Kong’s development and environmental goals.”

–WANG Yanhua
 Chairman and Managing Director,
 China Road and Bridge Corporation

–CHAN Chi Ming, Antonio
 Deputy Managing Director,
 REC Engineering Company Limited

–LO Kan Ip, Eric
 Director,
 Binnies Hong Kong Limited

–YUE Qinghua
 Chairman,
 Huadong Engineering (Shenzhen)
 Corporation Limited

BIM PARTNER
 Architectural Project Unit Limited

AUTODESK PRODUCTS USED
 Autodesk® 3ds Max®
 Autodesk® AutoCAD®
 Autodesk® Civil 3D®
 Autodesk® Construction Cloud
 Autodesk® Dynamo
 Autodesk® Navisworks®
 Autodesk® ReCap®
 Autodesk® Revit®
 COBie Extension for Revit
 Model Checker for Revit



Overall View of the Phase 1 District Cooling System at Kwu Tung North New Development Area
 Image Courtesy of CRBC-QH-REC-QTEC Joint Venture and Binnies Hong Kong Limited and Huadong Engineering (Shenzhen) Corporation Limited

Project Overview

The Kwu Tung North Phase 1 District Cooling System (DCS) project (Design-Build-Operate (DBO) Contract No. 2915EM21A) is a landmark initiative for the Kwu Tung North New Development Area (KTN NDA), commissioned by the Electrical and Mechanical Services Department (EMSD) of the Hong Kong SAR Government. The project is delivered under a Design-Build-Operate (DBO) contract by the CRBC-QH-REC-QTEC Joint Venture (JV), with Binnies Hong Kong Limited as the lead designer and Huadong Engineering (Shenzhen) Corporation Limited providing construction BIM consultancy support.

This state-of-the-art district cooling system provides a sustainable solution which will replace installation of chillers in individual buildings, to improve energy efficiency, and enhance urban livability by minimizing noise,

improving air quality and achieving carbon neutrality. Construction commenced in March 2024 with a 27-month program, featuring a chiller system using environmentally friendly refrigerants, freshwater cooling towers and an underground chilled water distribution network with efficient pumping systems.

BIM Adoption

BIM has been a cornerstone of this project, enabling innovation and collaboration across all stages.

The project demonstrates full BIM integration across the entire lifecycle, aligning with Construction Industry Council (CIC) BIM standards, EMSD BIM Asset Management (BIM-AM) framework, and client-specific requirements. Over 17 BIM uses have been implemented, including 3D design authoring, clash detection,

4D simulation, 5D cost estimation, 6D engineering analysis, and 7D asset management. A key success factor has been the seamless collaboration between the design team and the construction team, ensuring smooth BIM information flow in this fast-tracked DBO project. Advanced BIM applications, combined with AI, CFD, and intelligent construction technologies, have driven design optimization, enhanced energy efficiency and streamlined installation processes.

Common Data Environment Platform

The project leverages Autodesk Construction Cloud (ACC) as its Common Data Environment (CDE) which complies with ISO19650. The platform enables real-time multi-team collaboration on a single federated model, ensuring synchronized updates and efficient issue resolution. Robust metadata management, version control, and controlled access have significantly improved productivity and quality across all designers and construction teams.

3D Design Authoring

Using Autodesk Revit and other advanced BIM tools, the project teams produced high-quality models, coordinated drawings, enabling precise construction planning and accurate quantity take-offs. The synchronization offered by Autodesk Collaborate Pro also facilitated cross-discipline collaboration with over 50 BIM users, reducing design conflicts and accelerating approvals.

4D Simulation

The project successfully simulated critical construction sequences - including the engineering schedule, foundation design, temporary excavation works, MiC implementation, and MiMEP/DfMA installation. Through these processes, the team optimised logistic plan, refined the arrangement of mechanical systems, and resolved complex challenges, leading to significant time savings and a cost reduction.

5D Cost Estimation

Quantities generated from the BIM model are validated against the quantity surveyor's records, establishing a robust foundation for cost management. This process empowers the BIM team to deliver dynamic quantity insights that supporting accurate budgeting and efficient resource allocation.

6D Engineering Analysis

Integration of BIM with Computational Fluid Dynamics (CFD) enabled precise analysis of airflow, heat rejection, and cooling tower performance. The design BIM models were developed with various design options, which are used for CFD simulations for optimizing spatial layouts, cooling tower separation, roof arrangements, and decorative fin design, ensuring maximum thermal efficiency and compliance with environmental standards—well before physical implementation. This approach minimises trial-and-error in design, and also alterations during the construction.

7D Asset Management

The project follows EMSD's BIM-AM standard, which reflects concepts outlined in ISO 19650 for managing asset information requirement. A unique code field has been established to ensure consistency between component numbers across both the model and associated diagrams. This standardised coding system enhances traceability and supports efficient operation and maintenance. Asset codes and maintenance information are systematically recorded based on professional classifications and tailored to the operational needs of the DCS. This structured approach lays a solid foundation for the project's future operation and maintenance.

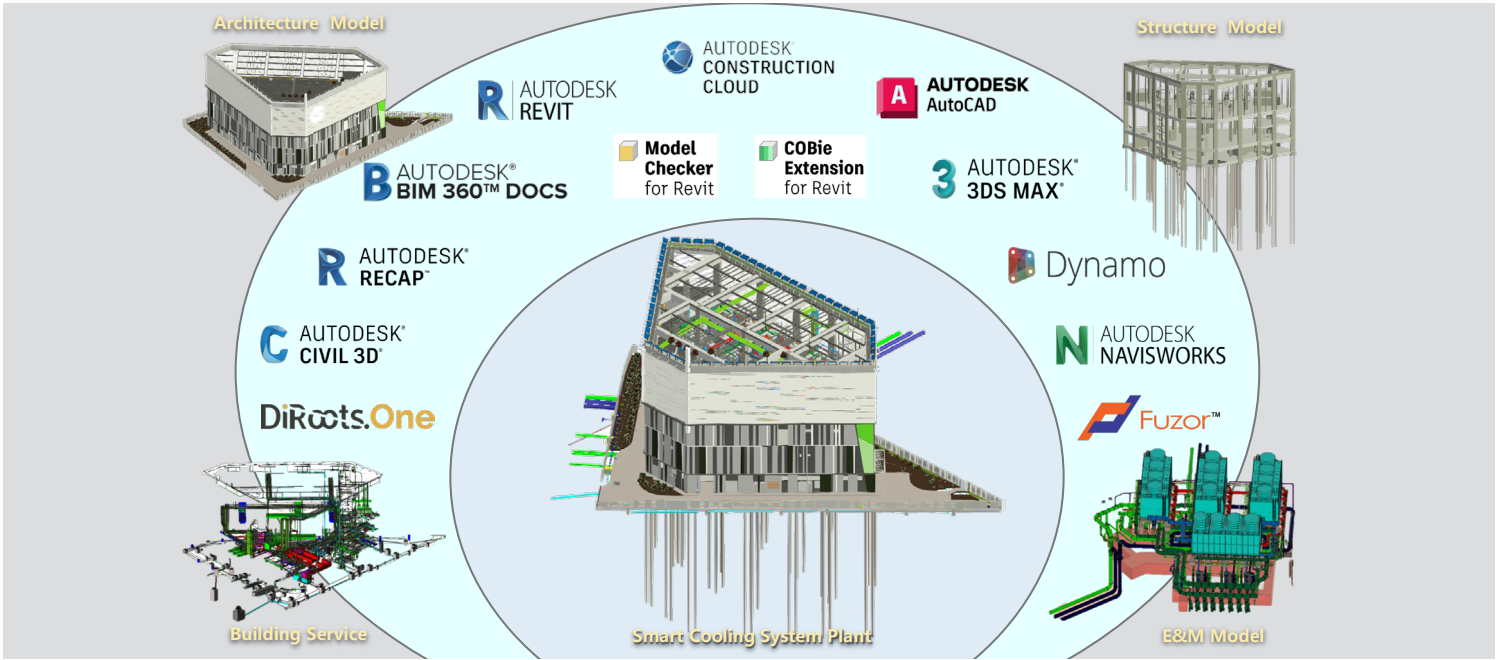
Intelligent Construction DfMA

The integration of BIM with Design for Manufacture and Assembly (DfMA), MiC and MiMEP has revolutionized the construction industry - particularly in the prefabrication of Mechanical, Electrical, and Plumbing (MEP) systems. This forward-thinking approach unfolds across four critical phases: Design, Fabrication, Transportation, and Installation. The BIM-driven prefabrication approach significantly reduced the installation time for pipework and equipment by 40%—from five months to three, saving approximately 600 man-days. Meanwhile, prefabrication elevates both quality and safety by shifting components production to controlled environments, where precision is higher and on-site risks are substantially reduced. The reduction of on-site welding achieves a 20% reduction in material waste and streamlines off-site assembly. As the industry continues to evolve, the synergy between BIM and DfMA will play a critical role in redefining construction practices and driving innovation across the built environment.

BIM + AI-Assist Energy Optimization

Integrating artificial intelligence (AI) into DCS plant control marks a transformative leap in energy optimization and operational efficiency. Traditional control methods typically depend on automated control with pre-defined logic and rules or manual control, making them inefficient under varying environmental and load conditions. In contrast, artificial intelligence leverages advanced machine learning algorithms to analyze real-time data – such as outdoor conditions, district-wise cooling demand, and equipment performance. By uncovering complex interdependencies among these variables, AI dynamically optimises chiller sequencing, water temperature settings, and variable speed drive of pumps and chillers to achieve maximum efficiency. AI systems also enhance predictive control by forecasting cooling demands and intelligently adjusting equipment operation pattern and mode, thereby reducing energy consumption while boosting energy efficiency. The BIM model and BIM-AM system provide a reliable data source for AI integration. The AI system will be integrated with the plant control system, i.e. District Cooling Instrumentation, Control and Communication System (DCICCS), to further enhance the data-driven decision making. DCS operators will receive real-time suggestions from the AI system and real-time visibility across multiple DCS sites and consumer DCS substations, enabling them to monitor performance, identify anomalies, and implement high performance strategies.

This project exemplifies how advanced BIM integration, intelligent construction, and AI-driven optimization are redefining sustainable urban infrastructure—setting a new benchmark for district cooling systems in Hong Kong and beyond.



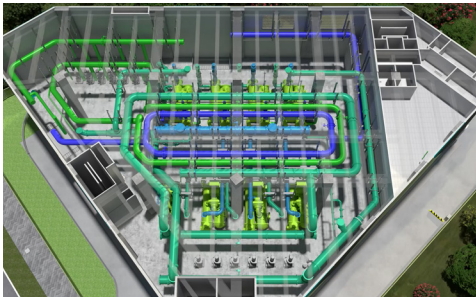
BIM Implementation Environment of the Phase 1 District Cooling System at Kwu Tung North New Development Area
Image Courtesy of CRBC-QH-REC-QTEC Joint Venture and Binnies Hong Kong Limited and Huadong Engineering (Shenzhen) Corporation Limited



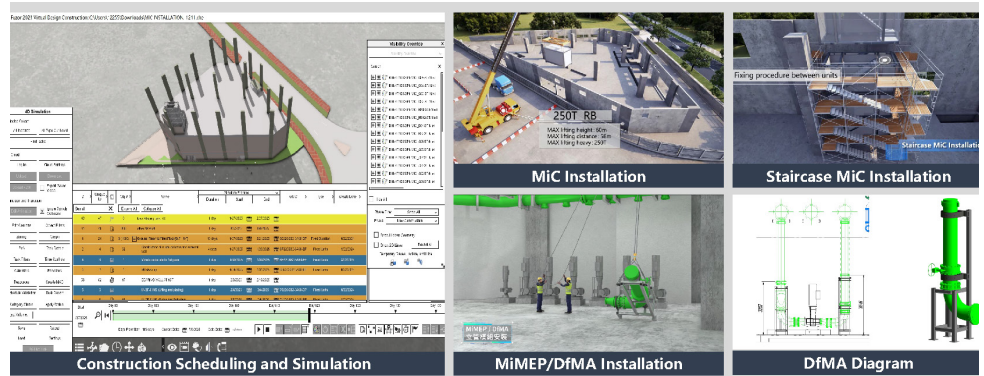
3D BIM Simulation of DCS Plant
Image Courtesy of CRBC-QH-REC-QTEC Joint Venture and Binnies Hong Kong Limited and Huadong Engineering (Shenzhen) Corporation Limited



Entrance of the Phase 1 District Cooling System at Kwu Tung North
Image Courtesy of CRBC-QH-REC-QTEC Joint Venture and Binnies Hong Kong Limited and Huadong Engineering (Shenzhen) Corporation Limited



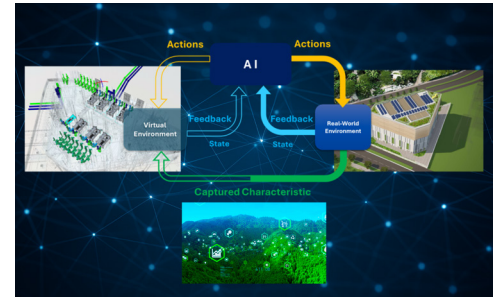
Design for DfMA
Image Courtesy of CRBC-QH-REC-QTEC Joint Venture and Binnies Hong Kong Limited and Huadong Engineering (Shenzhen) Corporation Limited



4D Phase Planning and Method Statement Simulation
Image Courtesy of CRBC-QH-REC-QTEC Joint Venture and Binnies Hong Kong Limited and Huadong Engineering (Shenzhen) Corporation Limited



Installation Simulation for DfMA
Image Courtesy of CRBC-QH-REC-QTEC Joint Venture and Binnies Hong Kong Limited and Huadong Engineering (Shenzhen) Corporation Limited



AI Workflow
Image Courtesy of CRBC-QH-REC-QTEC Joint Venture and Binnies Hong Kong Limited and Huadong Engineering (Shenzhen) Corporation Limited