

COMPANY

Water Supplies Department, HKSAR Government
China Road and Bridge Corporation
Digie Engineering Technology Pte. Ltd.

PROJECT

Construction of Siu Ho Wan Water Treatment Works Extension and Siu Ho Wan Raw Water Booster Pumping Station

LOCATION

North Lantau

TYPE

Water Treatment Works

SCHEDULED TIME OF COMPLETION

2025

Full-cycle 2D-7D BIM and Digitalization Implementation in Smart Water Treatment Plant

“Water Supplies Department has adopted Building Information Modelling (BIM) technology in the project of Construction of Siu Ho Wan Water Treatment Works Extension and Siu Ho Wan Raw Water Booster Pumping Station. Having a common goal to utilize BIM for digital project delivery, we integrate data across disciplines throughout the entire project lifecycle in a shared cloud-based common data environment. The data will be also transferred to asset management system for future operation and maintenance of the water treatment plant.”

— **Autonio Chan**

Chief Engineer/Consultants Management,
Water Supplies Department, HKSAR

— **Wang Yanhua**

Chairman and Managing Director, China
Road and Bridge Corporation

— **Yue Qing Hua**

Chairman, Digie Engineering Technology
Pte. Ltd.

BIM PARTNERS

Binnies Hong Kong Limited
Chevalier (Envirotech) Ltd.

AUTODESK PRODUCTS USED

Autodesk® 3ds Max®

Autodesk® Architecture, Engineering & Construction Collection

Autodesk® AutoCAD®

Autodesk® BIM360® Docs

Autodesk® Civil 3D®

Autodesk® Dynamo

Autodesk® Fabrication®

Autodesk® Navisworks®

Autodesk® ReCap®

Autodesk® Rendering

Autodesk® Revit®

COBie Extension for Revit

Model Checker for Revit

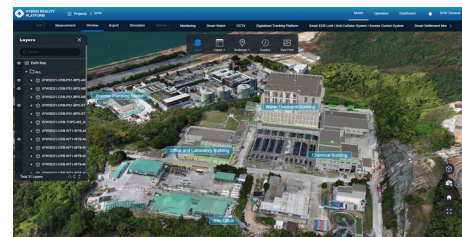


Works Completion Renderings of SHWWTW Extension Works
Image Courtesy of Water Supplies Department, HKSAR Government and China Road and Bridge Corporation and Digie Engineering Technology Pte. Ltd.

The Siu Ho Wan Water Treatment Works SHW WTW is a key part of the permanent water supply system for the Hong Kong International Airport, residential development projects in Tai Ho and Tung Chung, Discovery Bay, Hong Kong Disneyland Resort and port development projects in northern Lantau Island. Given the importance of the water treatment works in the water supply deployment, in terms of design, the Siu Ho Wan Water Treatment Works has two raw water sources, one main source and one backup source. The main source is the Tai Lam Chung Reservoir. Raw water is transported from here to the water treatment works through a submarine/onshore water pipe which is about 9 kilometers long with a diameter of 1800 millimeters. The backup water source is the Shek Pik Reservoir, where the water is transported to the plant through a 7-kilometer-long tunnel and a pumping station.



Water Supply of SHW WTW
Image Courtesy of Water Supplies Department, HKSAR Government and China Road and Bridge Corporation and Digie Engineering Technology Pte. Ltd.



Hybrid Reality Centralized Management Platform
Image Courtesy of Water Supplies Department, HKSAR Government and China Road and Bridge Corporation and Digie Engineering Technology Pte. Ltd.

The Siu Ho Wan Water Treatment Works has been in operation since 1996 with a designed water filtration capacity of 150,000 cubic meters per day. With the planned development projects in North Lantau, including the three-runway system of the Hong Kong International Airport and the expansion of Tung Chung New Town, it is anticipated that the existing Siu Ho Wan water treatment plant will be insufficient to meet the future water demand in North Lantau in 2028. The ongoing extension works of the plant will increase the treatment capacity of the Siu Ho Wan Water Treatment Plant from the current 150,000 cubic meters per day to 300,000 cubic meters per day, and correspondingly increase the water transmission volume of the above two raw water supply systems.

BIM Adoption

The project has integrated BIM with innovation and technology throughout the entire project lifecycle. This includes applying ISO-19650-1 & ISO-19650-2 International BIM Standard, and Central Intelligent Information Platform. The extensive use of BIM including 2D Design, 3D Coordination, 4D Simulation, 5D Quantity Take-off, 6D Engineering Analysis and 7D Asset Management and DfMA, MiMEP, MR technology, Reality Platform has the potential to transform and improve performance by reducing inefficiencies, increasing productivity and fostering greater collaboration among project stakeholders.

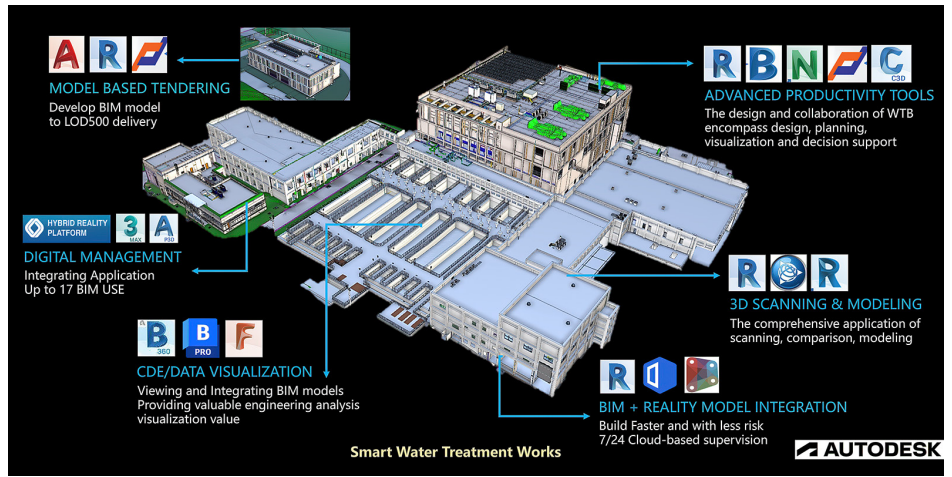


Image Courtesy of Water Supplies Department, HKSAR Government and China Road and Bridge Corporation and Digie Engineering Technology Pte. Ltd. Project 7/WSD/21 Digital Delivery

Full Cycle

By full-cycle utilizing the BIM technology-BIM visualization, coordination, and simulation, the integration of PIM models allows for effective pre-construction simulations. Digitalization facilitates the more precise approach to the design, construction and operation management of Water Treatment Works, enhancing the overall managing quality throughout the project lifecycle.

The application of BIM technology ensures all stakeholders are promptly informed about the progress, enabling timely 3D coordination and efficient organization and instruction to address the project issues. It greatly improves

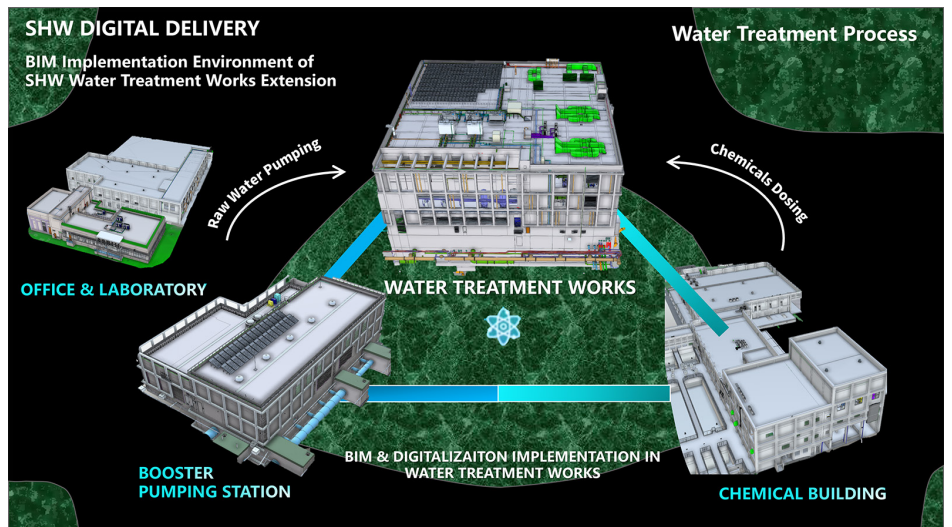
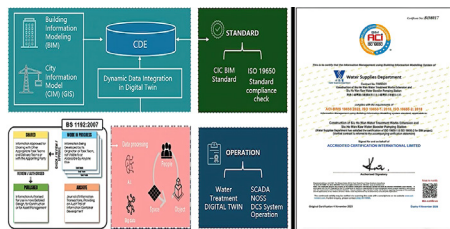


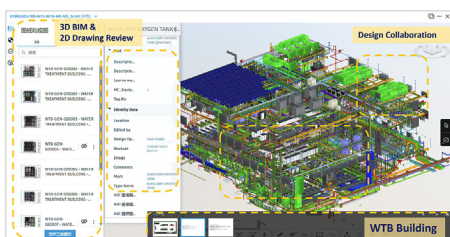
Image Courtesy of Water Supplies Department, HKSAR Government and China Road and Bridge Corporation and Digie Engineering Technology Pte. Ltd. Project 7/WSD/21 Digital Delivery



ISO-19650 International BIM Standard Procedure and Project ISO Certificate
Image Courtesy of Water Supplies Department, HKSAR Government and China Road and Bridge Corporation and Digie Engineering Technology Pte. Ltd.



New Water Treatment Works Building
Image Courtesy of Water Supplies Department, HKSAR Government and China Road and Bridge Corporation and Digie Engineering Technology Pte. Ltd.



Common Data Environment (CDE)
Image Courtesy of Water Supplies Department, HKSAR Government and China Road and Bridge Corporation and Digie Engineering Technology Pte. Ltd.

collaborative efforts among all parties involved, resulting in a significant enhancement in project quality.

Central Intelligent Information Platform BIM + GIS + IoT

The integrated platform visualizes the project's current status and future scenarios, enabling stakeholders to preview the completed project using BIM technology before construction begins. The platform integrates Project Management Dashboard including RFI status, monthly accident status, and overall progress display screen for digitalization management.

SCADA system can collect data, enabling proactive maintenance and immediate response. IoT devices can be installed in Water Treatment Works to monitor various parameters such as water quality, flow rates, and equipment performance in real-time. It provides quick response to any anomalies allowing for remote monitoring and control of WTW equipments.

BIM Use 3D Design

In the complex MEP design of water treatment plants, Revit 3D forward design has significantly benefited the project. The design team works

in a 3D space within a Common Data Environment (CDE), swiftly receiving feedback from relevant parties. This enables immediate updates to the BIM cloud model, optimizing design outcomes and improving efficiency.

4D Phase Planning

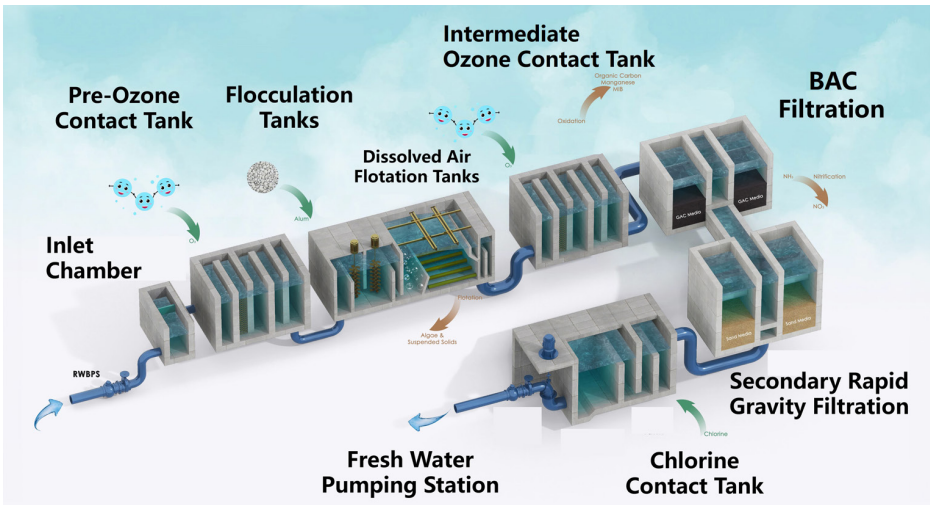
This project includes over 40 specialized construction method statement, such as excavation, MiMEP hoisting, the relocation of outdoor pipelines, etc. Through 4D simulation rehearsals, the BIM team optimizes spatial pathways and clarifies vehicle logistics on-site, effectively supporting the implementation of construction activities.

DfMA & MiMEP

Fully adopting DfMA & MiMEP prefabricated modules aids incost reduction, quality improvement, efficiency enhancement, and better collaboration.

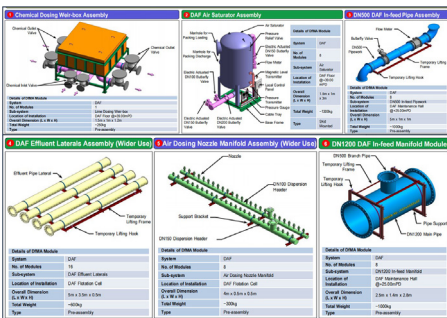
5D Quantity Take-off (QTO)

Through applying BIM 5D QTO in the project, time and cost are integrated into the BIM modeling process, which enables accurate estimates, effective budget management, and optimized resource



Water Treatment Process

Image Courtesy of Water Supplies Department, HKSAR Government and China Road and Bridge Corporation and Digie Engineering Technology Pte. Ltd.



Pre-fabricated MEP Element

Image Courtesy of Water Supplies Department, HKSAR Government and China Road and Bridge Corporation and Digie Engineering Technology Pte. Ltd.



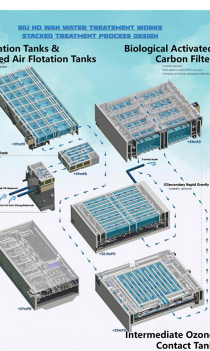
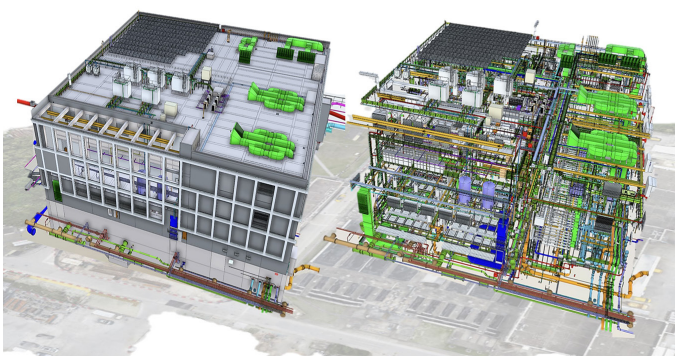
MIMEP of Lime Saturator and Lime Dross Recovery Tank

Image Courtesy of Water Supplies Department, HKSAR Government and China Road and Bridge Corporation and Digie Engineering Technology Pte. Ltd.

allocation. It enhances collaboration among stakeholders and improves decision-making, thus reducing financial risks.

6D Engineering Analysis

This analysis identifies possible alternatives to improve energy efficiency



MEP 3D Design BIM Environment

Image Courtesy of Water Supplies Department, HKSAR Government and China Road and Bridge Corporation and Digie Engineering Technology Pte. Ltd.

realizing Digital Twin. The digital twin platform is able to simulate the entire water treatment process, from the raw water booster pumping station to the final treated water outlet, considering factors such as equipment characteristics, hydraulic behavior, chemical reactions and operational procedures to achieve comprehensive examination. It provides value in simulating the operating principles and daily workload of the water treatment works. It offers training for the operating team, reducing risks and ensuring adequate preparation for their duty, thereby helping optimizing the operational management of the water treatment works.

WSD's Vision in BIM:

BIM enhances the design, construction and project management, and enables all stakeholders to visualise what is to be built in a simulated 3D environment to identify any potential design clashes, construction or operational issues via an efficient digital working platform for relevant modelling works and data sharing.



DFMA & MiMEP Transportation and Installation
Image Courtesy of Water Supplies Department, HKSAR Government and China Road and Bridge Corporation and Digie Engineering Technology Pte. Ltd.

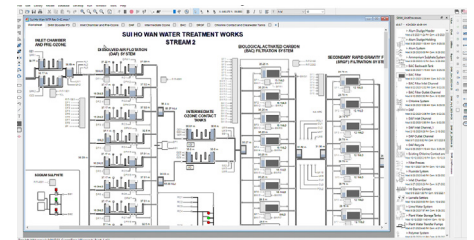
and improve lighting, as well as analyzing the possibilities of incorporating other more efficient forms of renewable energy, such as the use of daylight.

7D Asset Management - NOSS System

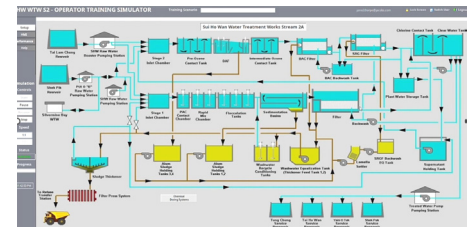
The NOSS integrated digital representation of the operation of this project provides historical and current operational behavior of the facilities and carries out predictive analysis in near real-time manner.

Digital Twin

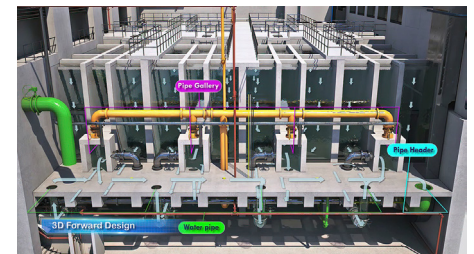
SHW WTW Extension Works utilizes BIM and digital twin technology. The BIM team input asset codes for a great amount of civil and MEP components in Revit and export COBie spreadsheets. This data is converted through the Asset System to meet the operational requirements. The NOSS System integrates assets, enabling visibility of BIM asset data on the platform and



Near-real-time Operation Simulation System (NOSS) Dashboard
Image Courtesy of Water Supplies Department, HKSAR Government and China Road and Bridge Corporation and Digie Engineering Technology Pte. Ltd.



Operator Training Simulator of SHW WTW Phase 2
Image Courtesy of Water Supplies Department, HKSAR Government and China Road and Bridge Corporation and Digie Engineering Technology Pte. Ltd.



Water Treatment Process Visualization and 3D Design
Image Courtesy of Water Supplies Department, HKSAR Government and China Road and Bridge Corporation and Digie Engineering Technology Pte. Ltd.



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About Water Supplies Department, HKSAR Government

Reliable and quality water supplies are indispensable to the lives and livelihoods of the people in Hong Kong, and are critical for supporting the territory's sustainable development. The Water Supplies Department (WSD) of the HKSAR Government is charged with the responsibility of maintaining reliable and quality water supplies. From the past to the present, WSD's management has made unremitting efforts in sustaining innovations and inspiring technological prowess for the enhancement of water usage, designs and applications in building Hong Kong into a water-smart city.

About China Road and Bridge Corporation

China Road and Bridge Corporation (referred to as "CRBC") was established in 1979 in the People's Republic of China. In 2005, CRBC was restructured and became a wholly-owned subsidiary of China Communications Construction Company Limited (referred to as "CCCC"). CRBC mainly undertakes contracting, investment, development and operation of projects, such as road, bridge, port, railway, airport, tunnel, real estate, and industrial park. With branches and offices in nearly 60 countries and regions in Asia, Africa, Europe and America, CRBC has developed an efficient global business market network. CRBC has started its construction business in Hong Kong since 1988 and then expanded its business to Macau in 2002. With its strong presence in both regions, CRBC has successfully completed over 100 major infrastructure projects and undertaken a number of infrastructure investment projects in Hong Kong and Macau. CRBC is committed to developing into a global outstanding enterprise group, being ethical, operation excellent, respected by the public, and popular in the capital market.

About Digie Engineering Technology Pte. Ltd.

Digie Engineering Technology Pte. Ltd. is a wholly-owned subsidiary of Powerchina Huadong Engineering Corporation Limited in Singapore since 2020, specializing in information, digital and intelligent technology services for the international engineering industry, providing customers with professional engineering digital solutions. Powerchina Huadong Engineering Corporation Limited (HDEC) was established in 1954. It is an international engineering company involved in Hydropower & Renewable Energy, Urban & Rural Construction, Ecology & Environment, as well as unique Digital Innovations tailored to meet the clients' requirements and exceed their expectations.

