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Advancing Infrastructure



Roaming at The Crossroad

Project Summary

Organization

CCCC Water Transportation Consultants Co., Ltd.

Solution

Digital Cities

Location

Baodi District, Tianjin, China

Project Objectives

- To implement BIM processes, coordinate multidiscipline teams, and deliver a digital twin of the new digital city.
- To integrate ContextCapture to produce a reality mesh from UAV terrain on-site data.

Products Used

ContextCapture, LumenRT[™], MicroStation[®], Navigator[™], OpenBridge Modeler[®], OpenRoads[™], ProjectWise[®], ProStructures[™]

Fast Facts

- The Zhong-Guan-Cun Science and Technology City project will require approximately 2 million cubic meters of excavation for the road works.
- The CNY 2.2 billion project includes designing and constructing roads, utility pipelines, and a 174,000-square-meter park, encompassing a total area of 477,000 square meters.
- CCCC created a BIM project management platform to help digital assets to construct the digital city.

ROI

- A digital twin of the city improved efficiency, increased design and construction quality, and shortened the construction period by 64 days.
- CCCC's BIM construction management platform helped save CNY 6.6 million in material costs.
- By using BIM technology, CCCC estimates savings between CNY 60 and 80 million to deliver this new digital city.

CCCC Water Transportation Implements BIM Processes to Establish New Digital City

Bentley Software Helps Project Team Create Digital Twin, Saving Substantial Costs

BIM Processes Implemented to Deliver Digital City

CCCC Water Transportation Consultants Co., Ltd. is ranked 91st on the Fortune 500 listing of top companies and is third on the ENR top design firms. The engineering, procurement, and construction (EPC) contractor specializes in real estate development, urban complex planning, and offshore heavy industry and port machinery manufacturing. CCCC was selected to provide project consulting services on the new Zhong-Guan-Cun Science and Technology City.

Located in the Golden Triangle development zone of the Beijing-Tianjin-Tangshan region, the CNY 2.2 billion project includes designing and constructing roads, utility pipelines, a 174,000-square-meter park, encompassing a total area of 477,000 square meters. On this project, the company was responsible for creating a BIM project management platform in the design, construction, and operation and maintenance phases, building digital assets to construct the digital city.

CCCC implemented a collaborative BIM process to coordinate the many engineering disciplines working on this project. With so many disciplines involved, project data was difficult to coordinate across the multiple teams. CCCC also had to overcome the project's vast geographical span, wide construction area, complicated underground pipe network, and a relatively tight construction timeframe.

To resolve these issues, CCCC created a 3D collaborative design platform, which has improved communication efficiency. Bentley's innovative design solutions enabled the firm to create and curate a digital twin of the site. The digital twin helped the team monitor progress and ensure quality and safety in the construction stage, as well as improve the level of refined management. Forming digital assets created conditions for building digital parks and cities based on asset management of the BIM technology during the operation and maintenance phase.

BIM Methodology Standardizes Software Applications

Establishing a BIM process allowed the project team to standardize the software applications so that they could be

easily used across the multidiscipline design team. Early in the project, the work environment – including the work space, unit library, cross-section templates and drawing templates – were consolidated to eliminate errors. CCCC increased project efficiencies further by adopting Bentley's ProjectWise collaboration system, which streamlined the storage of project information and the workflow to standardize the process management.

The team built a multidiscipline BIM model that included roads, bridges, tunnels, pipelines, and traffic engineering. Based on this model, the design team created vivid visualizations that could be shared with the project stakeholders for review and approval. Moreover, the project team used Bentley software to simulate vehicle sight distances, lighting, night scenes, and landscape layouts, allowing engineers to optimize their proposals.

During the design stage, the team used MicroStation CONNECT Edition and other Bentley technology to create multidiscipline BIM models. For example, MicroStation was used to create models for traffic engineering and electric lighting. The project team used OpenRoads Designer to create the road engineering model, OpenBridge Modeler for the bridge and culvert structural engineering model, and ProStructures to reinforce the bridge and culvert engineering structural model. Using the subsurface utilities design and analysis capabilities in Bentley civil design software, the team constructed models for rainwater, sewage, and water supply networks to complete integrated models of the underground pipelines.

Once the team created the models for each discipline, it performed reference nesting to carry out model assembly. The team then assembled the BIM models established by each discipline to form a complete BIM model. During the construction phase, the digital model and project data information were imported into the BIM project management platform through secondary development methods to continue the BIM methodology in the construction and operation and maintenance phases.

“Using Bentley software, we realize the integrated BIM application in the construction of the project. The highly efficient collaboration and highly integrated sharing of information resulted in all project participants expressing our design ideas directly and efficiently at the same time.”

*– Zhiqiang Lu,
Deputy Chief Engineer,
CCCC Water Transportation
Consultants Co., Ltd.*

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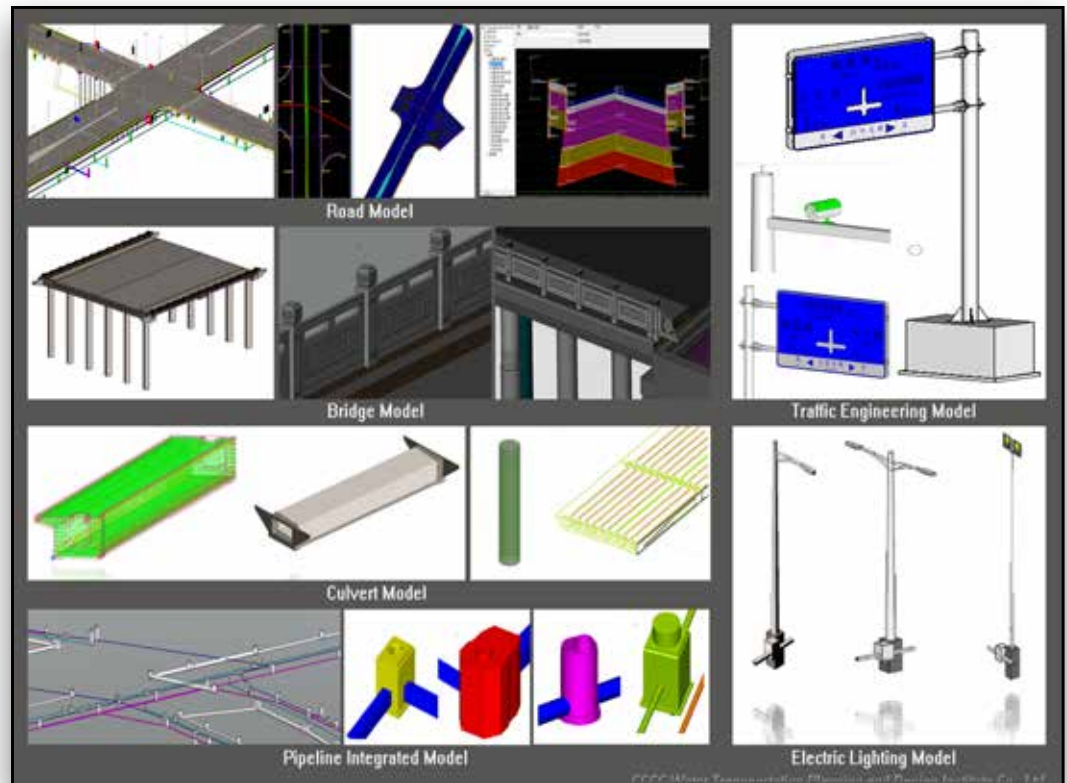
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Increased Efficiency, Design, and Construction Quality Saves 64 Days

Using innovated technology, CCCC generated a comprehensive 3D model of the entire city, which improved efficiency, increased design and construction quality, and shortened the construction period by 64 days. The software’s collaborative design and construction management platform and visualization capabilities reduced the time spent on communication and coordination among project participants by 15 percent. The 3D modeling environment also allowed the project team to integrate multidiscipline designs to detect and resolve more than 200 clashes, eliminating rework.

Through the project’s BIM construction management platform, the project team improved on-site refinement management and strengthened process management to save CNY 6.6 million in material costs. Lastly, the 3D live-action modeling of the project is realized using unmanned aerial oblique photography technology integrated with ContextCapture™, Bentley’s reality modeling software. Through this analysis, the project team obtained terrain and engineering data on site and allocated an earthwork plan, saving CNY 40 million in freight costs. By applying innovative BIM technology, CCCC estimates that it will save between CNY 60 and 80 million to deliver this new digital city.



CCCC used Bentley applications to create a BIM project management platform to generate the digital city.