Bentley
Advancing Infrastructure

CASE STUDY

WISDRI Delivers a New Roadway, Accelerating Development of Wuhan New Town

Using Bentley Technology Improved Design Efficiencies by 25%, Lowered Costs by CNY 60 Million, and Eliminated 25 Days of Construction

IMPROVED CONNECTIVITY SUPPORTS NEW URBAN DEVELOPMENT

Situated midway between Wuhan, Ezhou, Huanggang, and Huangshi, Wuhan New Town aims to relieve population density in central Wuhan. Its strategic location presents distinct geographic advantages and abundant natural and human resources, stimulating urban growth and technological innovation, laying a solid foundation for emerging industries. To accelerate development of the new planned town, WISDRI Engineering & Research was retained as the general contractor for the Gaoxin 4th Road project. This comprehensive roadway transformation and reconstruction initiative will improve road capacity by 42% and reduce traffic congestion by 38%, enhancing connectivity between the two areas.

Spanning 12.5 kilometers in length, the new corridor features eight lanes in both directions, as well as an auxiliary road with four lanes in both directions. The construction works simultaneously included an underground utility tunnel and three river-crossing bridges. "After the completion of the road, it will become the gateway connecting the main city of Wuhan and Wuhan New Town, helping Wuhan New Town to accelerate its construction into a world-class scientific and technological innovation and an emerging industrial highland, which has great strategic significance for the future development of Wuhan New Town," explained Jianlei Yu, BIM manager at WISDRI.

SITE CONSTRAINTS, COORDINATION, AND STRICT QUALITY STANDARDS

Delivering Gaoxin 4th Road presented many challenges for WISDRI, ranging from a constrained, congested project site to multiple disciplines and stakeholders. The team needed to collaborate efficiently across multiple disciplines to overcome these challenges and deliver a design that reflected the project's high standards. The reconstruction necessitated 2.1 million cubic meters of earthworks in a limited construction space with complicated underground pipelines, while considering significant above-ground traffic and existing infrastructure. "The designer needed to complete the project on the premise of ensuring uninterrupted traffic and the safety of existing structures," said Yu. With many businesses and dwelling units in the area, the project required collaborating and communicating with community, subway, utilities, and urban management organizations and agencies, as well as with the multiple project disciplines.

Furthermore, as a key access project in Wuhan, WISDRI had to comply with strict design and construction quality requirements. "As an EPC general contracting project, it required a high degree of design refinement, one-time construction, and cost control," said Yu. WISDRI realized that neither traditional 2D design nor single-discipline 3D design were capable of accurately conveying design intent, efficiently communicating and coordinating with the multiple parties, and timely meeting the high construction standards. To optimize delivery of the Gaoxin 4th Road, they needed an integrated design, construction, and project management technology solution.

ESTABLISHING A CONNECTED DIGITAL ECOSYSTEM

WISDRI turned to Bentley applications to establish a connected digital ecosystem, eliminating the information gap of traditional data transmission. The team was able to facilitate collaborative workflows to improve design efficiency and optimize construction. "Bentley software helped us realize the refined design of roads, bridges, structures, and

PROJECT SUMMARY

ORGANIZATION
WISDRI Engineering & Research Incorporation Limited

SOLUTION
Roads and Highways

LOCATION
Wuhan, Hebei, China

PROJECT OBJECTIVES
- To deliver a new roadway improving connectivity and accelerating development for Wuhan New Town.
- To establish a digital twin for intelligent maintenance, operations, and lifecycle management.

PROJECT PLAYBOOK
Bentley LumenRT™, iTwin® Capture, MicroStation®, OpenBridge®, OpenBuildings®, OpenRoads™, ProjectWise®, ProStructures™, SYNCHRO™

FAST FACTS
- Gaoxin 4th Road will accelerate development of Wuhan New Town into a world-class scientific and technological innovation center.
- The 12.5-kilometer, 16-lane roadway features an auxiliary road with four lanes in both directions, three bridges, a utility tunnel, and 2.1 million cubic meters of earthworks.
- WISDRI relied on ProjectWise and Bentley's Open™ applications to establish a connected digital ecosystem and digital twin.

ROI
- Going digital improved design efficiencies by 25% and saved CNY 60 million in costs.
- Working in Bentley's connected digital design and construction management platform reduced the construction period by 25 days.
- Bentley's applications enabled WISDRI to deliver a sustainable, low-carbon roadway, reducing annual carbon emissions by 3,500 tons.

> "With the help of [the] Bentley platform, we realized the digitalization of the whole stage of the design, procurement, and construction of the project, improving the efficiency and quality of the implementation of the project. At the same time, Bentley's digital achievements also helped us to expand more digital applications, making it possible for the digital management of the whole lifecycle of the project."
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> *– Haojun Zhang, Chief Engineer, WISDRI City Construction Engineering & Research Incorporation Ltd.*

electrical, as well as fully convey the design intent," said Yu. "The design results met the requirements of construction depth, which comprehensively guided on-site construction," he added. They used ProjectWise to quickly share project data among the team and stakeholders. They also deployed iTwin and Bentley's Open applications to create high-precision 3D models, refining all aspects of the project. Integrating Bentley LumenRT enabled them to overcome the limitations of 2D design, realizing 3D visual renderings to virtually demonstrate the design intent and results.

For construction management, WISDRI used SYNCHRO to perform 4D simulation, link the model with the project schedule, extract material quantities directly from the models, and facilitate remote access to the on-site crew to verify and adjust on-site works according to the model. "We directly recorded the road construction information and existing problems on the model, and the team remotely checked the construction situation according to the construction information in the model. They then accurately adjusted the design and construction according to the problems," said Yu. With the digital twin, they expanded the project's digital design and construction technology, introducing monitoring devices to develop smart maintenance and operations practices to realize full lifecycle digitalization.

LIFECYCLE DIGITALIZATION DRIVES SAVINGS AND SUSTAINABILITY

By using Bentley's integrated applications, WISDRI improved the quality and efficiency of design and construction, shortened the construction period by 25 days, and achieved considerable economic savings, as well as reduced the project's carbon footprint. Working in a collaborative design environment, the team performed clash detection, identifying and avoiding 1,087 errors to save CNY 13 million in costs and eliminating 25 days of construction. The solution improved standardization by 60% and ensured design and construction accuracy, reducing material loss and earthworks quantities. "With the help of the engineering quantity statistics function of Bentley 3D design, we can control the engineering quantity in real time, realize the quota design of the whole process, and optimize the project budget by over CNY 60 million, greatly reducing the project cost," explained Yu.

Through collaborative 3D digital design and construction management, WISDRI delivered a long-life composite pavement roadway that does not need structural maintenance, which will reduce carbon emissions by over 3,500 tons every year. By shortening the construction period alone, they reduced water consumption by 8% and energy consumption by 6%. The BIM model serves as the foundation for their digital twin for intelligent operations and maintenance management. "One model from the beginning to the end fundamentally solved the problem of information fault between various stages of the project lifecycle and the systems of disciplines, and comprehensively improved the information level of the project design, construction, and operation and maintenance management stages," concluded Yu.

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