

Inspiring Civil Construction Projects Rely on MicroStation

Leading civil design and construction organizations around the world rely on MicroStation as a mission-critical technology to deliver some of the most inspiring civil infrastructure projects. Construction firms use MicroStation to accelerate civil construction project delivery with better integration of design and construction information made possible by MicroStation's extensive interoperability, supporting all of the file formats and data types used on road, rail, site, and bridge projects. They also

use MicroStation to prevent misinterpretation and miscommunication of construction tasks through the application's integrated construction modeling, documentation, visualization, and reporting capabilities. And, construction firms achieve all this with software that provides a better long-term return on investment, and a more cost-effective path to advance into BIM workflows. The following challenging civil construction projects illustrate the impact MicroStation has made on their outcomes.



Leighton Asia

Hong Kong Boundary Crossing Facilities, Hong Kong-Zhuhai-Macao Bridge
Hong Kong

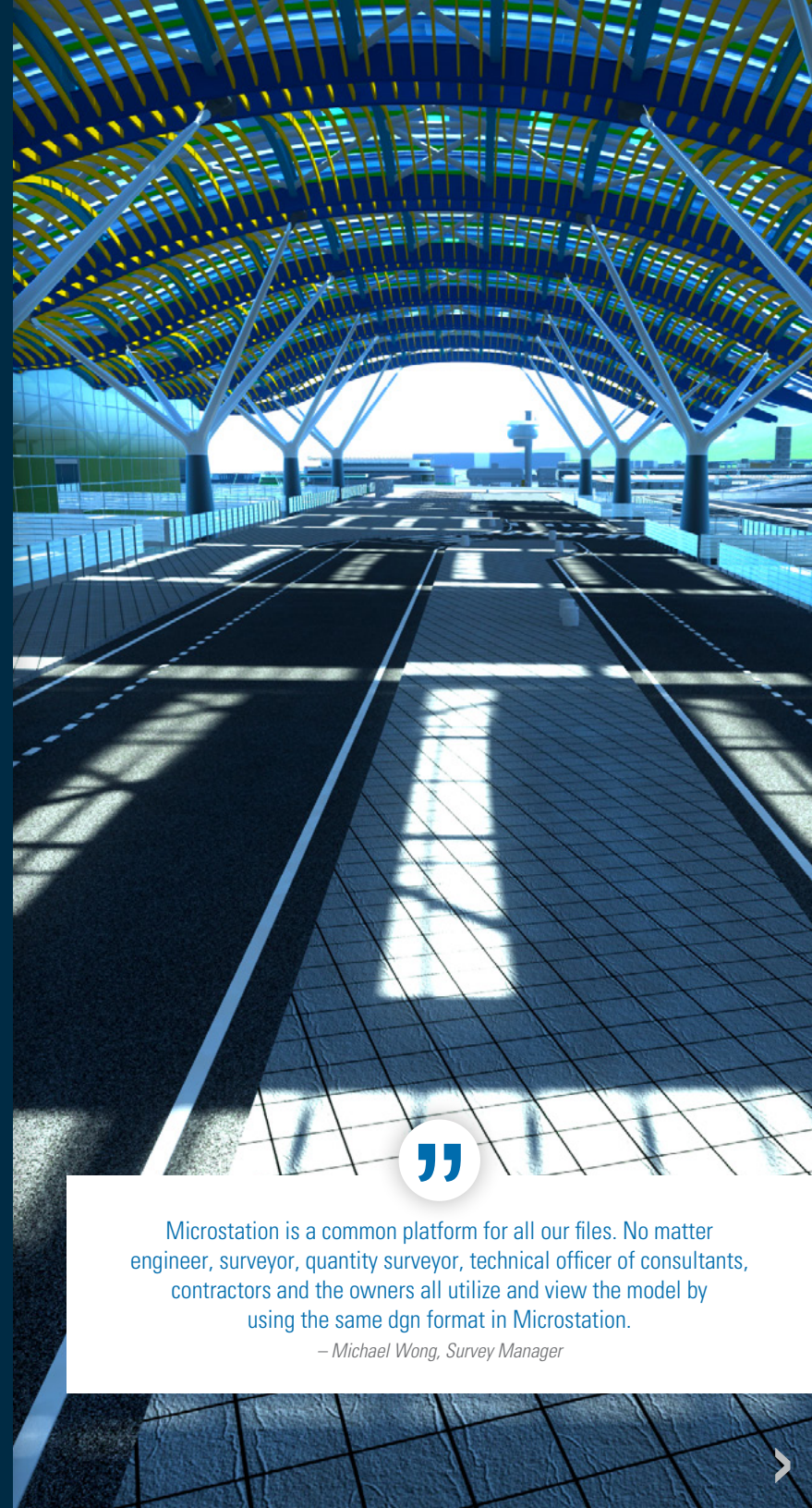
The new Hong Kong-Zhuhai-Macao Bridge is a 50-kilometer link that comprises a series of bridges and tunnels that will connect the three cities. Vehicles traveling to and from Hong Kong will leave and enter on a 130-hectare island that is being reclaimed to the east of Chek Lap Kok. A 40,000-square-meter, 30-meter-high passenger clearance building will accommodate vehicles passing through customs and immigration and become a distinctive entry point to Hong Kong. The Leighton-Chun Wo Joint Venture is responsible for constructing the passenger clearance building, drop off deck/area footbridges, and district cooling system for the Hong Kong Boundary Crossing Facilities.

The project scope includes bored pile foundations, reinforced concrete structures, profiled steel roof, curtain walling and glazing, architectural finishes, and mechanical and electrical work. Leighton-Chun Wo used MicroStation and OpenRoads to create a common platform to collaborate on all structures and to keep all project information. Leighton Asia used a BIM methodology and co-constructed a BIM model with the survey department for contractor works. The project team identified clashes before the construction stage using MicroStation, saving about 12 percent of the budget. Leveraging the accuracy of MicroStation, the survey department created a georeferenced BIM model that was used for survey checking. Later, the BIM model was exported to an iModel format for senior management to view and compare during site visits. LumenRT was also used to illustrate construction progress to the government and public.

In addition, the team used ProjectWise to share project information among disciplines, including 2D drawings and other data that different departments can import and export. The process facilitated effective communications among project stakeholders, detected and resolved problems in advance, and reduced miscommunication and redo works to achieve a cost-effective result. As well as MicroStation, Leighton-Chun Wo used Pointools and Descartes to compare the BIM model and the point cloud of the as-built structures to resolve problems in advance, saving 15 percent on the survey budget.

Project Playbook: AECOSim Building Designer, LumenRT, ContextCapture, Descartes, MicroStation, Navigator, OpenRoads, ProjectWise

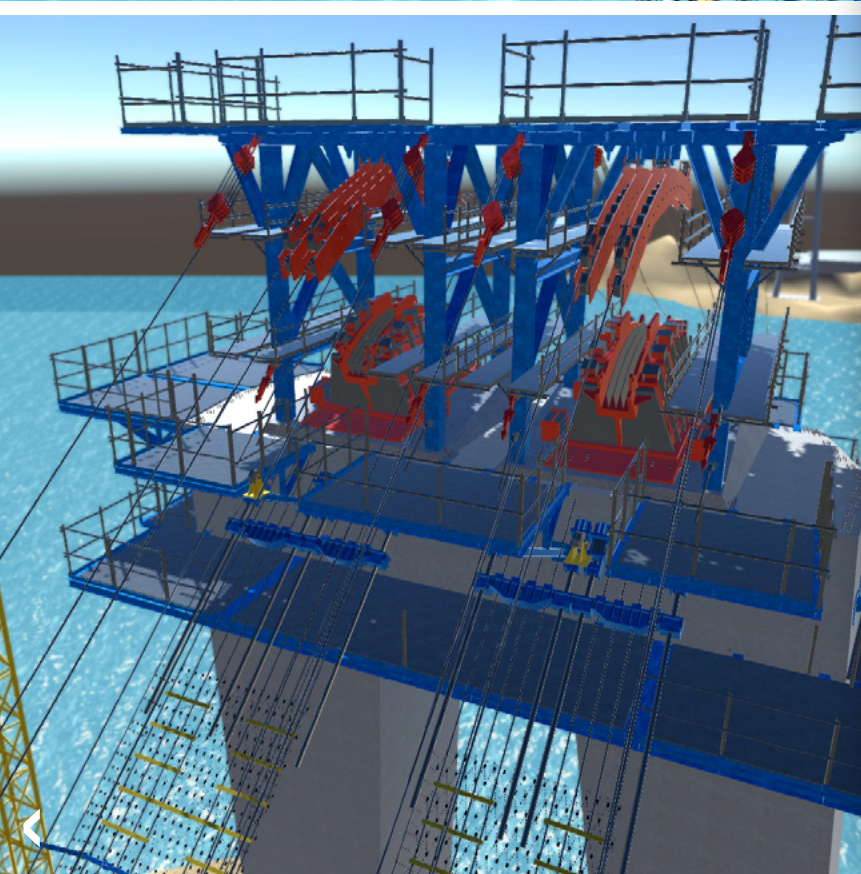
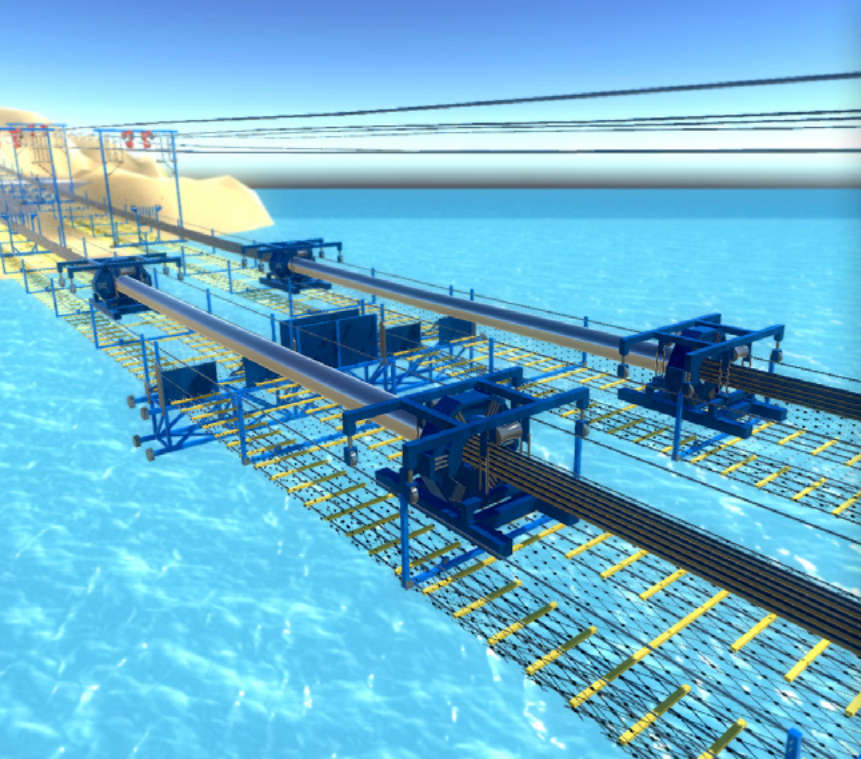
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Microstation is a common platform for all our files. No matter engineer, surveyor, quantity surveyor, technical officer of consultants, contractors and the owners all utilize and view the model by using the same dgn format in Microstation.

— Michael Wong, Survey Manager



Taesung SNI

The Second Namhae Bridge-Suspension Bridge Model
Namhae-gun, Gyeongsangnam-do, South Korea

This large-scale, KRW 180 billion project is the first suspension bridge of its kind with eight main towers leaning at about 8 degrees, creating a 3D image with suspension bridge cables. The atypical structure of the bridge proved to be difficult to model with the software that the project originally used. However, Taesung SNI adopted MicroStation and was able to produce the atypical model in a short amount of time. Using the MicroStation model, Taesung SNI identified interferences among the construction materials, which they could not identify with 2D CAD drawings, and excluded them in advance. After completing the bends, a cable wire installation was reflected in advance to adjust the position of the installation.

Since MicroStation is not available for worksites in Korea, there were limits to how the 3D model could be used. To get around this issue and utilize the information in the model on-site, the project team converted the model and exported it as a 3D PDF. "MicroStation has distinct features that makes it different from other products," said Sunghoon-Kim, CEO, Taesung SNI. "We planned to use MicroStation from the beginning of the project. Had we used another vendor's product, we would not have completed the project on time."

Each cable comprising the suspension bridge had as many as 10 stages of construction sequences. Part of the structure in the previous stage did not change, but for the new structure a new model was applied to convert each stage and the configured model into 3D PDF, which made it easy to use the layer to create the desired construction stage. Thus, the time required to issue a 2D drawing and receive a 3D model on-site was drastically reduced.

Project Playbook: MicroStation

Alabama Department of Transportation

Birmingham, AL I-59/I-20 Corridor Project
Birmingham, Alabama, United States

The Alabama Department of Transportation (ALDOT) initiated the reconstruction of the I-20/I-59 interchange located in the Birmingham Central Business District (CBD). The existing bridges, constructed in the 1970s, extend from just east of the I-20/I-59 and I-65 interchange to US 31. The I-20/I-59 interchange is the only east-west interstate through the Birmingham CBD and is primarily an elevated six-lane divided highway (three lanes in each direction) with minimal inside and outside shoulder widths through the 3.5-mile area. The twin bridges include 189 spans that require new girders and deck sections. The project objectives included replacing structurally deficient and functionally obsolete interstate bridges through downtown Birmingham. The expected outcomes are improved structures that meet the vehicular demands of the state's busiest corridor and provide improved aesthetics, noise abatement, and access management in Birmingham's CBD.

At USD 750 million, the I-20/I-59 corridor is the largest construction project in Alabama. ALDOT's visualization group was tasked with providing a complete 3D model for building information modeling (BIM) for visualizations, design checks, construction analysis, clash detection, right-of-way negotiations, lawsuits, and aesthetics. Model accuracy was key to providing construction bidders a more accurate cost estimate and lower bids. The design team created the digital terrain models in OpenRoads and refined it into a detailed 3D model in MicroStation CONNECT Edition. The complete 3D model was converted to a LumenRT LiveCube to allow the public, stakeholders, and various agencies see the progress. Using MicroStation's clash detection capability, ALDOT could provide more than a thousand clash reports. The reports were evaluated and addressed during the design, which saved over USD 10 million. Because of the vast amount of information that was exchanged among the project team, ALDOT used Bentley's ProjectWise document sharing and collaboration system. This information included where underground utilities were located. Using ProjectWise, the ALDOT team expects to save hundreds of hours reviewing documents, which avoided lengthy processes and maintained the 14-month schedule.

Project Playbook: Descartes, LumenRT, MicroStation, OpenRoads, ProjectWise

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MicroStation's clash detection tool was the most effective technology used in this project. The reports allowed designers to fix costly construction/design issues before the project was ever let.

— Matt Taylor, state visualization engineer with ALDOT



About Bentley Systems

Bentley Systems is a global leader in providing engineers, architects, geospatial professionals, constructors, and owner-operators with comprehensive software solutions for advancing the design, construction, and operations of infrastructure. Bentley users leverage information mobility across disciplines and throughout the infrastructure lifecycle to deliver better-performing projects and assets. Bentley solutions encompass MicroStation applications for information modeling, ProjectWise collaboration services to deliver integrated projects, and AssetWise operations services to achieve intelligent infrastructure – complemented by comprehensive managed services offered through customized Success Plans.

Founded in 1984, Bentley has more than 3,500 colleagues in over 50 countries, and is on track to surpass an annual revenue run rate of \$700 million during 2018. Since 2012, Bentley has invested more than \$1 billion in research, development, and acquisitions.

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