

MICROSTATION

Powering Transportation

Explore Global Case Studies
in Innovative Design and Engineering

Transportation agencies and engineering firms around the world trust MicroStation

There is a growing challenge for transportation agencies to build, maintain, monitor, and repair roads, bridges, railways, and other infrastructure efficiently and cost-effectively. This is no easy feat with increases in project costs, a limited workforce, and condensed project timelines.

Transportation agencies and engineering firms are struggling to:

- Deliver high-quality drawings, models, and construction-ready deliverables that meet project standards on time and on budget.
- Integrate various file formats and consolidate multiple applications' outputs into a single deliverable format.
- Collaborate across team members and projects in a connected environment.

To overcome these challenges, organizations are turning to innovative purpose-built technology solutions for help. Draftsmen, CAD (computer-aided design) managers, and civil engineers worldwide trust MicroStation to produce high-quality drawings and 3D models, serve as a data integration tool, and provide construction-ready deliverables for their transportation projects every day.



The majority of U.S. departments of transportation, the Federal Highway Authority, national transportation agencies around the world, and civil engineering firms choose Bentley's MicroStation and integrated civil solutions so they can:

- Access and share data regardless of file format without data conversions. Users can incorporate legacy client data and a variety of natively supported file formats, like DWG, SHP, point cloud data, and more, so workflows are accelerated.
- Incorporate multiple disciplines and easily integrate models, drawings, documents, and data from other sources to significantly improve the design process by eliminating errors prior to construction.
- Scale to meet the needs of all projects—large or small. Its robust modeling capabilities allow users to rapidly model projects of any scale and complexity while confidently maintaining design intent.
- Design within real-world context by integrating representations of existing conditions into designs to generate accurate 3D models. Leverage raster images, point clouds, reality meshes, GIS, and more.
- Develop complex models more easily with a comprehensive set of mesh, solid, surface, and feature modeling tools, so users can more easily develop demanding civil engineering designs.
- Output designs as plan sets or 3D videos—and everything in between—in one application.



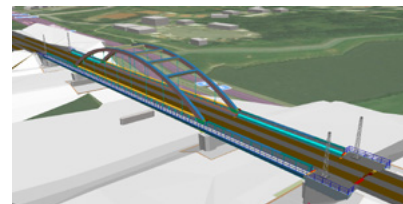
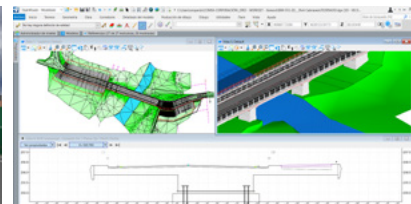
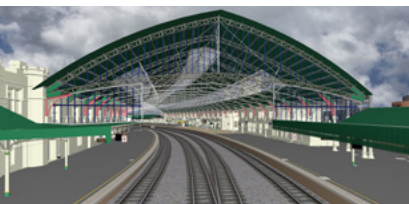
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I-90 — Snoqualmie Pass East

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
WASHINGTON, UNITED STATES

Washington State Department of Transportation (WSDOT) initiated a USD 551 million project to improve the 15-mile section of I-90 just east of Snoqualmie Pass in Washington State, where increasing traffic and avalanche control closures have caused congestion. They are adding one lane in each direction, realigning the roadway, stabilizing major rock cuts, constructing avalanche bridges, and making other improvements to meet safety and growing capacity requirements. In addition to designing the road improvements, WSDOT needed to visually communicate the environmental impact of the project to decision makers and the public.

The design team used OpenRoads to produce 3D models and complete the civil engineering road design. The visualization team then used MicroStation's visualization capabilities to produce a realistic fly-through/drive-through animation covering 7 miles of I-90 and about 75 square miles of surrounding forested terrain. Using MicroStation's traffic animation tools, WSDOT easily added realism. And, with the software's populate tool, they were able to add over 23,000 three-dimensional trees alongside the roadway to simulate the forested terrain.

MicroStation's ability to render animations using multiple computers greatly reduced the total rendering time. On one workstation, each frame would have taken about seven minutes, for a total of 42 days per rendering pass. Using a 14-unit server render farm, the job took three days per pass. As a result, MicroStation's process controller for distributed rendering saved 35 days in rendering time.



“Bentley’s innovations in visualization, such as MicroStation’s civil visualization tools, allow us to create amazingly realistic visualizations, which help to clearly and effectively communicate our project to decision makers and the public.”

— Ron Jones, Visualization Specialist, WSDOT-
Visual Engineering Resource Group (VERG)

The Pergenova Viaduct

ITALFERR S.P.A., GENOA, ITALY

After a bridge collapse in northern Italy, Italferr S.p.A. was tasked with designing a new viaduct. The structure would be a pivotal point for not only the city and county's transportation, but a part of a key roadway that links Italy and France and is a main access point to a nearby airport. The project team was required to use the same footprint as the original structure, measuring almost 1,200 meters in length and consisting of 19 steel-concrete spans. The EUR 202 million project also needed to follow an extremely tight schedule.

Italferr S.p.A. implemented a BIM model along with Bentley's connected data environment based on ProjectWise. The project team used MicroStation and Bentley's civil applications to create digital models of the terrain, roads, civil works, and mechanical and electrical systems. Bentley applications helped reduce design costs and improve collaboration due to faster decision-making, more accurate calculations, and better management of revisions.

[Read more of the story >](#)



“The BIM methodology used in this project follows the digital twin approach. The visibility and insight it enabled allowed us to significantly change the way in which we deal with the design and management of infrastructure work.”

— Daniela Aprea, BIM Manager, Italferr S.p.A.

Hong Kong Boundary Crossing Facilities

LEIGHTON-CHUN WO JOINT VENTURE, HONG KONG

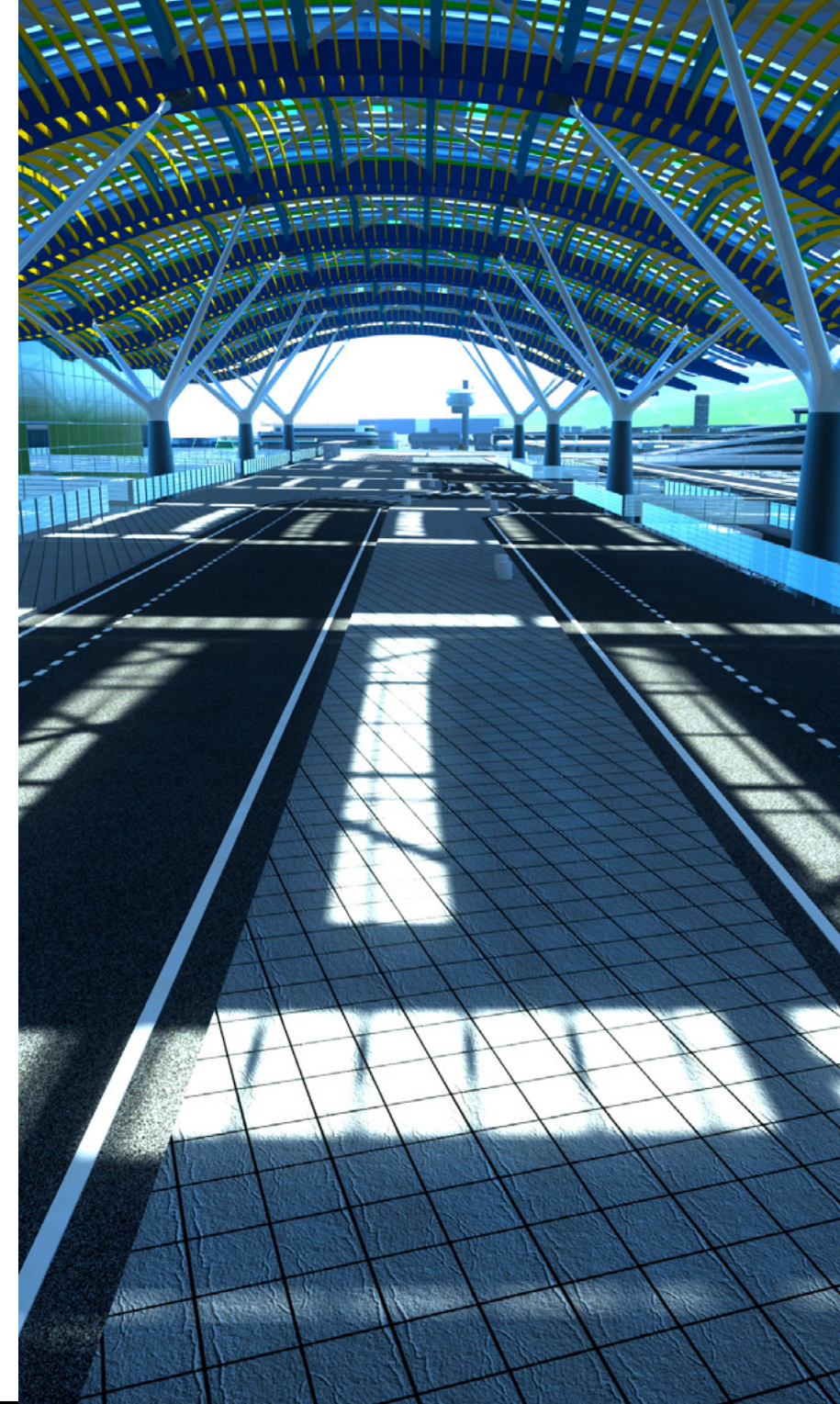
The new Hong Kong-Zhuhai-Macao Bridge is a 50-kilometer link that comprises a series of bridges and tunnels that connects the three cities. Vehicles traveling to and from Hong Kong will leave and enter via a 130-hectare island that is being reclaimed to the east of Chek Lap Kok. A 40,000-square-meter, 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, the drop-off deck/area footbridges, and a district cooling system for the Hong Kong Boundary Crossing Facilities.

The project scope includes bored pile foundations, reinforced concrete structures, a 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 manage all project information. They used a BIM methodology and co-constructed a BIM model with the survey department for contractor work. 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. Leighton-Chun Wo identified clashes before the construction stage using MicroStation, saving about 12 percent of the budget.

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“MicroStation is a common platform for all our files. No matter whether it is an engineer, surveyor, contractor, or owner-operator, we all use and view the model with the same DGN format in MicroStation.”

— Michael Wong, Survey Manager

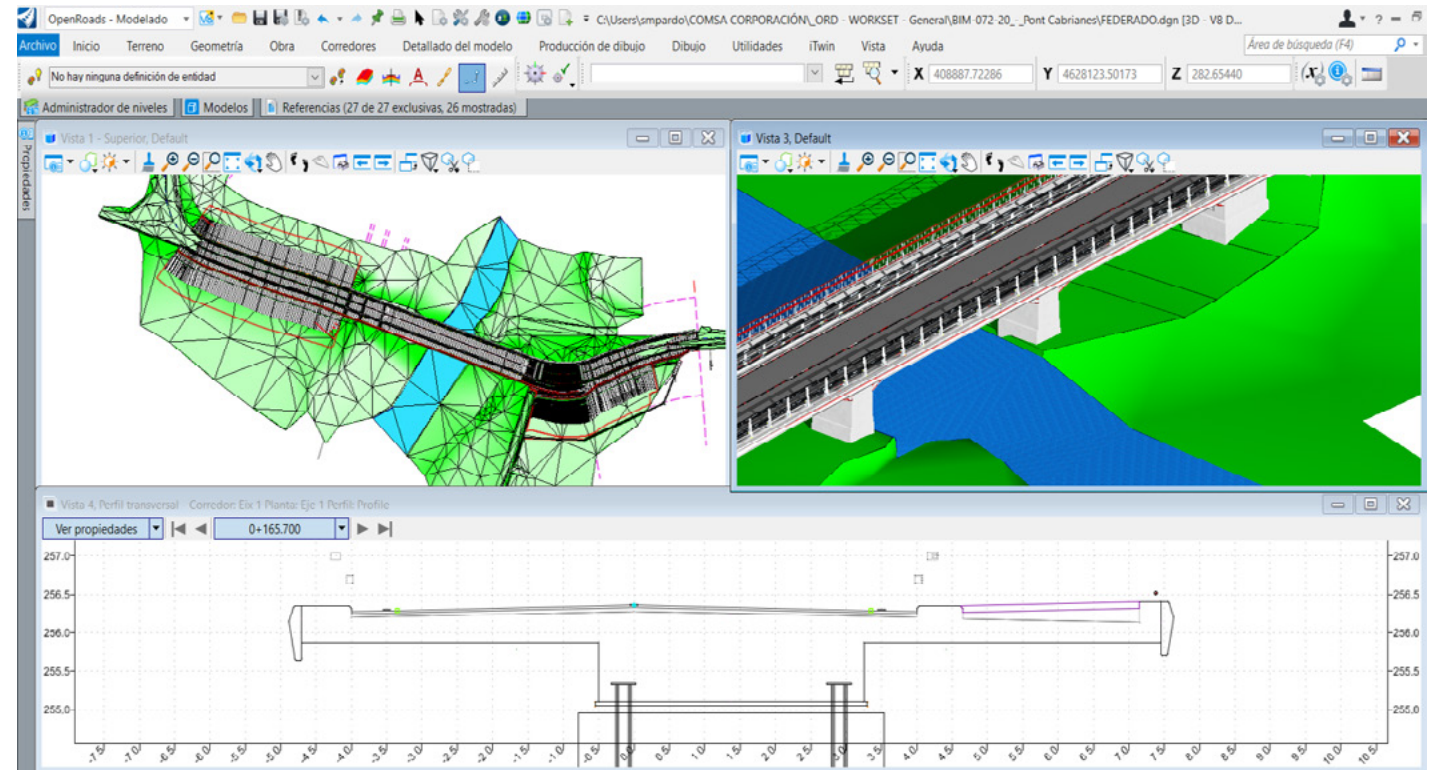


Bridge over the Llobregat River

COMSA SAU, CABRIANES, SPAIN

A EUR 2.4 million project involved renovating the century-old bridge over the Llobregat River and its access roads in Cabrianes, Barcelona. The bridge features various existing elements that required integration with newly renovated components. During the initial project phase, the bridge had not been modeled, making it difficult for engineers and the construction team to visualize and fully understand the design intent and construction plans. Comsa SAU was hired to implement collaborative BIM processes for the entire project. They needed integrated 3D modeling technology to streamline workflows and make the model accessible to the entire multidisciplinary team.

Comsa selected MicroStation, OpenRoads, and OpenBuildings to establish a collaborative 3D modeling environment, helping model different geological and structural elements and link them into an integrated BIM model. Using Bentley's applications, Comsa identified errors prior to on-site construction. The integrated digital solution facilitated better project understanding and optimized construction monitoring. The 3D model will be used for continued asset maintenance and management.



"With this complex infrastructure, working with 3D models enabled us to compare layers, structural elements, manholes, etc. If there were problems, they were spotted quickly. The model improves execution and acts as an "informer."

— Santiago Martinex Pardo
Surveyor and BIM Modeler of Linear Infrastructure

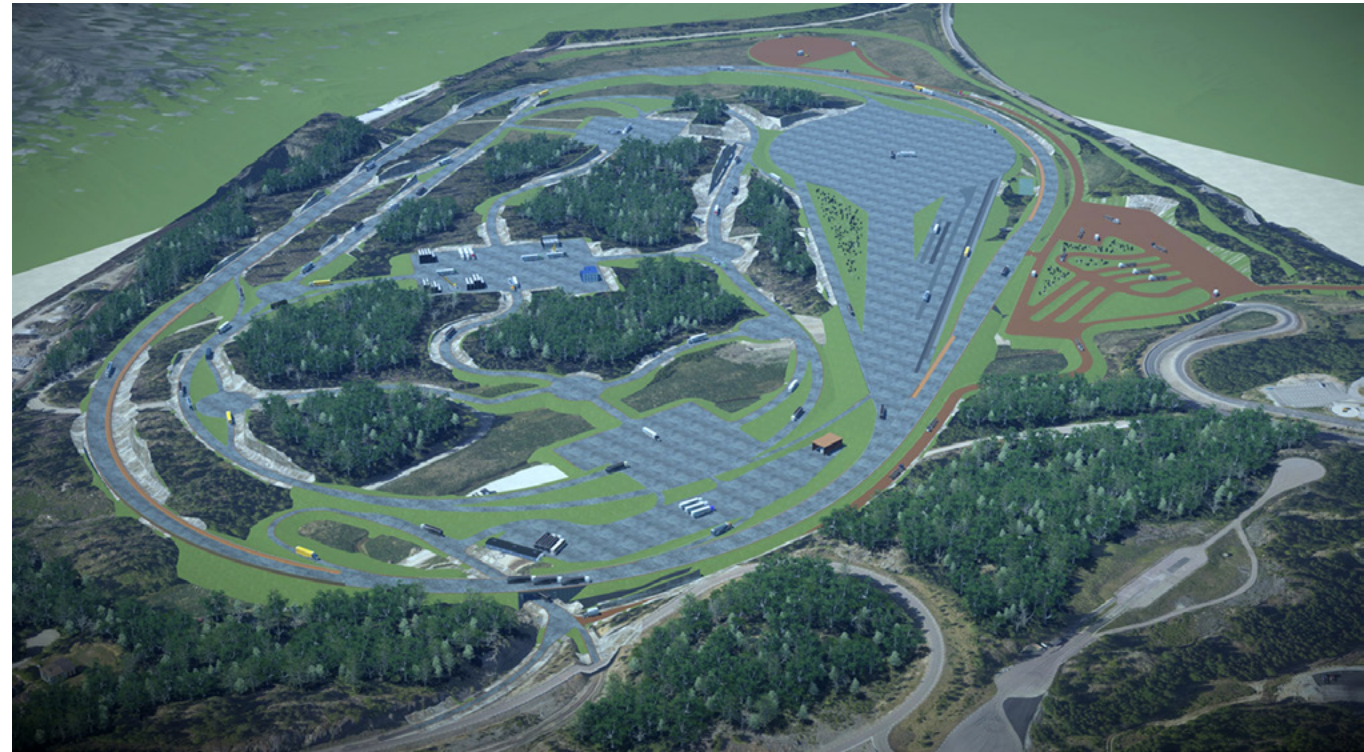
New Test Track for Autonomous and Electrified Vehicles

AFRY, STOCKHOLM, SWEDEN

AFRY was selected by commercial vehicle manufacturer SCANIA to design a new test track to test and drive electric and autonomous technology for heavy vehicles. The test track included 19 kilometers of roads with more than 60 intersections and junctions; complex, hilly ground conditions made the layout difficult. Since changing any single element would impact numerous others, AFRY needed a flexible, accessible design environment.

They determined Bentley applications could model the track while ensuring tight change management and constructability. AFRY used the applications to produce accurate 3D models enriched with product data as well as to verify the impact of design on the environment and calculate the amount of earthwork required. The ability to produce dynamic relationships between models reduced modeling time by 30%, and automated drawing production saved 30 resource hours. The applications helped AFRY detect and remove errors in the design stage, saving millions of Swedish crowns in rework and helping them take the lead in developing sustainable transport solutions.

[Watch the customer video >](#)



“Bentley software provided AFRY team with a collaborative and interoperable design environment. Engineering ideas were relatively easily introduced to the 3D data rich models and verified against multiple constraints and then communicated to the project stakeholders with eye-catching visualizations. Design is fun.”

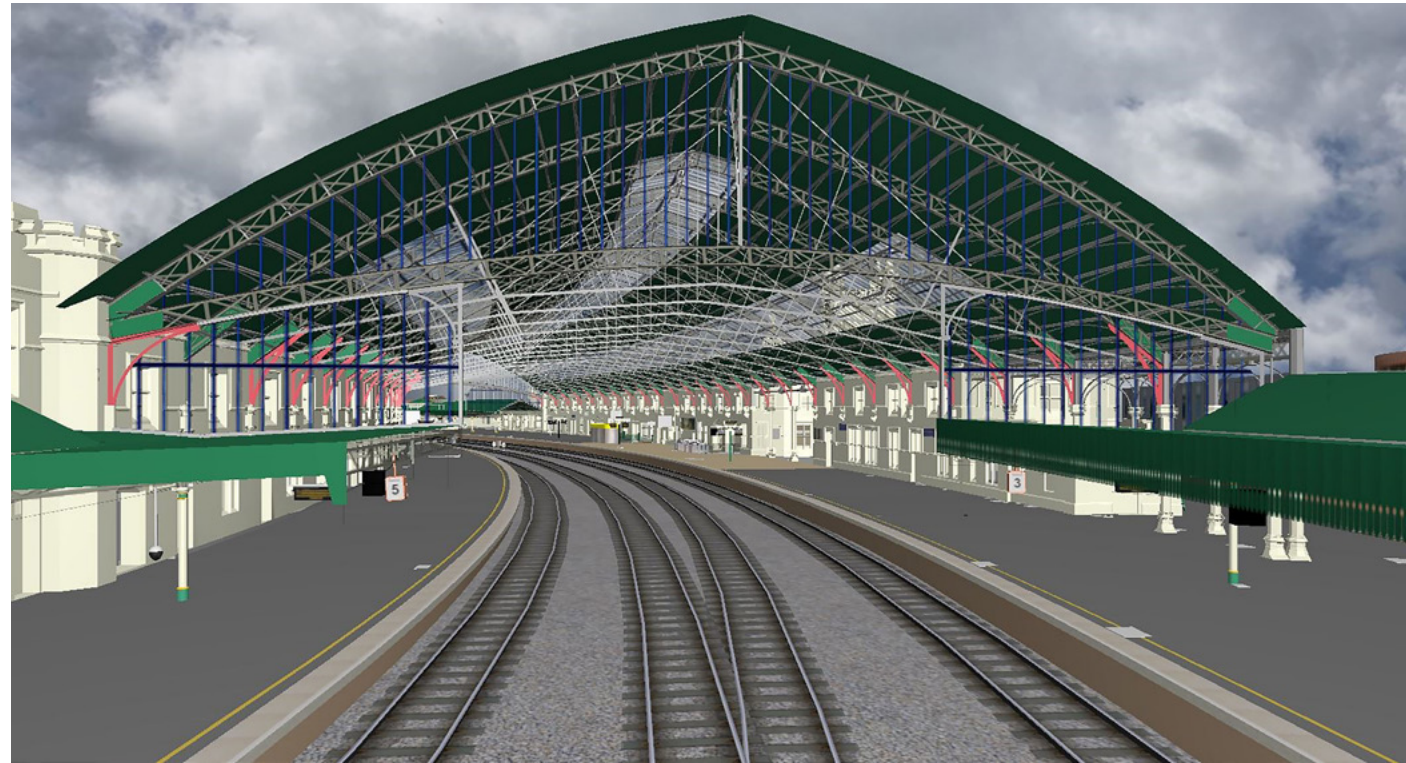
— Adam Wieczorek, Consultant and Designer

Bristol Area Signaling Renewal Enhancements

NETWORK RAIL, WALES AND WESTERN REGION,
UNITED KINGDOM

Network Rail Wales and Western Region had to install new signaling apparatus at Bristol Temple Meads station. However, evaluating and designing new track signals is expensive and difficult to coordinate. They did not have much space to perform construction, and there were many overlapping schemes. They realized that, to showcase all the necessary renewals and predict the impact of the new signaling, they would need software to support an intelligent 3D model.

Network Rail chose MicroStation as their CAD platform and used OpenRail Designer to recreate track geometry and place new signals before developing fly-through animations that allowed designers to view the project from the train driver's perspective. They replicated multiple train approaches toward signals virtually to correct train signaling issues ahead of time, avoiding costly rework and the risk and expense of site visits, as well as optimizing design. Bentley's 3D collaborative modeling environment helped Network Rail reduce months of work into one single meeting.



“The use of the Bentley suite of products has allowed Network Rail Wales and Western Region to deliver accurate information, reduce errors, and save time and money on our enhancement and renewal projects. This makes us more responsive to the needs of train and freight operators and, ultimately, the fare-paying passenger and freight shipper and to put the passenger first.”

— John Nolan, Programme Manager BIM, Network Rail

Transit Oriented Development Dubai

WS ATKINS & PARTNERS OVERSEAS, DUBAI, UAE

WS Atkins & Partners Overseas had to be innovative when designing an underground rail station for Dubai's Green and Red metro lines near an existing shopping mall. The USD 2.9 billion development will reduce roadway traffic, boost sales, and separate the flow of shoppers from daily commuters. However, right-of-way limitations, a shallow foundation, inadequate vehicle drop-off space, and a small utility tunnel presented design challenges. WS Atkins also had to achieve LEED GOLD certification and deliver a high-quality, design under-budget and on time.

They initially used Autodesk products, but when they found it insufficient for integrating the project with surrounding buildings and effectively delivering their BIM vision, they deployed Bentley software. WS Atkins overcame site constraints with MicroStation's parametric modeling capabilities. MicroStation's powerful constraints capabilities, usable in both drawing and modeling workflows, enabled them to maintain design intent while rapidly moving through design iterations and progressing development. They solved the station's complex interface geometry within the application, eliminating on-site measuring. Accurate quantity estimations reduced construction waste by 45% and material waste by 65%. They shared over 100 files of varying formats among the multidiscipline team to enhance collaboration and deliver the design one month early.



"Bentley helped in increasing the ROI for client and stakeholder"

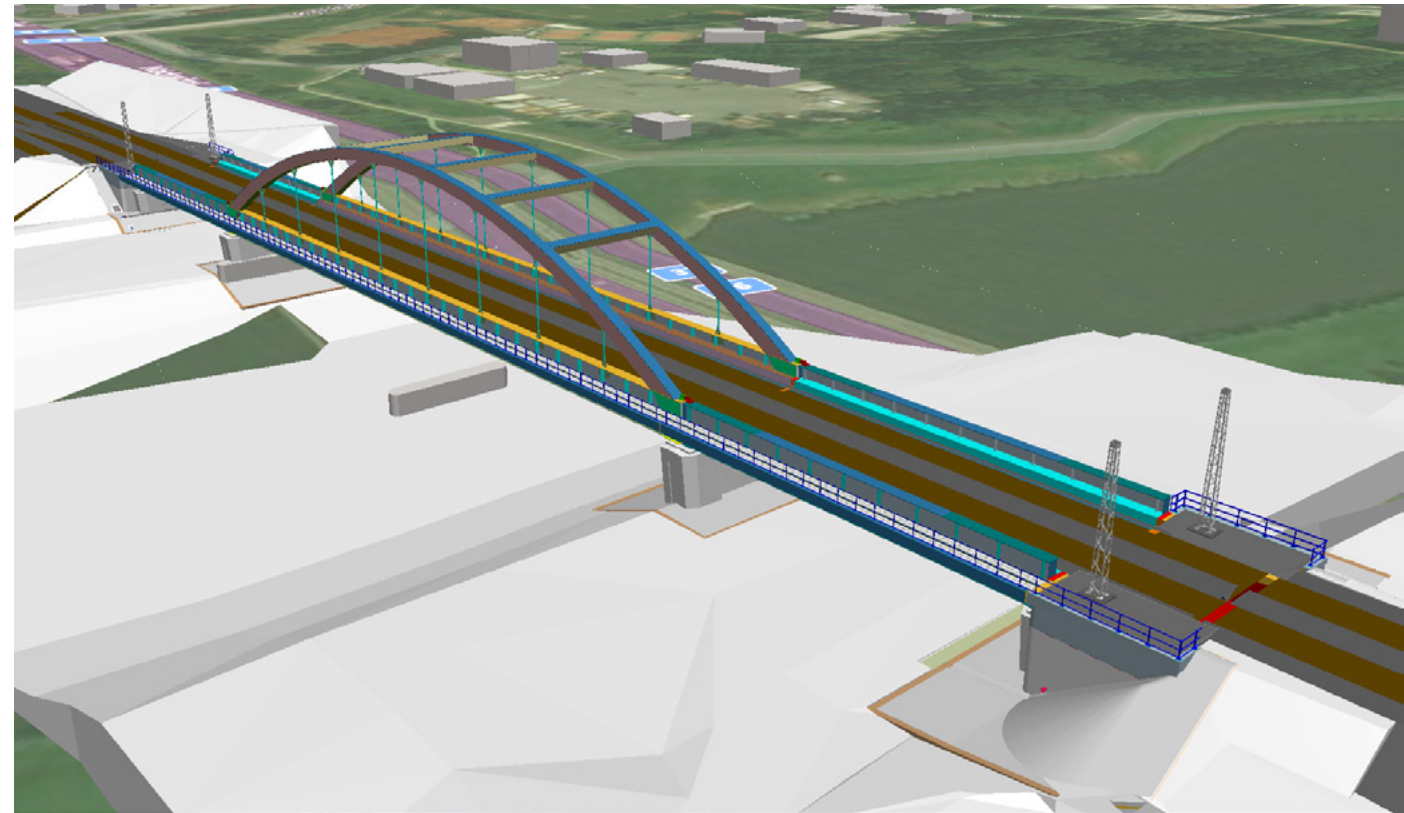
— Godson Jasper Sundaramony, Senior Architect

Modernization of the Pardubice Railway Junction

SUDOP PRAHA A.S., PARDUBICE, CZECH REPUBLIC

SUDOP PRAHA was tasked with modernizing Pardubice's railway junction in the Czech Republic's East Bohemia. The estimated CZK 2.6 billion project includes increasing the line speed through the junction to up to 160 kilometers per hour, constructing a new intermediate platform and footbridge, modernizing existing platforms, and improving freight train conditions. Due to the complexity of the surrounding environments, the project required BIM workflows and the use of 3D modeling to ensure accurate design and construction information sharing.

The design team used MicroStation to create, and regularly update, iModels for the contractor so that they had a clear understanding of all activities occurring on site. They also used ProjectWise to create a connected data environment so that the data could be easily accessed by the contractor, investor, and surveying company. The application streamlined the team's work, including throughout the design review phase, and eliminated any ambiguity of transmitted documents. The project is on track to be completed in 2023.



“A common data environment for communication between the information model creator and the construction contractor significantly helped to speed up the work, to speed up the information transmitted and, above all, ensure the unambiguity of the transmitted documents for the creation of the construction information model.”

— Jakub Ptacinsky, Head of the Dept of Marketing and Communication

Integrated High Speed Rail and Station

PT WIJAYA KARYA (PERSERO) TBK
JAKARTA – BANDUNG, INDONESIA

The integrated high-speed rail between Jakarta and Bandung will reduce congestion between the two cities and foster a culture of public transportation in Indonesia. Spanning 143 kilometers in length and featuring various structures, the project presented geological and coordination challenges, compounded by an accelerated project schedule amid a global pandemic. Having used 2D design and conventional survey methods on past projects, resulting in delays, additional cost, and inefficient construction, lead contractor PT Wijaya Karya (WIKA) realized that they needed an integrated BIM and digital twin solution.

Leveraging Bentley's open civil design and reality modeling applications and digital twin technology, WIKA developed a connected digital ecosystem and single source of truth, facilitating dynamic modeling and the generation of an intelligent digital twin. The integrated solution streamlined workflows, improving efficiency, design quality, and calculation, saving USD 185 million in construction costs, and shortening the construction schedule by six months. The project sets a benchmark to develop open digital building blocks for integrated public transportation in Indonesia.



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“Using Bentley technology allowed us to leverage the intelligent BIM model and significantly increase productivity and efficiency. This technology will guide our nation towards digital construction, realizing a new era of sustainable transportation.”

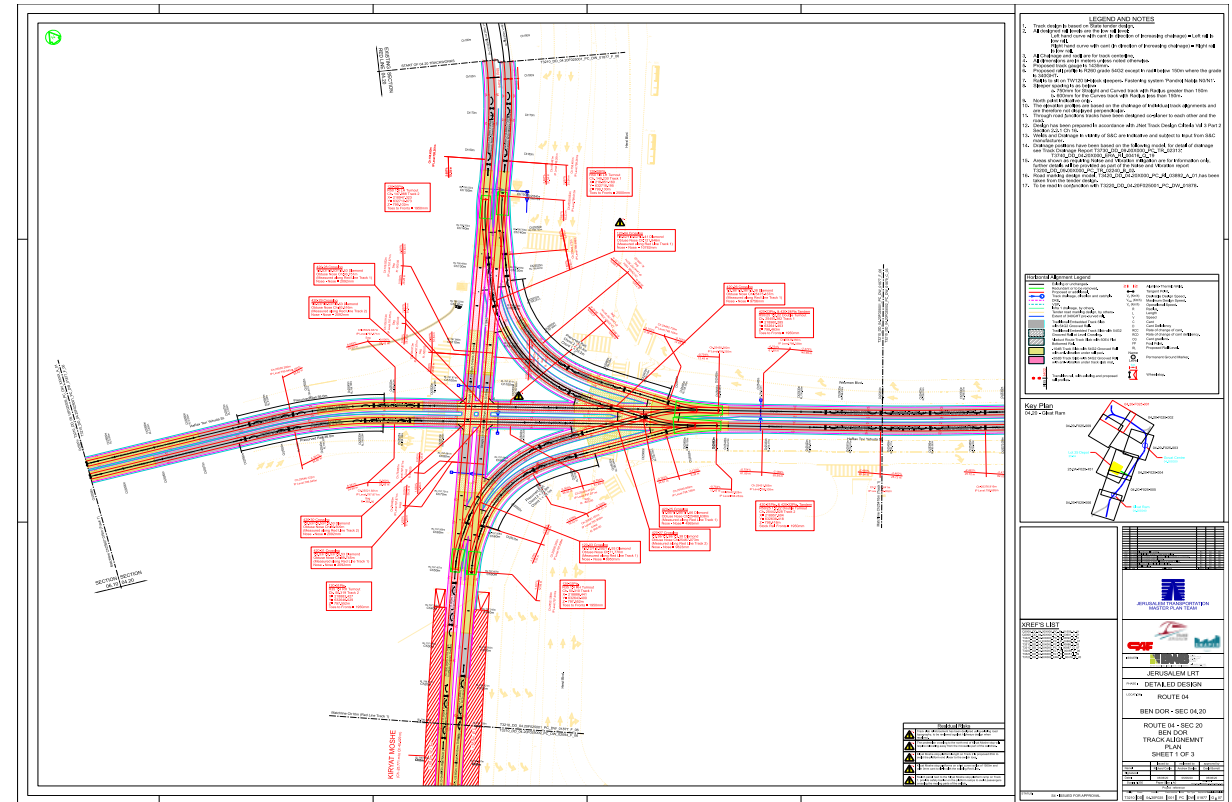
— Romi Ramadhan, GM BIM & Research

Jerusalem Light Rail Transit Network

BWB CONSULTING, JERUSALEM, ISRAEL

The estimated GBP 2.2 billion extension of the Jerusalem Light Rail network will add 17.2 kilometers of track to its existing Red Line between the Neve Yaakov neighborhood in the northeast and Ein Karem in the southwest of Jerusalem. The project also includes the design and construction of a new 19.6-kilometer Green Line with interfaces between the two to meet increasing ridership demand across the city. Engaged to deliver design solutions on the sizeable and complex project, BWB Consulting required effective collaboration with contractors to ensure data remained up-to-date and reliable.

Already familiar with Bentley applications, they created customized files, level libraries, and seed files before work commenced, ensuring smooth project start-up and high-quality deliverables throughout. As the project mandated that the design be submitted in DWG, MicroStation easily accommodated the conversion of DGN files without loss of information. OpenRail Designer was used to develop custom templates and automatically resolve transitions between section changes, reducing design turnaround from months to weeks.



“DWG deliverables displayed no loss or mistranslation of data from the DGN master files, enabling immediate and uninterrupted use by other project contractors with the confidence that the integrity of the data remained. This approach directly reduced the risk to the collaboration process whilst enabling BWB to work efficiently in familiar software, resulting in design turnaround of work sections being measured in weeks rather than months.”

— Richard Carlin, CAD Manager

MICROSTATION

The foundation of efficient transportation design workflows

MicroStation is the only CAD software purpose-built for infrastructure design, helping designers and engineers like you bring their vision to life, present their designs to their clients, and deliver their projects to the community.

MicroStation – and all Bentley BIM applications – are built on the same comprehensive modeling platform which means you can easily integrate all the tools you need for complete transportation design and engineering – from roads to bridges, rail, tunnels and more.

EXPERIENCE THE POWER OF MICROSTATION

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