e-BOOK | MICROSTATION *for* RAIL AND TRANSIT

MICROSTATION FOR TRANSPORTATION

On the Right Track to Better Rail and Transit Design

Bentley

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Rail networks will play an essential role in the future of mobility. But owner-operators and their supply chains face significant challenges—including aging infrastructure, shorter deadlines, tighter budgets, and distributed teams—that make designing rail infrastructure complex.

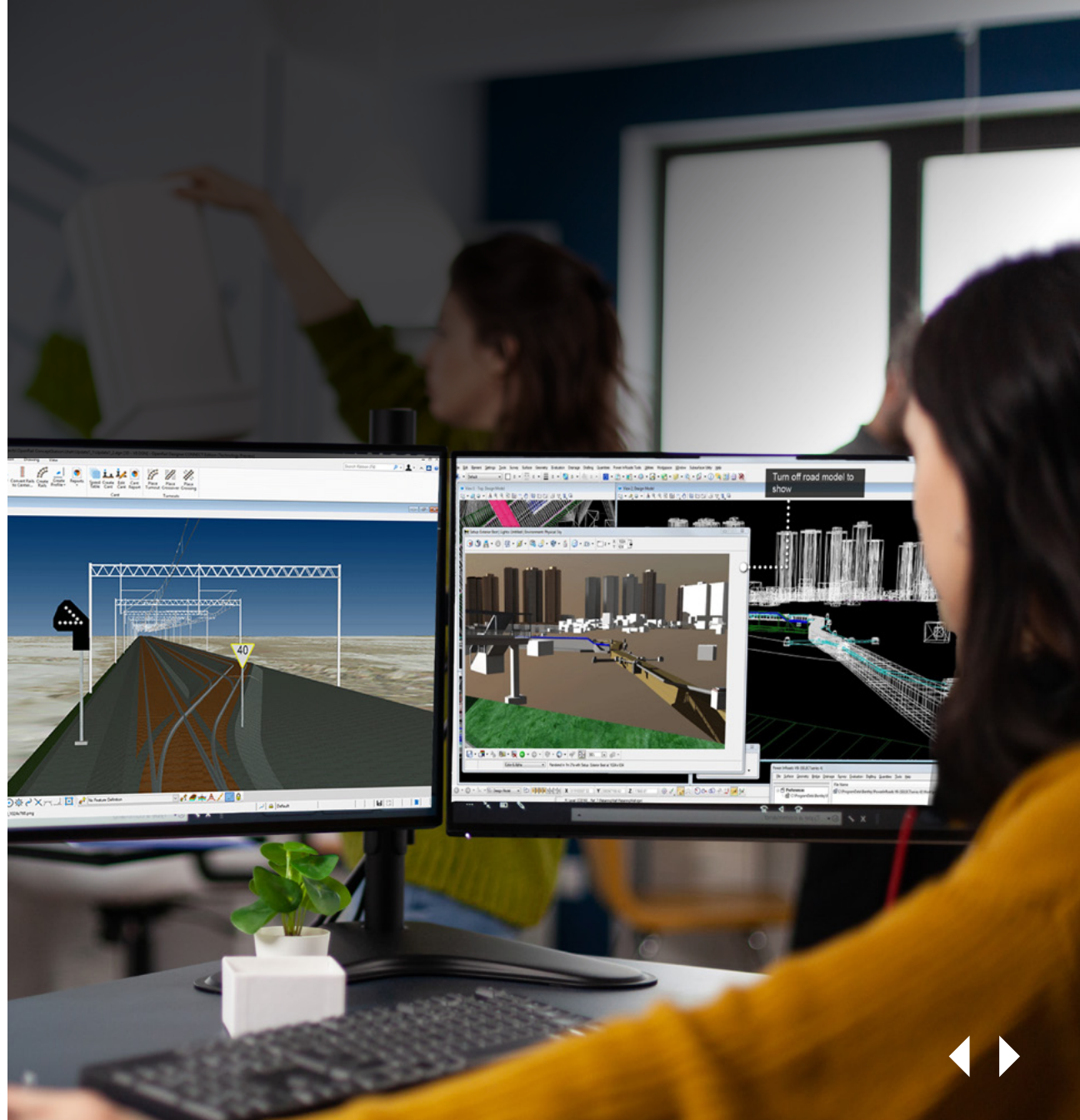
To help engineers, designers, asset managers, inspectors, and other specialists do their job better and faster, the rail industry is embracing digital workflows for existing and future networks.

The Challenges Are Real

Civil engineers, railway designers, and CAD technicians working on rail and transit infrastructure projects are often presented with major design challenges. These challenges result in time delays, safety risks, and costly rework, such as:

- The inability to coordinate data in multiple formats results in errors, project delays, and a waste of time and money. With all the different applications used by the many different consultants that collaborate on today's design projects, a lack of interoperability between software products represents a huge risk.
- Delivering and using drawings and models that do not conform to standards introduces safety risks to field staff, causes errors, and leads to rework during construction. Unstandardized drawings and models can result in losing future work and can damage the reputation of your organization.

Achieving a competitive advantage means delivering innovation on time, on budget, and profitably. Read on.



Get Your Rail Projects on the Right Track

With increased costs, shorter duration requirements, and limited engineering workforce capacity, design efficiency and productivity are critical. The status quo no longer makes sense for businesses.

Utilizing digital design applications improves design accuracy and coordination while helping to find constructability issues earlier in the design process to avoid costly delays. By blending traditional engineering workflows for plan, profile, and cross-sections with 3D modeling and connected workflows, the right technology solutions work the way that you work, making the transition easier than ever.

Whether your company is working directly on a railway project or you are partnering with another firm to get the job done, tailor-made software for the work you do is a game-changer.

Digital delivery and 3D modeling is changing rail projects. Find out how that works.

Rail Network Design is Quickly Evolving

BIM is about more than just software. At its heart, it is about people accessing the data that they need to collaborate and work more efficiently throughout all phases of a railway project—from conceptual design through construction and into operations. Start-to-finish multidiscipline support helps teams stay on schedule and budget, reducing construction risk by considering design concepts in the context of the real and unique project conditions.

See the Complete Picture

Ultimately, you build and operate in a 3D world, so you need to design in an environment that best replicates those conditions. Optimize design while keeping projects on budget and on schedule by enabling team members to collaborate in a common data environment and shared design model that facilitates better coordination across multiple locations and disciplines. In the case of rail projects, rail engineers and designers can lead the process and work directly with the model to define the track components. Using this same model data, electrical engineers can design and analyze the catenary system using the same track geometry, while drainage and utilities engineers can work on ditch and culvert design and utility relocation. By using the same set of assumptions and information during every stage of the project, firms can achieve better coordination, collaboration, and design consistency.

Many disciplines with one solution, one workspace, and one set of information produce one successful project.

Embrace Automation to Do More

Employing 3D modeling is a decision that firms often push down the road. Many designers fear a big learning curve that will reduce their design efficiency. However, it does not have to be an all-or-nothing approach. By selecting 3D modeling software that offers an integrated approach to both 2D and 3D design, you can work using intuitive and traditional design methods while benefiting from the advantages of the new technology. With a design-driven approach that connects your designs to plan set production, a connected workflow supports the production of high-quality drawings, including multidiscipline documentation sets that are consistent across the entire project, saving you significant time and therefore money.

Say goodbye to outdated paper plans and last-minute onsite change orders.

Avoid Expensive On-site Surprises

In today's industry, most design reviews are done with paper or PDFs. Traditionally, clashes are detected by the manual process of overlaying 2D drawings. However, following BIM methodology can bring models from all the disciplines together and compare them, detecting clashes before they are found on the construction site. Automatic clash detection is an important approach to determining design errors or omissions. Working in a 3D environment allows you to see potential conflicts immediately. Whether it is a conflict between design disciplines, utilities, or physical constraints, these potential problems are more apparent earlier in the project process.

Time is money, and automated clash detection saves you both.

Deliver for Today and Tomorrow

The delivery of 2D plan sets remains a key deliverable for your business today. Connecting design to documentation with automated drawing production means that once the drawing sheets are set up, engineers can concentrate on the model without having to worry about the knock-on effect that last-minute design changes might have on documentation. Whether you need to produce traditional 2D deliverables, advance to 3D modeling, or leverage a full digital twin, having a complete digital replica of physical assets replaces the inefficient and inaccurate methods of record or 'as-built' drawings. Understanding the future needs of infrastructure and existing conditions for future updates ultimately saves time and eliminates guesswork.

Limit rework and reduce the risk of human error with automated accurate drawing production.

Your Workflow, Your Way

As rail engineer, we know that you wear many hats. Your scope of work includes an array of responsibilities, across many phases, and with a diverse group of stakeholders. Your digital solution needs to support an efficient, comprehensive, and collaborative workflow from start to finish. That is why Bentley created a complete set of rail design and engineering solutions. MicroStation is the foundation for your transportation design projects.

Plan

- Create a conceptual and detailed model for any industry
- Consolidate project surveys and files

Design

- Develop 2D and 3D drawings and models
- Use geo-referencing

Communicate

- Integrate all your data
- Gain performance for large files
- Manage standards and compliance measures

Deliver

- Consolidate models and deliverables
- Generate reports
- Produce annotations
- Create sections, plans, and profiles sheets
- Produce drawings

MicroStation for Rail and Transit Design

Engineers around the world are turning to innovative, purpose-built technology solutions for help with overcoming common design challenges. Many of them trust MicroStation to produce high-quality drawings and 3D models, serve as a data integration tool, and provide construction-ready deliverables for their rail and transit projects every day.

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—such as DWG, SHP, and point cloud data—to accelerate workflows.

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, and GIS.

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.

Read on to learn how MicroStation users accomplished inspiring projects worldwide with Bentley's integrated, digital solutions.

CASE STUDY

Design and Construction of the Latvian North Section

INECO, SPAIN

As part of Rail Baltica's initiative to link five countries in Northeast Europe, Ineco was formed to provide BIM design and construction supervision for the Latvian North Section high-speed railway. The project required coordinating teams from different countries that had no prior knowledge of BIM methodologies. To overcome this challenge, meet Rail Baltica's information management and BIM requirements, and manage thousands of deliverables, they needed to configure comprehensive modeling applications within a connected data environment to work with all stakeholders.

Ineco selected ProjectWise® as the collaborative management platform. Integrating MicroStation, OpenRail™, OpenRoads™, and OpenBuildings® for 3D modeling, they identified design clashes early. By streamlining and integrating people, processes, and systems, they calculated an estimated return on investment of 8.17%. Using iTwin® applications to develop digital twins is helping them monitor and visualize project progress, estimate lifecycle cost calculations, and design more resilient infrastructure with better economic performance.

Image courtesy of Ineco

CASE STUDY

Overcoming Challenges Under COVID-19 Lockdown

NETWORK RAIL, UNITED KINGDOM

When the COVID-19 pandemic restricted people's movement, Network Rail's Western and Wales region had to think of creative ways to work virtually, while keeping railways safe and reliable. They needed innovative thinking, agile digital transformation, and strong teamwork to overcome the day-to-day challenges they faced in the new normal of that time.

Without meeting face-to-face with the development team, and in only three days, Network Rail created a comprehensive 3D model of Exeter Station using MicroStation and Descartes. Using OpenRail Designer, they performed signal sighting in the visually and technically accurate model. Unable to survey and review over 100 existing signs on site, Network Rail used point-cloud scans to create a digital twin of London's Paddington Station for wayfinding renewals a month ahead of schedule and ensuring future modeling work. Despite the lockdown, employees provided services above and beyond expectations of Network Rail's clients and stakeholders.

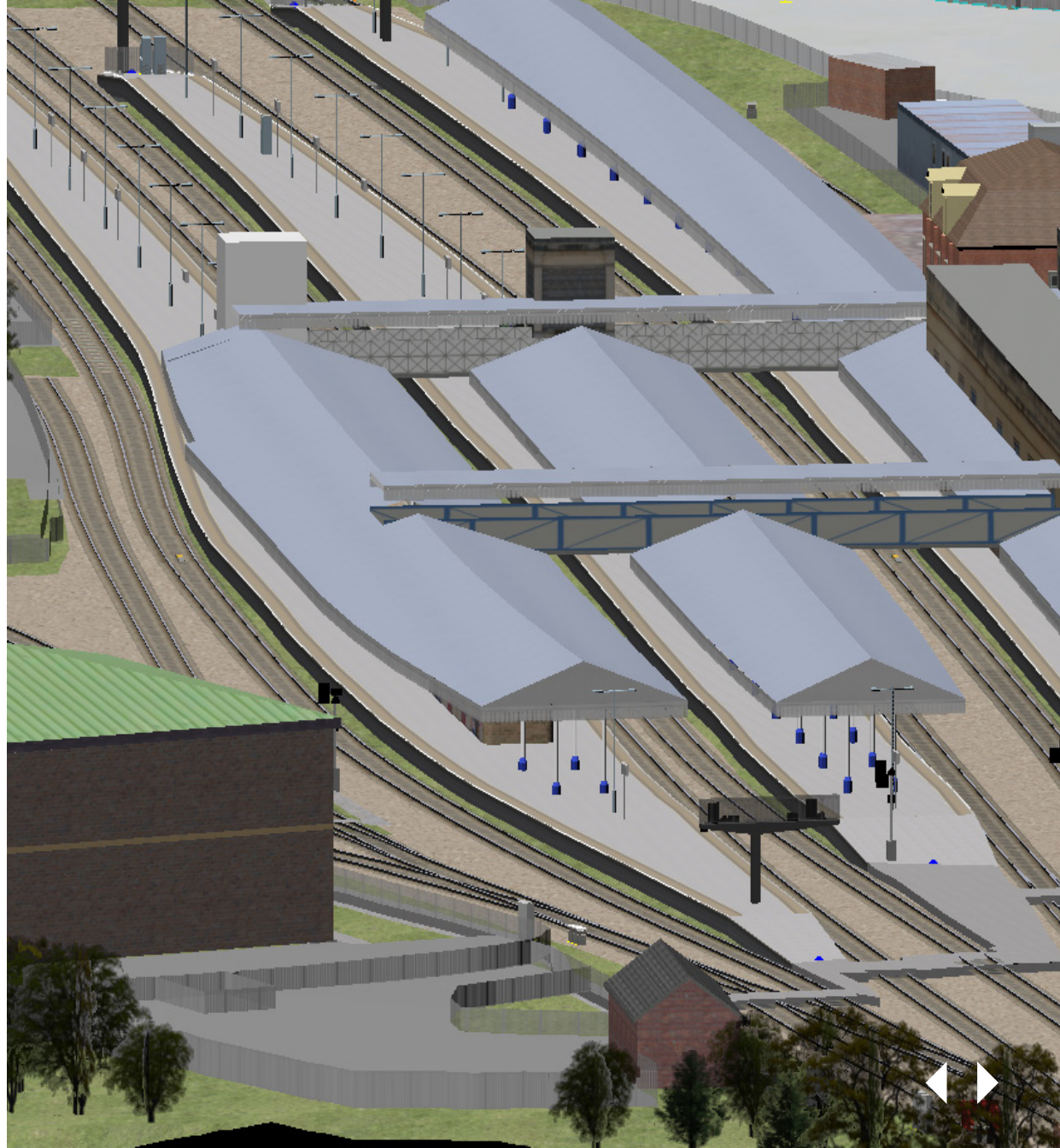


Image courtesy of Network Rail

CASE STUDY

Istanbul Golden Horn Tramline Construction and Electromechwanical Works

DOGUS CONSTRUCTION AND TRADE, TURKEY

Istanbul's Golden Horn Tram is Turkey's first catenary-free tramline, with an embedded ground power supply system. The EUR 170 million project is building a 10-kilometer double-track route starting at Eminonu, following Golden Horn, and ending at Alieykoy. There will be 14 stations accommodating as many as 25,000 passengers per hour in one direction. Dogus Construction and Trade is building the tramline, stations, tramcar depot and workshop, and electromechanical systems.

The seaside route through historical areas made it imperative to study design alternatives. Dogus used MicroStation and OpenRail Designer to produce 3D models of the existing terrain in the tramline sections. Bentley software enabled the team to explore and validate numerous iterations. The project team used Open Rail to select a design that would have the least impact on existing infrastructure, historical buildings, and other structures.

Image courtesy of Dogus Construction and Trade

CASE STUDY

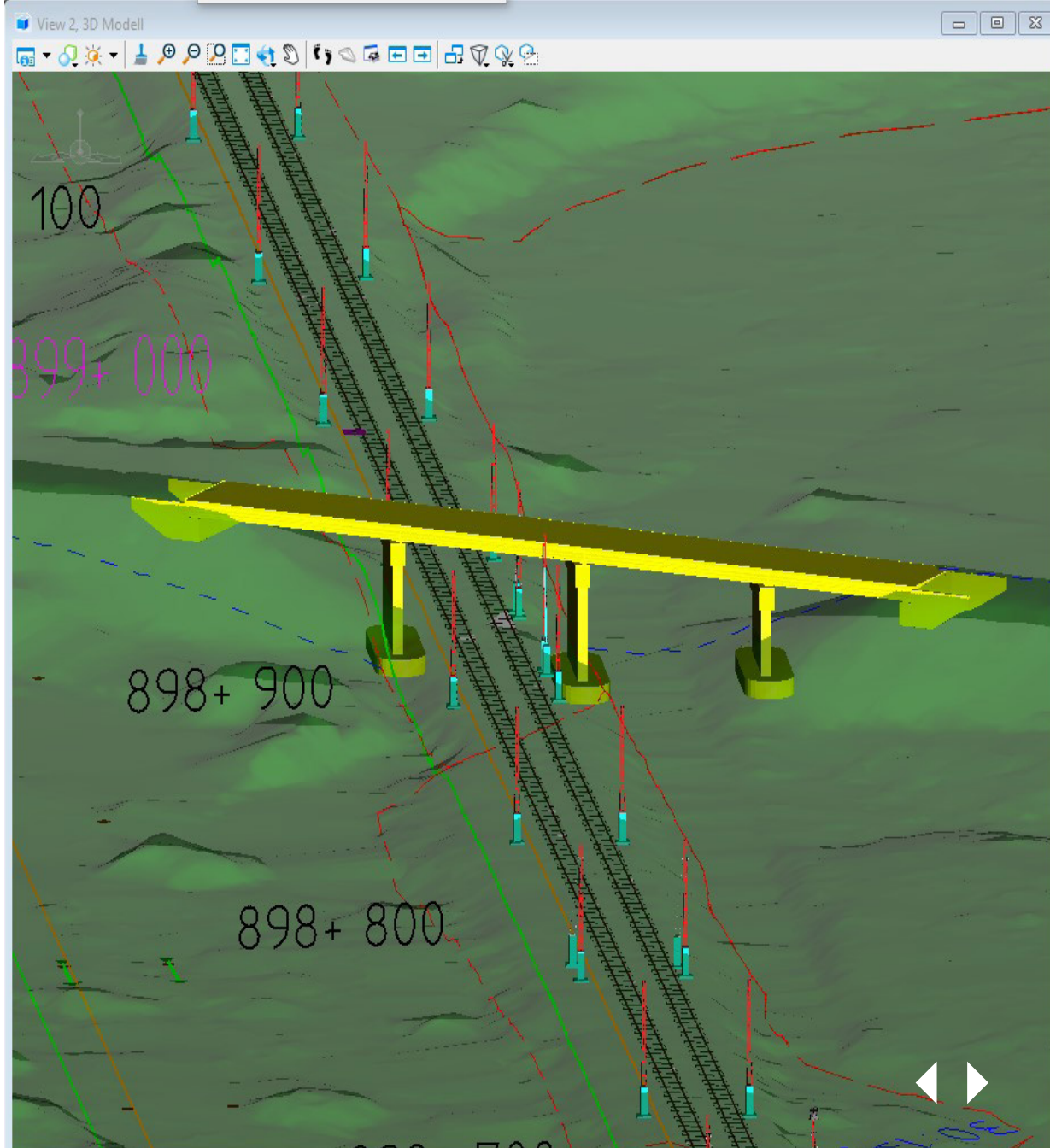
ERTMS Scanmed East Osby Area (Älmhult-Hässleholm)

SAITEC & TRAFIKVERKET, SWEDEN

European Rail Traffic Management System (ERTMS) is a European Union-wide system of signaling for railways that will improve safety, increase efficiency, and enhance cross-border interoperability of rail transport in Europe. The Swedish Transportation Administration had to introduce the railway signaling system on the country's main railways. In 2019, Saitec was awarded the contract to prepare tender documents for constructing ERTMS in the Osby area. The 47-kilometer rail project involves designing 43 new buildings along the track and any necessary earthworks, requiring BIM technology to meet the requirements and standards.

Saitec & Trafikverket chose Bentley applications to produce models for both existing and newly designed elements, which were incorporated into a larger model and shared with stakeholders. OpenRail Designer helped create the alignments and profiles of existing tracks, MicroStation modeled the surrounding buildings, and OpenRoads Designer helped develop a scalable terrain model. The team created and managed about 2,500 drawings, modeled over 5,200 existing and 2,000 new objects, and filled over 82,000 attributes.

Image courtesy of Saitec & Trafikverket.



The Bentley Ecosystem

MicroStation — and all Bentley BIM applications — are built on the same comprehensive modeling platform so that users can easily progress MicroStation work into discipline-specific BIM workflows. It enables every civil engineer and designer to:

Create better designs, faster

With MicroStation, users can model, document, and visualize infrastructure projects of any type, scale, and complexity using a comprehensive set of design and documentation capabilities. Reliably integrate any existing design content and work with any-size team using virtually any mix of design applications. MicroStation enables users to develop and document better designs in less time by better connecting tools, data, and the team.

Better integrated project teams

MicroStation provides a common environment for comprehensive project delivery and connects users, projects, and the enterprise. With MicroStation, users have a personal portal to access learning, communities, and project information.

Flexibility and compatibility

MicroStation offers the flexibility you need to work the way you want — with several customizable user interfaces, including a dark mode. There is also native support for RealDWG to ensure 100% compatibility and confidence in your data.

Getting Started

Bentley makes it easy for organizations to find the product license that offers the best options, affordable price, and the training you need to be successful – through Virtuosity, Bentley's eStore for practitioner licenses.

Whatever subscription is right for you, you will get access to our expert services, and the ability to leverage one-to-one mentoring by Bentley project experts, personalized training for your team, and on-demand learning. We call this bundle Virtuosity's **Virtuoso Subscription**, and it ensures your workforce can quickly learn the latest technology and workflows while minimizing downtime and project costs.

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