



Project Summary

Organization:

Sweco Nederland, B.V.

Solution:

Rail and Transit

Location:

Bergen, Hordaland, Norway

Project Objectives:

- To leverage digital twins to integrate multisourced data for coordinated design and project delivery.
- To create a public transport solution promoting urban development and environmental sustainability.

Project Playbook:

Descartes, LumenRT, MicroStation, Navigator, OpenBuildings™ Designer, OpenRail™ Designer, OpenRoads™ Designer, iModel.js, iTwin® Design Insights, iTwin Design Review, ProjectWise®

Fast Facts

- Sweco NL advanced BIM processes through a connected data environment to digitally manage and share information among 18 disciplines across five countries.
- Sweco NL's pilot of iTwin Design Review linked digital information from Bentley and third-party applications to enable a digital twins approach.
- Sweco NL leveraged OpenRail Designer and OpenBuildings Designer to realize significant productivity gains.

ROI

- Bentley applications helped reduce design time by 15%.
- Digital twins helped track and manage change reducing construction errors by 25%.
- Sweco NL expects iTwin Design Review to save EUR 1.5 million annually on projects of similar size.

Digital Twins Prove a Game-changer in Helping Sweco Nederland Deliver Bergen's Light Rail Extension

Leveraging Bentley's iTwin Design Review Reduces Costs to Resolve Construction Errors by 25%

A Public Transport Solution for Urban Development

Bergen, Norway's second-largest city and gateway to the fjords, is extending its Bybanen light-rail system to make it accessible to all residents and visitors, promote urban development, and reduce pollution from automobile emissions. To deliver a user-focused transport solution that would establish the light rail as the backbone of the public transport system, the city initiated a 9-kilometer extension of the railway line. The NOK 6.2 billion project adds eight new stops, including a stopping place and depot situated underground, and two tunnels totaling 4.5 kilometers in length. Sweco Nederland (Sweco NL), in collaboration with its client Bybanen Utbygging and sister company Sweco Norway, was responsible for providing an optimal design that connects to existing infrastructure within a limited footprint, as well as integrates and aligns conflicting stakeholder interests and needs.

Connecting and partly using the city's current tram line, Sweco's work included adjacent roads, bicycle lanes, pedestrian zones, supporting bridge structures, and surrounding public areas. The project also included relocating and adjusting existing infrastructure, without disrupting urban life. The total BT-4 project team consisted of 18 engineering disciplines spread across five countries, using different software, and included 24 contracts. Faced with mountainous terrain and challenges surrounding data integration, alignment, change management, collaboration, and communication, Sweco NL realized that traditional manual processes would not suffice. Given the project complexity, client requirements, and overall scale, the team required a new, digital-driven approach to successfully deliver the design on a tight timeline.

Connected Data Environment Provides Trusted Data Source

Working with data from multiple sources and in a variety of formats meant Sweco NL needed a controlled environment to manage and share the large volume and diversity of design information it was working with. Aware that traditional digital data management methods are often time consuming, labor intensive, and error prone, Sweco knew it needed a solution

that would encourage and enable collaboration, not limit and reduce the effectiveness of its multidiscipline design team. Using ProjectWise, Sweco therefore established an open, connected data environment to support coordination among the 18 geographically dispersed engineering disciplines and integrate the multisourced data. The universal platform offered interoperability, helping to share data among Bentley's applications and also with third-party applications, and ensured that accurate information was continuously available to all team members.

Trusted data was the foundation of Sweco's entire digital workflow as the team began creating 3D models from the outset. Housing more than 60,000 files to coordinate over 450 models, the connected data environment facilitated real-time information sharing of trusted data, crucial to maximizing productivity, accelerating design and optimizing construction. Leveraging Bentley's open modeling applications within the connected data environment enabled the multidiscipline team, spread across five countries, to work together seamlessly. "Using ProjectWise and adaptive modeling through MicroStation, we can work as one while being in different locations, resulting in a dramatic reduction in costs otherwise associated with resolution of issues during construction," stated Christiaan Post, consultant - BIM manager at Sweco NL.

Open Modeling Reaps Productivity Gains

Using Bentley's open modeling applications, including OpenRail Designer and OpenBuildings Designer, Sweco NL advanced coordination, streamlined multidiscipline design, and accelerated production of deliverables through connected digital workflows. The project team used OpenRail Designer to create the alignment, plan, and profile drawings, facilitating development of over 30 different intelligent templates for double, single, and depot track alignments. The team leveraged the track alignments in OpenBuildings Designer, creating scripts that helped automate the placement of line-wide equipment, including sleepers and drainage boxes. The interoperability of Bentley's applications enabled the design team to incorporate design changes within automated model updates. "With the push of a button, you can refresh and update all the sleepers

“Bentley’s solution has enabled Sweco NL to engineer the extension of Bergen’s Light Rail system ‘right first time,’ and, as a result, make significant time and cost savings on this complex project. In short, Bentley’s software made our work easier and more effective, enabling the team to optimize the design and complete work within a tight schedule.”

*– Christiaan Post, Consultant -
BIM Manager, Sweco
Nederland B.V.*

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and drainage boxes in accordance with the new alignment,” explained Post. Bentley’s interoperable modeling applications automated design iterations and helped avoid unwanted errors, saving approximately 500 resource hours. In addition to saving the team significant time and approximately NOK 500,000 on the Bergen Light Rail project alone versus using manual methods, the scripts it developed can be reused to promote standardization and further industrialize BIM processes on whatever projects the organization is engaged in the future.

Having trusted data in an open modeling environment enabled the team to establish accurate, multidiscipline 3D models from the outset, which are crucial to accelerating the design phase to meet the planned construction schedule and reap productivity gains. The integrated digital solution allowed multiple disciplines across multiple locations and multiple vendors to seamlessly share and coordinate 3D models, streamlining design workflows to save approximately 15% in design time.

Digital Twins Provide a Game-changing Digital Solution

To further capitalize on the value of a data-driven, open digital environment, Sweco NL was an early adopter of Bentley’s iTwin Services. The organization used Bentley’s iModel.js and iTwin Design Review, in parallel with its own BIM processes, to incorporate engineering data from the various sources into a living digital twin. “The large scale of this multidisciplinary project and [the] use of different kinds of software made this a strong test case,” said Post. As part of its ongoing commitment to digitalization to deliver improved outcomes and optimize productivity, Sweco NL embraced digital twins and iTwin Design Review specifically as an innovative solution for conducting design reviews and enhancing multidiscipline design coordination on the project.

Previously, Sweco NL’s BIM directors spent 60 hours a week to check about 500 data sets and ensure that the latest, most up-to-date model was being used. This practice was labor intensive and error prone, as it was easy to overlook small changes. “The biggest challenges [that] we face on projects of this size are around change, and the goal was to have all the different software models work together through iTwin Services,” explained Eric de Bruin, project manager at Sweco. Linking digital information from Bentley’s open modeling applications directly to an updated digital design review workflow using iTwin Design Review provided a game-changing digital solution. Using iTwin Design Review enables every team member to visualize and understand what changes are happening over time, see the impact on the design, and respond quickly and effectively. The results are measurable benefits in design review workflows by visualizing changes and leveraging insights to make informed decisions.

Having a digital twin that is continuously synchronized and aligned and that automatically tracks changes, regardless of the design technology used by the multiple disciplines, kept failures to a minimum and optimized resources. Using iTwin Design Review enabled co-engineering and design review to achieve right first-time engineering, saving 25% in costs to resolve construction errors. Bentley’s digital twin technologies

saved an estimated 300 hours a week through optimal change management and seamless communication among the different engineering disciplines. Not only did this innovative solution deliver many engineering benefits to the teams involved, it also satisfied Sweco NL’s client expectations, as it was much easier to share the project model with its client. “It was actually what our client was looking for – an open platform that shows an up-to-date and complete model that they can look at from any laptop without requiring special software,” commented de Bruin.



Bentley’s open applications and iTwin Services enabled Sweco NL’s digital twins approach.

Digital Twins to Become Business as Usual

Sweco NL’s work on the Bergen Light Rail project built on its use of a connected data environment, while Bentley’s open applications and BIM workflows enabled a digital twin approach. Already using open 3D modeling technology from the outset, the project team very quickly recognized that the value of its data-driven environment in combination with Bentley’s digital twin applications would increase continually as it connected more data and was leveraged in the work. As part of a pilot project, Sweco NL used Bentley’s iModel.js to provide the open platform it needed to connect all project data regardless of the source with its digital twin. Built on the iModel.js platform, iTwin Services are helping Sweco NL drive BIM advancements across the organization. Based on the success of this pilot project, Sweco estimates to save EUR 1.5 million annually on projects of similar size and is embracing digital twins for future engineering initiatives.

Sweco NL has started to roll out iTwin Services on railway and metro system projects in the Netherlands. Using iTwin Design Review has helped with planning along the tight timeline and sharing the model among the diverse team, providing all disciplines, stakeholders, and companies with access to a fully integrated digital twin. To better understand the impact that design changes have on cost and schedule, Sweco NL is now piloting iTwin Design Insights for project analytics. Recognizing that each digital connection that can be added will improve engineering quality, efficiency, collaboration, and decision-making, the organization is transforming its project delivery processes, aiming to make digital twins using Bentley software business as usual.