Infrastructure Yearbook 2024

The extraordinary projects of the 2024 Going Digital Awards

Bentley

Recognizing
going digital
innovations
in infrastructure
delivery and
performance

Bentley®

Advancing Infrastructure

Table of Contents

The 2024 Going Digital Awards ceremony was held as part of the Year in Infrastructure conference in Vancouver, Canada on October 8-9.

Going Digital

Bentley Systems' 2024 *Infrastructure Yearbook* celebrates the outstanding accomplishments of Bentley software users who design, build, and operate the world's infrastructure.

Going digital

This yearbook highlights over 260 remarkable projects nominated for the 2024 Going Digital Awards program. Each project reflects the vision and talent of infrastructure professionals who applied innovative strategies to improve project delivery and asset performance.

Underlying these advancements are Bentley's "Project Playbooks," which feature the infrastructure engineering software used by project teams to improve their digital workflows. By going digital, the engineers, constructors, and owner-operators behind these exceptional projects delivered quantifiable improvements in their work, leading to better, more resilient infrastructure. Other users can learn from their examples.

The projects included in this edition of the *Infrastructure Yearbook* feature the use of:

- Intelligent 3D models that help improve deficient bridges across Kentucky, which saved taxpayers more than USD 3 million;
- A digital twin that integrates water supply, sewage, and sanitation data to ensure reliable access to clean water across 375 municipalities in São Paulo, Brazil;
- A connected data environment that helped electrify the Midland Main Line, a railway upgrade aimed at meeting the United Kingdom's net-zero carbon emissions target;
- A digital twin that helps teams more efficiently access files and save time in their work on an ambitious new subway line in Toronto, Canada;
- Digital twins that help firefighters and officers of the Dublin Fire Brigade quickly find information, improving emergency response times and helping to save lives; and
- A 3D subsurface model that helped to save AUD 16 million and 1,500 hours of work on the Australian state of Victoria's largest infrastructure project.

These innovations play an instrumental role in advancing infrastructure for better quality of life.

About the Going Digital Awards

The Going Digital Awards program has recognized more than 5,000 of the world's most outstanding infrastructure projects since its inception in 2004. Its goal is twofold: to advance innovation and best practices in infrastructure engineering, design, construction, project delivery, and operations, and to celebrate the extraordinary work of the organizations that help advance the world's infrastructure.

The projects nominated for the Going Digital Awards are submitted by Bentley's global community of software users. The submissions are judged by panels of independent industry experts to determine the finalists in 12 categories. For the 2024 Going Digital Awards program, the jurors deliberated on over 260 project submissions by more than 210 organizations from 36 countries. Representatives of the user organizations named as finalists presented their projects before the jurors, press, and attendees at Bentley's Year in Infrastructure conference in Vancouver, where the winners were announced during an awards ceremony.

Additionally, 16 outstanding and noteworthy projects were selected by Bentley's founders, with input from senior company executives, for special Founders' Honors recognition.

Searchable digital versions of this and previous *Infrastructure Yearbooks* are available.

Year in Infrastructure Conference

During the Year in Infrastructure conference in Vancouver, Bentley unveiled its vision for open data ecosystems to advance infrastructure engineering.

“The future of infrastructure engineering is open,” said Bentley's CEO Nicholas Cumins during his keynote address. “It’s flexible, collaborative, and built on a foundation of data that can be shared securely. At Bentley, we are leading the way—ensuring that the applications, platforms, and solutions that we create meet the evolving needs of our industry.”

Cumins explained that infrastructure sectors can no longer afford to work in silos, with data locked away in proprietary systems. The secure flow of data is necessary to solve global infrastructure challenges, including the expansion of energy grids, modernization of transportation systems, and retrofitting of existing assets to meet sustainable development goals.

Watch the 2024 Year in Infrastructure's keynotes and breakout sessions.

“The future of infrastructure engineering is open. It’s flexible, collaborative, and built on a foundation of data that can be shared securely.”

— Nicholas Cumins
CEO, Bentley

Year in Infrastructure Conference

Open data ecosystems

Because infrastructure projects are complex, involving multiple organizations, teams, disciplines, and stakeholders, infrastructure organizations need an open ecosystem for their data that enables integration and interoperability across different tools and platforms.

In addition to its Bentley Open applications for infrastructure modeling and simulation, which allow users to edit models from other vendors, Bentley has developed a robust, open-source schema specifically for infrastructure over the last decade. The Base Infrastructure Schema structures and organizes data so that it can be queried, analyzed, and reused across multiple platforms, enabling infrastructure professionals and organizations to fully leverage the value of their data.

"At Bentley, we understand that openness is not just a feature—it's a necessity," Cumins said. "We've spent years refining this framework so that organizations don't have to start from scratch, and we welcome others to benefit from its maturity and richness."

Read "Bentley Systems: The Promise of Data Freedom" in *AEC Magazine*.

Enhancing geospatial capabilities

The value of open data ecosystems was demonstrated through Bentley's partnership with Google, announced at the conference. The partnership integrates the breadth and depth of Google's geospatial data with Bentley's infrastructure engineering software.

The partnership builds on Bentley's acquisition of Cesium, the foundational open platform for creating powerful 3D geospatial applications. Cesium is the creator of the 3D Tiles open standard, also used by Google. By combining 3D geospatial data with infrastructure data, stakeholders can visualize their assets, both existing and planned, in full, real-world context.

For example, this technology has been used on HS2, the high-speed railway under construction in the U.K. BBV, a Balfour Beatty Vinci Joint Venture, developed an in-house application utilizing Bentley's iTwin Platform, which allows users to quickly navigate to any asset, generate imagery, and view flythrough videos. Through Cesium technology, Google 3D Tiles provide geospatial context to aid navigation and enhance the digital twin.

"When this data is combined with Bentley's infrastructure engineering expertise, the result is an ecosystem where data can flow seamlessly, providing users with access to the most comprehensive and actionable geospatial insights available," Cumins said.

Learn more about Bentley's Google partnership, the Cesium acquisition, and what they mean for infrastructure sectors.

AI is a paradigm shift

Cumins called AI a "paradigm shift" for infrastructure sectors, which create massive amounts of data during design, construction, and operations. By applying AI, infrastructure data can be analyzed for deeper insights.

While AI has been used to improve asset operations, Cumins explained that AI's potential extends even further into the design phase of the infrastructure lifecycle. Infrastructure organizations can leverage AI and reuse their data to automate repetitive tasks, such as documentation and annotation, enabling engineers to focus on higher-value activities.

At the 2024 Year in Infrastructure conference, Bentley announced OpenSite+, a new digital twin-native engineering application for civil site design that features generative AI capabilities, including a design copilot that will drive new levels of productivity and accuracy.

"At the end of the day, AI's true power will be measured by its ability to improve outcomes—more sustainable designs, faster and safer builds, and more reliable infrastructure systems. As we look to the future, the possibilities seem endless," Cumins said.

Bentley Asset Analytics

Open data and AI can come together to enhance asset performance. Because more than 95% of the infrastructure that will be in use in 2030 already exists today, owner-operators need to ensure that existing infrastructure is resilient, efficient, and capable of meeting current and future demands.

To address this challenge, Cumins announced Bentley Asset Analytics, a new product portfolio that combines existing products and solutions with new innovations and recent acquisitions. Bentley Asset Analytics leverages AI to generate insights into the condition of existing infrastructure assets while eliminating costly, manual activities.

The portfolio includes Blyncsy, which automates roadway maintenance and asset inventory activities through crowd-sourced imagery and AI, and OpenTower iQ, which automates every stage of the telecommunications tower lifecycle through drone-capture imagery, other data sources, and AI. Bentley plans to cover a wide range of asset classes and incorporate diverse data capture techniques, such as IoT sensors and drones, to create advanced solutions for owner-operators.

Looking ahead

The 2024 Year in Infrastructure conference followed Bentley's celebration of its 40th anniversary in September 2024. Cumins used the occasion to reflect on the opportunities for infrastructure engineering over the next decades.

"The key to moving forward, to harnessing the paradigm shifts of the next 40 years, is to unlock the value of data," Cumins said.

"Together, we're laying the groundwork for a future where open data ecosystems and AI work seamlessly to create more sustainable and resilient infrastructure—for better quality of life—for generations to come."

Year in Infrastructure Conference

Bentley's iLab

The conference featured Bentley's iLab, a stunning immersive experience powered by digital twin technology, 3D geospatial capabilities, and AI. Attendees lined up to step inside the exhibit and interact with infrastructure's future. "The technology we're seeing here is absolutely amazing for cities," said Jamie Cudden, smart city program manager with the Dublin City Council in Ireland. "It's a game changer. You can layer 3D data, engage citizens, and I'm so excited to use it in Dublin."

Going Digital Awards Turn 20

The Going Digital Awards program marked its 20th anniversary in 2024. Over two decades, the program has honored more than 5,000 extraordinary infrastructure projects—and the people behind them.

20 Years

The first iteration of what are now the Going Digital Awards was held in 2004. The BE Awards of Excellence celebrated "the extraordinary work of Bentley software users and their role in improving the world." The inaugural year attracted 135 nominations from architecture and engineering firms and owner-operators, including cities, DOTs, and government departments. Winners were announced at a black-tie gala in Philadelphia.

From the very beginning, the projects highlighted the tangible, quantifiable benefits of using Bentley software. The 2004 winner in Extreme Mapping, for instance, went to Toronto's use of MicroStation GeoGraphics to create a 3D topographic map encompassing the city's building outlines, catch basins, streetlights, and fire hydrants. The project, which also categorized the public and private ownership of over 1.1 million trees, saved the city an estimated USD 7 million.

Since then, the awards have highlighted many high-profile projects, such as the National Swimming Center for the 2008 Beijing Olympics and the Channel Tunnel Rail Link between France and the U.K. Yet the majority of Going Digital Awards recognize the equally extraordinary work of those who design, build, and operate infrastructure assets that function best by attracting the least attention—sewers that don't flood, highways that don't jam with traffic, and lights that don't flicker in foul weather. Where else can the otherwise anonymous engineers responsible for these projects gather in tuxedos and evening gowns to punch the air in triumph as their names are called out in front of their most accomplished peers?

Throughout the years, the technical detail and sophistication of Going Digital Awards submissions have evolved, moving well beyond 2D design to encompass 3D modeling, cloud-based collaboration, and AI-powered digital twins. Longtime Going Digital Awards juror and industry analyst Monica Schnitger has seen this technology advancement through the awards first-hand. "Originally, these awards recognized designers who used 3D technology to drive efficiency," she explains. "Now, we're assessing how massive projects are building and leveraging rich data assets to create value throughout the entire lifecycle of a project—from initial financial decision-making through design and construction."

Infrastructure sectors' increased focus on sustainability and climate resilience is also reflected in the submissions. In 2008, Bentley celebrated architects, engineers, planners, and owner-operators at the vanguard of the "global movement to provide society with pollution-free renewable energy, clean water, efficient transportation, and sustainable buildings" by introducing two new categories: "Sustaining Our Society" and "Sustaining Our Environment." By 2024, 90% of award submissions demonstrated how digital technologies enable sustainable and climate-resilient outcomes. Over three-quarters reported tangible, net-positive impacts—social, environmental, or both.

While the technical details and sophistication of the project submissions will continue to evolve, there is little doubt that the essence of what makes the awards so unique remains intact. Bentley's CEO Nicholas Cumins said, "The Going Digital Awards showcase how infrastructure is advancing—shaping the future today through innovation, the use of technology and data, and inspiring problem-solving."

Bentley's former Chief Communications Officer Chris Barron returned to entertain the crowd in Vancouver. Discover more about Chris and his performances at the Going Digital Awards.

Going Digital Awards turn 20

Forty Years of Bentley Systems

2024 marked a significant company milestone: 40 years of Bentley Systems. As we reflect on when it began in 1984 and where we are today, the pace of change has been remarkable.

In 1984, computer-aided drafting required a costly mainframe and specialized workstations, restricting it to very few organizations. Today, AI-powered digital twins enable engineers to design, build, and operate the world's infrastructure across vast networks with millimeter-level precision, and Bentley software is used by more than 41,000 organizations in 194 countries.

Those 40 years tell the story of the Bentley brothers and the contributions that they have made to infrastructure engineering. The software that they created has helped the world's engineers and other infrastructure professionals improve quality of life for millions of people around the world. Indeed, the Bentley brothers created a very special company.

Of course, those 40 years would not have been possible without the passion, motivation, and innovation of our users, partners, colleagues, and everyone else who has been part of the Bentley journey.

To learn more, watch "Advancing Infrastructure: The Bentley Systems Story," a short film about Bentley's journey from a small startup to a global leader in infrastructure engineering software.


Bentley


MicroStation V8
XM edition


Nasdaq

BRIDGES & TUNNELS

This category recognizes projects that demonstrate going digital innovations in the planning, design and engineering, construction, project delivery, or operations and maintenance of bridges and tunnels.

Winner: Going Digital Award in Bridges and Tunnels

JMT

Digital Experience for I-95 Rappahannock River Crossing Construction Project
Location: Fredericksburg, Virginia, United States

Project Playbook: Bentley Descartes, Bentley Infrastructure Cloud,
Bentley LumenRT, iTwin, iTwin Capture, iTwin Experience, iTwin IoT, MicroStation,
OpenBridge, OpenCities, OpenFlows, OpenRoads, ProjectWise

To alleviate congestion along I-95 across the Rappahannock River in Northern Virginia, JMT was contracted to deliver six miles of new southbound lanes and four bridges. The design included complex plans to maintain traffic during construction and was subject to strict environmental requirements. Previous attempts to renovate one of the busiest roadways in the United States had failed, requiring JMT to implement a streamlined digital approach.

JMT selected Bentley Open applications to model the existing roadway and propose designs and construction plans. Advanced modeling and simulation features allowed JMT to effectively assess traffic management and the sustainability of the new roadway designs, identifying and resolving issues early on to save time and resources, as well as minimize community and environmental impact. Integrating Bentley LumenRT produced clear, immersive animations, enhancing stakeholder and public understanding and engagement. The 3D models and simulations will help shorten construction time and minimize future roadway repairs.

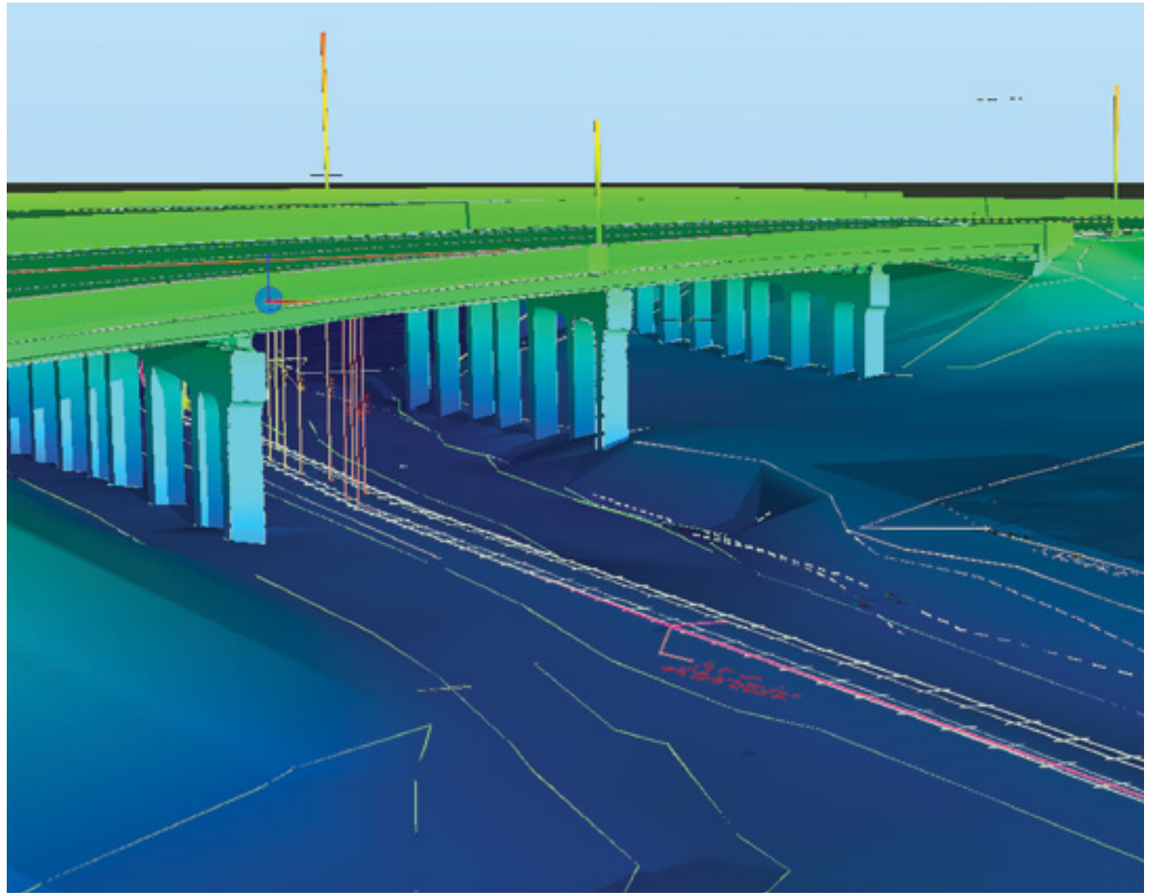
Tecne Systra-Sws Advanced Tunneling Srl

Digital Implementation in Tunnel Assessment and Rehabilitation
Location: Italy

Project Playbook: Bentley LumenRT, Leapfrog, OpenTunnel, PLAXIS, ProStructures

To improve the safety of decades-old tunnels along Italy's Autostrada motorway, Tecne Systra-Sws Advanced Tunneling (Tecne) was hired to perform structural renewal and reinforcement works. The project included investigative surveys to evaluate existing tunnel conditions, as well as design demolition and reconstruction recommendations. With multiple disciplines working simultaneously, and the requirement to minimize impact on motorway traffic, Tecne sought an integrated digital 3D modeling and simulation platform accessible to all project participants.

Tecne selected OpenTunnel Designer and Bentley's geological, geotechnical, and structural modeling and analysis applications, establishing a connected data environment to create three comprehensive 3D models representing the existing conditions, demolition, and proposed works. The interoperable and automated features of Bentley software helped streamline workflows, accelerate optioneering and decision-making, and improve design efficiencies by 20%. They also used the software to reduce modeling time by 21% to save approximately EUR 26.6 million in costs. The rehabilitations will extend the existing tunnel lifecycle, and the 3D design models provide the basis for developing a digital twin for future asset management.



QK4, Inc.

Going Digital Survey with Bridging Kentucky
Location: Kentucky, United States

Project Playbook: Bentley Descartes, Bentley LumenRT, iTwin Capture, MicroStation, OpenRoads, ProjectWise

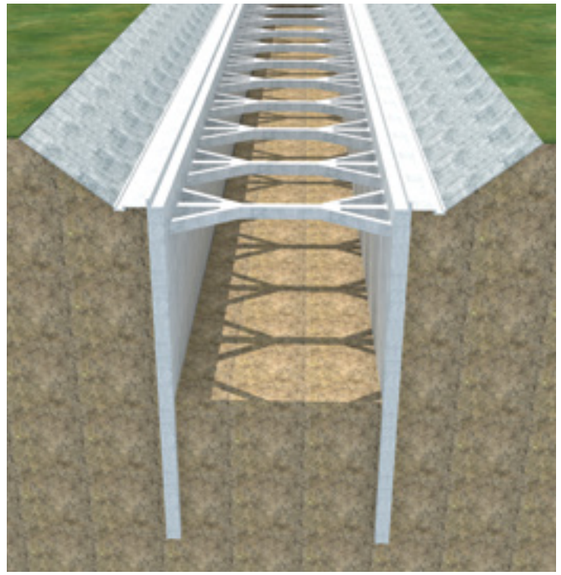
Bridging Kentucky focuses on improving the condition of over 1,000 deficient bridges across the state to enhance and ensure traveler safety and mobility. Given the volume, time, and geographic scale of the project, it was predicted to take over a decade and cost more than USD 7 million, requiring a new approach to land surveying and engineering. Leading land surveying for this project, QK4 wanted to implement a fully digital approach, integrating all survey data into accurate, intelligent 3D models, accessible to all teams working on multiple bridges simultaneously.

QK4 selected iTwin Capture, OpenRoads, and ProjectWise to digitally survey, model, and communicate 3D data for more than 700 bridges. Using Bentley's integrated applications, they delivered the project with almost a 90% reduction in time surveying the bridges, reducing survey costs by almost 50% to save Kentucky taxpayers more than USD 3 million. Bentley's collaborative and comprehensive technology solution helped QK4 create digital twins that design engineers can use for construction plans, setting new standards in bridge surveying, design, and construction.

China Railway No. 10 Engineering Group Co., Ltd. Jinan Survey and Design Institute

Application of BIM Technology in the High-speed Railway Tunnel Project of the Comprehensive Transportation Hub of Jinan Yaoqiang International Airport
Location: Jinan, Shandong, China

Project Playbook: MicroStation, OpenBuildings, OpenRail, OpenRoads



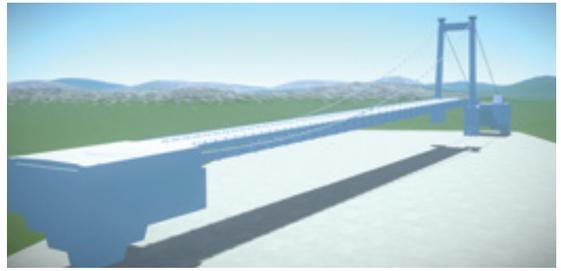
To enhance travel safety, offer more transport options, and support population growth, the Comprehensive Traffic Hub project of the Jianan Yaoqiang International Airport was initiated along the Jinan Liaison rail line. The reconstruction and expansion project includes construction of the 3,164-meter Jinan-Binzhou high-speed railway section, featuring two tunnels and a station building. Located on the original airport site, the project presented limited construction space for multiple works to be executed without impacting airport use. To coordinate numerous stakeholders and optimize resources on a tight construction schedule, the team realized that they needed a digital approach to transport design and construction.

The team selected MicroStation and OpenRoads to establish a model-based approach for building the tunnels, providing a digital, visual environment for construction debriefing. Using Bentley's integrated applications reduced modeling time by 50% and enabled the identification and eliminatio n of 180 collisions, avoiding rework and shortening the construction period by 97 days to save CNY 1.2 million. The 3D modeling helped minimize carbon emissions, optimizing material usage and resources.

China Railway No. 4 Engineering Group Co., Ltd.; Anhui Digital Intelligent Construction Research Institute Co., Ltd.

Comprehensive Application of BIM in the World's First One-tower Ground-anchored Slewing Cable Suspension Bridge
Location: Shanxi, China

Project Playbook: Bentley LumenRT, iTwin Capture, OpenBridge, OpenRoads



Crossing the Xianolangdi Reservoir of the Yellow River, Jixin Yellow River Bridge adopts the world's first one-tower, ground-anchored slewing cable suspension bridge, achieving flood resilience and environmental protection of the surrounding cliffs designated as a national heritage reserve. The project location presented complex site conditions and challenges constructing and installing the various bridge elements. China Railway No. 4 is the construction contractor and realized that they needed an integrated BIM technology solution to successfully deliver the project.

They selected OpenBridge and OpenRoads to create a BIM model, iTwin Capture to establish a GIS model of the existing site, and Bentley LumenRT to generate a realistic animated visualization of the entire project. The integrated BIM solution enabled simulation of the construction process, identifying and eliminating collisions, avoiding waste, and minimizing environmental impact. Their collaborative, digital BIM workflows reduced construction difficulties by 10% and shortened the construction period by 90 days, saving a total of CNY 6 million in construction costs.

Kung Sing Engineering

Construction Project of Tamkang Bridge, New Taipei City
Location: New Taipei City, Taiwan

Project Playbook: iTwin, MicroStation, OpenBridge, OpenBuildings, OpenRoads, ProjectWise, ProStructures

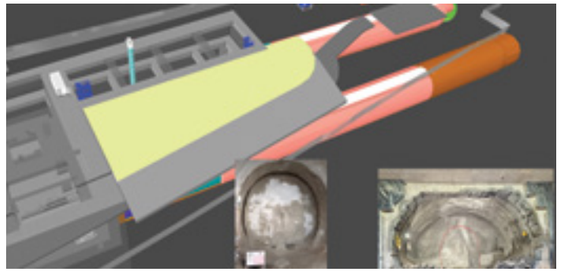
A railway and road dual-purpose bridge, Tamkang Bridge crosses the mouth of the Tamsui River and will alleviate traffic at Tamsui New Town. With a design speed of 80 kilometers per hour and reserved center corridor for the Bali Light Rail Transit, the 12.08-kilometer bridge is set to become the world's longest single-tower cable stayed bridge. Kung Sing Engineering was contracted to construct the bridge and faced challenges accommodating the irregular curved structural design of the towers, piers, and bridge deck. They realized that they needed an integrated digital modeling solution.

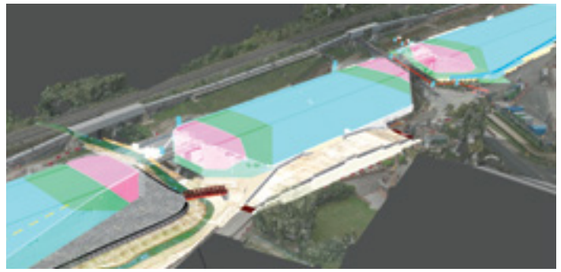
Kung Sing selected Bentley's open 3D modeling applications and ProjectWise to establish a connected data environment. Then, they created 3D construction models, performed construction simulation, and virtually reviewed the various aspects of construction in real time with the design team and stakeholders. Through visual, digital collaboration, the team clarified design issues and resolved conflicts during construction, improving efficiencies and reducing the carbon footprint of the project. The digital platform provides a solid foundation for ongoing asset management.

Skanska Costain Strabag JV

H2 Main Works South PH-1
Location: London, United Kingdom

Project Playbook: AssetWise, iTwin, iTwin Capture, MicroStation, OpenBuildings, ProjectWise, STAAD, SYNCHRO





Britain's final 26.4-kilometer stretch of the railway from Northolt to Euston, London will complete the HS2 line, improving connectivity in the United Kingdom. As part of a joint venture, Skanska, Costain, and Strabag are managing the project. They faced challenges navigating the tunneling through complex geological terrain, ensuring structural integrity, managing logistical hurdles, and engaging with stakeholders and the local community. To address these issues, the joint venture needed a comprehensive suite of technology for design, project management, and construction.

They selected Bentley's open modeling applications, ProjectWise, and SYNCHRO to deliver the project, allowing for efficient collaboration, data management, and visualization. Integrating iTwin provided advanced modeling capabilities, allowing for precise design and visualization of the complex bridge and tunnel structures. Bentley's digital solution facilitated real-time collaboration, 4D optioneering, and digital rehearsals, streamlining communication, optimizing scheduling, and reducing costs to improve overall project efficiency. Working in a collaborative digital environment offered valuable insight to develop a realistic construction plan and reduced the project's carbon footprint and construction waste.

CSCEC Road and Bridge Group Co., Ltd.

Intelligent Construction of Baoding Lekai Street South Extension Project Based on BIM
Location: Baoding, Hebei, China

Project Playbook: Bentley LumenRT, MicroStation, OpenRoads

The Baoding Lekai Street South Extension project was initiated to ease traffic congestion in Baoding and improve connectivity between the central urban area and the city's Qingyuan District. CSCEC is constructing the roadway, which includes a world-record-setting, double-swivel cable-stayed bridge for both the weight and span of its swivel. Located in an urban center amid public transport infrastructure, the project presented a limited footprint and required numerous traffic diversions to minimize traveler and community impact. To address these issues and optimize coordination among stakeholders and the construction crew, CSCEC realized that traditional construction technology and 2D drawings would not suffice.

They selected MicroStation, OpenRoads, and Bentley LumenRT to model, simulate, and generate a realistic, immersive visualization of the entire project, ensuring all personnel understood the construction scheme. Working in an integrated digital environment, CSCEC identified and resolved more than 1,000 collisions to save CNY 2.4 million in potential rework. Bentley's applications shortened the construction period by 105 days, lowered resource consumption, and minimized environmental pollution, reducing annual carbon emissions by 20%.

Hunan Provincial Communications Planning, Survey & Design Institute Co., Ltd.

Shunde Waterway Expansion and Upgrading Project
Location: Foshan, Guangdong, China

Project Playbook: Bentley LumenRT, MicroStation, OpenRoads

Essential to China's Greater Bay transportation network, the Shunde Waterway provides significant economic value for Foshan and nearby ports, leading the local government to initiate an expansion and upgrade project that includes demolition and reconstruction of the Sanhongqi Bridge. Located five meters upstream from the old bridge, adjacent to residential areas in a high environmental protection zone, the project presented a limited construction space and complex structural elements. To meet owner-imposed BIM demands, the project team needed flexible and interoperable modeling and engineering technology.

The team selected Bentley's integrated 3D modeling applications to create a model of the existing bridge, design the new bridge, and visualize the demolition and reconstruction works. Working in a collaborative BIM platform, the team virtually evaluated the construction process prior to onsite works, identifying and resolving 93 collisions, saving time and costs. The digital solution streamlined workflows, ensuring synchronous implementation and verification, and enhancing decision-making to keep the project moving forward.

ABM Knowledgeware Limited

Swatantrya Veer Savarkar Sea Link Project – Versova-Bandra Sea Link Project
Location: Mumbai, Maharashtra, India

Project Playbook: AssetWise, OpenBridge, OpenRoads, ProjectWise, SYNCHRO

ABM Knowledgeware is part of a consortium delivering the Versova-Bandra Sea Link project in Maharashtra, India. The project required setting up a digital project management system to ensure timely completion, environmental sustainability, and asset lifecycle management. To effectively manage and share the voluminous project data with multiple stakeholders, ABM realized that they needed a connected digital ecosystem and single source of truth for collaboration and real-time progress monitoring.

Leveraging Bentley's Open applications with ProjectWise and SYNCHRO, ABM established a digital BIM platform for 3D modeling, as well as 4D and 5D BIM simulations. Working in a common data environment and visual platform helped effectively monitor project progress in terms of schedule, cost, environmental impact, and quality of deliverables. The integrated digital solution streamlined collaboration and approval processes and provided ABM with a solid foundation for redeploying the technology on future projects.

Burgess & Niple, Inc.

Virgin River Gorge – Structure Health Monitoring
Location: Littlefield, Arizona, United States

Project Playbook: iTwin Capture, iTwin Experience, iTwin IoT, MicroStation, STAAD

When the Arizona Department of Transportation (ADOT) wanted to improve inspection and maintenance of the Virgin River Gorge bridges located in the northwest corner of the state, they engaged the national bridge engineering firm Burgess and Niple to determine an optimal approach. The project required Burgess to provide ADOT with a platform to monitor critical areas of concern, offer insight into potential issues, and facilitate strategic decision-making. The remote location and surrounding terrain presented challenges accessing the bridge structure. To minimize field inspection trips and ensure cost-efficient bridge maintenance, Burgess realized that they needed an integrated digital modeling and analysis solution.

Burgess selected STAAD to model the bridge structure and perform finite element analysis. The application's flexibility and interoperability ensured seamless integration with monitoring devices and instrumentation. Using Bentley's iTwin Platform provided a visual, interactive environment to present the data, transforming it into actionable information that ADOT can use to make intelligent, cost-effective decisions regarding bridge maintenance.

K2 Estudio de Ingeniería S.L.

Zumelegui Viaduct in Elorrio
Location: Elorrio, Vizcaya, Spain

Project Playbook: OpenBridge

The Zumelegui viaduct is part of a new high-speed railway in Vizcaya to reduce traffic between the provincial capitals of the Basque Country and connect Spain's cities through fast, clean, and safe transportation. Spanning 481 meters in length and divided into seven spans, the deck is connected to four central piers using the balanced cantilever construction method. The project presented site and structural challenges requiring comprehensive and flexible bridge modeling and analysis technology.

The team selected OpenBridge to perform 3D modeling and structural analysis, enabling them to quickly and comprehensively implement the adaptations and modifications needed to meet the client's design requirements. Working in a digital environment was key to keeping the project on schedule. Without the flexible and robust features of OpenBridge, the team could not have completed the project.

Representatives of JMT accept the award in the Bridges and Tunnels category of the 2024 Going Digital Awards.

CONSTRUCTION

This category recognizes projects that demonstrate excellence using 4D modeling to digitally plan and optimize construction, including leveraging project, performance, and cost management workflows that unite the office and field.

Winner: Going Digital Award in Construction

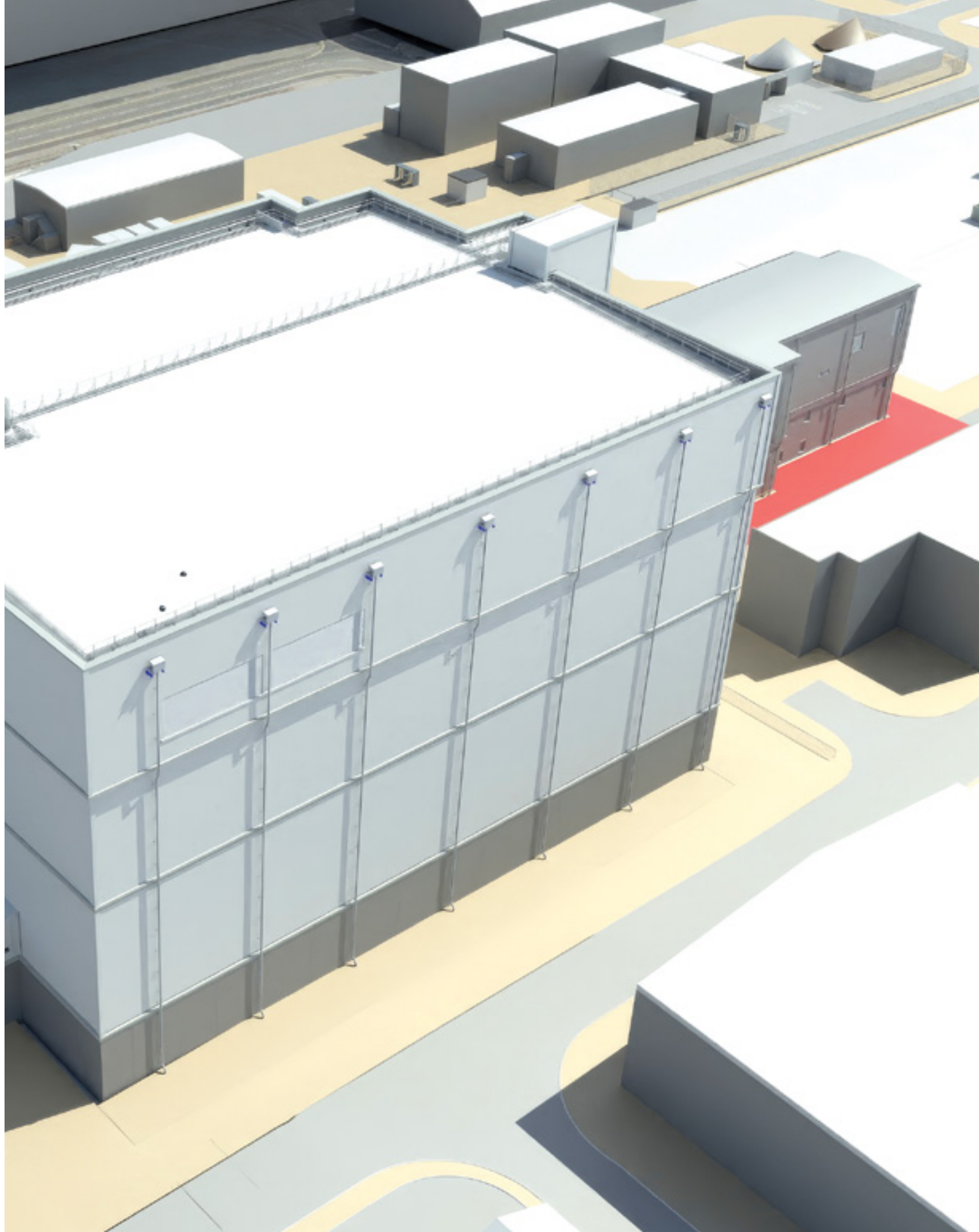
Proicere Digital

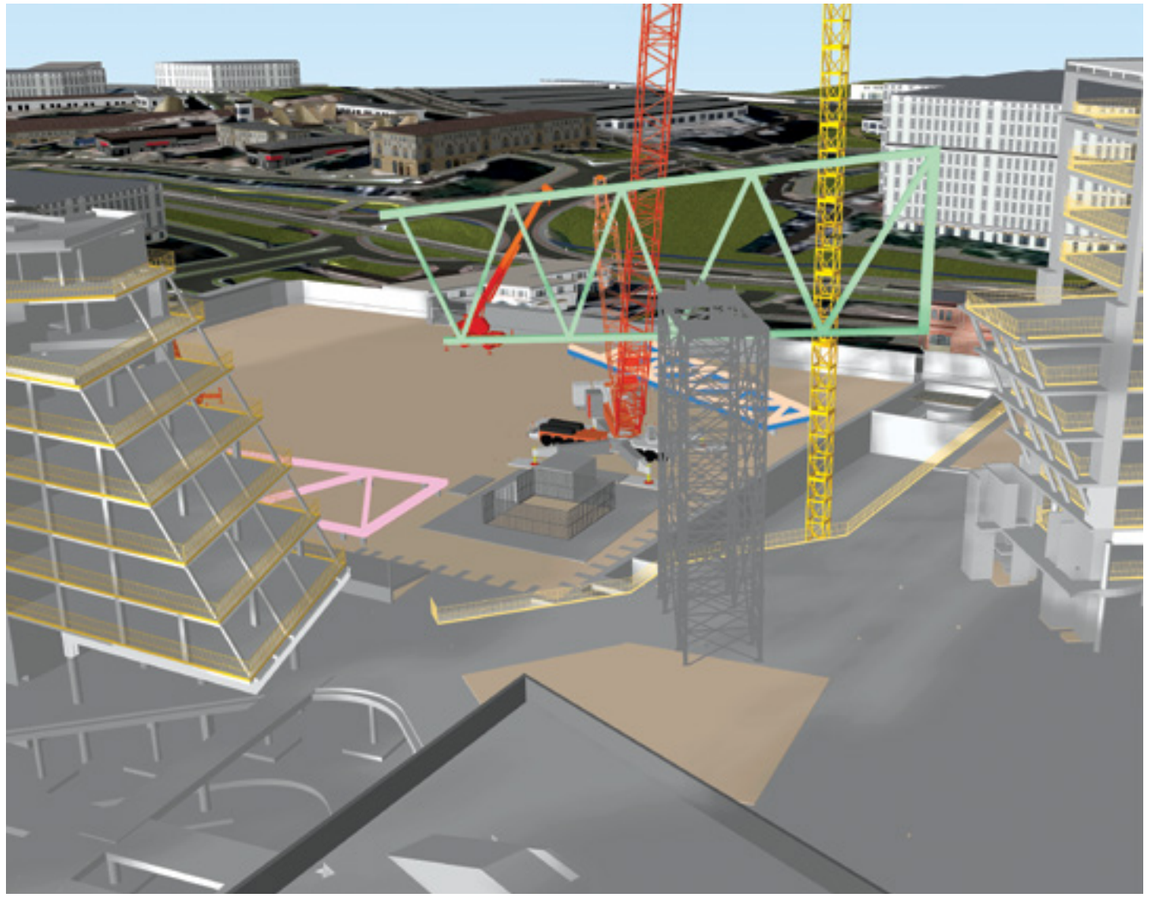
Sellafield Retreatment Plant (SRP) Project
Location: Seascale, Cumbria, United Kingdom

Project Playbook: iTwin, SYNCHRO

The Sellafield Retreatment Plant (SRP) is part of the United Kingdom's Nuclear Decommissioning Authority's (NDA) initiative to gradually transfer, repackage, and safely store 140 tons of separated plutonium for 100 years, playing a vital role in safeguarding public health, protecting the environment, and advancing scientific knowledge. Proicere Digital is delivering the project subject to complex regulatory requirements and stringent safety standards. To meet these criteria and coordinate multiple disciplines and interfaces amid schedule pressures, Proicere Digital needed a collaborative digital solution for optimal planning, execution, and monitoring.

Proicere Digital leveraged SYNCHRO for 4D planning and scheduling, empowering the team to digitally visualize, plan, and execute the complex site works. Working in a connected digital platform, they established a digital twin to perform construction simulations, streamlining workflows, as well as identifying and mitigating over 160 potential risks. The digital solution has already saved over GBP 80 million in costs, avoided over 500 days of rework, and achieved a substantial reduction in environmental impact. By maximizing handprint and minimizing footprint, the project sets a benchmark for sustainable infrastructure development in the industry.





Webuild s.p.a.

4D Modeling and Construction Management for Pedestrian Steel Bridge Construction in the New ENI HQ
Location: San Donato Milanese, Lombardia to Milano, Italy

Project Playbook: SYNCHRO

One of the world's most innovative sustainable developments, Milan's new, iconic ENI headquarters featured three interconnected office buildings, a landmark skybridge, and 11,684 square meters of total green surface area. Webuild was contracted to deliver the project over a short timeline amid a limited footprint. However, the critical node of the entire construction plan was the large steel sky bridge, presenting a deeply complex assembly. To keep the project on schedule and ensure safe, streamlined workflows, Webuild sought a collaborative digital construction simulation solution.

Webuild chose SYNCHRO to establish a dynamic, virtual construction environment and a digital twin to evaluate multiple scenarios, perform clash detection, and determine a construction solution that optimized planning and safety while minimizing social and environmental impact. Bentley's 4D construction technology reduced rework by 90% and the construction schedule from 85 days to just four days. Working in a connected digital platform optimized the site layout, decreasing the carbon footprint of the project by 30%, and provided insight into all phases of construction, achieving zero on-site accidents.

PT Hutama Karya (Persero)

Navigating the Complexities of Jakarta MRT Phase 2A CP203 with Digital Solutions
Location: Jakarta, South Jakarta, Indonesia

Project Playbook: Bentley LumenRT, iTwin, Leapfrog, PLAXIS, ProjectWise, SYNCHRO

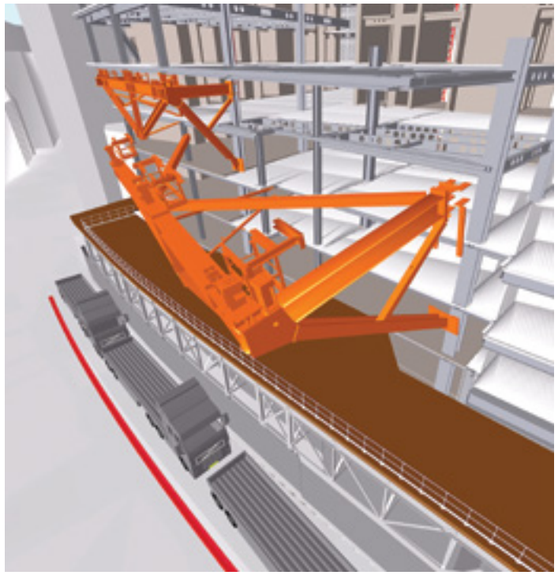
PT Hutama Karya (Persero) is delivering Phase 2A of Jakarta's MRT, involving the construction of two main underground stations. Upon completion, the rail line will enhance citywide connectivity and mobility, integrating with Jakarta's entire transportation network to reduce traffic congestion and carbon emissions by up to 35%. Located in a dense urban area, the project presented site constraints and complicated ground conditions, demanding meticulous planning and scheduling. To address these issues, Hutama Karya needed a comprehensive, integrated digital solution.

Hutama Karya selected Leapfrog and PLAXIS for geotechnical modeling and analysis, SYNCHRO for 4D planning and construction simulations, and ProjectWise and iTwin to establish a digital twin. Bentley's geotechnical applications improved soil data collection and analysis by up to 95% and mitigated risks during excavation, saving up to USD 2.5 million. SYNCHRO 4D reduced heavy equipment use, promoting eco-friendly construction to save 50 tons of carbon emissions. Through real-time digital collaboration and data analysis, Hutama Karya streamlined coordination and communication, slashing on-site operational inspection efforts by 90%.

Lendlease

8 Bishopsgate
Location: London, United Kingdom

Project Playbook: SYNCHRO



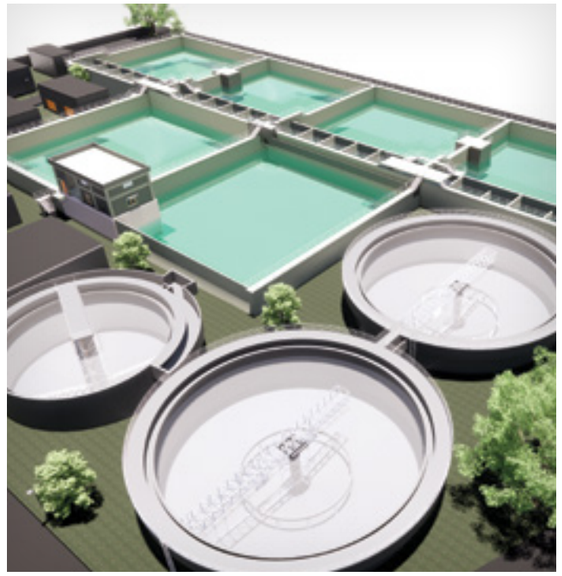
8 Bishopsgate is a demolition and new-build construction project that replaces an existing 79-meter-high office building with a 51-story skyscraper in the heart of London. Lendlease is acting as the construction manager and faced tight logistical constraints, an accelerated schedule, and public safety concerns amid global events disrupting project progress. They realized that previous software solutions lacked the interoperability and sophistication necessary to optimize construction sequencing and keep the project moving forward. They needed a 4D construction management solution that offered real-time insights into the construction schedule and project progress.

Lendlease selected SYNCHRO to handle the voluminous, multisourced data and to perform construction simulations, facilitating visual, coordinated workflows to quickly adapt to changes, avoiding risks and rework. The solution produced a more efficient construction sequence, enabling faster works and a more rapid handover, saving over three months in project delivery time. Through collaborative digitalization, they saved 200 tons in carbon emissions designing the steel structure frame and maximized space to offer one of the most sustainable office buildings in Europe.

MaRS Planning & Engineering Services Pvt. Ltd.

30 MLD Common Effluent Treatment Plant
Location: Ahmedabad, Gujarat, India

Project Playbook: SYNCHRO



To control pollution of the Sabarmati River and foster a healthier living environment for residents, Ahmedabad Municipal Corporation established a 30 million-liters-per-day (MLD) wastewater treatment plant. MaRS was the chief BIM consultant responsible for providing construction management services. To coordinate the multiple disciplines and ensure timely, cost-efficient delivery, MaRS sought an innovative digital approach that enabled a real-time, comprehensive overview of the project schedule and deliverables.

MaRS selected SYNCHRO to implement 4D schedule and 5D cost simulations, as well as establish a virtual environment for optimal construction sequencing, logistics planning, and cost control. Through accurate 3D modeling and reporting and improved collaboration, MaRS achieved a 90% accuracy rate in projected cost estimates, reduced material waste by 30%, and shortened the construction schedule by 60 days. The digital rehearsals mitigated on-site risks, improved data exchange by 80%, and reduced the plant's energy consumption by 15%, compared to the original design. The resulting facility digital twin will be used for lifecycle operations and maintenance.

Kent

Ampol Future Fuels Gasoline Desulfurization Project
Location: Brisbane, Queensland, Australia

Project Playbook: SYNCHRO

Located in Lytton, Queensland, the Ampol Future Fuels Gasoline Desulfurization project is a major oil refinery upgrade supporting Australia's initiatives to provide a cleaner product and secure the country's long-term fuel supply and sovereign refining capabilities. Kent faced an accelerated timeline for project implementation to ensure compliance with new legislation. They realized that they needed a comprehensive construction solution to provide accurate, real-time project progress updates, ensuring any potential risks to the schedule were identified early on, communicated, and appropriately mitigated.

Kent chose SYNCHRO to digitalize construction management processes, providing clear visibility into cost and schedule forecasts, identifying potential risks prior to on-site works, and streamlining workflows and client reporting. Bentley's construction software offered a centralized, secure, and accurate source of truth in real time, significantly reducing report production times and environmental impact. The digital solution reduced frontline resources required for project execution while facilitating accurate and timely reporting.

Jacobs - Greenman Pedersen Inc. JV

Brooklyn Bridge-Montgomery Coastal Resilience
Location: New York City, New York, United States

Project Playbook: SYNCHRO

The Brooklyn Bridge Montgomery Coastal Resilience project is a critical initiative designed to protect New York City from flooding and enhance the resiliency of communities at risk of storm surges. The project will serve as a benchmark for coastal resilience in the face of global warming and rising sea levels. Greenman-Pedersen Inc. (GPI) is leading project and construction management services and faced many challenges navigating the city's complex landscape and addressing the frequent changes in work sequences.

GPI leveraged SYNCHRO for 4D construction planning and management, creating simulations that simplified the complex work sequences and facilitated proactive problem-solving, reducing delays to keep the project on schedule. Using Bentley's application improved risk identification by 50%, compared to traditional methods, and shortened construction schedule reviews by up to 24 hours. The advanced visualization and simulation features of SYNCHRO helped optimize construction plans, contributing to the reduction in the overall carbon footprint of the project.

China Construction Buer Curtain Wall & Decoration Co., Ltd.

Building T2 and T10 Curtain Wall Project of Shenzhen Metro Qianhai International Hub
Location: Shenzhen, Guangdong, China

Project Playbook: AutoPIPE, MicroStation, MOSES, ProjectWise, RAM, STAAD, SYNCHRO

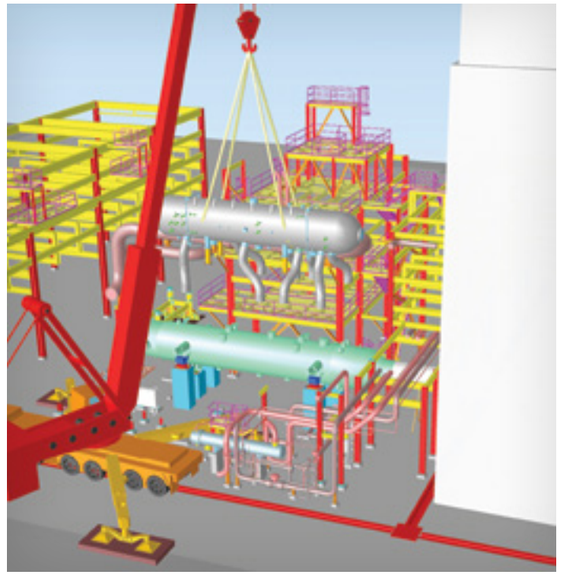
This project involved the construction of curtain walls for two buildings in the Shenzhen Metro Qianhai International Hub, promoting the integration of regional transportation, commerce, and culture. The complex geometrical shape of the curtain wall presented challenges for the construction team, compounded by coordinating data and workflows among multiple disciplines on a tight timeline and budget. The construction firm sought to apply full lifecycle BIM strategies, but previous software failed to meet collaboration, simulation, and processing requirements.

The team selected Bentley's integrated BIM, construction management, and digital twin technology to establish a connected data environment, model the project, and perform construction simulations. Working in ProjectWise's collaborative platform improved data integration by 40% and enabled the team to eliminate 3,530 potential conflicts. Using SYNCHRO for intelligent construction planning helped optimize resources and material use, reducing carbon emissions by 6,905 tons and shortening the construction period by 97 days, saving USD 800,000. The successful construction of the hub sets a new standard for the application of global BIM technology.

Mitsubishi Heavy Industries Asia Pacific Private Limited, Singapore

Complex Process Equipment Replacement Project
Location: Jose, Etado Anzoategui, Venezuela

Project Playbook: MicroStation, RAM, STAAD, SYNCHRO



As part of a critical boiler replacement project in Venezuela, Mitsubishi Heavy Industries was involved in the engineering, procurement, and construction planning of a new waste heat boiler to increase the steam production capacity and avoid regular plant visits. A heavy piece of equipment located amid an active, congested plant, the boiler's weight, location, and surrounding congestion presented a multitude of technical, coordination, and safety challenges. Understanding that the construction processes presented many unknown risks, Mitsubishi sought a digital solution to ensure accurate construction planning.

They selected MicroStation and SYNCHRO to collaboratively model and simulate the boiler lifting process to visualize any blind spots and virtually review the construction plan. Bentley's interoperable construction solution enabled the team to analyze safety measures, identifying and reducing risks. Working in a coordinated digital environment minimized site visits, saving approximately SGD 60,000 and 40 resource hours by virtually identifying and resolving clashes in heavy lifting activities.

Promet Montajes

Desalination Plant for Mining
Location: Tocopilla, Antofagasta, Chile

Project Playbook: SYNCHRO

With many mineral deposits located in Antofagasta, Chile, the region has become a strategic water supply for large mining companies. To offer more sustainable water supply alternatives and reduce the impact of mining on Chile, construction of a seawater desalination plant using reverse osmosis was proposed. Promet Montajes is responsible for construction works, including the facility structures, offshore works, and a water supply system spanning 99 miles with pipes at an altitude above 9,800 feet. The large-scale project had ample data and multiple disciplines, which required integration and coordination that previous technology failed to support.

Promet selected Bentley's SYNCHRO solutions to establish a connected data environment and construction management platform. The digital solution ensured transparent and open data access for the project team and enabled virtual simulations of the construction process to visualize project progress and keep the client informed. Through digitalization and automation, Promet optimized collaboration and ensured data-driven decision-making. Working in an integrated platform reduced errors and response times, saved significant time and resources, and improved risk management, all while reducing costs and the carbon footprint.

Italferr S.p.A.

Digital Solutions for Monitoring the Progress of Large Infrastructure Projects
Location: Italy

Project Playbook: Bentley LumenRT, iTwin, iTwin Capture, MicroStation, OpenRail, ProjectWise, SYNCHRO

With an ambitious goal to revolutionize railway construction management, Italferr initiated a project across various construction sites in Italy to implement a monitoring system to optimize planning, perform regular progress checks, and proactively manage construction schedules. The voluminous data and need for real-time updates presented challenges in finding technology fit to adapt to the dynamic needs of the construction site and ensure compatibility within a multidisciplinary BIM workflow. Italferr needed an integrated digital solution that automated documentation updates and streamlined communication of project progress.

Italferr selected Bentley's ProjectWise, iTwin, and SYNCHRO to establish a common data environment and digital twin, then perform construction simulations. Working in a flexible, integrated digital platform enabled model-based dashboard customization for each project, providing a detailed, accurate, and up-to-date view of progress at each construction site. This increased productivity, improved construction efficiency, and reduced delivery times and costs associated with delays and unforeseen events. The success of this innovative approach has facilitated unprecedented site control and construction management, setting a new standard for managing complex infrastructure projects.

Delhi Metro Rail Corporation Limited

DMRC Phase IV Metro Extension
Location: New Delhi, India

Project Playbook: iTwin, nPulse, PLAXIS, STAAD, SYNCHRO

Aiming to provide a safe and seamless commuter experience, Delhi Metro Rail Corporation (DMRC) is working on Phase IV of the metro's extension. Located in the dense urban capital and connecting to existing metro corridors in multiple locations, it was critical for DMRC to minimize public impact. The elevated and underground passages added additional challenges of ensuring timely and cost-efficient project delivery. To overcome these issues, DMRC sought to establish a connected data environment and needed integrated technology to capture cost and various other project schedules, data, and models.

DMRC selected iTwin and SYNCHRO to create an integrated platform and leverage a single source of truth for all project information, streamlining the workflows of more than 100 people, to save at least 15% in resource hours coordinating the project. The ability to perform real-time, virtual reviews improved management reporting by 50%. Working in a connected digital environment facilitated proactive project controls. Given that the 3D model contains all project information collected in context, the team is exploring how the model can be used for future operations, maintenance, and asset management.

Worley Services India Private Ltd.

Fairley East (LCD 2) Project
Location: Kuala Belait, Belait District, Brunei

Project Playbook: SACS, SYNCHRO

Worley was awarded the engineering, procurement, and construction management contract for the Fairley East Greenfield topside and jacket project, responsible for the detailed design and maintenance of an integrated project management team. They faced challenges providing construction drawings and materials to the site team, resulting in poor project visibility. Previous manual solutions using spreadsheets and document management reports proved laborious, erroneous, and ineffective. Worley realized that they needed comprehensive digital construction management technology.

They selected SYNCHRO to perform 4D modeling and construction simulations, integrating the model with the contractor's work management system to provide detailed insight into the fabrication and installation works. Working in an integrated digital platform streamlined communication and provided clear visibility into the construction process to proactively identify and resolve clashes. Bentley's application ensured 100% adherence to the project schedule and completion date while saving approximately 10% in costs. Based on the success of this project, Worley is continuing to use this digital 4D approach to help manage projects in an agile way to achieve their goals within deadlines.

Heilongjiang Airports Management Group Co., Ltd., PowerChina Guiyang Engineering Corporation Limited, Shanxi Mechanization Construction Group Co., Ltd, Beijing Jinghang'an Airport Engineering Co., Ltd., Beijing Jiahe Construction Engineering Co., Ltd.

Harbin Taiping International Airport Phase II Expansion Project
Location: Harbin, Heilongjiang, China

Project Playbook: Bentley LumenRT, MicroStation, OpenBuildings, OpenRoads, ProjectWise, SYNCHRO

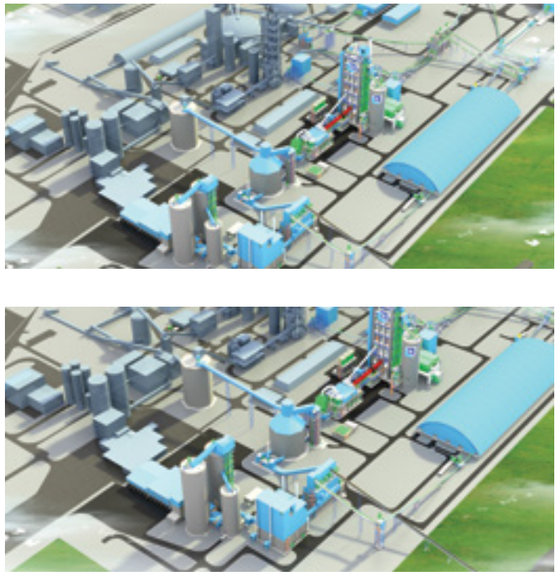
Designed to support 38 million passengers annually and 300,000 tons of cargo and mail, the Phase II Harbin Taiping International Airport expansion project will transform the airport into an international gateway hub, spreading throughout Northeast Asia and connecting the United States and Europe. The large, complex project covers the airport structure, air traffic control, fuel supply, and filling station, presenting challenges integrating design engineering across multiple disciplines and coordinating 30 different construction sections. The cold, rainy climate compounded these issues, necessitating an integrated digital modeling and simulation solution.

The team selected ProjectWise, Bentley's Open applications, and SYNCHRO to establish a connected data environment, perform coordinated design, and simulate the construction process. Working in a collaborative, integrated design engineering and construction management platform avoided 164 potential design changes to save CNY 8 million in rework costs. By accurately simulating and planning material and earthwork routes, the team saved 4,800 truck trips, reducing carbon emissions by 120 tons. Using Bentley's integrated applications improved collaboration efficiencies by 23% and shortened the construction period by 182 days.

CBMI Construction Co., Ltd.

International Cement Engineering Construction Empowered by Intelligent Construction
Location: Kinere, Dakar, Senegal

Project Playbook: iTwin, ProjectWise, SYNCHRO



Located in Kinere, Senegal, this project involves delivering a complete cement production line with a daily output of 6,000 tons as a smart, green cement plant. The project's completion will make the cement company the largest in West Africa, achieving an annual output of 5 million tons. The project included several heavy equipment and building structures, as well as required coordination among a multidisciplinary, geographically dispersed team. Seeking to implement full lifecycle digitalization and intelligent workflows, the team needed integrated BIM and 4D construction management technology.

The team selected ProjectWise as the collaborative BIM design platform, and SYNCHRO to simulate the construction plan, linking the project schedule to the 3D model for 4D management. Working in a connected, immersive digital environment improved international communication efficiency by 20%, shortened the design period by 5%, and ensured 100% accuracy of construction drawings. Through 4D construction planning, the project schedule was accelerated by 60 days, expected to save CNY 30 million. The digital solution helped the team utilize more alternative fuel options by 35%, reducing by 240,000 tons.

John Sisk & Son

Latitude Purple
Location: Leeds, England, United Kingdom

Project Playbook: SYNCHRO

Situated in a previously underutilized industrial zone of Leeds City Center, Latitude Purple is a build-to-rent development initiative, promoting the area as a new vibrant quarter. The project presented an array of complex site constraints, requiring well-planned temporary works, meticulous construction sequencing, and access management. John Sisk & Son, the main contractor on this project, knew that traditional planning and survey techniques would not suffice. Committed to digital project delivery, they deployed 4D planning to maintain alignment with the design development and construction schedule.

John Sisk & Son selected SYNCHRO to collaboratively develop a digital model of the site, utilizing and integrating all available data to virtually rehearse the project. The flexibility and interoperability of Bentley's application facilitated 4D construction simulations, streamlining communication among stakeholders and enabling better insight and decision-making regarding on-site works. Working in a connected, digital environment helped improve safety and cost efficiency for timely, on-budget project completion, while reducing waste and excess equipment on site. By leveraging 4D planning, John Sisk & Son estimates to avoid an average of GBP 4.68 million in potential costs.

MaRS Planning & Engineering Services Pvt. Ltd.

National Rail and Transportation Institute (NRTI)
Location: Vadodara, Gujarat, India

Project Playbook: SYNCHRO

National Rail and Transport Institute (NRTI) in Vadodara, Gujarat, India, is constructing a new university and hostel building. MaRS Planning & Engineering is providing BIM and construction management services, and faced challenges coordinating the diverse group of stakeholders, as well as the complex architectural, mechanical, electrical, and plumbing systems within the building design. Previous applications lacked robust collaboration features and 4D modeling capabilities, requiring MaRS to search for an advanced integrated digital modeling and construction planning solution.

MaRS selected SYNCHRO to implement a collaborative and efficient BIM workflow and perform construction simulations. Bentley's application provided a central BIM model accessible to all stakeholders and allowed for the creation of a comprehensive and coordinated construction sequence, addressing issues virtually in real time prior to on-site works. Working in an integrated digital platform optimized scheduling and improved resource utilization by 20% to reduce the construction schedule by 15 days and overall costs by 8%. The digital solution improved material management, reducing waste by 10% and carbon emissions by an estimated 6%.

The Third Construction Co., Ltd. of CTCE Group, China Railway No. 4 Engineering Group Co., Ltd.

Qingdao Feng River Wetland Park Project
Location: Qingdao, Shandong, China

Project Playbook: OpenBridge

Located along the West Coast New District of Qingdao, Feng River Wetland Park project is a new underground water treatment plant, covering a 19.5-hectare area. The plant has a treatment capacity of 200,000 cubic meters per day with a future treatment scale capable of treating 300,000 cubic meters per day. The project presented deep excavation, voluminous earthworks, and complex geological conditions, compounded by a tight schedule. To address these issues, the project team needed a robust, intelligent digital solution.

They developed a BIM-based integrated platform for construction simulation and management, using monitoring systems and sensors connected with IoT technology, for real-time intelligent analysis and to ensure safe construction. Through digital simulations and collision detection, the team saved CNY 50,000 on the earthworks and excavation scheme and CNY 250,000 on the pipeline layout. Working in a connected digital platform improved project management efficiencies, reducing costs and shortening the construction schedule by 36 days. Monitoring the foundation pits and surrounding construction environment in real time eliminated potential safety hazards and minimized environmental impact.

Yuzawa Kogyo Co., Ltd.

R2 Komu River Upstream Bank Protection
Location: Nirasaki, Yamanashi, Japan

Project Playbook: iTwin Capture

Located at an altitude of 1,200 meters in the upper reaches of the Komu River is a mountain road leading to the three peaks of Mount Hoo in Yamanashi. To help prevent erosion and landslides, the R2 Komu River Upstream Bank Protection project was initiated, requiring significant earthworks and temporary construction. The narrow, winding road sees many animals that can jump out suddenly and potentially cause falling rocks, presenting dangerous on-site working conditions.

To minimize time on site, the project team used drones along with iTwin Capture to photograph the area and generate a 3D reality model to visualize construction works and potential safety hazards. Bentley's application reduced modeling time by 95% and facilitated collaboration among the team, improving operational efficiencies. Compared to conventional construction methods, working in a digital environment optimized earthworks using heavy machinery, shortening the construction period by 40%.

Shanghai Construction No. 4 (Group) Co., Ltd.

Shanghai Grand Opera House
Location: Shanghai, China

Project Playbook: SYNCHRO

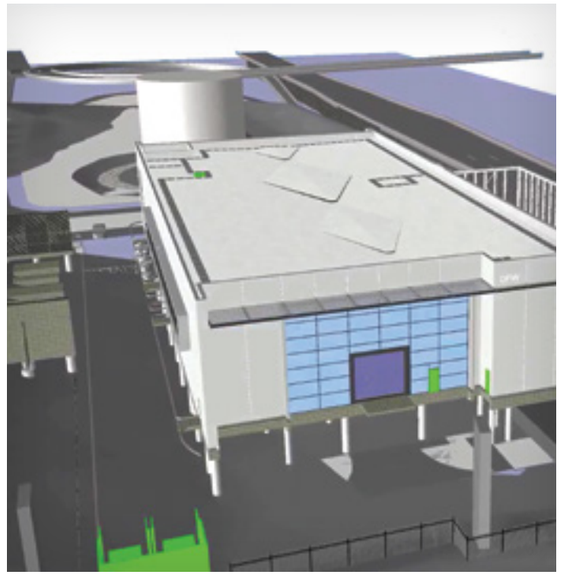
Set to become one of the major cultural landmarks of the city, promoting Shanghai as an Asian art performance capital, Shanghai Grand Opera House has a striking geometry that is shaped like a traditional Chinese fan. Shanghai Construction No. 4 (Group) is the general contractor and faced challenges building the super-long-span, double-helix staircase in the structure's core area. The team realized that they needed to digitally rehearse the construction process, but previous applications failed to meet their needs.

They selected SYNCHRO to simulate the working conditions of the whole core structure prior to performing on-site construction works. Using Bentley's application, they were able to virtually visualize the construction process to determine an optimal construction plan and keep the project on schedule. The software eliminated 642 potential collisions and nearly 500 tons of steel molds, saving approximately CNY 15 million. Working in a collaborative 4D platform provided a preview of the construction process for 100 participants, enabling the team to shorten the construction period by 50 days.

DFW International Airport - Controls & Analytics

Transforming DFW Airport Program Delivery
Location: Texas, United States

Project Playbook: iTwin, MicroStation, OpenBridge, OpenRoads, OpenSite, SYNCHRO



Servicing 81.7 million passengers with 663,000 operations annually, DFW International Airport is committed to modernizing its infrastructure through major capital and expansion projects—totaling billions of dollars. Typically, airport projects have been implemented using traditional, fragmented construction methods based on a singular project perspective, resulting in inefficiencies. The project team wanted a more interdependent, holistic approach to project delivery that considers the whole program of construction works. They knew they needed a digital 4D construction management solution to meet their project requirements.

The team selected SYNCHRO to implement a campus-wide 4D construction management program, for enhanced visualization of the construction schedule and its operational impact. Using Bentley's application to synthesize all data and view multiple projects within the context of a portfolio provided a collaborative work environment that helped the team proactively resolve conflicts, improve decision-making, and mitigate risks. Extrapolated across over 160 projects, SYNCHRO saved 50% in project review time alone and has enabled six of the major capital projects to be completed below budgeted estimates, setting a precedent for smart, future-focused airport management.

North Western Program Alliance (NWPA)

Using SYNCHRO Perform to Improve Efficiency and Drive Real-time Decision Making
Location: Melbourne, Victoria, Australia

Project Playbook: SYNCHRO

As part of Melbourne's level crossing removal project, NWPA is delivering three construction projects involving docketing more than AUD 2.5 million of works each week. They had to collect, document, and value a voluminous amount of hours worked and materials used to ensure that their projects are meeting cost and productivity targets. Manual efforts proved time-consuming and error-prone, resulting in inefficient decision-making regarding construction works. NWPA sought a centralized, digital solution, facilitating real-time data tracking, consistency, and transparency for all parties.

NWPA piloted SYNCHRO to manage the docketing and collection of daily costs and progress. The digital solution accelerated collection and availability of daily costings by 80% and reduced site engineers' time handling dockets and data by 10% to 20%. With real-time visibility into project data, all parties are better aligned, resulting in better decision-making to ensure project targets are met, resources are optimized, and cost overruns are avoided. Bentley's application also facilitates rigorous management of sustainability data, which has helped NWPA achieve industry-leading reductions in construction emissions.

SCEGC Mechanized Construction Group Co., Ltd.

Xi'an International Football Centre
Location: Xi'an, Shaanxi, China

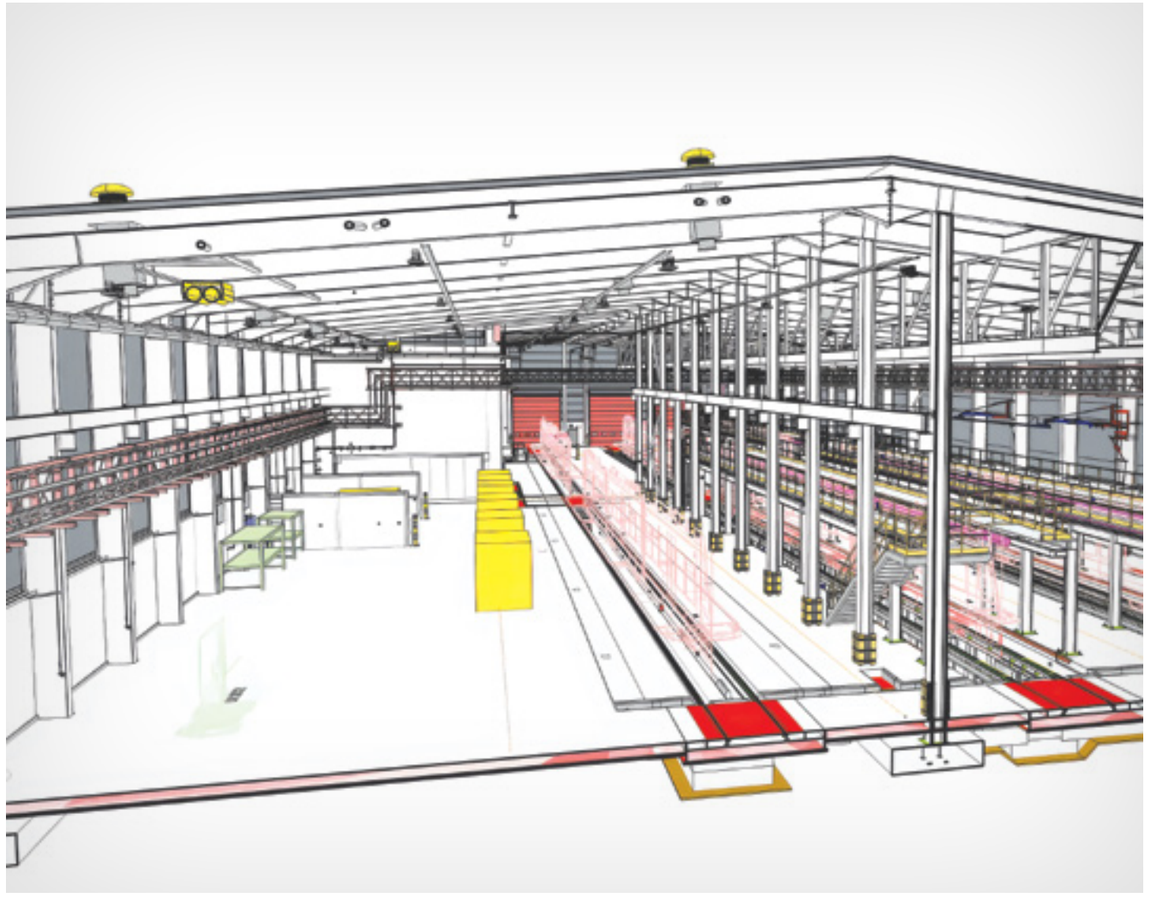
Project Playbook: SYNCHRO

SCEGC Mechanized Construction Group is constructing an international-standard professional football stadium in Xi'an that can accommodate 60,000 people. The project included the installation of a metal roof panel and several special-shaped components, with a long processing cycle and on-site installation period. To address these challenges and ensure the structural integrity of the building's uneven loads, SCEGC knew that they needed a digital solution to visualize and plan the appropriate design and construction plan in advance of on-site works.

SCEGC used BIM technology and SYNCHRO to conduct simulation analysis and optioneering to determine an appropriate design and installation scheme. The solution optimized the shape and number of components, reducing processing difficulties and shortening the on-site installation period. Using the model to generate an accurate bill of quantities saved CNY 54.7 million in costs and reduced the construction period by 10 days.

ENTERPRISE ENGINEERING

This category recognizes projects that have demonstrated excellence and innovation in digital collaboration, information management, information mobility, or content management through implementing digital workflows for improved outcomes.



Amey

Core Valley Lines (CVL) Transformation - South Wales Metro, UK
Location: Cardiff, Wales, United Kingdom

Project Playbook: Bentley Descartes, Bentley LumenRT, iTwin Capture, MicroStation, OpenGround, OpenRail, PLAXIS, ProjectWise, SYNCHRO

The GBP 1 billion Core Valley Lines (CVL) Transformation project will add new track loops, increase line speed, update signaling systems and stations, and introduce new hybrid battery-electric trains to the Cardiff region of South Wales. Amey was tasked with providing an initial design of the project, constructing the overhead line assets and a new train depot, and ensuring the safe operation and maintenance of the entire line. The team realized that, to securely and efficiently manage data across four main contractors and numerous subcontractors, they needed a connected data environment.

While Amey first used a simple web-based connected data environment, they quickly realized that it could not meet their needs. They migrated project data to ProjectWise, allowing access to over 1,500 users across 40 organizations. They also developed over 30 different, ISO 19650-compliant, automated workflows and implemented industry-leading approaches to managing client requirements. When complete, the project will improve line accessibility, providing four trains per hour on most of the network, and reduce carbon emissions throughout the network.

Arcadis (As part of ASC)

HS2 Sections C2-C3
Location: Birmingham, England, United Kingdom

Project Playbook: Bentley LumenRT, MicroStation, OpenBuildings, ProjectWise

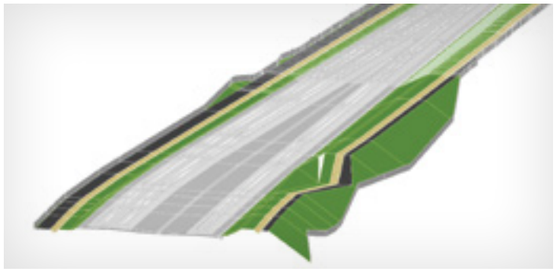
As part of a joint venture, Arcadis is delivering designs for permanent works along the C2 and C3 sections of the High Speed 2 (HS2) project that will improve connectivity and capacity between London and Birmingham. Spanning 80 kilometers with 4,346 physical assets comprising 900 gigabytes of data, the project presented challenges managing and delivering design information, prompting Arcadis to automate methods for creating design files and autonomously onboarding designers into the new system.

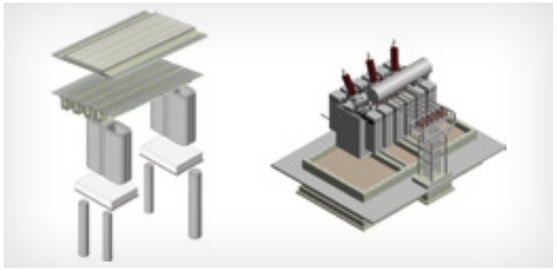
Already familiar with ProjectWise, Arcadis established an automated process to retrieve information, utilize it within Bentley's connected data environment, and create designer accounts to enable immediate accessibility. The innovative use of Bentley applications for controlling file creation improved quality of deliverables, saved 5,000 resource hours on repetitive tasks, and provided greater insight into project information and progress. The new configuration has led to more projects adopting ProjectWise and capitalizing on the added available insights.

Italferr S.p.A.

Business Process Enhancement and Advanced Project Management
Location: Rome, Italy

Project Playbook: Bentley Infrastructure Cloud, Bentley LumenRT, iTwin, iTwin Capture, iTwin Experience, iTwin IoT, Leapfrog, MicroStation, OpenBridge, OpenBuildings, OpenCities, OpenGround, OpenRail, OpenRoads, OpenSite, OpenTunnel, OpenUtilities, PLAXIS, ProjectWise, SYNCHRO





To create a holistic system to optimize engineering workflows, quality of deliverables, and operations, Italferr initiated a digitalization project across all company sectors. The project required integrating various sector-specific and siloed processes and data from multiple, often obsolete, software applications. Italferr explored various technology options but they lacked interoperability, resulting in data fragmentation and preventing integrated workflows, crucial for large-scale, multi-stakeholder projects. They needed a unified platform that could integrate multisourced models and data throughout design, construction, and post-construction monitoring for all projects. Italferr leveraged ProjectWise and iTwin to create and manage digital twins. Bentley's integrated applications provided a framework for unprecedented collaboration across geographically dispersed teams and allowed the teams to simulate various operational scenarios and optimize planning, increasing efficiencies by up to 30%. Italferr's digitalization efforts improved decision-making and reduced errors. They reduced costs, as well as enabled precise control of design and construction works to reduce energy consumption and carbon emissions.

Arcadis

Cambridge South Infrastructure Enhancements
Location: Cambridge, United Kingdom

Project Playbook: iTwin, iTwin Capture, MicroStation, OpenBuildings, OpenRoads, ProjectWise, SYNCHRO

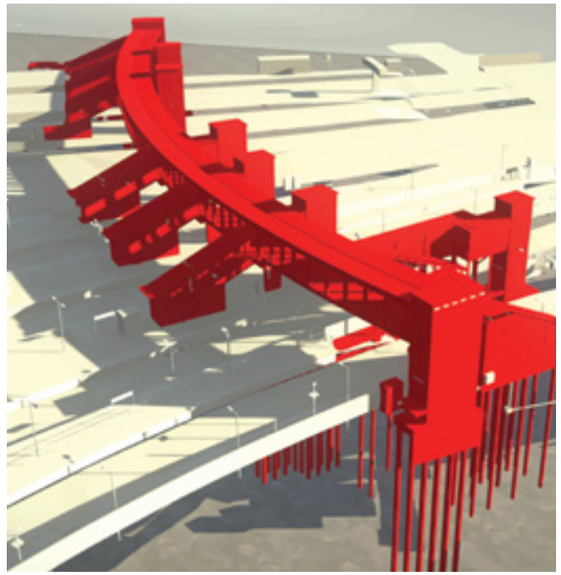
On the Cambridge South project, Arcadis is the primary design consultant, helping deliver a brand-new four-platform station, railway systems improvements, and access improvements to the Cambridge Biomedical Campus, Addenbrookes Hospital, and Hobson's Park. With early passenger numbers expected to increase to over 2 million by 2043, this station is essential and will improve the quality of life for the people who live and work in the area.

Arcadis chose Bentley applications to coordinate in a 3D environment and used clash detection to ensure designs were aligned across disciplines. ProjectWise served as the connected data environment for all phases of the project while OpenRoads was used to create a parametric corridor that automatically updated, resulting in earthworks reuse increasing from 60% to 100%. MicroStation helped detect and resolve 26,539 clashes, saving significant time. By creating a 4D timeline of construction, the team reduced risk, site complexity, and construction time.

Arcadis

Clapham Junction Station Congestion Relief Pedestrian Interchange Footbridge
Location: London, Wadsworth, United Kingdom

Project Playbook: iTwin, MicroStation, OpenBuildings, OpenRail, ProjectWise



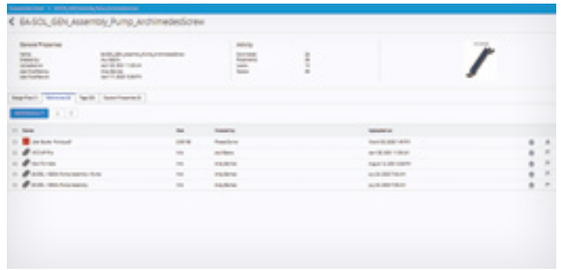
As part of the Wessex Southern Multidisciplinary Framework, Network Rail is proposing the construction of a new interchange footbridge at one of their busiest railway stations, accommodating approximately 29 million passengers annually. Arcadis is executing the proposed works aimed at alleviating station congestion and increasing passenger safety. The project presented multidiscipline coordination challenges throughout design development and review. To integrate workflows, Arcadis wanted to establish a connected data and collaborative modeling environment.

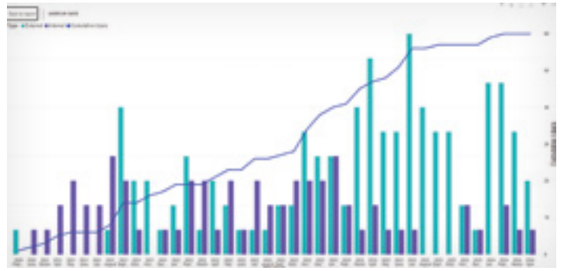
They selected ProjectWise as the connected digital platform, and MicroStation and Bentley's Open applications to implement a model-based approach and facilitate coordinated design of the rail footbridge. iTwin was used to visualize the project information model, making it accessible to all stakeholders, enabling digital model sharing and enhancing collaboration. Working in the 3D digital environment reduced site visits by 90%, enhancing safety, and shortened the decision-making process by 30%.

Mott MacDonald

Continuing to Maximize Value from the Smart Object Library for the Environment Agency
Location: England, United Kingdom

Project Playbook: ProjectWise





To help streamline asset design, delivery, and management for the United Kingdom's Environmental Agency (EA), Mott MacDonald is refining the EA's smart object library (SOL) to meet efficiency and sustainability goals. Aiming to make it more than a central database of models, Mott MacDonald wants to ensure that the library supports standardization, bulk fabrication, low-carbon design, and modern construction and manufacturing methods. Faced with multiple users and multisourced information, the team needed interoperable and robust software capable of providing secure accessibility, parametric functionality, and standardization for new builds and refurbished schemes.

They selected ProjectWise, offering the flexibility and versatility to support various users and different design applications. Working with the SOL and its standardized 3D objects facilitates reusability and has enabled clients to configure designs for efficiency, sustainability, and reduced carbon emissions. The EA and supply chain have recorded more than 17,000 hours in content reuse, saving GBP 800,000. Using the library resulted in 10 times their return on investment, expected to increase exponentially as the library adds smart objects and becomes accessible to more users for more projects.

DAR International for Engineering Consultancy

DAR Engineering's Digital/Enterprise Document Management System
Location: Saudi Arabia

Project Playbook: Bentley Descartes, iTwin, MicroStation, OpenBuildings, OpenFlows, ProjectWise, Promis.e, RAM, STAAD, SYNCHRO

DAR International Engineering initiated a project to establish a digital data management system (DMS) to provide clear procedures within the organization's engineering departments, ensuring access control, data availability, and security. The DMS project aimed to standardize file structures, develop workflows, and deploy procedural sequences across entire project lifecycles. With offices in Saudi Arabia, the Middle East, and South Asia, spanning a variety of business specialties, DAR faced compatibility issues migrating data from local servers and integrating various BIM processes. These issues were compounded by challenges customizing workflows to accommodate diverse departmental requirements.

DAR selected ProjectWise as the foundation for their DMS and leveraged Bentley's open modeling applications for architectural and engineering tasks. Working in an integrated digital environment facilitated seamless data exchange and collaboration among multidiscipline teams, reducing resource hours for document management by 40% and boosting efficiencies by 50%. The solution reduced modeling times by 60% and helped expedite construction schedules by 75 days to save USD 500,000 in costs, as well as reduced paper-based processes, contributing to sustainable resource management practices.

Navantia, S.A.

F-310 Program Class Fridtjof Nansen
Location: Ferrol, La Coruña, Spain

Project Playbook: MicroStation, ProjectWise

Known as F-310, Fridtjof Nansen is a class of Spanish-made anti-aircraft frigates used by the royal Norwegian Navy, equipped with an advanced combat system capable of detecting aircraft movement within a radius of 500 kilometers. Consisting of five frigates, the program was designed and built at Navantia shipyards through their integrated modular construction (IMC) concept, requiring the implementation of a collaborative modeling platform and connected digital environment.

Navantia selected MicroStation for its advanced 3D modeling capabilities and ProjectWise as their common data platform to facilitate design and construction of the vessels through their IMC system. Using Bentley's applications enabled them to build the ships made up of 20 modules in almost half the time compared to traditional methods. The Bentley-based digital solution enabled Navantia to become a world leader in the development of frigates.

Baosteel Engineering & Technology Group Co., Ltd. (China Baowu Design Institute)

Full Lifecycle Digital Technology Application for Xinyu Iron & Steel Blast Furnace Low Carbon Oxygen Enrichment Project
Location: Xinyu, Jiangxi, China

Project Playbook: AutoPIPE, Bentley Descartes, Bentley LumenRT, Bentley Raceway and Cable Management, MicroStation, OpenBuildings, OpenPlant, OpenRoads, ProjectWise, ProStructures

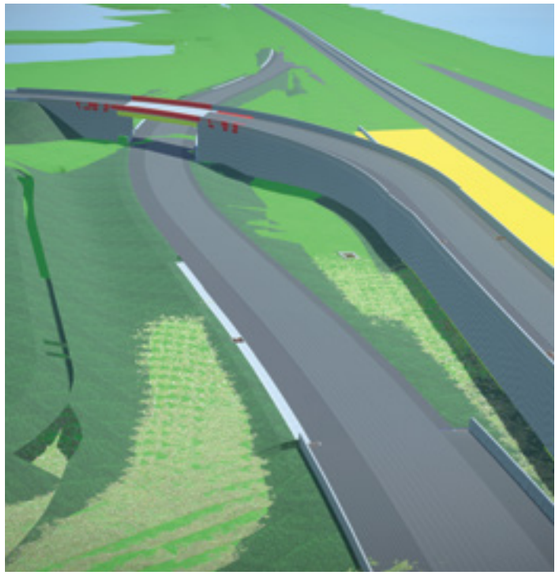
This landmark oxygen enrichment project in China's metallurgical industry involved building two sets of oxygen generating units, along with supporting equipment and facilities for an iron and steel conglomerate. Upon completion, the project will improve the stability of the plant's blast furnace and oxygen supply while reducing carbon emissions. Faced with a complicated equipment and pipeline layout, and managing a multidiscipline team on a tight schedule and budget, Baosteel Engineering needed an integrated technology solution to deliver an energy-saving, low-carbon, and intelligent factory.

Baosteel leveraged ProjectWise and Bentley's open modeling applications to establish a cloud-based, collaborative digital ecosystem and digital twin. Working in a connected digital environment reduced design time, improved efficiency of construction drawings by 20% to 30%, and accelerated the construction schedule by 25 days, saving a total of CNY 13.8 million in costs. Through intelligent digital workflows and factory processes, Baosteel reduced the carbon and environmental footprint of the project, cutting annual carbon emissions by 36,098.56 tons.

GAI Consultants

GAI Consultants: Unprecedented Productivity and Collaboration
Location: Orlando, Florida, United States

Project Playbook: Bentley LumenRT, iTwin, OpenBridge, OpenRoads, ProjectWise



To increase the productivity, efficiency, and security of project data to ensure timely, cost-efficient, and quality client deliverables within their transportation group, GAI explored collaborative design strategies for their increasing number of projects and personnel. With multiple, voluminous files required to be shared among dispersed project teammates at various offices or at home, conventional file sharing and e-mail applications failed to align with the company's project delivery goals. GAI realized that they needed to establish a connected data environment.

They selected ProjectWise to develop a fully federated workflow, including 3D modeling and digital delivery, establishing a single source of truth for all project data. Based on demonstration projects in Florida and West Virginia, working in Bentley's connected digital platform reduced file opening time by about 10% for on-site employees, and from five to 15 minutes down to 90 seconds for remote staff. Combined with iTwin to review 3D models and perform clash detection, the Bentley-based solution streamlines design and engineering workflows, improving schedule management and quality and cost control.

WSB

I-10 Inner Katy Corridor, I-610 to West of I-45
Location: Houston, Texas, United States

Project Playbook: Bentley Infrastructure Cloud, iTwin, MicroStation, OpenBridge, OpenRoads, ProjectWise, SYNCHRO

This Texas multiproject transportation program aims to improve connectivity, establishing a strategic link between the West and Downtown Houston areas. It includes three key transport initiatives being executed simultaneously along the Inner Katy Corridor and I-610 to west of I-45. WSB was selected to develop a digital representation of existing conditions and schematic-level designs, and faced technical, coordination, and planning challenges. They sought to improve early design decision-making and provide the owner critical insight into the risks and opportunities by creating a planning phase digital twin.

WSB used ProjectWse to establish a connected data environment and Bentley's open 3D modeling, SYNCHRO, and iTwin applications to model the project, digitally simulate construction planning, and create a digital twin. Bentley technology enabled them to create models for design management and public engagement in just over three months. Working in an integrated digital environment saved 10% to 30% in time accessing data, compared to manual methods. The digital twin improved decision-making and saved 20 resource weeks developing the traffic management plan.

WISDRI Engineering and Research Incorporation Limited

Innovative Applications of BIM Design of the Pipeline and Cable for Vietnam HPDQ
Location: Wuhan, Hubei, China

Project Playbook: AutoPIPE, Bentley Descartes, Bentley Raceway and Cable Management, iTwin Capture, MicroStation, OpenBuildings, OpenPlant, OpenRoads, ProjectWise, ProStructures, STAAD, SYNCHRO

Vietnam's HPDQ pipeline and cable project is part of a new steel production plant in Quang Ngai, aimed at building the most competitive industry enterprise in Vietnam and Southeast Asia. Located adjacent to the South China Sea and exposed to frequent typhoons with natural reserves within a 100-mile radius, the project presented complex geological conditions and strict environmental requirements. Compounding these site challenges were data integration and multidiscipline coordination challenges. WISDRI sought to achieve comprehensive BIM application, digital construction guidance, and intelligent operations.

WISDRI selected ProjectWise, Bentley's Open applications, and SYNCHRO to establish a connected data environment, perform construction simulation, and generate a digital twin for real-time design and construction coordination, as well as network monitoring. Working in an integrated digital platform improved communication efficiency by 50%, saved CNY 5.8 million in design costs, and shortened the design cycle by 36 days, as well as reduced the construction period. The digital twin solution optimized pipeline design, enabling smart, energy-saving distribution processes, reducing carbon emissions by 36,500 tons per year.

Oriental Consultants Global Co. Ltd.

Metro Manila Subway Project
Location: Manila, Philippines

Project Playbook: ComplyPro, ProjectWise, SYNCHRO

To ease traffic congestion, improve connectivity, and ensure safe, reliable commuter transport in and around Manila, the Department of Transportation (DOTr) proposed the Metro Manila subway project. The rail line will traverse the National Capital region, passing through six cities with 13 underground stations and a train depot covering about 28.8 hectares. The sheer scale of the project presented coordination, communication, and risk management challenges achieving timely and cost-efficient deliverables that current data sharing applications failed to accommodate. DOTr needed BIM-centric, collaborative engineering and content management technology.

They selected ProjectWise, SYNCHRO, and ComplyPro, establishing a connected data environment and single source of truth, facilitating collaborative BIM, construction simulation, and digital management processes. Bentley's integrated engineering solution streamlined workflows to identify and resolve more than 100 clashes prior to construction, eliminating rework and saving 5,000 resource hours. Through digital engineering, DOTr has shortened delivery timelines and reduced carbon emission generated during construction. They plan on integrating sensors with the 3D models to create a digital twin of the entire metro asset.

SMEC

North East Link
Location: Melbourne, Victoria, Australia

Project Playbook: MicroStation, ProjectWise

Having won the design tender for North East Link in 2021, SMEC was then awarded the contract to provide design and construction services for the entire project. The design will ensure North East Link is built to the highest standards, with safety, functionality and sustainability at the forefront. Working with specialists from offices in South Africa, India, the Philippines, and Australia, it was essential that the teams efficiently collaborate with each other, as well as with the client and other contributors, through digital sharing of information, ideas, and expertise.

SMEC used MicroStation and ProjectWise to create designs and a shared information environment, respectively, improving design coordination and space proofing with virtual design construction workshops. The environment automated workflows that were once manual and time consuming, driving down resource costs. Overall, the team saved 6,450 hours or 161 weeks, equating roughly to AUD 30,000 in savings. When complete, the North East Link will significantly reduce travel times, improve community connections, and remove over 15,000 trucks from local roads each day.

Avangrid

Preventive Maintenance Program Creation
Location: Rochester, New York, United States

Project Playbook: AssetWise

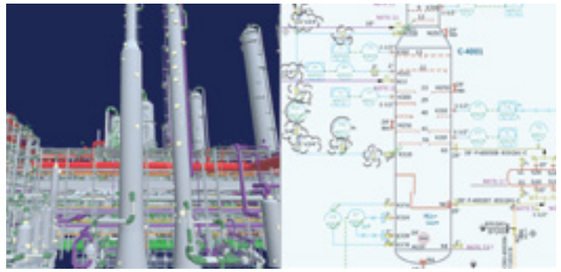
To ensure reliable 24/7 operations for their nine hydroelectric generating units, New York Electric and Gas and Rochester Gas and Electric initiated a preventive maintenance program. Once implemented, the program will help overcome operational inefficiencies, enabling the facilities to reach their total maximum output of 120 megawatts of clean, renewable electricity, servicing over 50,000 New York households. With operational records dispersed across multiple systems and locations, the project required creating controlled document procedures and a centralized database for all asset data to develop a proactive approach to asset maintenance and management.

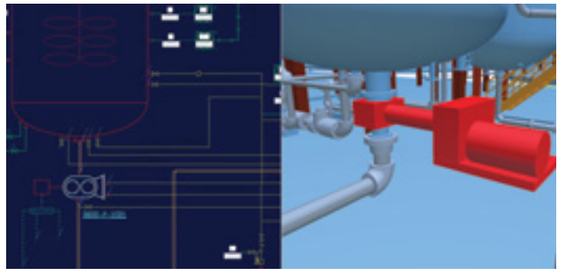
The project team selected AssetWise, providing a single source of truth for all hydroelectric documents, and linking them to their respective components in each facility. The solution reduced rework and costs associated with mismanaged and out-of-date asset data and files. It enabled accurate performance tracking of each piece of equipment to predict asset failures and implement proactive measures, decreasing shutdown times. Bentley's application promotes digital transformation of the hydroelectric fleet, allowing for the creation of a digital twin for each facility.

China Huanqiu Contracting & Engineering Co., Ltd.

Whole-process Digital Delivery of Guangxi Petrochemical's Refining-Chemical Integration Project
Location: Qinzhou, Guangxi Zhuang Autonomous Region, China

Project Playbook: AssetWise, AutoPIPE, iTwin, ProjectWise





This petrochemical engineering project aims to reduce the output of refined oil products, driving industrial upgrading at Guangxi Petrochemical through a new phase of green, low-carbon, digital, and intelligent development. The project includes more than 10 equipment installation units and more than 100 suppliers and construction units required to implement and achieve standard digital deliverables. Faced with multiple stakeholders and various data sources generating terabytes worth of data, documents, and models, the project team realized that they needed an integrated technology solution to meet the tight delivery schedule and digital delivery requirements.

Leveraging ProjectWise, iTwin, and AssetWise, the team established a connected digital ecosystem, integrating multisourced information, streamlining collaboration among the various team members and the owner, and automating workflows and quality assessments. Bentley's digital solution improved efficiency by 30% and reduced labor resources by 60%, optimizing design, procurement, and construction. The digital delivery processes and platform lay a solid foundation for the owners to create digital twins and a smart factory.

CCTEG Wuhan Engineering Company

Xinjie No. 1 Mine Project in Taigemiao Mining Area, Xinjie
Location: Ordos, Inner Mongolia Autonomous Region, China

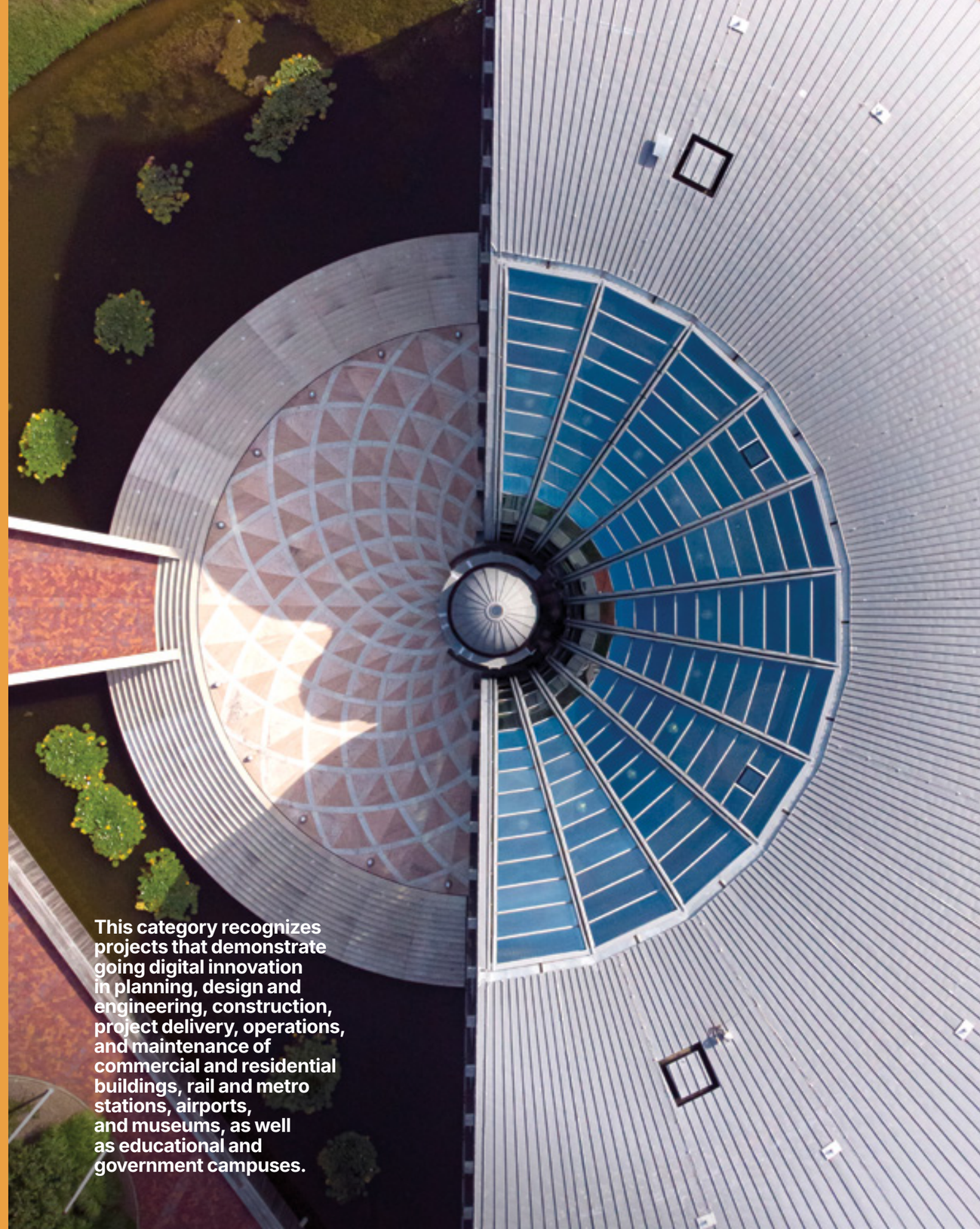
Project Playbook: Bentley Raceway and Cable Management

Located in Ordos, Inner Mongolia, within the Xinjie Taigemiao Mining Area rich in coal resources, this new mining plant will produce high-quality chemical raw coal and power coal. The large-scale project presented a long construction period and challenges managing more than five terabytes of data among 500 project participants. To improve project delivery, the team wanted to implement collaborative BIM strategies; however, as the country's first mining project to adopt full lifecycle BIM, the team needed robust, integrated technology to handle the voluminous data.

The team leveraged Bentley's BIM applications to facilitate collaborative modeling, simulate planning and construction, and establish a digital delivery platform where all participants could visualize and optimize plant layout and processes. Compared to traditional workflows, BIM significantly improved design quality, reporting, material quantities estimation, and overall delivery. By developing a BIM-based, smart engineering management system, the team reduced onsite business inspections by 90%, improved data integration by 50% and multidisciplne collaboration by 95%, and cut design modification time by 95%.

Representatives of Mott MacDonald and HDR accept the award in the Enterprise Engineering category of the 2024 Going Digital Awards.

FACILITIES, CITIES & CAMPUSES



This category recognizes projects that demonstrate going digital innovation in planning, design and engineering, construction, project delivery, operations, and maintenance of commercial and residential buildings, rail and metro stations, airports, and museums, as well as educational and government campuses.

Winner: Going Digital Award in Facilities, Cities, and Campuses

China ENFI Engineering Co., Ltd.

Digital Construction Project of Comprehensive Waste Treatment Facilities in Xiong'an New Area
Location: Beijing, China

Project Playbook: AutoPIPE, Bentley Descartes, Bentley LumenRT, Bentley Raceway and Cable Management, iTwin, iTwin Capture, MicroStation, OpenBuildings, OpenPlant, OpenRoads, ProjectWise, ProStructures, SYNCHRO

The Comprehensive Waste Treatment Facility Project of Xiong'an aims to make the area a "waste-free city." The 220,000-square-meter facility will process 3,060 tons of garbage, kitchen waste, solid sewage, and medical waste per day. This process will be invisible to residents, as the facility will be underground and topped by a park. However, the design presented China ENFI Engineering Co., Ltd. with challenges including ventilation, tight space for equipment, fire protection, seepage control, and a short schedule.

The team moved from 2D drawings to digital design using Bentley applications, unifying all collaborators among 13 design specialties and helping them determine how to overcome challenges through 3D modeling and construction simulation. In the process, they improved efficiency by 130% and greatly reduced errors. In addition to effectively building within curved mountainous terrain, they eliminated the need for four cranes and avoided rework, saving CNY 13.7 million. Planning construction sequences in advanced reduced construction time by 50 days.

Guangdong Airport Authority, Central-South Architectural Design Institute Co., Ltd., China Airport Planning & Design Institute Co., Ltd., Civil Aviation East China(Zhejiang), Construction And Development Co., Ltd, Airport Construction Engineering Co., Ltd, CCCC Tunnel Engineering Company Limited, China Railway Beijing Engineering Group Co., Ltd., Hebei Construction Group Corporation Limited, China Huashi Enterprises Company Limited, Shanxi Mechanisation Construction Group Co., Ltd., Shanghai Baoye Group Corp., Ltd., PowerChina Airport Construction Company Limited, China Railway 19 TH Bureau Group 2nd Co., Ltd., The Construction of Guangzhou Baiyun International Airport Development Co., Ltd., Zhonghang Electricity System Engineering Co., Ltd., China Construction Eighth Engineering Division Corp., Ltd, Guangdong Construction Engineering Group Co., Ltd., China Construction Third Engineering Bureau Group Co., Ltd., Beijing Construction Engineering Group Co., Ltd.

Digital Innovation Application of Guangzhou Baiyun International Airport Phase III Expansion Project
Location: Guangzhou, China

Project Playbook: Bentley LumenRT, iTwin, iTwin Capture, MicroStation, OpenBridge, OpenBuildings, OpenPlant, OpenRoads, ProjectWise, ProStructures, SYNCHRO

The Guangzhou Baiyun International Airport Phase III Expansion Project is the largest reconstruction and expansion project in the history of the Chinese civil aviation airport construction. The CNY 53.77 billion project will increase passenger and cargo volume by 50% and 52%, respectively. During the construction of two new runways, a new terminal, and expansion for an existing terminal, and a comprehensive transportation center, the existing airport infrastructure had to remain in operation while meeting a tight deadline.

The project developers selected Bentley applications to establish digital construction methodology and deliver the complex project. They created 3D models of the full project, enabling teams to adhere to national standards for project qualities. With enhanced collaboration, they detected and resolved 3,200 clashes early in development, saving CNY 15 million in potential rework. In total, going digital helped teams improve design efficiency by 35%, and data management combined with digital construction rehearsals is expected to improve construction efficiency by 25%.

PT Wijaya Karya (Persero) Tbk

Nusantara Presidential Complex, New Capital City of Indonesia
Location: Nusantara, Indonesia

Project Playbook: Bentley LumenRT, iTwin Capture, iTwin IoT, iTwin Platform, LEGION, MicroStation, OpenBuildings, PLAXIS, ProjectWise, ProStructures, STAAD, SYNCHRO

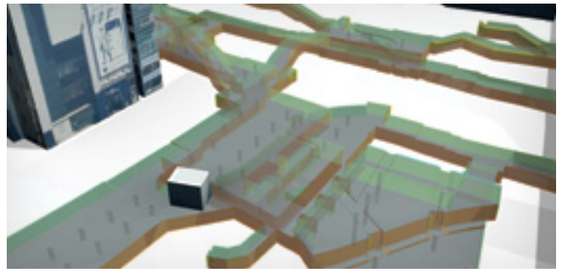
Jakarta, the previous capital city of Indonesia, suffered from pollution, flooding, and overcrowding. As a result, the country is building a new city, Nusantara, 1,000 miles away. Part of its development includes a new, IDR 10.5 trillion presidential palace, which features a 50-megawatt solar plant and a façade featuring a Garuda bird, the symbol of Indonesia, with a wingspan of 117 meters. Wijaya Karya had to develop the massive, complex project in a short timeframe.

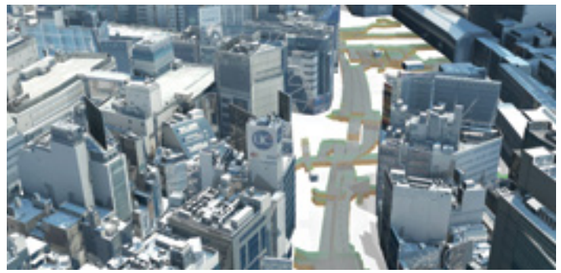
The organization used Bentley applications to design and model the project, starting with using iTwin Capture to process nine hectares of aerial site data. Next, they used Bentley Open applications and MicroStation to model all elements of the site together, detecting and correcting clashes in the process. Digital modeling helped Wijaya Karya lower costs by USD 63 million and lower the amount of rebar needed by 138.8 tons, while also accelerating design by 33 days and determining ways to lower ongoing energy use.

Kokusai Kogyo, Co., Ltd.

3D Modeling of the Most Complicated Underground City in Japan: Conquering the Shibuya Train Station and Shopping Mall Complex
Location: Shibuya, Tokyo, Japan

Project Playbook: iTwin, MicroStation, OpenCities





As part of Tokyo Metropolitan Government's initiative to address city-wide issues using 3D simulation, linking 3D city models with underground data, Kokusai Kogyo was retained to model the underground shopping network beneath Tokyo's Shibuya terminal station. Known as Shibuya Chikagai, the mall covers a small 0.4-square-kilometer area with a complicated layered structure, connecting multiple stations and servicing more than one million passengers. To accurately model the interior space, Kokusai had to process voluminous laser measurement data in a very limited time.

Leveraging MicroStation and iTwin, Kokusai created detailed 3D models from the point cloud data and quickly shared them with engineers to modify and refine them, streamlining inspection and correction workflows from one and a half weeks to just three days. The models provide the basis for design, maintenance, and management of the Shibuya Chikagai, and provide insight into areas prone to crime and natural disasters to help improve public safety. The underground 3D data will be used for planning and development of terminal stations and underground spaces in other prefectures in Japan.

Ire Information Technology

Building a Spatial Information Library for the Goyang Smart City Project
Location: Goyang, Gyeonggi, South Korea

Project Playbook: iTwin Capture

As part of a smart city initiative for Goyang, a spatial information library is being built. The project required photographing multiple roads covering 1.2 square kilometers and generating a reality mesh. The large project scale presented challenges processing the photos into a high-resolution 3D model. Initial applications did not have the processing capacity, rendering model creation impossible.

The project team selected iTwin Capture, the only solution they found that could handle the unmanageable project scale. While the team still had to reduce the final output file to approximately 80%, Bentley's application was still able to maintain a sufficient level of quality of the model to be used for the smart city initiative.

Tianjin Tianhe-Cloud Building Engineering Technology Co., Ltd.

Building Infectious Diseases Wards and Other Renovation and Expansion Projects of Tianjin Haihe Hospital
Location: Tianjin, China

Project Playbook: iTwin Capture

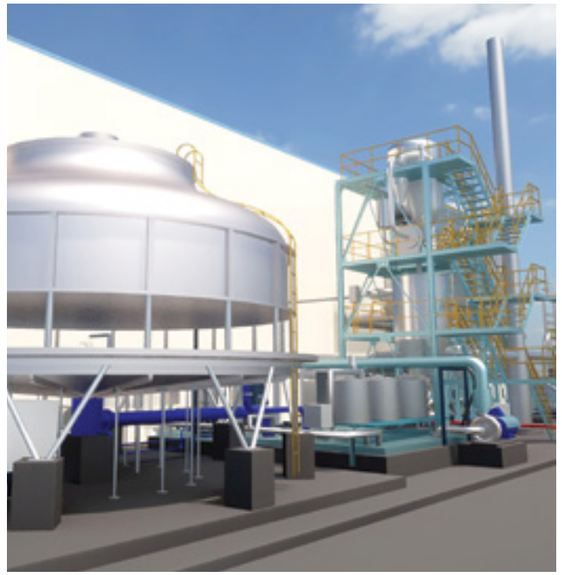
The largest designated Grade-A tertiary hospital for treating infectious disease in the southern region of Tianjin, Haihe Hospital is being expanded and upgraded to include new and renovated in-patient buildings and outpatient clinics, and a newly built power center. Tianjin Tianhe-Cloud Building Engineering Technology (TTCB) faced challenges managing the multidiscipline design team and construction works on a tight project timeline amid a global pandemic.

TTCB relied on iTwin Capture to process 23,191 images into a reality model and digital twin to streamline planning, design, and construction. Working in a cloud-based BIM environment reduced modeling time by 50%, shaving 15 days off the survey period to save CNY 800,000. Through collaborative design, they optimized earthworks and onsite road demolition, saving 76 cubic meters of concrete to reduce the project's carbon footprint. The digital solution eliminated 135 design collisions to help shorten the construction period by 131 days, saving CNY 2.3 million. The digital twin will be used during operations and management for proactive asset maintenance.

PrimeTech

Building N3 Test Chamber Piping Lines Using Reality Mesh
Location: Daejeon, Chungcheong, South Korea

Project Playbook: iTwin Capture, OpenPlant



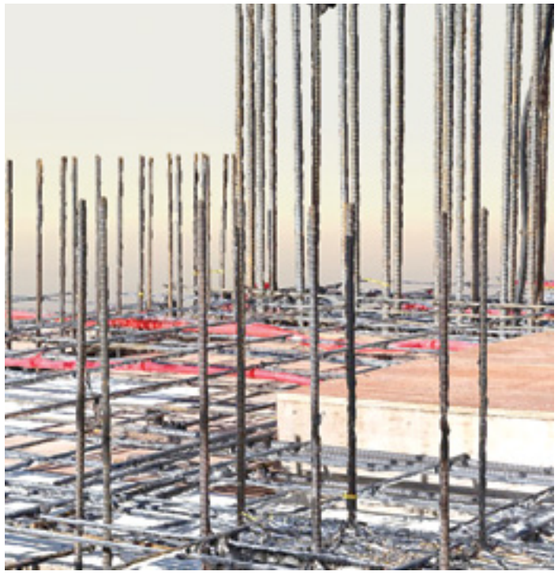
Constructed in 1994 and still operational, the KEPCO Electric Power Research Institute required renovation of some of its facilities. Given that the building was commissioned 30 years ago, PrimeTech faced challenges securing blueprints of the campus. They wanted to generate a 3D reality mesh to capture the site's current condition and use the 3D modeling data for the renovation works. The facility presented complex wiring and curved surfaces, along with a challenging onsite traffic flow that made it difficult to use laser scanning.

The team at PrimeTech manually captured 1,240 photographs of the site and used iTwin Capture to process the images into a high-resolution reality mesh in two weeks. Using Bentley's advanced applications with AI features facilitated precise reverse engineering and blueprint creation. The model will be useful for the renovations, including retrofit projects, making it an essential component in safety-critical electrical retrofit operations.

PrimeTech

Check Construction Site Status with Reality Mesh
Location: Incheon, South Korea

Project Playbook: iTwin Capture



To monitor and manage on-site works and ensure correct installation of rebar for this construction project, PrimeTech implemented 3D modeling. They wanted to create a reality mesh of the site to enable remote supervision and avoid safety hazards at the construction site. The complexity of the building construction site made it difficult to use laser scanning. The team needed a flexible and robust reality capture solution.

PrimeTech took 815 photos of the site and processed them with iTwin Capture into a 3D reality mesh in two days. The robust features and AI capabilities of Bentley's application produced accurate, high-resolution results that required minimal retouching. The model was compared to construction drawings to verify the rebar installation and ensure corrective measures were taken in the event of any omissions.

Beichen Convention & Exhibition Investment Co. Ltd.

China National Convention Center Phase II
Location: Beijing, China

Project Playbook: ProjectWise

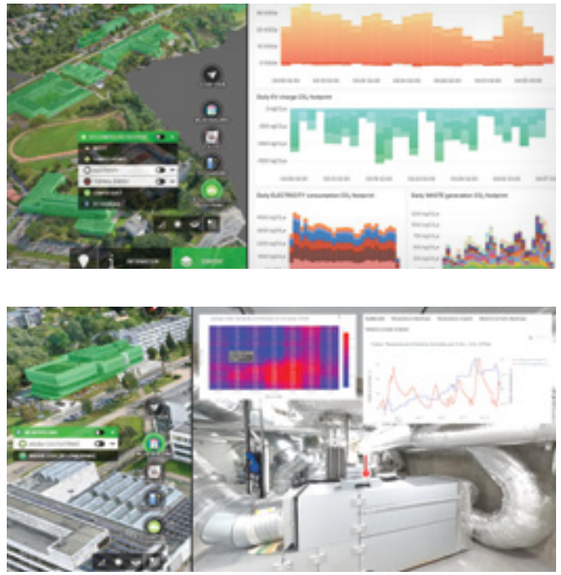
China's National Convention Center is being built in the Beijing Olympic Center as an important international exchange center, diplomacy facility, and world-class exhibition complex for the Winter Olympics. Covering over 1.3 million square meters, the project includes construction of the main building along with hotels, offices, and commercial spaces. Beichen is responsible for the construction of the large-scale project and sought to implement lifecycle BIM workflows. Faced with voluminous, scattered data and a team comprised of 30 specialties and more than 50 units, Beichen faced data integration, coordination, and collaboration challenges, necessitating a connected data environment.

Beichen leveraged ProjectWise as their project management platform and single source of truth for data and document storage, as well as information sharing. Working in a unified online system streamlined workflows and approval processes, avoiding rework typical of traditional methods. Bentley's application improved the efficiency of data exchange for more than 10 terabytes of data among 200 project participants by 40%. The collaborative digital solution shortened the construction period by 30 days, saving approximately CNY 300,000.

Kaunas University of Technology Centre for Smart Cities and Infrastructure

Digital Twin for KTU Buildings Operational Carbon and Climate Monitoring and Improvement
Location: Kaunas, Lithuania

Project Playbook: iTwin, iTwin Capture, OpenBuildings, OpenCities



As part of Kaunas University of Technology's (KTU) efforts to develop a green, smart campus ecosystem, they initiated a digital twin project to present the carbon footprint of campus buildings and monitor their energy usage. The project involved integrating voluminous multisourced, multidiscipline data, and implementing renewable energy sources and efficient asset management protocols to reduce the school's overall carbon footprint.

The team used Bentley's modeling applications to develop a digital twin model and OpenCities Planner as the platform for integrating various digital outputs within the model to assess and monitor the campus's carbon impact. Working in a connected digital environment enabled the team to analyze, identify, and quantify specific areas contributing to their building operations' carbon footprint. Based on their digital evaluation, they installed solar power plants and electric vehicle charging stations, which have so far mitigated the university's operational environmental impact by 14%. The digital twin offers continuous insight to improve building energy consumption through more efficient energy and waste regulation.

Dublin Fire Brigade

Digital Twins for Emergency Response (DTER)
Location: Dublin, Ireland

Project Playbook: iTwin, iTwin Capture, OpenCities

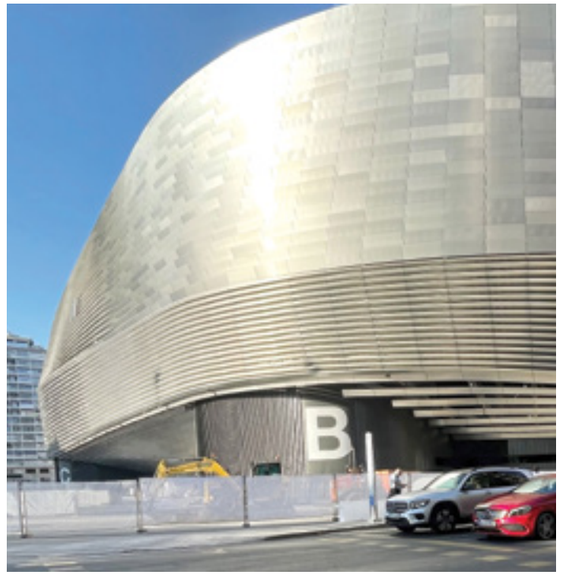
Dublin Fire Brigade (DFB) provides fire, rescue, and emergency medical services for 1.6 million people. The staff of approximately 1,000 relies on pre-incident planning, which provides operational intelligence for making better decisions during emergencies. Traditionally, this information was prepared on paper forms, which limited the available information. DFB needed a planning solution that could unify data from multiple sources, instantly provide information to anyone on the field, and help users quickly navigate 3D models.

DFB determined iTwin technology could easily incorporate 3D models into a database and share them remotely, empowering incident commanders with a much better understanding of relevant building environments, no matter how large or complex. Bentley applications reduced the time needed to assemble the information for 3,000 high-risk sites, including detailed imagery captured by drones, from 7,500 hours to 1,500 hours. OpenCities Planner helped teams manage emergency incidents and assign workers to specific sectors. Trained officers can now find needed information in an average of 12 seconds, greatly improving response times and saving lives.

Buchanan

How LEGION Changed Madrid through Pedestrian Simulation:
Real Madrid Stadium
Location: Madrid, Spain

Project Playbook: LEGION



As transport and mobility consultants, Buchanan was retained to perform pedestrian modeling and simulation for Real Madrid's stadium design, the adjacent upgrade of Santiago Bernabeu's metro station, and Madrid's largest urban development, Distrito Castellana Norte. All three initiatives were interlinked and presented complexities assessing dynamic pedestrian flows to assist with performance-based design, construction works, and operations. Previous pedestrian simulation applications based on social force models lacked the accuracy required to meet deliverables for these iconic projects.

Leveraging LEGION, Buchanan presented the owners with the most reliable analyses, recommending design improvements to eliminate bottlenecks, identifying issues prior to construction to reduce costs associated with changes, and minimizing the risks of crushing. Bentley's application enabled them to model more than 80,000 football fans during ingress, egress, and emergency situations, increase the capacity of the metro station threefold, and reduce the deviation of pedestrian routes along the Distrito Castellana Norte by 30% to enable walking and cycling across the entire site. The digital solution promotes placing pedestrians at the forefront of traditional car-centric cities.

Kyoto Institute of Technology

Kyoto Institute of Technology Point Cloud Data Video
of Matsugasaki Campus
Location: Sakyo, Kyoto, Japan

Project Playbook: iTwin Capture

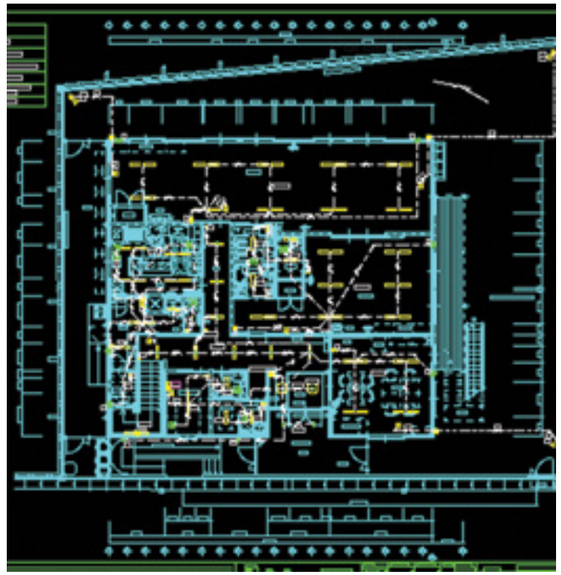
As part of efforts to develop a metaverse-linked disaster simulation system, Kyoto Design Lab staff and 25 students at Kyoto Institute of Technology performed 3D laser scanning at the institute's Matsugasaki campus. The scan data was comprised of 2,025 measurement points, including off-campus areas outside the target site, presenting challenges editing the large volume of data as well as potential copyright issues. To create the video simulation from the voluminous scanned data, the team needed robust processing technology.

They selected iTwin Capture to process and render the point cloud data into an accurate graphic representation of the campus, allowing the surrounding offsite buildings to be made inconspicuous through the application's color processing feature. Bentley's reality modeling solution enabled the team to process the large point clouds into a high-definition sequence movie in a very short time.

Five Technology, Inc.

Legal Disaster Prevention Equipment Management
and Maintenance Project
Location: Minato, Tokyo, Japan

Project Playbook: iTwin Capture, ProjectWise



A nationally certified company specializing in disaster prevention equipment inspections, Disaster Prevention Support Technology G.K. (DPS) prepares and manages reports for jurisdictional fire captains for building management. In Japan, fire captains still prepare paper reports. To ensure the safety and security of the buildings and cities, DPS initiated a project to improve disaster prevention equipment maintenance and management through digitalization. The project required integrating BIM data, legal inspection reports, and firefighting equipment drawings into a single repository.

DPS selected ProjectWise as the common data platform, integrating firefighting equipment drawings and search reports, and streamlining workflows and management processes, improving disaster prevention and ensuring building safety.

Abussaif Group

Medina Industrial City
Location: Medina, Saudi Arabia

Project Playbook: Bentley LumenRT, OpenCities, OpenCities Planner

Located in the northeast of Al-Madinah Al-Munawarah, Saudi Arabia, this urban development project aims to establish a central industrial city for automotive supplies, envisioned as a hub for car maintenance. Spanning 160,000 square meters, the project includes innovative administrative facilities for city management, workshops for efficient delivery services, and ample green areas, as well as a mosque, sports club, and football field. Designed with a distinctive approach, incorporating sustainability and renewable energy solutions, the project presented challenges integrating the various concepts and service facilities.

The team selected Bentley LumenRT and OpenCities Planner to simulate and analyze lighting conditions, create accurate, detailed city models, and evaluate various design scenarios to optimize urban planning. Compared to traditional workflows, Bentley's open and integrated technology saved 30% to 50% in overall time. Working in a cloud-based platform leveraging data-driven analytics improved collaboration and decision-making throughout the project lifecycle. Establishing a digital context for project delivery helped determine energy efficient solutions and minimized resource consumption to achieve sustainable development.

Communaute d'Agglomeration Pau Bearn Pyrenees CAPBP

Multipurpose Urban Digital Twin of Communaute d'Agglomeration de Pau Bearn Pyrenees
Location: Pau, Pyrenees Atlantiques, France

Project Playbook: iTwin Capture, OpenCities

CAPBP initiated a digital twin project for France's Pau city to simulate and analyze complex urban design and planning issues, then communicate them with all stakeholders.
The project involved producing a high-resolution reality mesh for 31 communes covering 370 square kilometers, and integrating the voluminous, multisourced data into a single digital twin accessible to planners, architects, businesses, and citizens. To create their accurate 3D city model and publish it for multiple users to access for a variety of purposes, CAPBP needed a comprehensive, cloud-based digital twin solution.

Using iTwin Capture and OpenCities Planner, CAPBP established an accurate digital twin and urban hub, scalable to multiple workflows and stakeholders. Combined with IoT data, Bentley's applications optimized data transparency and provided a universal platform to visualize and plan urban projects with greater precision, improving infrastructure management and promoting social sustainability. Working in a cloud-based environment with an immersive digital twin eliminated the production and sharing of static videos, saving almost EUR 200,000 annually, and reduced the cost of accessing city asset information by 95%.

Changsha BIMcloud Information Technology Co., Ltd.

New-Phrase Operation Zone (ZOP) and Entrance Complex (CI) Construction Project of Chancay Comprehensive Port
Location: Canars, Lima and Huaral, Peru

Project Playbook: Bentley LumenRT, OpenBuildings, OpenRoads

This wharf project located in Chancay Bay, 78 kilometers north of Peru's capital Lima, includes construction of several berths, 530,000 square meters of bulk and container yards, and an entrance complex covering 320,000 square meters, equipped with a road connecting the Pan-American Highway. Upon completion, it will serve as an important maritime hub, facilitating development of the regional economy and trade exchanges between Peru and China. The project site has poor sea conditions that presented challenging dredging operations, requiring consultants Changsa BIMcloud to implement collaborative BIM workflow processes.

Leveraging Bentley's open BIM applications and Bentley LumenRT, Changsa created a connected data platform, developed and refined BIM models, and generated an animated visualization of the wharf, monomer buildings, and pipe networks. Using Bentley's applications, they simulated the entire construction process, optimizing on-site works to reduce the construction period by 60 days, save USD 480,000, and reduce carbon emissions by 10%. Working in a cloud-based, collaborative environment streamlined workflows to save 20% in communication time and 35% in modeling time.

Five Technology, Inc.

Real Estate Property Management & Asset Management
Location: Osaka, Japan

Project Playbook: iTwin, ProjectWise

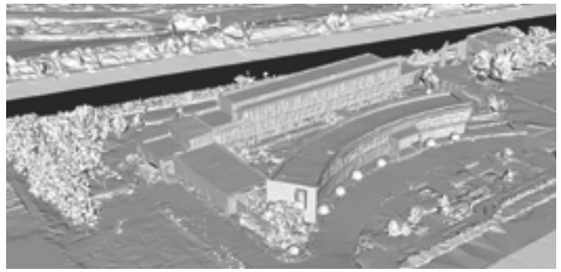
To help real estate divisions of building management companies manage their large numbers of properties, Visionary, Inc. implemented a project to digitalize property drawings, maps, and related documents. Previous manual methods and scattered information proved inefficient and error prone. Visionary wanted to develop an enterprise real estate property management system and needed to digitalize and integrate voluminous documents from various offices and systems.

They selected ProjectWise and iTwin to link all information and documents, analyze business and management requirements, and create digital workflows. Having all documents and data located in a single repository improved department coordination, streamlining management processes, resulting in a 90% reduction in efforts searching for distributed property management information. The digital solution achieved operational efficiencies, reducing property maintenance work by 30%.

PowerChina Huadong Engineering Corporation Limited

Research on the Key Digital Twin Technologies Based on BIM Technology in Full Lifecycle of the Project - Geographic Space Data Mapping Technology
Location: Huai'an, Jiangsu, China

Project Playbook: iTwin Capture



This digital twin project aims to promote intelligent workflows and digitalization for China's water conservancy industry. With 34 large pumping stations, 159 pumping units, and thousands of workers, the dispatch, distribution, and management of these facilities presented challenges that manual methods and initial modeling applications failed to address. Taking Hongze Pumping Station as a pilot project, the team sought to generate a 3D model and digital twin, collecting 20,000 points of the Jiangsu Section daily and exploring intelligent application. To optimize model production, the team needed comprehensive and robust reality modeling technology.

They selected iTwin Capture to generate the models and digital twin, performing water flow simulation, thermal simulations, and structural analysis. The digital twin provided valuable insight into potential problems and risks related to engineering, construction, and facility management, enabling early resolution of issues and proactive maintenance. The automated features of Bentley's application enhanced data processing efficiency, reducing resource hours and costs. By using iTwin Capture, data production time was reduced by 64 hours, saving costs and accelerating deliverables, while introducing smart management processes.

Geospatial Information Co.

Sunchang CC Digital Twin Simulation
Location: Sunchang, Jeollanam, South Korea

Project Playbook: Bentley LumenRT, iTwin Capture

This project involved creating a virtual replica of a large golf course. The team wanted to generate a digital twin, simulating and analyzing the slope, landscaping, and lighting for each hole, and needed an integrating reality capture and modeling solution.

They used drones and iTwin Capture to capture and process images into high-quality reality meshes and created a digital twin of the entire course. Using Bentley LumenRT, the team easily simulated landscape layouts and lighting arrangements, which provided insight into budgeting and management. Bentley's applications reduced modeling time and project costs.

Beijing Institute of Architectural Design

Swimming Center Project of Olympic Sports Park
Location: Hangzhou, Zhejiang, China

Project Playbook: MicroStation, ProjectWise, ProStructures, STAAD

This milestone project for Hangzhou provides citizens with a high-quality sports arena for cultural and athletic events and will significantly improve the city's vitality, promoting regional development and international tourism. Beijing Institute of Architectural Design (BIAD) is responsible for the planning and design of the structures, including the stadium building, swimming pool, and commercial and parking facilities. The unique shape spans nearly 400,000 square meters amid a complex urban environment and difficult terrain, presenting technical and multidiscipline coordination challenges.

BIAD leveraged ProjectWise with MicroStation and STAAD to establish a connected data environment, model the reticulated shell, and ensure consistency between the architectural design and complex steel structure. Working in a collaborative BIM platform streamlined workflows and optimized the design to adapt to the environment. Bentley's integrated digital design solution reduced modeling time by 45% and improved collaboration by 60%. The project serves as a benchmark for using 3D BIM for unique global architecture design in related fields.

FANTAWILD Institute of Design Co., Ltd.

Yingtan Boonie Bears Water World Theme Park
Location: Xiamen, Fujian, China

Project Playbook: iTwin Capture, ProjectWise

Boonie Bears Water World Theme Park is a sustainable development project spanning a total of 64,200 square meters in Xinjiang New Area, aimed at providing visitors an immersive entertainment experience while minimizing resource consumption and negative environmental impact. FANTAWILD was responsible for full process design and planning, seeking to implement a lifecycle BIM strategy. Faced with complex modeling, multiple disciplines, and multi-sourced data and models amid a tight timeline, FANTAWILD needed an integrated 3D modeling solution and connected data environment.

They selected ProjectWise as the common data and model sharing platform, and iTwin Capture to create a digital terrain model of the existing site to optimize design and construction. Bentley's integrated BIM technology solution resolved more than 1,745 multidiscipline errors, saving approximately CNY 10.10 million. Working in a collaborative digital environment streamlined workflows to save nearly 1,000 resource days, while extracting material quantities directly from the models saved nearly CNY 9.48 million in material costs. Through digital simulation, they developed energy-saving design concepts, reducing carbon emissions by about 18,053 tons annually.

Representatives of China ENFI Engineering Co., Ltd. accept the award in the Facilities, Campuses, and Cities category of the 2024 Going Digital Awards.

PROCESS & POWER GENERATION

This category recognizes projects that demonstrate going digital innovations in the planning, design, and construction of new or major refits to industrial process or power generation plants, as well as the ongoing operations and maintenance of existing facilities.

Winner: Going Digital Award in Process and Power Generation

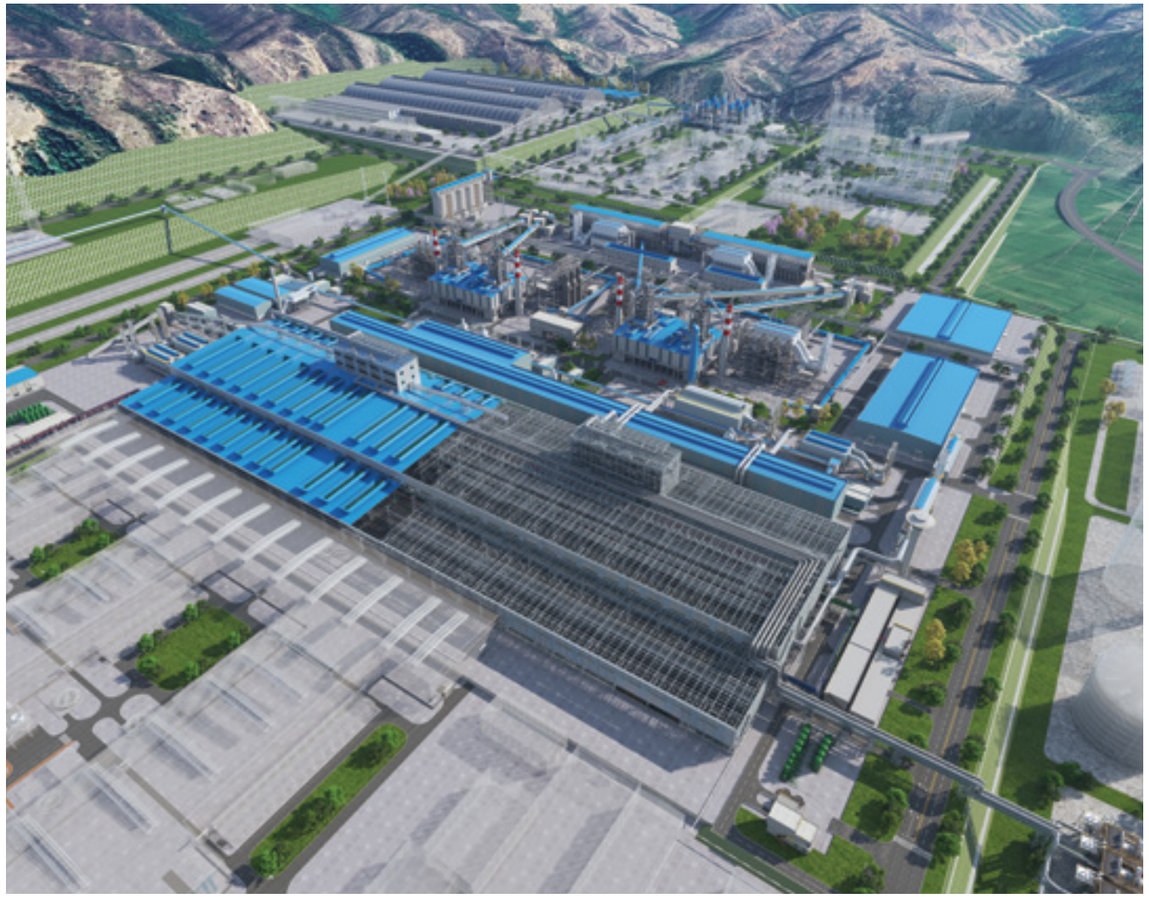
PowerChina Zhongnan Engineering Corporation Limited

Shandong Energy Group Bozhong Offshore Wind Farm Site A Project
Location: Dongying, Shandong, China

Project Playbook: Bentley Raceway and Cable Management, MicroStation, OpenBuildings, OpenPlant, OpenRoads, OpenWindPower, PLAXIS, ProjectWise, ProStructures

The Bozhong Offshore Wind Farm is the first grid-parity offshore wind farm project in Shandong, pioneering the intersection of submarine cables and oil and gas pipelines. Upon completion, the facility will provide 1.698 billion kilowatt-hours of clean electricity to the grid annually, reducing carbon emissions by 1.26 million tons. The project presented complex hydrological and geological site conditions, required cost-efficient design solutions, and involved coordinating multiple stakeholders on a tight timeline. To address these issues, the team needed an integrated technology solution.

Leveraging Bentley's open 3D modeling software with ProjectWise, they established a collaborative digital environment, BIM models, and a digital twin to realize automated design and intelligent workflows and delivery. The integrated technology approach reduced modeling time by 30%, shortened the construction period by 20%, and saved 10% in costs. Using Bentley's applications, the team developed a full lifecycle digital twin, achieving digital and intelligent construction control, facility operations, and maintenance.



WISDRI Engineering and Research Incorporation Limited

Digital Innovative Applications throughout
the Process of Iron and Steel EPC Projects
Location: Yuxi, Yunnan, China

Project Playbook: AutoPIPE, Bentley Descartes, Bentley LumenRT, Bentley Raceway and Cable Management, iTwin Capture, MicroStation, OpenBuildings, OpenPlant, OpenRail, OpenRoads, ProjectWise, ProStructures, STAAD, SYNCHRO

Located in Yuxi close to three national nature reserves, this iron and steel EPC project covers eight square kilometers and involves constructing four iron and steel production lines simultaneously. The massive, multidiscipline project presented complex terrain, design, construction, and coordination challenges, and high environmental requirements that traditional 2D design and single-discipline 3D design could not accommodate. WISDRI is the general contractor and realized that they needed integrated design, construction, and project management technology.

Leveraging ProjectWise, Bentley's Open applications, and SYNCHRO, WISDRI established a connected data environment and collaborative design models, performed construction simulation, and created a digital twin, realizing integrated design, refined construction, and green operations. The solution reduced annual carbon emissions by 346,500 tons and resolved 157 design issues, saving CNY 28.6 million in design costs. Visually monitoring construction progress shortened the construction period by 76 days, saving an additional CNY 40 million in costs. The digital twin also supports intelligent operations and maintenance.

MCC Capital Engineering & Research Incorporation Limited

World's First Hydrogen Metallurgy Engineering
Demonstration Project
Location: Zhangjiakou, Hebei, China

Project Playbook: AutoPIPE, AutoPLANT, Bentley LumenRT, iTwin, MicroStation, OpenBuildings, OpenPlant, OpenRoads, ProjectWise, ProStructures, STAAD, SYNCHRO

To reduce carbon emissions generated by iron and steel smelting, MCC was retained to design and deliver the world's first hydrogen metallurgy project. As a pioneer initiative, the project presented a large, complex engineering workload across various industries and disciplines, a compact layout, and high safety requirements on a short design cycle. To address these challenges, MCC sought a collaborative design and construction management approach and realized they needed to establish an open connected data environment.

They selected Bentley's design, construction management, and digital twin technology to streamline workflows and perform construction simulation, avoiding 216 potential clashes. The digital twin helped MCC complete the project in two years, shortening the construction period by 33.33%. Through virtual planning, they optimized the shaft furnace structure, saving CNY 4.3 million, while reducing annual carbon emissions by 800,000 tons. The successful digital twin project validates the use of hydrogen as a low-carbon solution for iron and steel production.

Shanghai Investigation, Design & Research Institute Co., Ltd.

500MW Photovoltaic Power Plant in the Section I of the Pilot Project of Kubuqi Desert New Energy Base
Location: Ordos, Inner Mongolia Autonomous Region, China

Project Playbook: OpenBuildings, OpenRoads, STAAD

This 500-megawatt photovoltaic power plant project aims to develop clean energy in Mongolia's Kubuqi Desert. Upon completion, it will provide solar power to the Beijing-Tianjin-Hebei region and reduce annual carbon emissions by 834,200 tons. The large project scale and amount of equipment and pipelines, compounded by harsh environmental conditions and a tight design and construction cycle, presented challenges for lead general contractor and designer SIDRI. Previous CAD and plant design software lacked interoperability and the robust modeling and processing features needed to realize convenient and reliable data integration.

Leveraging OpenRoads, OpenBuildings, and STAAD, SIDRI established a photovoltaic intelligent design environment for rapid 3D modeling, and terrain and structural analysis, shortening the project design cycle by 28 days. Using Bentley's applications improved design efficiency and accuracy by 70% and 80%, respectively, and optimized plant layout, reducing land costs by millions of Chinese yuan. Working in an intelligent, connected digital design environment enabled SIDRI to design the photovoltaic plant to provide approximately 1.01 billion kilowatts per hour of electric energy to the grid annually.

MCC Capital Engineering & Research Incorporation Limited

Application of the Digital and Intelligent Construction Technology in the 2.7 Million-ton Project of Eastern Steel
Location: Kemaman, Terengganu, Malaysia

Project Playbook: AutoPIPE, AutoPLANT, Bentley LumenRT, iTwin, iTwin Capture, MicroStation, OpenBuildings, OpenPlant, OpenRail, OpenRoads, ProjectWise, ProStructures, STAAD, SYNCHRO

To enhance industrial production capacity and meet market demand in Malaysia and Southeast Asia, Eastern Steel contracted MCC Capital Engineering to upgrade an existing old steel plant with annual output of 700,000 tons to a modern facility that produces 2.7 million tons without changing the existing foundation. The comprehensive metallurgical project involved coordinating multiple disciplines and 2,500 cubic meters of concrete pour amid challenging climatic conditions and a short construction period. MCC realized that they needed integrated technology to implement collaborative 3D digital design workflows.

Leveraging Bentley's powerful modeling, simulation, and project management applications, MCC established a connected digital environment to seamlessly integrate 3D design, analysis, and delivery of the project. Working in an integrated modeling platform facilitated 3D visualization and online construction progress management to monitor risks in real time. The collaborative digital solution improved design efficiency by 27%, shortened the overall construction period, and provided the foundation for building a factory digital twin.

PetroChina Company Limited Changqing Petrochemical

Asset Performance Management Project of CNPC Changqing Petrochemical Branch
Location: Xianyang, Shaanxi, China

Project Playbook: AssetWise

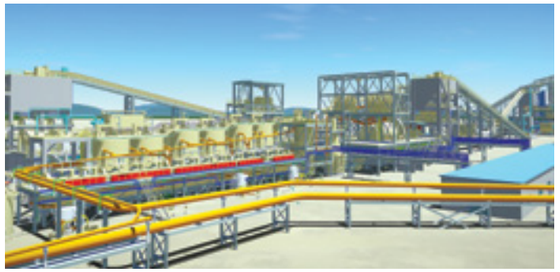
Located five kilometers from downtown Xianyang, Changqing Petrochemical has a crude oil processing capacity of 5 million tons per year. To maintain prolonged stability, ensure safe optimal operations, and minimize unplanned shutdowns and environmental impact, the company initiated an asset performance management project. As the first systematic, structured equipment reliability program, the project required interoperable asset management technology capable of integrating multiple information systems to develop and streamline condition detection and predictive maintenance workflows.

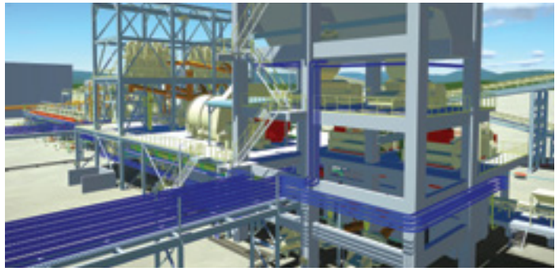
Changqing leveraged AssetWise and IoT devices to generate a factory digital twin and build an intelligent monitoring and management platform that visually presents changes in equipment status in real-time, reducing risks and costs associated with asset failures. Using Bentley's application, Changqing established a culture of proactive plant maintenance, where passive maintenance has dropped to less than 5%, reaching world-class levels. Having optimized equipment reliability and production, Changqing has had no unplanned shutdowns for an entire year, setting a record for the longest operating cycle in 30 years and a benchmark for safety and environmental protection management within the industry.

China ENFI Engineering Co., Ltd.

Digital Application Project of Expansion Project of Saindak Copper-Gold Mine in Pakistan
Location: Saindak, Quetta, Balochistan, Pakistan

Project Playbook: Bentley LumenRT, iTwin Capture, MicroStation, OpenBuildings, OpenPlant, OpenRoads, ProjectWise, ProStructures





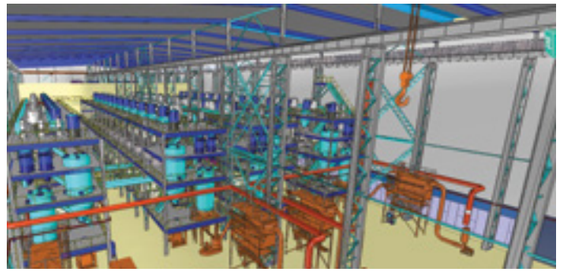
After more than 30 years of mining, Pakistan's Saindak Copper-Gold Mine is being upgraded and expanded to make full use of the existing mining infrastructure, add a treatment series to treat 8.5 million tons of copper ore annually, and minimize carbon emissions. China ENFI undertook design, procurement, and construction management. As Pakistan's largest copper beneficiation mine, the project presented site constraints and a short construction period, and challenges coordinating 17 design specialties, 50 procurement packages, and material logistics from China. To effectively design and manage the project, ENFI needed integrated modeling and digital twin technology.

Leveraging ProjectWise, iTwin Capture, and Bentley Open applications, ENFI established a collaborative design platform, a 3D reality mesh of the existing site, and a digital twin to simulate various design schemes to fit the site footprint. Working in an integrated digital environment, they resolved 82 cross-discipline issues to save USD 1.12 million in construction costs. The digital twin solution facilitated accurate quantity takeoffs to reduce material costs by 10% and shortened the project duration by 90%.

Guiyang Aluminum Magnesium Design & Research Institute Co., Ltd.

Digital Delivery and Digital Twin Engineering of Baofeng Anode Materials
Location: Yinchuan, Ningxia Hui Autonomous Region, China

Project Playbook: AutoPIPE, OpenBuildings, OpenPlant, OpenRoads, ProjectWise



A typical industry processing factory, the Baofeng anode material processing plant project includes digital delivery requirements, complex process flows, equipment data gathering needs, and difficult production management. With multiple participants and software platforms, the project presented coordination and integration challenges. To streamline workflows, ensure data and model compatibility, and meet the owner's digital delivery requirements, the project team needed to establish an open modeling and connected data environment.

Leveraging ProjectWise and Bentley's 3D modeling applications, the team implemented collaborative design workflows and generated an integrated digital model that met the owner's deliverables needs and ensured intelligent operations and maintenance. Compared to traditional design, OpenPlant shortened plant design time by 1,600 hours, while OpenBuildings reduced civil design time by 2,400 hours. Bentley's integrated technology solution improved efficiencies by 20% to save CNY 30 million. The digital delivery project sets an industry benchmark, transitioning from traditional factories to smart, digital factories of the future.

CCTEG Beijing Huayu Engineering Co., Ltd.

Digital Design and Delivery Project of Xinjie No. 2 Mine and Coal Preparation Plant in Taigemiao Mining Area, Xinjie, Inner Mongolia
Location: Ordos City, Inner Mongolia Autonomous Region, China

Project Playbook: iTwin, MicroStation, OpenBuildings, OpenPlant, OpenRoads, ProjectWise

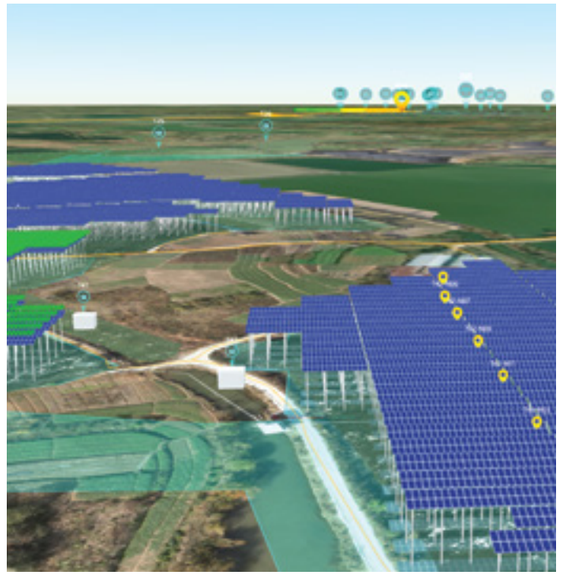
The Xinjie Taigemiao mining area includes the Xinjie No. 2 mine and ancillary facilities for coal preparation and power and water supply. CCTEG is designing the plant and sought to implement intelligent digital design strategies to support full lifecycle digitalization for sustainable mining and carbon emissions reduction. Faced with a large, complex equipment layout and multiple disciplines to coordinate, CCTEG needed collaborative BIM and digital twin technology.

Leveraging ProjectWise with Bentley Open applications and iTwin, the team established a connected data environment, facilitating multidiscipline design and data integration to generate a BIM delivery model to be used throughout the project lifecycle. Working in Bentley's BIM platform reduced design coordination time by 20% and design changes by 26%. Having a virtual visual model improved insight into the entire project, enabling the identification and resolution of issues prior to construction, avoiding rework and associated costs and delays. The 3D model supports subsequent digital construction, operations, and management, promoting intelligent technology solutions within China's mining industry.

PowerChina Hubei Electric Engineering Co., Ltd.

Digital Twin Intelligent Operation and Maintenance Power Plant of PowerChina Xishui 160MW Fishery-Solar Complementary Project
Location: Xishui, Hubei, China

Project Playbook: Bentley LumenRT, MicroStation, OpenBuildings, ProjectWise



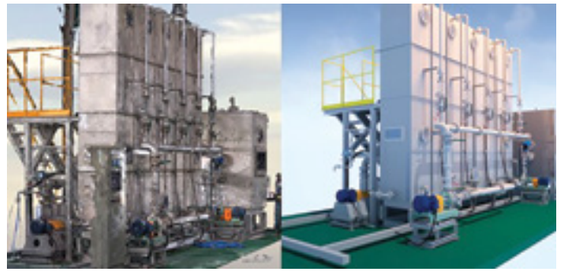
This fishing solar complementary photovoltaic power station has a planned installed capacity of 350 megawatts, that, upon completion, will provide 484,477.67 megawatt hours of clean energy for the grid each year. Covering 474.5 square hectometers with 378,000 photovoltaic panels and 54 box transformers, the vast land area and huge amount of equipment presented challenges, compounded by inspection and monitoring difficulties to ensure successful operations and maintenance of the system. To overcome these issues, PowerChina aimed to develop an intelligent photovoltaic plant, requiring integrated modeling and data management applications to create a digital twin.

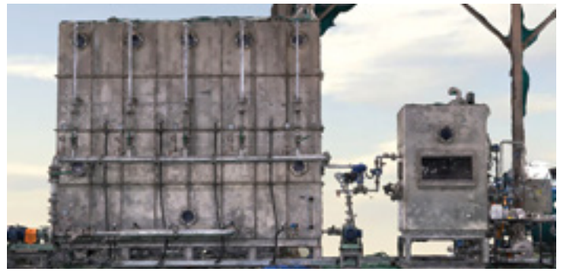
Leveraging ProjectWise and Bentley's open modeling technology, the company developed a 3D model during the design stage and established an information-sharing engineering platform to build a digital twin and smart operation and maintenance system, streamlining and improving data exchange by 70%. The intelligent photovoltaic digital twin management scheme saves CNY 2 million per year in manual inspection costs and improves power generation efficiency, recovering an annual median power generation loss equal to CNY 2.32 million.

Primetech

Obtain Drawings through Reverse Engineering of Facilities
Location: Ulsan, Gyeongsangbuk, South Korea

Project Playbook: iTwin Capture





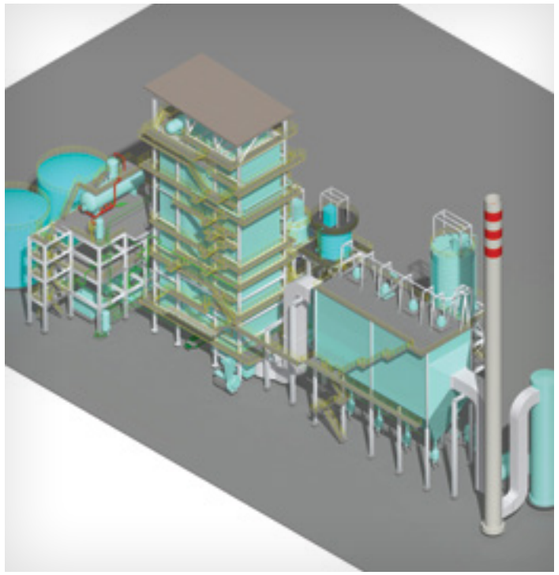
This project involved creating technical drawings for a facility fabricated on site at the Taesung Environmental Research Institute in Ulsan, South Korea. The goal of the project was to compare the differences between the drawings and the facility, and then update the drawings to match the newly added field structure. Given that the piping of the new facility was fabricated differently than the original design, the team needed scanned data and a digital mesh to compare the drawings with the current state of fabrication.

The team leveraged iTwin Capture to process the scanned data into a 3D reality model to perform reverse engineering, identify differences, and update the original drawings. Bentley's application enabled the team to create the 3D model within just two days, quickly and accurately securing the status of the facility to refine the drawings.

Hangzhou Bole Digital Intelligence Technology Co. Ltd.

Onyear Betel Nut Processing Plant Project
Location: Xiangtan, Hunan, China

Project Playbook: AutoPIPE, OpenPlant, ProStructures, STAAD



A typical process factory project, the Onyear betel nut processing plant is recognized as a local benchmark initiative, promoting 3D digital design and supporting environmental protection of the surrounding area. The owner placed very strict requirements on the design team to be realized on a tight schedule. To meet the project deliverables, the team needed integrated modeling and analysis technology.

Leveraging OpenPlant, the team established a 3D factory model and used AutoPIPE and STAAD to generate pipeline and structural analysis models that were integrated into the single digital plant model. Working in an open modeling platform ensured the model was accessible to all project participants and streamlined workflows to shorten project completion time by 20%, saving 200 hours of design time and CNY 800,000 in costs. The digital solution enabled the team to deliver the factory three months ahead of schedule and in accordance with owner requirements.

MCC Capital Engineering & Research Incorporation Limited

Relocation and Upgrading Project of Dazhou Iron & Steel Group—Integrated Application of the BIM Technology of Ironmaking Unit in Design and Construction
Location: Dazhou City, Sichuan, China

Project Playbook: AutoPIPE, Bentley Raceway and Cable Management, MicroStation, OpenBuildings, OpenPlant, OpenRoads, ProjectWise, ProStructures

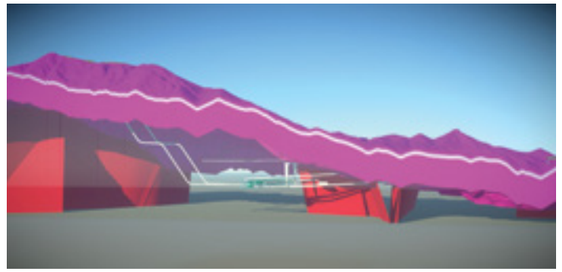
Given the expansion of the main urban area of Dazhou, the existing steel and iron factory is being relocated and upgraded to a green ecological plant. The project will reduce total energy consumption by 450,000 tons, saving 1.089 million tons per year in carbon emissions. MCC Capital is the general contractor for the ironmaking unit and faced space constraints designing the specialized equipment and arranging more than 20 types of process pipes. To integrate design, construction, and delivery workflows, MCC needed to set up a common data environment.

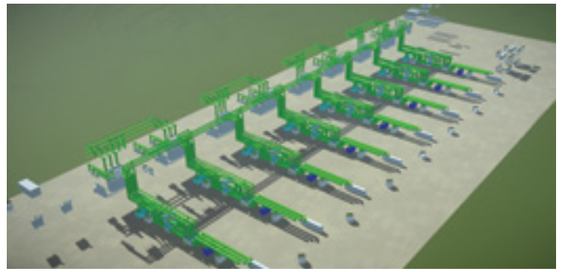
Leveraging ProjectWise and Bentley's Open applications, the team established a collaborative digital platform to perform coordinated modeling and simulation, streamlining design and construction workflows, and shortening the design cycle by 11 days. Working in an integrated 3D environment, the team identified and resolved more than 300 design collisions, saved 450 square meters of factory floor space, and reduced steel and concrete quantities to save 2.3% in civil construction costs. The project lays the foundation for the construction of future intelligent digital factories.

Shanghai Investigation, Design & Research Institute Co., Ltd.

Yanglin Pumped Storage Power Station
Location: Sanya, Hainan, China

Project Playbook: Bentley LumenRT, Bentley Raceway and Cable Management, iTwin, iTwin Capture, MicroStation, OpenBuildings, OpenFlows, OpenPlant, OpenRoads, OpenUtilities, ProjectWise





With a total installed capacity of 2.4 million kilowatts, Yanglin pumped storage power station is China's largest pumped storage project aimed at shaving peak loads in Sanya to reduce carbon emissions and promote clean energy consumption and sustainability. Faced with a short design cycle and challenging geological conditions, compounded by coordinating multiple engineering disciplines, the project team sought to implement collaborative BIM strategies. Numerous 3D design applications proved ineffective for designing the large-scale pumped storage power station, requiring the team to find an integrated digital BIM solution.

The team selected ProjectWise to establish a connected data environment and Bentley's Open applications to quickly perform 3D collaborative design and accurate simulations, optimizing the design scheme and improving the efficiency and reliability of the power station. The applications shortened the design cycle by 25%, improved the water design scheme delivery by 50%, and helped detect issues earlier in the design process.

Representatives of PowerChina Zhongnan Engineering Corporation Limited accept the award in the Process and Power Generation category of the 2024 Going Digital Awards.

RAIL & TRANSIT

This category recognizes projects that demonstrate going digital innovations in the planning, design, and construction of new rail assets, or the maintenance and upgrade of existing rail and transit networks.

Winner: Going Digital Award in Rail and Transit

SPL Powerlines UK

Midland Main Line Electrification
Location: Hertfordshire, Bedfordshire, Northamptonshire, Leicestershire, Nottinghamshire, Derbyshire, and South Yorkshire; United Kingdom

Project Playbook: AssetWise, Bentley Descartes, Bentley LumenRT, iTwin, iTwin Capture, MicroStation, OpenRail, Pointools, ProjectWise

The Midland Main Line Electrification (MMLE) Programme is a multidiscipline infrastructure project implemented to increase capacity and provide a full overhead electrified route from London. SPL Powerlines UK was tasked with installing 447 single track kilometers of overhead line along the rail corridor. However, the scheme was divided into eight route sections that SPL needed to manage across a multidiscipline team. Therefore, they needed to ensure that everyone had access to the latest design information.

SPL used ProjectWise as the basis for their connected data environment, sending and receiving information from 20 design organizations on the project. They also created an iTwin for further improved visibility of all design data. In just one month, their first-time submission success rose from 41% to 67%, freeing up time to achieve compliance. Because everyone had access to the information that they needed, site walkouts reduced by 94%, ensuring safety while reducing carbon emissions and project costs.

Transport for London

The Elizabeth Line
Location: London, England, United Kingdom

Project Playbook: OpenPaths, LEGION

Fully opened in May 2023, the Elizabeth Line is the largest addition to London's public transport network since the Victoria Line in 1968. Operating up to 24 trains per hour with the capacity for 1,500 passengers per train, the line has transformed how passengers use public transport within London. Transport for London (TfL) operates the line and wanted to understand future demand patterns to ensure that it would run smoothly for years to come. Due to the scale and complexity of the project, they knew that spreadsheet-based models would not be possible.

TfL used OpenPaths EMME and LEGION to assist with conceptual creation, route selection, and final delivery of an operational railway. They continued to use it for post-opening optimization. During the pandemic, OpenPaths EMME provided a complex crowd assignment in two hours, a reduction of 70% from previous model run times. LEGION tested iterative station designs over the project lifecycle, ensuring optimal station design, adherence to passenger safety standards, a positive passenger experience, and sufficient capacity until 2076. TfL forecasted 10 million fewer car journeys per year to transfer to the Elizabeth line, a net reduction of 24.6 million fewer grams of carbon emissions per day.

INECO

Master Design Stage RBDTD-LV-DS3 Design & Construction Supervision Estonian/Latvian-Vangazi
Location: Latvia

Project Playbook: Bentley Descartes, Bentley LumenRT, iTwin, iTwin Capture, iTwin Platform, Leapfrog, MicroStation, OpenBridge, OpenBuildings, OpenGround, OpenRail, OpenRoads, PLAXIS, ProjectWise, SYNCHRO

INECO is undertaking design and supervision services for constructing the Rail Baltica high-speed Latvian North project, running along the Estonian and Latvian border to Vangazi, Latvia. This section includes 41 overpasses, eight ecoducts, and 17 viaducts, one of which stretches 1,480 meters over the Gauja River. In addition to the vast amount of assets, the site also contained peatland that created geotechnical issues. Knowing that they needed to work with over 200 professionals across Europe, the United Kingdom, and South America, INECO sought digital solutions.

The team used ProjectWise to create a connected data environment that allowed them to grant access to a validated source of information, while OpenRail and OpenRoads helped model hundreds of kilometers of the roads and railways. When complete, the project will help link the Baltic states to the European Union, saving 5.3 million passenger hours per year, EUR 7.1 billion in climate change costs, and over 400 human lives over the next 30 years.

WSB

11th Street Railroad Grade Separation Project
Location: Moorhead, Minnesota, United States

Project Playbook: iTwin, iTwin Capture, OpenBridge, OpenRail, OpenRoads, PLAXIS, ProjectWise, ProStructures, SYNCHRO

Running through downtown Moorhead, Minnesota, the Great Northern Corridor moves freight to support millions of Americans and their businesses. However, with most emergency services on the north side, emergency responses were often delayed. WSB was tasked with designing the roadway to go under the railroad lines and build two new bridges that carried Amtrak passengers and BNSF Railway goods and services. However, there were other factors that made this project challenging, from flat topography, coupled with contaminated and clay soils, which limited design solutions.

WSB established an open, connected data environment with ProjectWise, ensuring information was always up to date and readily available. Using Bentley Open applications established a model-based approach to the design. All of this information was then combined into the iTwin Platform, creating a single digital model accessible to all stakeholders. SYNCHRO helped demonstrate each stage of construction that showed how the railway would be fully operational during construction. By using Bentley applications, WSB reduced survey time upfront by 15 days and design schedule by three months to allow for construction to finish in 2024 instead of 2025.

Taiwan BIM Technology Co., Ltd.

Ankeng Light Rail Transit System
Location: New Taipei City, Taiwan

Project Playbook: Bentley LumenRT, iTwin, MicroStation, OpenBridge, OpenBuildings, OpenRail, OpenRoads

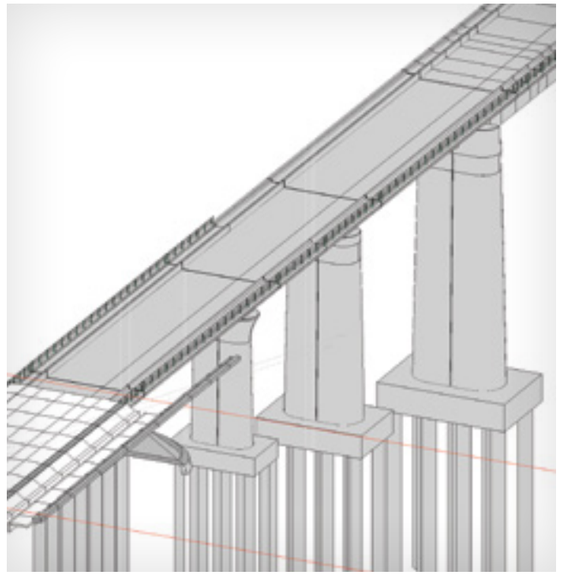
As part of New Taipei City Government's Department of Rapid Transit Systems' transportation construction plan, the Ankeng Light Rail Transit (LRT) is being built to reduce commuting times from Ankeng to Taipei City and improve accessibility and transportation efficiency in the Ankeng-Xindian area. The project covers terrain, bridges, track stations, and surrounding buildings and roads along the LRT route. The team sought to implement a BIM approach, but faced challenges managing and coordinating the multiple disciplines and voluminous, diverse models.

Bentley Open applications and iTwin provided a collaborative modeling and design review platform for all participants to discuss and collaborate, saving hundreds of resources hours. Working in an integrated digital environment streamlined workflows, facilitated clash detection, and reduced construction costs. Using Bentley's applications helped improve efficiencies in delivering an environmentally friendly, energy-saving, and user-friendly mode of transportation aligned with the government's environmental sustainability initiatives.

China Railway First Survey and Design Institute Group Co., Ltd.

API Library and Common Toolkit for Spatial Positioning of Railway Lines
Location: Xi'an, Shaanxi, China

Project Playbook: MicroStation, OpenRail



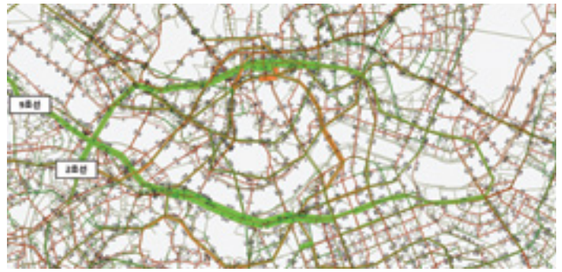
To provide unified business support for BIM design of railway engineering, China Railway initiated a project to research technologies for developing an API library for calculating line spatial position that would serve as a general resource for railway engineers. The voluminous data and multiple disciplines characteristic of railway engineering projects necessitated a comprehensive, integrated BIM technology solution.

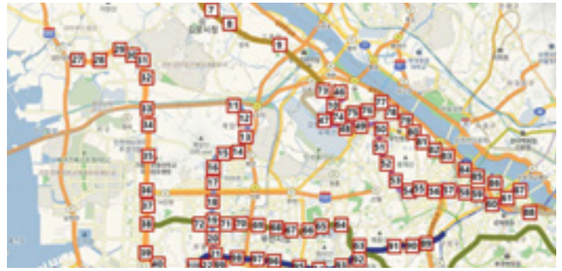
Leveraging MicroStation and OpenRail, China Railway built the API library, realizing the general calculation and integration of railway line design. The interoperability between Bentley's BIM applications and third-party modeling software enabled them to create BIM model components, establish a logical structural relationship between each component, and automate attribution of non-geometric information during the design process. The digital BIM database can improve efficiencies in research and development of railway line-related functions.

Korea Railroad Research Institute

Assessing the Social Benefits of the Implementation of the Autonomous Train Control System
Location: Uiwangi, Gyeonggi, South Korea

Project Playbook: OpenPaths





To help alleviate urban railway congestion in densely populated areas, Korea Railroad Research Institute (KRRI) conducted research to analyze the social effects of implementing an autonomous train control system on the urban railroad connecting Seoul with Korea's capital region. The goal is to maximize rail transport capacity and efficiency without constructing new rail lines. To complete the effectiveness analysis in a timely manner, the institute needed a comprehensive transport forecasting application to evaluate multiple scenarios.

KRRI selected OpenPaths EMME to digitally assess the effectiveness of an autonomous train control system under different scenarios. Compared to manual analysis and coding, OpenPaths EMME saved four months in analysis work time, enabling KRRI to evaluate additional scenarios, leading to a more accurate analysis that saved approximately KRW 1.382 billion in costs. Based on the digital analysis of the Seoul lines, the new train technology system would save KRW 411.5 billion in annual operating costs and KRW 6.1 billion in annual environmental costs, validating the adoption of this eco-friendly solution.

J Murphy & Sons Ltd.

Beaulieu New Station – Use of 4D for Digital Rehearsal
Location: Anglia, United Kingdom

Project Playbook: iTwin, MicroStation, OpenBuildings, ProjectWise, SYNCHRO

Beaulieu New Station is the first railway station to be built along the United Kingdom's Great Eastern Main Line in over 100 years. Upon completion, it will enhance railway accessibility, relieving pressure at the busy Chelmsford station, improving public transport and reducing traffic on the roads. J Murphy & Sons is managing design and construction, and faced challenges coordinating the numerous stakeholders and multisourced information to meet required handover dates and digital deliverables to the client. They wanted to utilize 4D construction simulation and digital twins to deliver the project.

Leveraging SYNCHRO and iTwin, J Murphy & Sons implemented federated modeling and developed a digital twin to visualize planning and construction works. By simulating and visualizing the construction process, they essentially developed a digital rehearsal to ensure safe and efficient onsite works. The digital solution integrated data in multiple formats into a single 4D model, streamlined coordination, and enabled quantities extraction directly from the model. Bentley's applications provided confidence with planned activities, ensuring construction targets are met, and enabled successful digital handover to the client.

Jacobs

C1 Align MWWC for HS2
Location: Birmingham, West Midlands, United Kingdom

Project Playbook: BCDE, iTwin, iTwin Capture, iTwin Experience, MicroStation, OpenBridge, OpenBuildings, OpenRail, OpenRoads, ProjectWise, SYNCHRO

Known as Contract C1, this significant civil works contract is part of the United Kingdom's High Speed Two (HS2) railway program, aimed at increasing rail capacity and improving connectivity between London and Birmingham. Jacobs is one of the design partners on the project that includes the twin-bored, 16.5-kilometer-long Chiltern tunnels, as well as the U.K.'s longest rail viaduct, spanning 3.7 kilometers across the Colne Valley. Faced with managing multiple disciplines and stakeholders and meeting demanding asset requirements, Jacobs needed an integrated technology solution to deliver Europe's largest infrastructure project.

They used ProjectWise, Bentley's Open applications, and iTwin to establish a connected data environment and digital twin, improving efficiencies and automation in the design process, streamlining workflows, and reducing design iterations. Working in an integrated digital platform helped identify potential risks, reducing rework and ensuring timely project delivery. Through digitalization and automation, the team optimized resource allocation and cost management, saving thousands of days in tedious manual labor and minimizing the project's environmental footprint.

Beca Ltd. and Auckland Transport

Homai's Rail Innovation: Digital Pathways to Community Engagement
Location: Auckland, New Zealand

Project Playbook: Bentley LumenRT, MicroStation, SYNCHRO

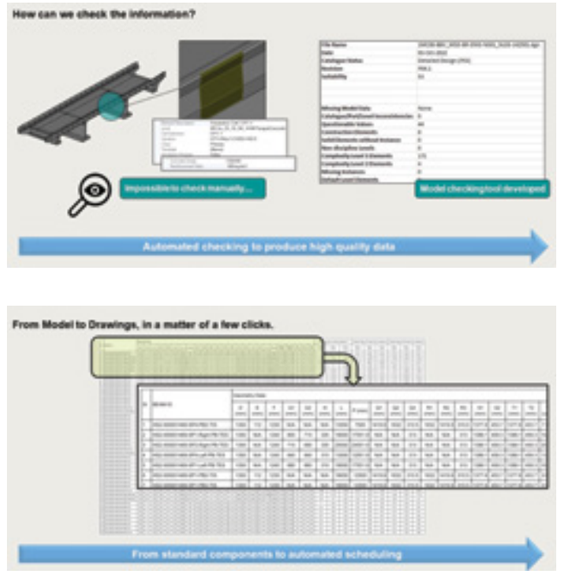
As part of Auckland's Level Crossing Removal Program, Beca developed preliminary and detailed designs for closing two level crossings at Homai Station. Home to a diverse community with the station adjacent to a campus for blind and low-vision students and constrained between two operational railway tracks, the Homai project presented communication, coordination, and site challenges. Traditional 2D drawings lacked the immersive experience necessary for stakeholder and community engagement and effective constructability reviews. Recognizing the need for a model-based approach, Beca needed integrated digital modeling and visualization technology.

Using MicroStation, Bentley LumenRT, and SYNCHRO, Beca developed collaborative digital design workflows, produced high-quality visuals and an interactive printed 3D model with Braille details, and performed 4D simulations. The solution successfully prioritized Homai's diverse community needs and resulted in using modular construction methods that significantly reduced traffic and environmental impact. Bentley's applications saved 10% in costs and shortened the construction period by two weeks. The project's success serves as a benchmark in stakeholder engagement and digital excellence for over 40 subsequent level crossing initiatives under the program.

Balfour Beatty Vinci/Mott MacDonald SYSTRA DJV

HS2 Area North Main Civil Works Contract
Location: Birmingham, West Midlands, United Kingdom

Project Playbook: iTwin, MicroStation, OpenBuildings, OpenRoads, ProjectWise



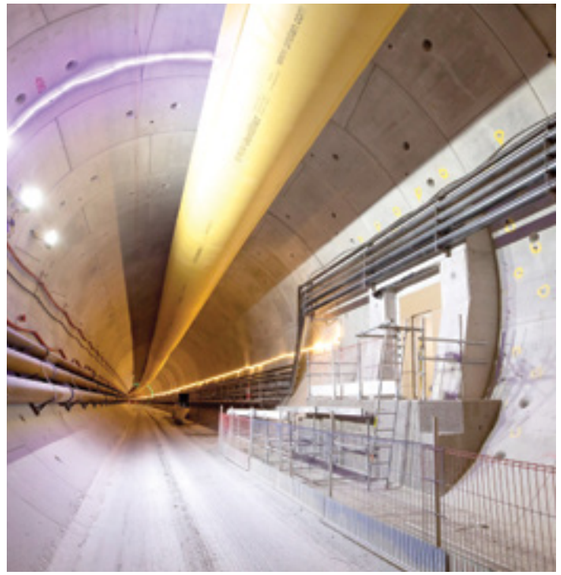
HS2 is a new purpose-built high-speed railway that will connect London and Birmingham via 140 miles of track, passing through 32 miles of tunnels and over 10 miles of viaducts. Upon completion, it will accelerate travel times, increase passenger capacity, and offer greater freedom to travel using low carbon options. Operating across eight time zones with more than 10 disciplines and organizations and multiple assets, the project presented coordination challenges necessitating standardized digital solutions and BIM requirements throughout the project lifecycle and handover to the client.

The design joint venture team selected ProjectWise, Bentley's open modeling applications, and iTwin to establish a connected data environment, a standard digital component library, and a digital twin. The team created 785 standard components that accelerated development of design models, saving over 100,000 hours and GBP 5.1 million. Using Bentley's applications automated schedule reporting and quantity extracts to improve the quality of deliverables and carbon calculations, minimizing carbon emissions at every stage of the project to help meet HS2's 50% carbon reduction target.

Jacobs

HS2 C1 MWCC
Location: London, England, United Kingdom

Project Playbook: iTwin, MicroStation, OpenBuildings, OpenRoads, ProjectWise, SYNCHRO



Known as Contract C1, this significant civil works contract is part of the United Kingdom's High Speed Two (HS2) railway program, aimed at improving connectivity between London and Birmingham. Jacobs is one of the design partners on the project that includes the twin-bored, 16.5-kilometer-long Chiltern tunnels and the U.K.'s longest rail viaduct, spanning 3.7 kilometers across the Colne Valley. Housing 3,000 cross pipes for drainage and cable routing, the tunnels presented a large volume of elements to be modeled. Manual methods proved time-consuming and error-prone, requiring the team to explore a more robust technology solution.

Leveraging OpenBuildings and OpenRoads Designer, the team integrated multiple datasets to generate a 3D model for 20 miles of drainage network. Bentley's applications automated previous manual processes, saving significant time, while ensuring accuracy and consistency.
The flexibility and interoperability of the software enabled one person to create the model within two hours, compared to multiple resources taking 200 hours using conventional strategies. Based on the resource and time savings, the automated workflows delivered a 9,900% return on investment.

Italferr S.p.A.

Methods for the Feasibility Analysis of Design Alternatives in Railway Projects
Location: Italy

Project Playbook: Bentley Infrastructure Cloud, Bentley LumenRT, Central, iTwin, iTwin Capture, Leapfrog, MicroStation, OpenBuildings, OpenCities, OpenRail, OpenRoads, OpenUtilities, SYNCHRO

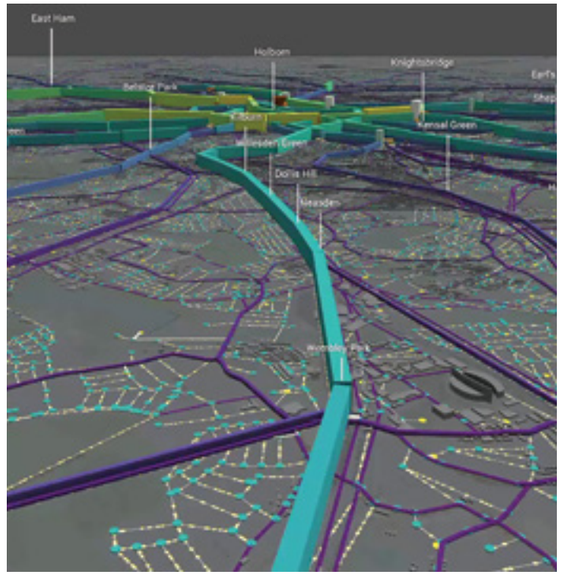
To improve design workflows and coordination for railway projects in Italy, Italferr implemented digital methods for the feasibility analysis of design alternatives. They aimed to ensure greater accuracy and control of design data, streamline design processes, and optimize decision-making. To address data integration and multidiscipline coordination challenges common in railway engineering design, and consider the impact of each design from local, environmental, architectural, and technical perspectives, Italferr realized that previous technology lacked the necessary flexibility and integration.

Using ProjectWise, Bentley's open applications and iTwin, Italferr developed a unified solution that facilitated coordination and integration of data and disciplines, enabled process automation, and optimized design workflows. The software's interoperability and robust features reduced design and analysis time to generate and refine railway models. Working in a collaborative digital platform helped streamline decision-making, directly impacting sustainability by decreasing energy consumption and the carbon footprint of the design process, and provides a model for digital construction and operations management.

Transport for London

OpenPaths CUBE and OpenPaths EMME Application in Transport for London's Multimodal Demand Forecasting
Location: London, England, United Kingdom

Project Playbook: OpenPaths



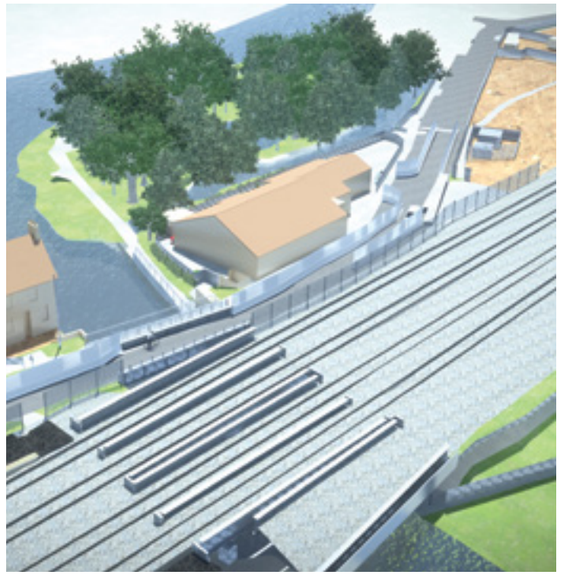
Transport for London (TfL) develops strategic models with the primary aim of understanding travel in London and how interventions impact the city's transport strategy. To improve model integration, transparency, functionality, and visualizations, TfL appointed a consortium to develop a new model of travel in London known as MoTiON. To successfully implement the new modeling program, the team needed an integrated and interoperable technology solution.

Leveraging OpenPaths CUBE and OpenPaths EMME, the consortium implemented MoTiON, creating seamless interaction between London's four different transport models and the software used to generate those models. Using Bentley's integrated applications provided a more flexible and accelerated processing environment to address connected autonomous vehicles, private hire vehicles, parking, and zoning systems.
The new multimodal demand model enabled a more accurate, in-depth assessment of potential transport policies at a strategic level for the city. Through integration and automation, the team reduced total model run time by 8% and delivered a more attractive presentation, fostering a wider range of stakeholder engagement.

Network Rail

Oxford Railway Station
Location: Oxford, England, United Kingdom

Project Playbook: Bentley Descartes, Bentley Infrastructure Cloud, Bentley LumenRT, MicroStation, OpenBuildings, OpenRail, ProjectWise, SYNCHRO



As part of the Oxfordshire Connect program, Network Rail is upgrading Oxford Station, expanding the area's road and railway infrastructure while also improving access to fast, sustainable passenger and freight transport. The project presented multiple disciplines and multi-sourced data, comprised of geometric CAD, survey, and unstructured data. Contractually obligated to meet owner-imposed BIM requirements, the project team needed to establish a connected data and modeling environment.

The team used ProjectWise as the common data platform and MicroStation to perform coordinated modeling and clash detection. Using Bentley LumenRT provided realistic visualizations, fostering stakeholder collaboration with local residents and Oxford City Council, while SYNCRHO enabled advanced simulation to optimize resource allocation, reduce environmental impact, and ensure project milestones were met. The integrated digital solution shortened the design period by one month and offers a comprehensive digital business model for lifecycle management of railway projects.

WSP

Oxford Station Phase 2C/2D
Location: Oxford, England, United Kingdom

Project Playbook: iTwin, MicroStation, OpenBuildings, OpenRail, OpenRoads, ProjectWise, SYNCHRO

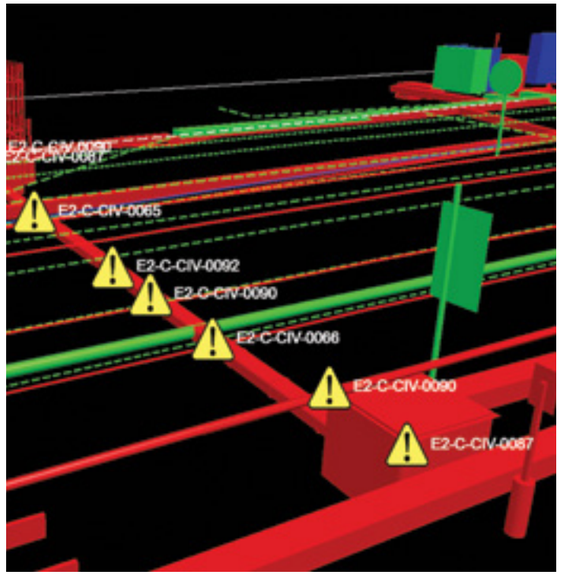
Aimed at enhancing connectivity and promoting multimodal transportation, Oxford Station redevelopment will improve the rail network in the region to support population growth. WSP is spearheading the project that encompasses construction of a new track and platform, a new station entrance, and upgrades to the Botley Road bridge. With intricate ground conditions, multiple stakeholders, and tight deadlines, the project presented challenges that traditional methods could not accommodate. WSP needed an integrated, collaborative digital technology solution.

Leveraging ProjectWise, Bentley's Open applications, and iTwin, WSP established a connected digital platform and digital twin, integrating design and construction workflows to shorten the project timeline. The digital twin provided accurate and reliable data throughout the project lifecycle, streamlining decision-making and reducing errors. Working in a collaborative digital environment reduced modeling time by 35,000 hours and improved data exchange by 90%. By simulating design scenarios, WSP cut the carbon footprint, lowered energy use, and protected natural habitats. Bentley's integrated digital solution helped WSP deliver critical rail infrastructure in a more efficient, cost-effective, and sustainable manner.

SYSTRA UK Ltd.

SafetyByBIM - Collaborative Tool
Location: United Kingdom

Project Playbook: iTwin, MicroStation, ProjectWise



Responsible for design works on the Transpennine Route Upgrade (TRU), SYSTRA identified a need to improve risk management across the multi-discipline railway project. Traditional spreadsheet-heavy approaches to health and safety management failed to facilitate the necessary collaboration to ensure all stakeholders are involved in risk reduction. SYSTRA wanted to maximize collaboration and communication of hazards throughout the project for all parties, but faced challenges managing large digital models and obtaining stakeholder buy-in.

SYSTRA leveraged iTwin to develop their SafetyByBIM program, enabling users to simultaneously visualize and add hazards to the digital twin in a cloud-based platform. The Bentley-based digital solution reduced time for health and safety review meetings by 25% to 30%, improved data exchange related to hazards by 80%, and reduced onsite risks. By utilizing digital twins as the foundation for their SafetyByBIM program, SYSTRA can provide a digital handover to the client, offering a comprehensive, visual overview of residual risks. The collaborative, digital risk management system serves as a benchmark for managing health and safety risks across future projects within the construction industry.

SUDOP PRAHA a.s.

Smichov Station Terminal
Location: Prague, Czech Republic

Project Playbook: iTwin Capture, LEGION, MicroStation, OpenBuildings, ProjectWise

Prague's' Smichov Station Terminal project aims to unify different types of public transport, including metro, railway, bus, tram, bicycle, car, and pedestrian services within one complex. Upon completion, the transport facility will be the largest in the Czech Republic and improve mobility within the city and suburban municipalities around Prague. With different components of the project at various stages of development by different investors, the project team faced challenges coordinating design and construction works, necessitating a collaborative modeling solution.

Sudop Praha A.S. selected ProjectWise, MicroStation, and Bentley's Open applications to streamline data sharing and design workflows. Integrating iTwin Capture and LEGION, they modeled existing objects of the city road and analyzed passenger movement to better organize the space. Working in a collaborative digital environment enabled them to perform clash detection and identify design errors early, ultimately saving time and costs. With a photovoltaic power plant proposed to be installed on the roof terminal, the team expects to eliminate 900 tons of annual carbon emissions.

Representatives of SPL Powerlines UK accept the award in the Rail and Transit category of the 2024 Going Digital Awards.

ROADS & HIGHWAYS

This category recognizes projects that demonstrate excellence and going digital innovations in planning, design and engineering, construction, project delivery, or operations of roads or highways.

Winner: Going Digital Award in Roads and Highways

Department of Public Works and Highways (DPWH)

Digital Twin Implementation for NLEX-SLEX Connector Road Project
Location: Caloocan to Manila, Metro Manila, Philippines

Project Playbook: Bentley LumenRT, iTwin Capture, OpenBridge, OpenRoads, SYNCHRO

Manila, one of the most densely populated metro areas in the world, suffers from significant road congestion—commuters lose nearly five days of their lives sitting in traffic each year, and average rush hour speeds are just 19 kilometers per hour. To improve the situation, DPWH is developing an eight-kilometer, all-elevated, high-speed road connecting major road networks in the north and south. Developing roads in a dense urban center presented challenges, including right-of-way issues and limited space for construction equipment.

After considering several technologies, DPWH chose Bentley solutions to develop a mixed reality digital twin of the project. Using iTwin Capture enabled DPWH to incorporate reality data early in the project. Using OpenBridge and OpenRoads they accurately modeled the project components. Overlaying the project model in the reality mesh gave the team an early and easy opportunity to determine clashes between structures during detailed engineering design and access its impact on the surrounding communities. With Bentley LumenRT and SYNCHRO, they visualized the construction process. In addition to improving productivity by 15%, they boosted equipment logistics by 40%. The new road improves the transportation of goods and reduces travel time by one hour, saving 315 million kilograms of carbon emissions per year.

China Road and Bridge Corporation, China Highway Engineering Consulting Corporation

Phnom Penh – Bavet Expressway
Location: Phnom Penh, Cambodia

Project Playbook: Bentley LumenRT, iTwin, iTwin Capture, MicroStation, OpenBridge, OpenRoads, ProjectWise, ProStructures

The Phnom Penh-Bavet Expressway is the second expressway in Cambodia, stretching 138 kilometers and passing through three provinces. China Road and Bridge Corporation (CRBC) was tasked with constructing the expressway that would shorten travel times from two hours to 20 minutes. However, the project was located in a floodplain, with water reaching a maximum of six meters during the rainy season. The team also needed to work around Buddhist temples and culture relics. Therefore, the team chose to implement digital delivery workflows.

CRBC established an open connected data environment using the iTwin Platform, ensuring that the team could always access the most up-to-date information at anytime and any location. MicroStation, OpenRoads, and OpenBridge helped develop models that could be shared with stakeholders. By using Bentley applications, everyone on the project worked together in a unified environment, shortening the design cycle by 20%. The terrain and geological models optimized vertical alignment, reducing earthwork volume by 2 million cubic meters and the equivalent of 2.75 million tons of carbon emissions by eliminating truck travel.

WISDRI Engineering and Research Incorporation Limited

Wuhan Gaoxin 4th Road Comprehensive Reconstruction Project
Location: Wuhan, Hubei, China

Project Playbook: Bentley LumenRT, iTwin Capture, MicroStation, OpenBridge, OpenBuildings, OpenRoads, ProjectWise, ProStructures, SYNCHRO

To accelerate the development of Wuhan New Town into a world-class scientific and technological innovation center, a new 12.5-kilometer road will be constructed, becoming the main gateway between Wuhan and Wuhan New Town. This road will feature eight lanes in both directions, an auxiliary road with four lanes in both directions, three bridges, and require 2.1 million cubic meters of earthwork. WISDRI had to work with a complex, limited site, coordinate numerous stakeholders, and adhere to high standards of quality.

The organization turned to Bentley applications to improve design efficiency through 3D modeling. They used ProjectWise to quickly deliver information among the team and stakeholders, then they deployed iTwin and Bentley Open applications to create 3D models and refine all aspects of the project. Going digital helped them improve design efficiency by 25%, lower costs by CNY 60 million, and eliminate 25 days of construction. WISDRI plans to use the digital model to manage the entire lifecycle of the road.

Prointec

A6 Dungiven to Drumahoe Dualling Scheme
Location: Ireland

Project Playbook: OpenRoads

Initiated by Northern Ireland's Department of Infrastructure, this roadway project involved upgrading the A6 trunk road from a single carriageway to a dual two-lane carriageway between Dungiven and Drumahoe. The project spanned 25.5 kilometers and included a bypass with new roundabouts. Prointec is part of the design joint venture team responsible for detailed design of the structures, earthworks, and road alignment. Working closely with the construction team and stakeholders, Prointec faced coordination challenges compounded by environmental issues and an ambitious project timeline.

Leveraging OpenRoads as the leading civil design technology for the project, Prointec modeled the roadway alignment and elements, delivering an optimal design that maximized sustainable reuse of local materials. Working in an open digital modeling platform streamlined design workflows and communication with the construction team and stakeholders. It also provided significant carbon savings by reducing haulage trips, minimizing impact to the local community and environment. Using OpenRoads helped Prointec deliver the project on time, within budget, and in compliance with all contractual requirements.

JSTI Group Co., Ltd.

Application of BIM Technologies in Lianyungang City Ring Road
Location: Lianyungang, Jiangsu, China

Project Playbook: Bentley Descartes, Bentley LumenRT, iTwin, iTwin Capture, MicroStation, OpenBridge, OpenBuildings, OpenRoads, ProjectWise, ProStructures

This roadway reconstruction project will meet growing urban development needs and ease roadway congestion in Haizhou. JSTI Group is undertaking construction drawing design for the 10.28-kilometer, six-lane divided highway with non-motorized vehicle lanes, sidewalks, and a 9.56-kilometer overpass. Faced with harsh construction site conditions, space constraints, and complex pipelines and structures, JSTI needed integrated 3D BIM and digital twin technology to successfully manage, coordinate, and deliver the multidiscipline project.

JSTI selected ProjectWise to establish a connected data environment, and iTwin Capture and Bentley's Open applications to develop a reality mesh of the existing conditions and 3D models of the new roadway design. With the iTwin Platform, they integrated the 3D models into a single digital twin, then used Bentley LumenRT to create an animated presentation to visualize the design intent. The collaborative digital design solution streamlined workflows, enhancing design efficiency by 20%. Working with a digital twin improved internal and external communication, decreased the construction period by 30 days, and saved approximately USD 20 million in costs.

CCCC First Harbor Engineering Urban Transportation Engineering Co., Ltd.

Baise North-South Transit Highway (North Ring Road) Section I
Location: Baise, Guangxi Zhuang Autonomous Region, China

Project Playbook: Bentley View, iTwin Capture, MicroStation, OpenBridge, OpenRoads

As part of the Guangxi Highway Network Plan, the Baise North Ring Road is a north-south roadway construction project that, upon completion, will reduce city traffic congestion, unnecessary fuel consumption, and exhaust emissions, contributing to a 2.5% annual reduction in carbon emissions. Spanning 16.364 kilometers, the project presented unfavorable geology conditions and inputs from multiple disciplines, requiring complex engineering solutions and remote coordination. Previous software lacked data integration, robust modeling features, and digital delivery capabilities, necessitating a collaborative digital approach.

The team selected Bentley's Open applications and iTwin to develop a digital twin, facilitating real-time collaboration, visual construction simulation and planning, and risk management. Working in an integrated digital modeling environment improved productivity by 30% and reduced the construction schedule by 30 days to save CNY 1.7 million. The digital twin optimized material use and route layout, saving 8,000 tons of concrete and improving logistics efficiencies by 20% to reduce overall energy consumption and the project's carbon footprint.

CCCC First Harbor Southwest Engineering Company, Ltd., CCCC Port Engineering Design & Consulting Company, Ltd.

Bid Section III Project of Baise North-South Transit Line Highway (North Ring Road)
Location: Baise, Guangxi Zhuang Autonomous Region, China

Project Playbook: OpenRoads

Located in the rapidly developing Baise area of Guangxi, this roadway project will improve the highway network and promote Guangxi as a strategic hub for developing the southwestern and central-southern regions of China. Spanning 14.207 kilometers and featuring bridges, culverts, and a main roadbed, the project presented complex ground conditions and challenges coordinating the multiple existing utilities, simultaneous housing projects in the area, and the multidiscipline team. To address these issues, the team wanted to implement BIM and intelligent construction processes.

Leveraging OpenRoads, a digital twin, and IoT technology, the team built an integrated 3D model and intelligent site platform, enabling visual simulation and clash detection to identify and resolve 33 design conflicts prior to construction. Working in an integrated digital environment shortened the construction period by 45 days to save CNY 4 million in construction costs. Through BIM and smart digital workflows, the team was able to implement green construction processes, achieving energy savings and emissions reduction.

The Civil Engineering Group Corporation of China Construction Second Engineering Bureau Ltd.

Construction of the Third Bidding Section of the Baipeng Road-Xiaowan Interchange Project of the First Longitudinal Line
Location: Chongqing, China

Project Playbook: Bentley LumenRT, MicroStation, OpenBridge, OpenRoads

This section of the Baipeng Road-Xiaowan Interchange project includes the design and construction of two main bridges, the Moujiawan interchange with 18 bridges, 2.5 kilometers of main roadway, and 2,910 meters of pipeline. The municipal project presented technical and coordination challenges, leading the team to implement a BIM approach. However, initial software applications were limited in collaborative modeling and visualization capabilities. To reduce delays and over-budgeting, as well as streamline design and construction workflows, the team needed an open, integrated BIM solution.

Leveraging OpenRoads and Bentley LumenRT, the team generated a 3D terrain model and animated visualization, then uploaded it to a web page for all parties to view and understand the detailed engineering information, design intent, and construction process. Working in a collaborative, cloud-based BIM platform enabled design changes to be made virtually, optimizing construction and reducing onsite costs. Bentley's integrated applications improved coordination and reduced modeling time by 70%, increasing productivity.

CSCEC AECOM Consultants Co., Ltd.

Design, Construction and General Contracting of Western Zhenyuan Comprehensive Pipeline Network Renovation Project and Zhenyuan Dongxin Street Phase II Road Project
Location: Lanzhou, Gansu, China

Project Playbook: Bentley LumenRT, MicroStation, OpenBridge, OpenFlows, OpenRoads

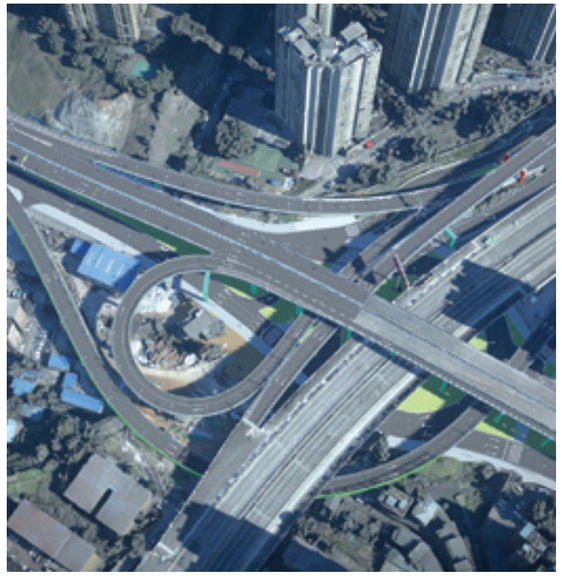
The Zhenyuan Urban Renovation project will support local economic development and population growth in Lanzhou City through the construction of more than twenty municipal roads, two bridges, and a storm sewerage network for the entire city. With complex ground conditions and multiple engineering disciplines, the project presented technical and coordination challenges meeting the tight construction deadlines. The consultants needed an integrated digital platform to share information and models among the roadway, bridge, and pipeline engineering teams, as well as achieve digital delivery.

By leveraging MicroStation, OpenRoads, and OpenBridge, the team generated a reality mesh and digital twin, adopting a model-based approach to project delivery. Integrating Bentley LumenRT provided animated visualizations of proposed designs, enhancing understanding of design intent and optimizing decision making. Working in a connected digital platform streamlined workflows, reducing modeling time by 50% and improving overall design efficiency by 10% to save CNY 200,000 during the design phase. The digital twin reduced the construction period by 35 days, saving 10% to 15% in construction costs.

Beijing Railway Construction Co., Ltd. of China Railway 6th Bureau Group, Traffic Engineering Branch of China Railway 6th Bureau Group

Digital Application in the Double-Track Tunnel of Chongqing University Town
Location: Chongqing, China

Project Playbook: Bentley LumenRT, iTwin Capture, MicroStation, OpenBridge, OpenRoads



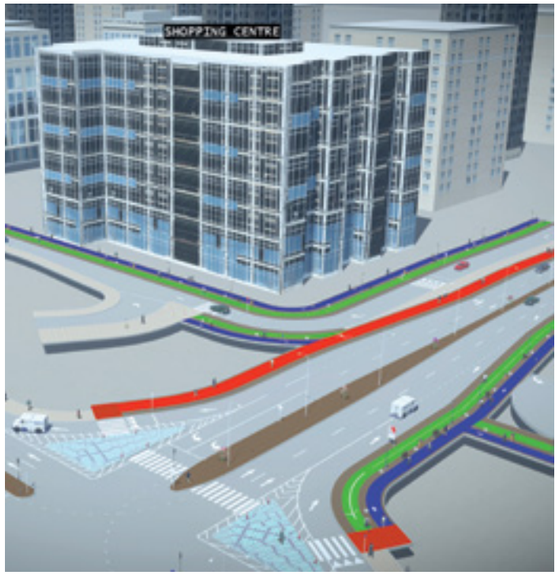
Located in downtown Chongqing, this project runs through the mountains to connect the two main urban areas, and is significant for local transport and development of the regional economy. The project involves constructing a four-kilometer, six-lane double tunnel, two interchanges, and an overpass, as well as elevating three spans of bridge and demolishing part of an existing bridge. The unfavorable geological conditions, congested urban area, and multiple disciplines, compounded by a tight construction schedule, presented technical and coordination challenges requiring an integrated digital approach.

Leveraging Bentley's reality capture and open modeling applications, the team implemented collaborative modeling and dynamic design processes, minimizing the impact to area residents and reducing design conflicts. Working in a connected digital environment improved design efficiency by 20%. Through 3D modeling and visualization, the team optimized renovation and demolition works, saving more than CNY 30 million in costs and reducing the construction schedule by 45 days.

SYSTRA India

Etihad Rail: Detail Design of MBZ Station Link Roads
Location: Mohamed Bin Zayed City, Abu Dhabi, United Arab Emirates

Project Playbook: Bentley LumenRT, MicroStation, OpenRoads, ProjectWise



Etihad passenger rail service aims to improve connectivity in the United Arab Emirates and streamline transportation across the Gulf Cooperation Council countries. An essential component of the rail network is the link roads to Mohammed Bin Zayed City station. SYSTRA is designing the complex road network, spanning 7.1 kilometers with ten junctions. Located in a dense urban environment, the project presented challenges accommodating existing buildings and utilities, compounded by coordinating multiple disciplines and authorities throughout planning and design. Initial software applications lacked the interoperability, modeling, and visualization capabilities to address these challenges.

SYSTRA selected ProjectWise to establish a collaborative design environment and Bentley's Open applications to model the corridor, streamlining and automating previous manual workflows. Bentley LumenRT provided stakeholders a holistic view and understanding of the project and proposed changes in real time. Through collaborative digital design processes, SYSTRA improved data exchange by 40% while the use of OpenRoads Designer reduced modeling time by 120 resource hours. Using Bentley's integrated technology eliminated the need to relocate a 132-kilovolt utility line, saving USD 80,000 and reducing the project's carbon footprint.

PT Waskita Karya (Persero) Tbk

Jakarta-Cikampek II South Toll Road
Location: Karawang-Purwakarta, West Java, Indonesia

Project Playbook: Bentley LumenRT, iTwin Capture, MicroStation, OpenBridge, OpenRoads, SYNCHRO

To expand capacity along the Jakarta-Cikampek Toll Road that accommodates 53% of the country's 138 million vehicles, Indonesia's Ministry of Public Works and Housing initiated development of a second, south toll road. PT. Waskita Karya (Waskita) is the main contractor for the 32-kilometer-long tollway and faced change management challenges near the end of the project related to the toll gate locations and vertical clearance of an existing overpass. To quickly and effectively address these issues, Waskita needed to establish a connected data environment and digital twin.

Leveraging iTwin Capture and Bentley's Open applications, Waskita generated a reality mesh and digital twin, enabling collaborative workflows and rapid decision making. Integrating Bentley LumenRT allowed for real-time visualization to find an alternative place to construct the toll booths, avoiding an USD 8.4 million potential loss. Working in a connected digital ecosystem enabled quick implementation of design changes to complete the project 58 days ahead of schedule, saving USD 1.1 million. Using the digital twin during construction bidding led to a 50% savings in construction costs.

PT Wijaya Karya (Persero) Tbk

Nusantara Road and Highway Connectivity, New Capital City of Indonesia
Location: Balikpapan, East Kalimantan, Indonesia

Project Playbook: Bentley LumenRT, iTwin, iTwin Capture, MicroStation, OpenBridge, OpenRoads, OpenTunnel, PLAXIS, ProjectWise, SYNCHRO

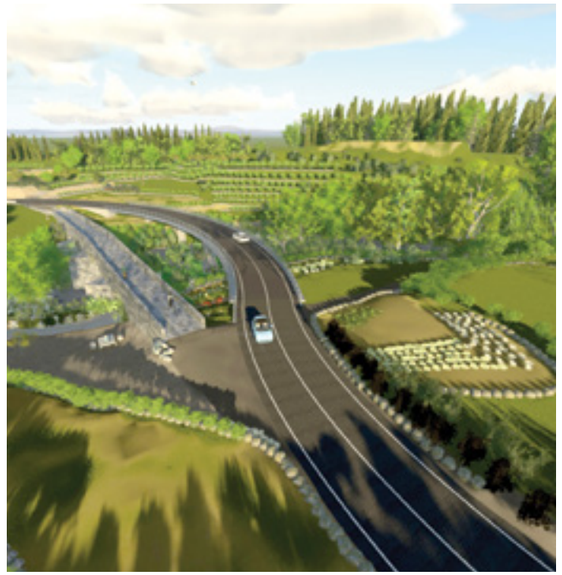
As part of moving Indonesia's capital city to Nusantara, PT Wijaya Karya (WIKA) was tasked with constructing 57 kilometers of toll road, three long-span bridges, two helipads, two toll gates, and a seven-kilometer pile slab. When complete, the project will reduce travel time from two hours to 30 minutes. However, WIKA had to ensure that the roadway could withstand landslides while avoiding 10 transmission towers. To overcome these challenges, as well as orchestrate 33 work packages simultaneously, WIKA needed digital twin workflows.

WIKA used iTwin Capture Modeler to process 500 hectares of aerial survey data, then used OpenRoads to design the roadway and OpenBridge to manage the massive amount of structural data. By using iTwin Capture, the team increased the speed, accuracy, and consistency of processed data by 100% versus traditional survey. Bentley's civil applications helped iterate design alternatives up to 35% faster and increased the safety factor 1.79 for the most critical jobs, standing and deep excavation work. Not only did they save 667,708 working hours, they also reduced their carbon emissions by 51,000 tons.

STRENG

Piscais Bridge
Location: Vila Real, Portugal

Project Playbook: Bentley LumenRT, MicroStation, OpenRoads



To ensure safe and shorter passage over the river in Vila Real, Portugal, STRENG is one of the engineering companies designing and executing the new road bridge to replace the ancient Piscais Bridge. Upon completion of the new structure, the existing bridge will serve exclusively as a pedestrian bridge. A monument of national interest dating back to medieval times, the Piscais Bridge, along with its heritage characteristics, needed to be preserved. This required STRENG to design a new bridge in harmony with the existing bridge and surroundings, presenting design and integration challenges.

STRENG selected OpenRoads to model the road and existing terrain, as well as determine a proposed design solution. They used MicroStation to model the new bridge. To present their design to the project owner and public, they created an immersive 3D digital visualization of the new bridge design within the surrounding environment. Bentley's application allowed STRENG to explore various design options within a short timeframe, improving productivity and change management.

Aurecon

SH1 Papakura to Drury
Location: Auckland, New Zealand

Project Playbook: Bentley LumenRT, Leapfrog, MicroStation, OpenRoads, ProjectWise

This New Zealand roadway project will upgrade a five-kilometer-long stretch of Auckland's Southern Motorway originally built in the 1960s to a modern, six-lane highway that will accommodate the area's significant growth. Aurecon is the designer and construction supervisor, and faced technical and coordination challenges given the site constraints, simultaneous onsite works, rapidly changing landscape of the project area, and a multidiscipline team spread across three countries. Therefore, Aurecon needed interoperable modeling software and a connected data environment.

Leveraging OpenRoads and ProjectWise enabled Aurecon to directly reference multiple data sets within the 3D roadway model, ensuring the model was always current and accessible to the entire team. The interoperability of Bentley's applications improved model and data integration by 95%. Working in a collaborative design environment facilitated clash detection and streamlined workflows, optimizing design, improving safety, and reducing construction disruption, as well the project's embodied carbon. Using the 3D federated model reduced the number of on-site staff, saving 15,000 resource hours during the construction phase.

Hegoalde II JV

South Metropolitan Bypass, Phase 1B
Location: Bilbao, Vizcaya, Spain

Project Playbook: OpenRoads

The South Metropolitan Bypass, known as VSM, aims to provide a functional and safe road alternative to the most congested area of the A-8 motorway, reducing accident rates and optimizing Bilbao's metropolitan road network. This phase 1B connects the VSM from the Peñascal junction to the AP-68 highway in Venta Alta. The project involved managing and coordinating tunneling, drainage, roadway alignment, and signaling and lighting works. To streamline workflows and improve collaboration, the team wanted to implement a BIM methodology and establish a common data environment.

Leveraging OpenRoads Designer, the project team performed collaborative 3D modeling and achieved real-time necessary sharing. Working in a connected data platform helped manage construction works and facilitated digital construction monitoring. Using Bentley's open BIM application optimized project coordination, setting a benchmark in BIM standards at the state level.

SMEC South Africa

Upgrade of National Route 3
Location: Durban, KwaZulu-Natal, South Africa

Project Playbook: Bentley LumenRT, MicroStation, OpenBridge, OpenFlows, OpenRoads, SYNCHRO

Responsible for carrying 40% of South Africa's gross domestic product, the N3 corridor is being upgraded to improve access to Durban Harbour's import and export facilities while reducing vehicle carbon emissions. SMEC South Africa is delivering the first two sections of the project, including bridge widening, 10 kilometers of a dual five-lane carriageway, and a continuous median barrier wall between the two carriageways. The concrete median, roadway width, and varying level differences of the two carriageways presented sight distance, aquaplaning, and clearance challenges, compounded by tight deadlines and strict client requirements.

Leveraging Bentley's Open applications, SMEC created a 3D design model and used Bentley LumenRT to generate realistic project renderings to showcase at client meetings and obtain stakeholder buy-in. Compared to manual methods, SMEC saved 25% in drawing production time and 33% in modeling time, reducing costs by a total of ZAR 2.27 million. Bentley's interoperable technology reduced the stockpile site by 300,000 cubic meters and minimized the use of concrete to reduce the overall carbon footprint of the project.

Representatives of Department of Public Works and Highways accept the award in the Roads and Highways category of the 2024 Going Digital Awards.

STRUCTURAL ENGINEERING

This category recognizes projects that have demonstrated excellence and innovation in digital collaboration, information management, information mobility, or content management through implementing digital workflows for improved outcomes.

Winner: Going Digital Award in Structural Engineering

Hyundai Engineering

New Physical Modeling Method for Plant Steel Structures Using STAAD API
Location: Seoul, South Korea

Project Playbook: STAAD

To help engineers avoid repetitive tasks and foster creative, more efficient design of plant steel structures, Hyundai Engineering initiated a project to automate structural design processes. They wanted to develop a new physical modeling method and generate an analytical digital twin. However, with numerous design variables that can be mismatched and deliver unreliable assessment results, Hyundai realized that they needed comprehensive structural modeling and analysis technology to optimally consider constructability enhancements.

Hyundai selected STAAD to apply design automation techniques to a plant steel structure on a sample project. Bentley's application enhanced structural design efficiency, reliability, and quality, as well as optimized design while considering constructability. Based on the total steel volume in their sample project, the digital solution reduced structural analysis time by 70% and design errors by 50%, expected to save approximately KRW 330 million. The new design automation program adjusts the design variables in real time as the steel structure is modified, facilitating creative and efficient structural design, reducing material steel volumes and lowering the carbon footprint of structural frameworks.

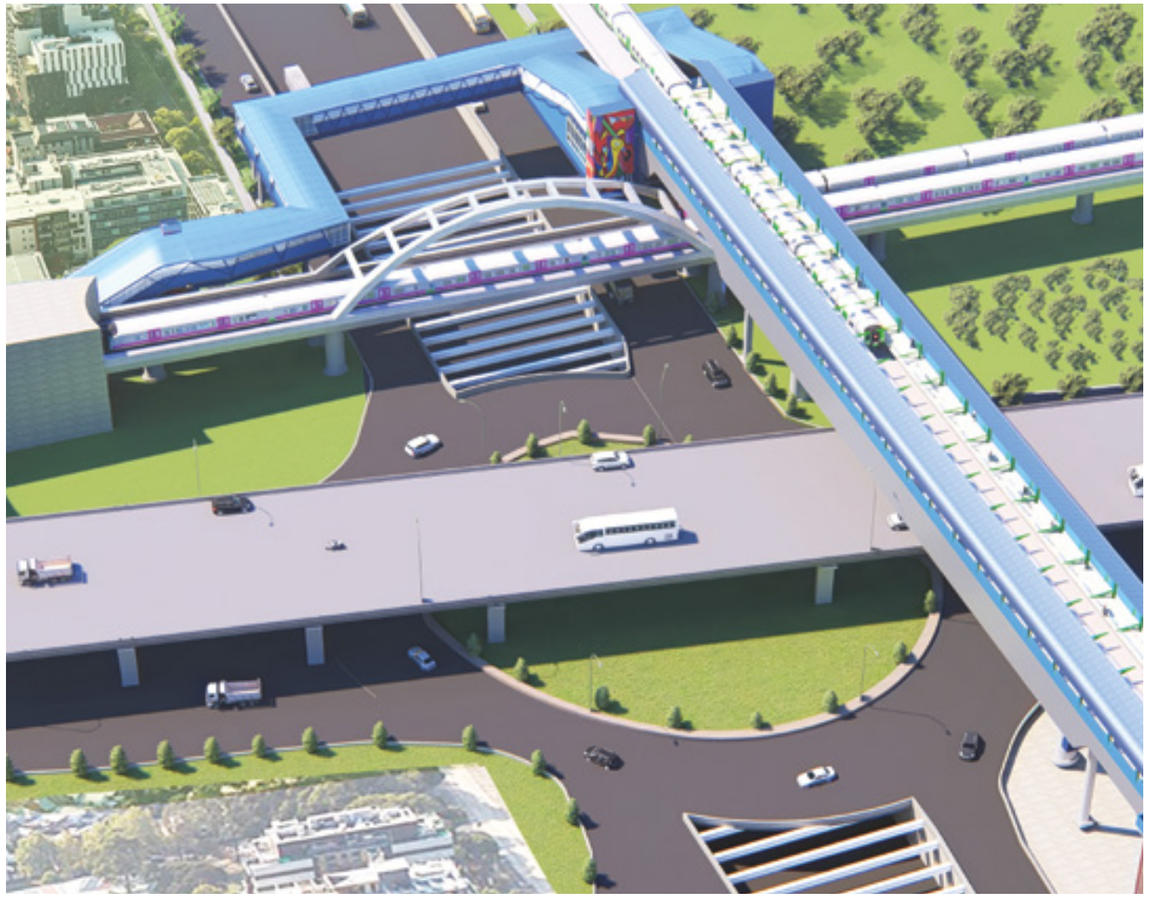
Arcadis

Advanced Analysis and Design of Flood Protection Structures through Automation
Location: New York City, Indianapolis, and Dallas; New York, Indiana, and Texas; United States

Project Playbook: STAAD

To improve efficiencies in flood management and mitigation projects, Arcadis' engineering team initiated a program to fast-track analytical modeling of flood protection structures. After working on three large projects requiring 1,000 hours to conventionally model more than 20 flood gates, 25 flood walls, and various monoliths, they realized that they needed a more efficient and automated solution that delivered fast and accurate results.

Leveraging STAAD, the team automated and standardized design of critical flood management structures. The Bentley-based solution enabled the creation of analytical models at the click of a button, compared to 16 to 32 hours using traditional methods, reducing modeling time by 95%. The consistency and accuracy of the models saved an additional one to two hours in time on quality assurance and quality control. The successful implementation of advanced structural analysis and automation workflows has led to evaluating and adapting these processes for future initiatives.



Delhi Metro Rail Corporation Limited

Enhancing Urban Connectivity–
The Punjabi Bagh Interchange
Location: New Delhi, Delhi, India

Project Playbook: OpenBridge, RAM, STAAD

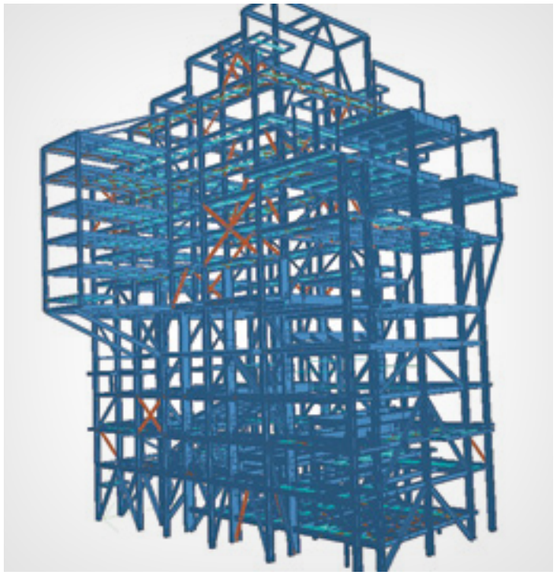
To improve connectivity along Delhi's metro line, Delhi Metro Rail (DMR) initiated a project to construct the Punjabi Bagh West interchange station, supporting sustainable transport and shorter travel times for public transport users. DMR faced technical and engineering challenges determining the optimal height of the interchange's platform crossing two operational lines, compounded by site constraints and continuous heavy traffic. To optimize structural integrity, design, and construction, DMR realized that they needed integrated technology for careful planning, simulation, and analysis.

DMR selected OpenBridge, STAAD, and RAM to develop 3D models and a digital twin, evaluating numerous design options to determine an optimal solution. Working in a flexible and collaborative digital environment streamlined workflows, enabling the team to perform real-time model modifications and clash detection, improving efficiencies by 20% to save up to INR 8 million in costs. The Bentley-based solution optimized design and construction, saving 12% to 16% in concrete materials and 350 megatons of steel to reduce the overall carbon footprint of the project.

Qingdao Yijia Architectural Design Co., Ltd.

A Paper Mill in Japan
Location: Tokyo, Japan

Project Playbook: STAAD



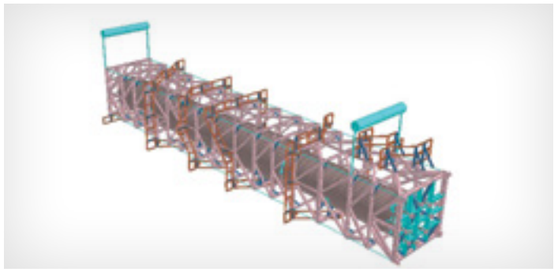
Located in Japan, this project involves structural design of boiler stands for a paper mill. The weight of the machine is heavy, and the structure is complicated. The company delivering this project previously designed boiler stands for nine other projects using software that made it difficult to perform accurate stress analysis. They realized that they needed a robust structural modeling and analysis solution.

Leveraging STAAD, the company performed accurate stress analysis to meet all project requirements for successful delivery. Bentley's application reduced review and revision times, shortening the project period by 10% to deliver the project 60 days ahead of schedule. By incorporating digital, streamlined analysis processes, they reduced design time by 100 hours and saved CNY 200,000 in costs, while improving the quality of deliverables.

Linde Engineering APAC Co., Ltd.

A Refining and Chemical Integration Project
Location: Ningbo, Zhejiang, China

Project Playbook: STAAD



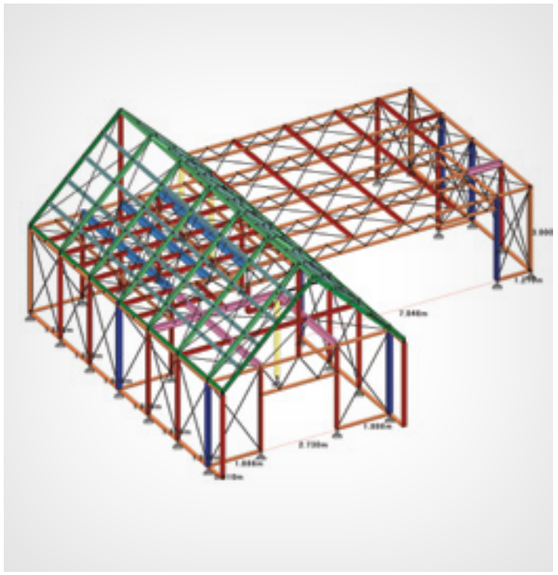
This refining and chemical integration project has an oil refining capacity of 16 million tons per year and produces paraxylene and ethylene cracking, as well as hydrogen and methane. The plant includes a refrigeration box and internal equipment that together weigh a total of about 640 tons. To consider the structural integrity during operating, lifting, and transportation conditions, the project team needed comprehensive structural design and analysis technology.

The team selected STAAD, enabling rapid modeling, data consistency, and accurate simulation of actual load bearing capacity under all three conditions. Bentley's application reduced design time by 100 hours, saving CNY 1 million. Working in an open structural design platform introduced new digital workflows that helped the team complete the project 70 days ahead of schedule.

Neutral Design Co., Ltd.

Application for Building Approval Using STAAD.Pro
Location: Kitaueno, Taito, Japan

Project Playbook: STAAD



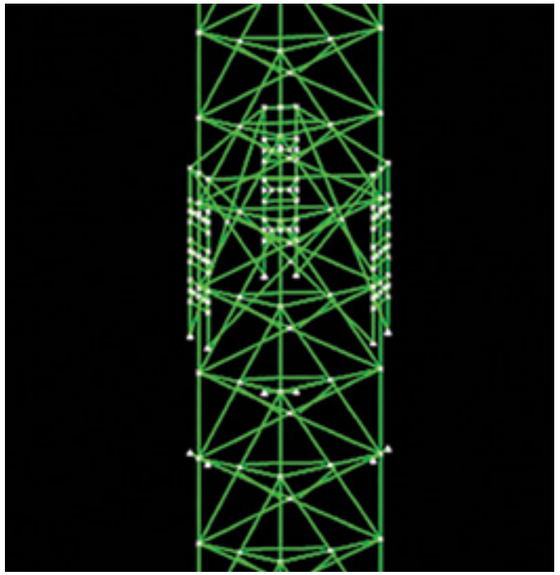
This project involved providing a rational economic design while ensuring structural integrity for approval of a building. The special shape of the lightweight steel structure presented challenges verifying the stress state and determining a cost-efficient design. Existing software applications lacked automation, comprehensive analysis, and structural calculation features.

Leveraging STAAD, the team modeled all components with accurate dimensions and conducted coupled analysis of the building, foundation slabs, and ground conditions. Based on their digital assessment, they implemented a rational foundation and ground improvement design with high economic efficiency. Using the 3D model, they were able to create a user-friendly, visual structural calculation document for non-structural experts to better understand structural design parameters and express their opinions.

Longitude Consulting Engineers Limited

Automation of Assessment of Jack-up Rigs Using SACS
Location: London, England, United Kingdom

Project Playbook: SACS



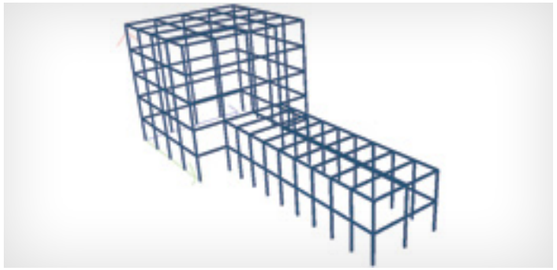
To speed up execution of site-specific assessments (SSA) of jack-up vessels, Longitude Consulting sought to automate SSA in accordance with energy standard guidelines. The project required configuring software for dynamic model-creation of jack-up vessels according to user-defined, site-specific inputs, and updating the calculations and results post-processing. To meet these requirements, Longitude needed interoperable, dynamic, and robust offshore modeling technology.

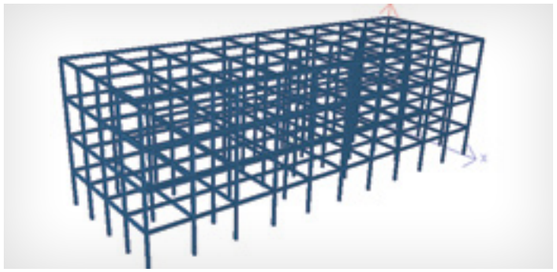
Longitude selected SACS given its robust calculation library and dynamic response assessment capabilities, enabling them to perform SSA in a manner that complied with industry-standard guidelines. The software automated the creation of detailed leg models and gap elements, replacing manual model updates to accelerate approval processes. Using Bentley's application reduced analysis and modeling time by an estimated 80%, boosting productivity and revenue, and supporting next-generation jack-up vessels for the offshore wind industry to help the United Kingdom meet its carbon neutrality goals.

Hokaido University

Comparison of H Steel Web Section Area
Location: Sapporo, Hokaido, Japan

Project Playbook: STAAD





This project aims to compare multiple analysis results of a steel web area, with and without intersections of the flange and web. The large model scale presented challenges performing the comparison analysis and comparing the different steel web versions when using previous software and hardware with limited resources. The team needed a structural design application capable of performing cloud-based analysis.

The team selected STAAD to perform the model comparison and evaluation, determining that there were significant differences between the two cases when subjected to lateral loads such as wind, or seismic loads. Using Bentley's application saved 24 hours in design and analysis time.

L&T Construction

Construction of Sewage Treatment Plant 30MGD Capacity at Chandigarh
Location: Chandigarh, Punjab, India

Project Playbook: STAAD

As part of India's Smart City Mission urban renewal program, Chandgarh Sewage Treatment Plant is being constructed, benefitting 1 million individuals and while reducing annual carbon emissions by 10,328 tons through biogas power generation. L&T Construction is delivering the project from concept to commissioning, which includes designing and building the 30 million-gallon-per-day treatment plant, covering 83,000 square meters. The short design period, multiple disciplines, and large complex equipment and buildings presented challenges ensuring structural integrity of the facility that conventional analysis failed to accurately address.

L&T leveraged STAAD for 3D modeling and loading simulation to accurately assess various loading combinations, optimizing structural design. Working in an open digital platform automated previously manual processes and streamlined workflows to reduce modeling time by 75%. Using Bentley's application reduced concrete quantities by 5%, improving sustainability of the project. The 3D models are being used during operations to monitor performance for planned and predictive maintenance.

Northeast Electric Power Design Institute Co., Ltd. of the China Power Engineering Consulting Group

Dubai Hassyan 4 × 600,000 kW Clean Coal-fired Power Plant Project
Location: Dubai, United Arab Emirates

Project Playbook: STAAD

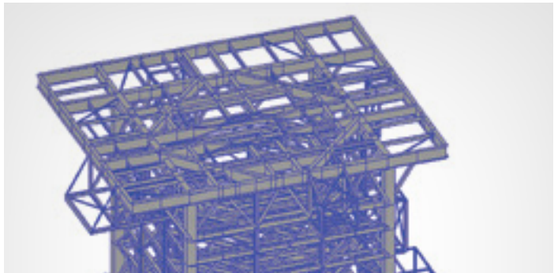
This clean coal-fired power plant in Dubai has a total installed capacity of 2.4 million kilowatts and is the first in the world to realize full-load, dual-fuel power supply. Upon commissioning, it will provide 20% of Dubai's electricity and contribute to diversifying the local energy mix. Northeast Electric Power Design Institute is delivering the project and faced challenges meeting international design and construction standards, as well as addressing the complex processes and approvals particular to the Middle East market. They realized that they needed advanced structural modeling and analysis technology capable of complying with international design standards.

Leveraging STAAD, the team changed their traditional design modes, performing specialized design to ensure the structural integrity of the facility in accordance with international standards. Using STAAD saved the design team 200 hours and CNY 1 million in costs delivering a coal storage yard spanning 12 standard football fields, comprised of 8,100 tons of steel. Bentley's application helped establish new digital workflows that enabled project delivery 100 days ahead of schedule.

Tata Consulting Engineers Limited

Engineering Design for Blast Furnace
Location: Hazira, Gujarat, India

Project Playbook: STAAD



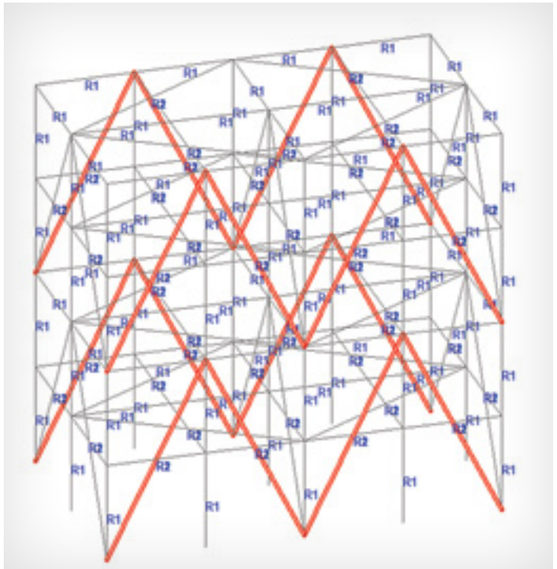
This project involves designing a four-poster structure that surrounds a blast furnace with a capacity of 3.5 megatons per year, and houses all the associated equipment necessary for smooth and safe operations. Tata Consulting Engineers (TCE) is designing the structure, comprised of a tower and platforms at various levels in a high elevation area. With massive box columns and beams, and complex interfacing between utilities and piping, the project required multiple changes throughout the various stages of design and presented challenges designing a structurally sound facility.

Leveraging STAAD, TCE modelled and analyzed the complex structure under various wind, seismic, and operational loads to determine an optimal design. Bentley's application enabled them to accurately model and calculate the structural behavior against specific loading variables. The software saved nearly 12% of working hours to adopt the required design changes and ensure structural integrity. Analyzing 64 basic load cases under thousands of load combinations in minimal time, TCE delivered a quality structure, timely and cost-efficiently.

C-design Partners Co., Ltd.

Former City Hall Branch Revitalization Project
Location: Kanagawa, Japan

Project Playbook: STAAD



For more than 60 years, a branch office in the Kanagawa prefecture was used as a lifelong learning center and library. However, given its age and deteriorating state in recent years, the facility has closed. This renovation project will make the building available as a gallery and co-working space for the local community. To repurpose the structure, the project team needed to conduct structural analysis, design the renovation in compliance with the latest design codes, and compare it with the original analysis of the facility.

The team selected STAAD to model and simulate the new structure in accordance with current structural design codes. Using Bentley's application enabled the team to perform the analysis and compare the results all on one PC, saving approximately 30% in design time and 10% in costs.

SEPCOIII Engineering Consulting Institute

Internal Combustion Engine Power Generation Project
Location: Mandalay, Myanmar

Project Playbook: STAAD

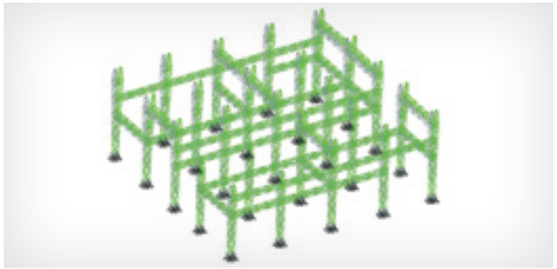
Located in Kyaukse, approximately 30 kilometers from Mandalay in Myanmar, this 145-megawatt, internal combustible engine power generation station will support much needed power development to help alleviate the country's 50% power shortage. With just a two-month project period, the team faced daunting challenges designing and constructing the main plant facilitates, auxiliary buildings, and equipment. To quickly assess and optimize structural integrity prior to construction, the team needed robust modeling and analysis technology.

The team selected STAAD to digitally design and analyze the plant structures, reducing design time by 500 hours, resulting in immeasurable cost savings. Using the application enabled the team to accurately and timely analyze and ensure structural integrity for construction of the engine room, chimney tower, and other assets. Working in Bentley's structural modeling application facilitated development of new digital workflows that helped deliver the project 10 days ahead of schedule.

CHINT Group Co., Ltd.

Joint Frame Design Project for a Power Station in Philippines
Location: Caron, Palawan, Philippines

Project Playbook: STAAD



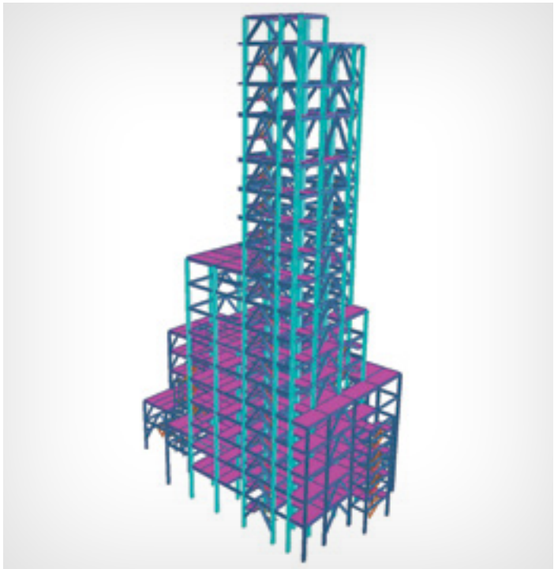
This substation expansion project featured substation frames, concrete houses, firewalls. and foundation design. With strict cost controls, a tight schedule, and full American Standard design requirements, the project presented challenges requiring digital workflows and comprehensive structural design software.

Leveraging STAAD, the team implemented digital design processes that reduced design time by 100 hours. Bentley's application saved significant design costs and enabled the team to deliver the project 30 days ahead of schedule.

CNCEC SEDIN Engineering Co., Ltd.

KAN Ammonium Nitrate Project in Indonesia
Location: Bontang, Kalimantan Timur, Indonesia

Project Playbook: STAAD



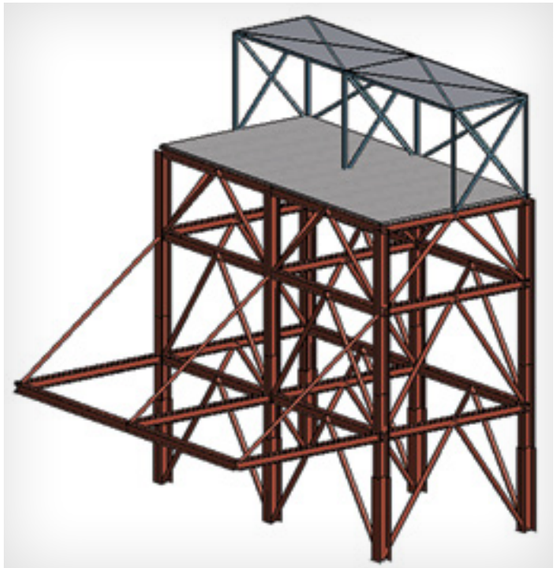
Known as KAN, this project is the first nitric acid and ammonium nitrate plant constructed by CNCEC SEDIN Engineering (SEDIN) in Indonesia. Upon completion, the facility is expected to produce 60,000 tons of nitric acid and 75,000 tons of ammonium nitrate per year. A complex monolithic unit required to be designed in accordance with both United States and local Indonesian design codes, the project presented technical challenges, compounded by global supply chain issues. To ensure structural integrity of the facility and timely deliver the project, SEDIN needed comprehensive structural modeling and analysis software.

SEDIN selected STAAD to model and analyze the different building structures, including plant towers, ponds, and equipment foundations, establishing digital workflows that optimized design and delivery of structurally sound plant components. Using the Bentley application reduced design time by 150 hours, saving CNY 1 million in costs. By digitalizing structural design processes, SEDIN delivered the project three months ahead of schedule.

C-design Partners Co., Ltd.

Neko Coffee Sky Terrace Café – Creating a Multipurpose Space that Connects the Local Community
Location: Odawara, Kanagawa, Japan

Project Playbook: STAAD



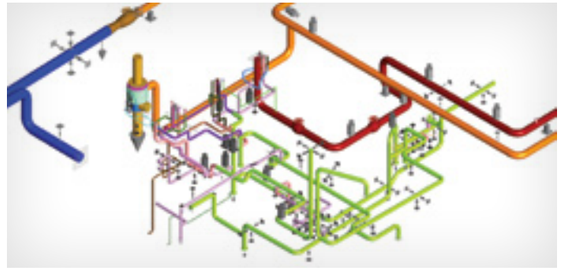
The Neko Coffee Sky Terrace Café features an indoor café space and outdoor rooftop multipurpose area for local community gatherings. To make the rooftop space more convenient, the project team is redesigning it. To ensure the structural integrity of the design and quickly produce drawings, they needed comprehensive structural modeling and analysis software.

Leveraging STAAD, they modeled and simulated the new design. Based on the 3D model, the team generated the drawings, saving 10 hours in drawing creation time. The automated features in Bentley's application enabled them to extract accurate bills of material directly from the model. Working in the digital environment reduced project costs by 5%.

Nippoh Engineering

Nippoh Creates an Era of New Carbon-neutral Steam Turbine Piping Design
Location: Japan

Project Playbook: AutoPIPE, STAAD



To help achieve their sustainability goal of affordable and clean energy, Nippoh is delivering a new thermal power plant designed to reduce greenhouse gas emissions to zero and contribute to the revitalization of the region. Responsible for the piping design work, Nippoh is developing a basic design concept that ensures allowable stress ratios and loads, while minimizing the use of spring hangers and designing the piping without support gaps. These technical design difficulties, compounded by data integration and change management challenges, necessitated flexible and robust pipe stress analysis and design technology.

Nippoh imported CAD data into AutoPIPE to create a piping model without spring hangers and perform stress analysis to ensure the loads were effectively absorbed. The features in Bentley's application enabled them to quickly evaluate various design alternatives and easily transfer analysis results, reducing resource hours by approximately 50%. Working in a digital design environment, they developed a design using fewer spring hangers to reduce material costs by 10%, compared to conventional design, and improved productivity by 20%.

C-design Partners Co., Ltd.

Old Post Office Renovation Project
Location: Odawara, Kanagawa, Japan

Project Playbook: STAAD

This project involved renovating a closed post office in Kanagawa Prefecture to serve as a dance studio. The renovations included designing the studio with mirrors on one wall. The team needed to perform structural modeling and analysis and link the structural model with BIM software.
To achieve these project goals, they required a flexible and interoperable structural design application.

They selected STAAD to model and simulate the structural designs, accelerating modeling time. Using Bentley's application, they were able to convert the model to be used with BIM software, shortening the time required for the architectural design. By linking STAAD with BIM technology, the team was able to quickly respond to design changes. Working in a digital environment reduced modeling time by 50% and costs by 10%.

Design and Research & Development Center of CNOOC EnerTech Equipment Technology Co., Ltd.

Project of Adding Slots to WHPA Platform of Bozhong 19-4 Oilfield
Location: Tianjin, China

Project Playbook: SACS

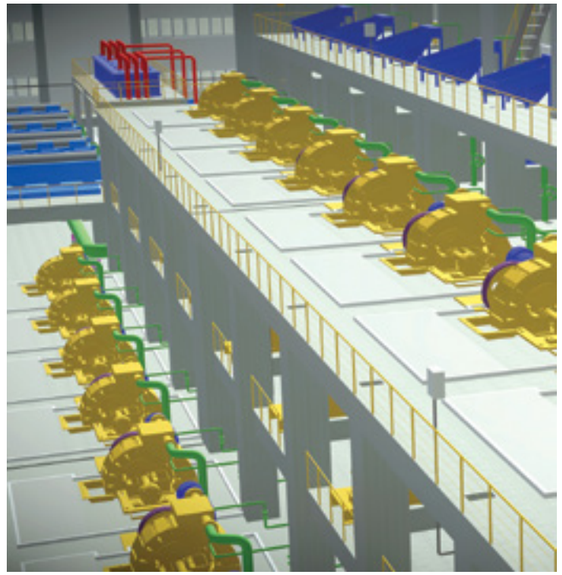
To support China's oilfield construction, development, restructuring, and redevelopment, this project explored the feasibility of adding 16 slots to an existing wellhead protection area (WHPA) offshore platform rather than building a new conduit rack platform that would require a three-year construction period and CNY 500-800 million investment. Faced with an aging bearing capacity of the original platform located in a highly seismic zone, the team needed advanced structural design and analysis software to verify structural integrity of the project.

Adopting SACS to perform analysis of the existing platform with the additional production enhancing components, the team ensured the structural strength met all required specifications for safe operations. SACS enabled the team to verify the feasibility of renovating the original platform, saving two years in construction time and CNY 300 million in investment costs. The solution saved significant structural steel and raw materials, lowering the carbon footprint of oilfield development and providing a benchmark for production capacity enhancement of other offshore oil platforms in the future.

Ansteel Mining Engineering Corporation

Refractory Ore Beneficiation Technology Upgrading Project
of Donganshan Sintering Plant
Location: Anshan, Liaoning, China

Project Playbook: Bentley LumenRT, OpenBuildings, OpenPlant, ProjectWise, ProStructures



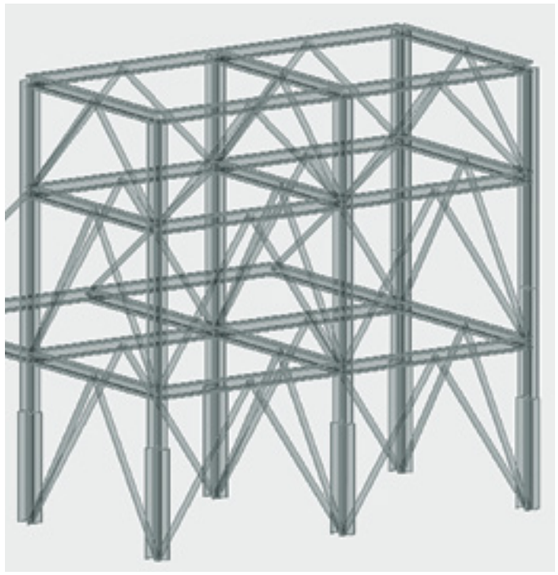
To increase production capacity, improve the grade of iron ore concentrate, and lower tailings at the Donganshan Sintering plant, Ansteel Mining Engineering is upgrading the facility's beneficiation process technology. The modernized plant will have an annual processing capacity of 6 million tons and production capacity of 1.9314 tons. With multiple disciplines working simultaneously, Ansteel needed an integrated technology solution to improve accuracy, quality, and time and cost efficiencies throughout design, construction, and delivery.

Leveraging ProjectWise and Bentley's Open applications, the team established a collaborative digital design and construction environment, streamlining workflows and providing visual insight into the design intent and on-site works. Using Bentley's applications eliminated more than 3,000 collisions during the design stage, shortening the construction period by 20 days and saving CNY 500,000 in costs. The 3D model will be handed over to the owner to digitally manage on-site operations in real time.

C-design Partners Co., Ltd.

Renovation Work Using STAAD for a Building Complex in Odawara City
Location: Odawara, Kanagawa, Japan

Project Playbook: STAAD



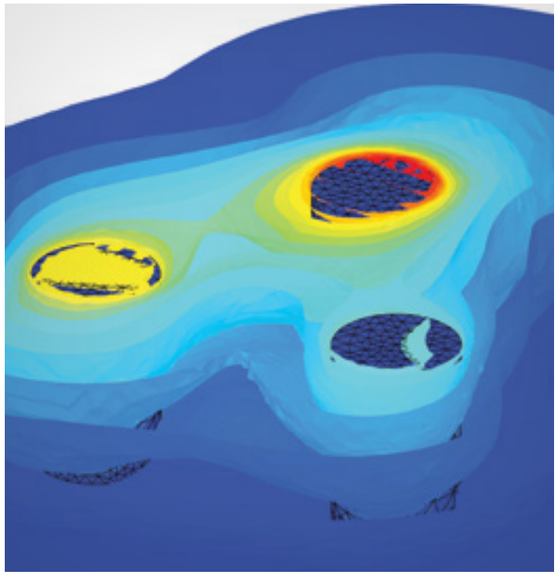
This project involves renovating a three-story, 40-year-old building complex, where the first floor is a nursery school, the second is a rental space, and the third is a café. The building is comprised of old steel materials with non-standard fittings. To ensure a structurally sound building redesign capable of withstanding earthquakes and natural disasters, the project team needed comprehensive structural modeling and analysis technology.

The team selected STAAD to perform structural design and simulation. Using Bentley's application, they were able to easily model and analyze the non-standard parts and customized fittings. Working in the digital platform saved 24 hours, equal to 50% of the total modeling time, and improved accuracy of the analysis. The time savings and improved analysis reduced costs by 5%.

Longyuan (Beijing) New Energy Engineering Design and Research Institute Co., Ltd.

Research on Key Technologies of Jacket Foundation
for Offshore Wind Power Suction Tube
Location: Beijing, China

Project Playbook: PLAXIS, SACS



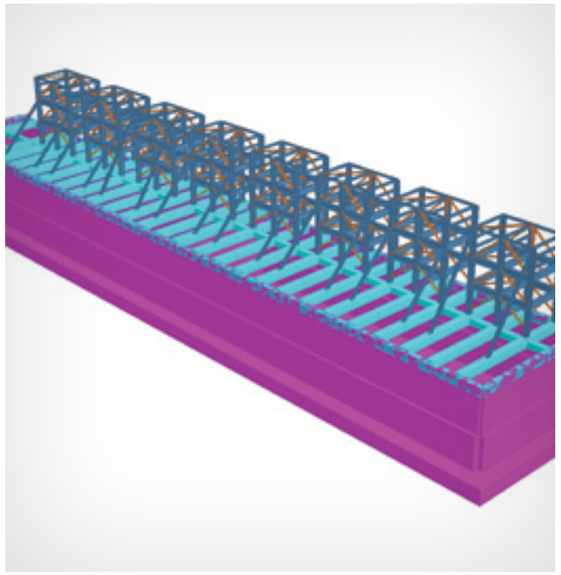
This research project was initiated to determine the structural feasibility of using multibucket jacket foundations for offshore wind turbines to support affordable, safe, and sustainable power. Located in deep waters amid a harsh marine environment and complicated geological conditions, the project presented challenges finding optimal structural foundation solutions with no domestic specifications for this type of jacket. Previous manual methods and disparate software applications proved time-consuming, costly, and inaccurate, requiring the team to find an integrated geotechnical and structural technology solution.

The research team selected PLAXIS and SACS to model the jacket foundations and perform the necessary pile-soil and superstructure load analyses. Using Bentley's applications enabled them to accurately simulate and verify the strength and deformation of the jacket model under various environmental conditions. Working in an integrated digital environment reduced modeling time by 30% and increased design accuracy by 10%, optimizing structural steel consumption, estimated to help save 15% to 30% in construction costs when delivering an environmentally friendly foundation that can be extensively applied to offshore wind farm construction.

CEC

Retention Pit with Piperack for Combined Cycle Cogeneration Power Plant
Location: Bangkok, Thailand

Project Playbook: RAM, STAAD



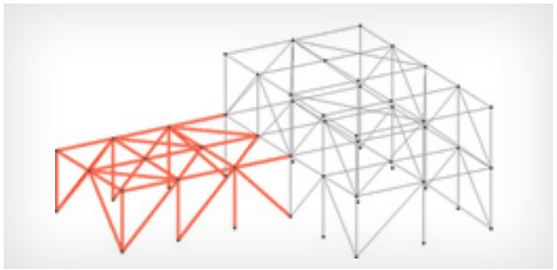
This project involved designing facilities for a combined cycle cogeneration power plant. The scope of work included detailed design, layout, and provision of a calculation report for the superstructure and retention pit. Faced with a confined space and managing large amounts of piping, electrical, and storm water data, the team needed structural design and analysis software to model and assess the reinforced concrete foundation structure and steel superstructure.

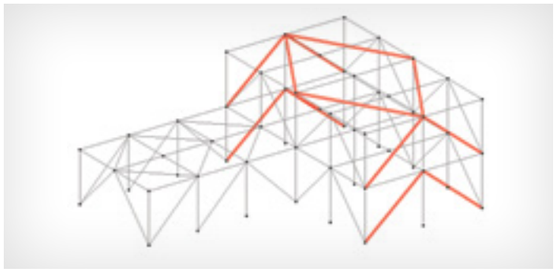
Leveraging STAAD, the team was able to build a combined hybrid model of the superstructure and retention pit and perform their structural analysis. Working in an open, user-friendly platform streamlined workflows, reducing modeling time and saving 20% in calculation time. Using Bentley's application facilitated accurate digital modeling and analysis, enabling the team to reduce the amount of concrete, minimizing the carbon footprint while still ensuring structural integrity.

C-design Partners Co., Ltd.

Seaside B&B Retrofitting Project
Location: Kanagawa, Japan

Project Playbook: STAAD





A popular accommodation visited by many overseas tourists, this small B&B on the Kozu coast is being retrofitted to house more guests. The project required analyzing the building's structural integrity and designing an increased support system for earthquake resistance. Faced with comparing numerous options under various loads in accordance with multiple design codes, the team needed robust structural modeling and analysis technology.

They selected STAAD to model and simulate the structure, using multiple design codes within the same model. Using Bentley's application saved 12 hours in design time and reduced costs by approximately 15%.

Oil and Natural Gas Corporation Ltd (ONGC)

Structural Adequacy (SIA) of Fixed Offshore Platforms for Proposed Additional Facilities
Location: India

Project Playbook: SACS

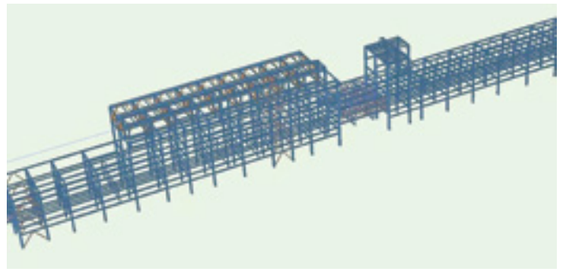
To ensure structural and operational integrity of fixed offshore platforms off the western coast of India to support additional facilities, ONGC initiated an assessment of 18 unmanned wellhead jacket steel platforms that were having clamp-on wells installed to enhance production. Faced with new design codes and additional loadings, NGC needed comprehensive offshore structural analysis technology to ascertain structural adequacy to support the clamp-on wells and ensure personnel, marine, and environmental safety.

Leveraging SACS, ONGC modeled the structures and performed multiple analyses, revealing that many of the structures could not safely accommodate the additional components within the new design requirements. Using Bentley's application, they quickly and accurately performed detailed assessments and explored numerous design mitigation options in a short period of time, saving 30% to 40% in analysis time. The digital approach optimized the existing platforms' structural integrity, reducing risks to the environment and avoiding disaster occurrences. Compared to installing new platforms, modifying the existing platforms to meet the new design standards saved significant time and costs, while ensuring sustained production.

CNPC East China Design Institute Co., Ltd.

Structural Design for a Main Pipe Bridge of a Refinery in South China
Location: Jieyang, Guangdong, China

Project Playbook: STAAD



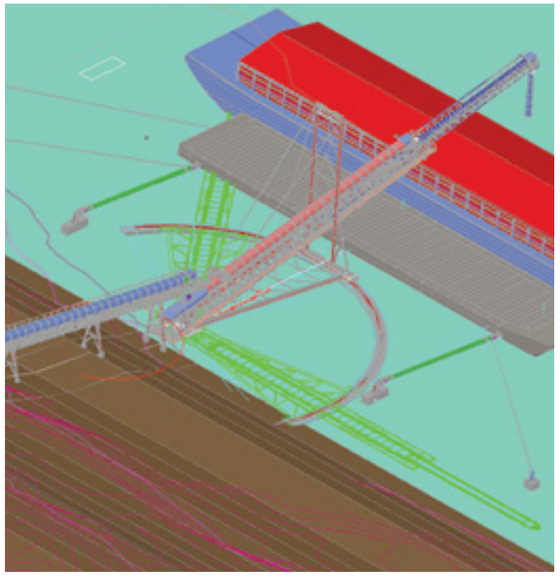
This project involved the structural analysis of the main pipe bridge of a refinery in South China. The structure is 220 meters long and six stories tall, with its highest point reaching 21.5 meters. It is equipped with two spanning trusses and localized air coolers. Bearing heavy loads, the structure required assessment to determine its structural integrity. The team realized they needed comprehensive structural analysis and design technology to successfully deliver the project.

Leveraging STAAD, the team modeled the structure and established digital workflows, performing structural analysis and obtaining satisfactory results. Using Bentley's application reduced design time by 100 hours and saved CNY 500,000 in costs.

Chiappini, Cassano, Blacud Rotger, Segala, associate engineers

Structural Design of a Floating Facility for Loading Grain Barges in Fluvial Environments
Location: La Paz, Entre Ríos, Argentina

Project Playbook: iTwin, RAM



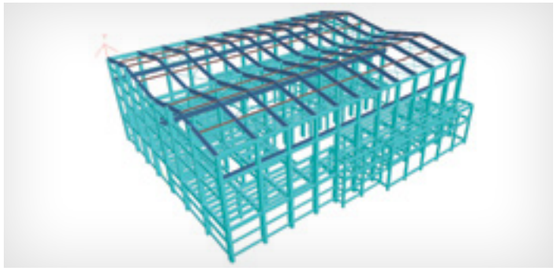
To overcome the drawbacks of fixed installations for berthing and mooring of ships in high water-variable locations, this project will link a bulk barge to the ground, reconditioning it as a floating deck to maintain its location when the river runs six meters higher or lower. The structural engineering team is delivering the project from concept to presentation to national waterway authorities with requirements to use prefabricated metal structures, avoiding construction works on the river. To meet these deliverables, they needed comprehensive structural design software.

The team selected RAM to model and predict the behavior of structural systems with fixed supports on land that are articulated to floating elements and modeled with elastic supports to simulate floatation. Using iTwin Analytical Synchronizer, the team could export the model to different rendering programs for visualization and presentation. Using Bentley's application allowed them to quickly evaluate the performance of various configurations under numerous conditions and varying loads. The software streamlined and reduced modeling, analysis, and design time, to achieve cost savings costs and deliver the project ahead of schedule.

CEC

Structural Engineering of a Project in Indonesia
Location: Djakarta, Karawang, Indonesia

Project Playbook: STAAD



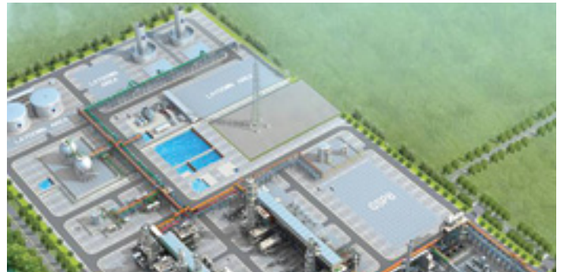
CEC was retained to determine the overall civil engineering design plan for this project, including organizing designers to carry out design works. Located in Djakarta, Indonesia, the project featured a lower frame and cantilever system, concrete columns and steel roof, and various workshop equipment. The multiple structural and heavy equipment, some of which was sensitive to vibration, presented challenges modeling and analyzing structural integrity, and designing the project in accordance with American standards. Previously used software proved insufficient to meet the project demands.

CEC selected STAAD with its international recognition for structural design standards, enabling the team to simultaneously analyze the reinforced concrete and steel components in accordance with the required codes. The post-processing features in Bentley's application streamlined detailed design and production of detailed calculation sheets. After stress analysis, the design efficiency for the structural components was enhanced by 50%. Working in an open digital platform, contractors could access models and drawings, accelerating project progress and saving 20% in design and management costs.

Southwest Branch of CPECC

Thailand No.7 Natural Gas Processing Plant Project
Location: Rayong, Thailand

Project Playbook: STAAD



Located in Rayong, Thailand, this high-carbon content, natural gas processing plant is being designed and delivered in full accordance with United States standards. The plant is quite large, featuring a 7,000-ton steel structure, 55,000 cubic meters of concrete, 10,800 piles, and 27 highly integrated devices with complex processes, presenting structural design challenges. The project team realized that they needed comprehensive structural modeling and analysis technology with advanced concrete design capabilities.

The team selected STAAD to perform structural calculations for all the buildings and structures. Bentley's application generated accurate calculation results, featured editable command flows, enabled direct analysis methods for steel, and facilitated advanced design features for concrete. Working in a digital environment streamlined workflows, shortening the design period by 500 hours and enabling the team to deliver the project five months ahead of schedule while reducing costs.

Harbin Boiler Company Limited

The Steel Structure Design of Ultra-supercritical Boiler for Installing 2X1000MW Large Generator Sets and Closing Small Generator Sets at Jiangsu Huadian's Jurong Base
Location: Jurong, Jiangsu, China

Project Playbook: STAAD

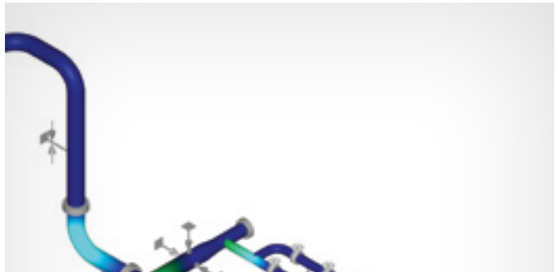
Jurong Phase II is part of the strategic development of Jiangsu Province and power generation enterprise Huadian Group. A steel frame of the ultra-supercritical boiler was required for installing 2×1,000 megawatt large generator sets and closing small generator sets at Jurong base. Harbin Boiler is delivering the steel structure and strived to improve quality control, accelerate project and engineering progress and processes, and deliver a benchmark project with excellent environmental protection indicators. To achieve these goals, Harbin realized they needed flexible and highly accurate structural analysis software.

Harbin selected STAAD to model, simulate, analyze, and design and verify the structural integrity of the steel frame. Bentley's application streamlined modeling, analysis, and design, reducing design time by 400 hours to save CNY 1 million in costs. By digitalizing structural design and analysis workflows, Harbin accelerated project delivery by 60 days and reduced steel consumption by 20%.

Kyowa Design Co., Ltd.

Thermal Stress Analysis of Plant Piping Using Bentley Solutions
Location: Yokohama, Kanagawa, Japan

Project Playbook: AutoPIPE, STAAD



This project involved analyzing the thermal stress of plant piping to confirm the structural integrity of the pipe supports. Previous digital assessments supported only linear analysis. To incorporate nonlinear analysis, the project team needed integrated pipe stress analysis and structural design technology.

Leveraging AutoPIPE and STAAD, the team modeled and simulated the gap between the pipe and support, determining that the allowable thermal stress could not be met. Using Bentley's integrated applications to model the support frame, they were able to virtually check the soundness of the piping without adding piping supports or changing the pipe route, as well as reduce the amount of thermal stress.

SUBSURFACES MODELING & ANALYSIS

This category recognizes projects that demonstrate excellence and digital advancements in subsurface modeling and analysis, which helps firms understand the underground to reduce risk, promote environmental sustainability, and optimize their designs.

Winner: Going Digital Award in Subsurface Modeling and Analysis

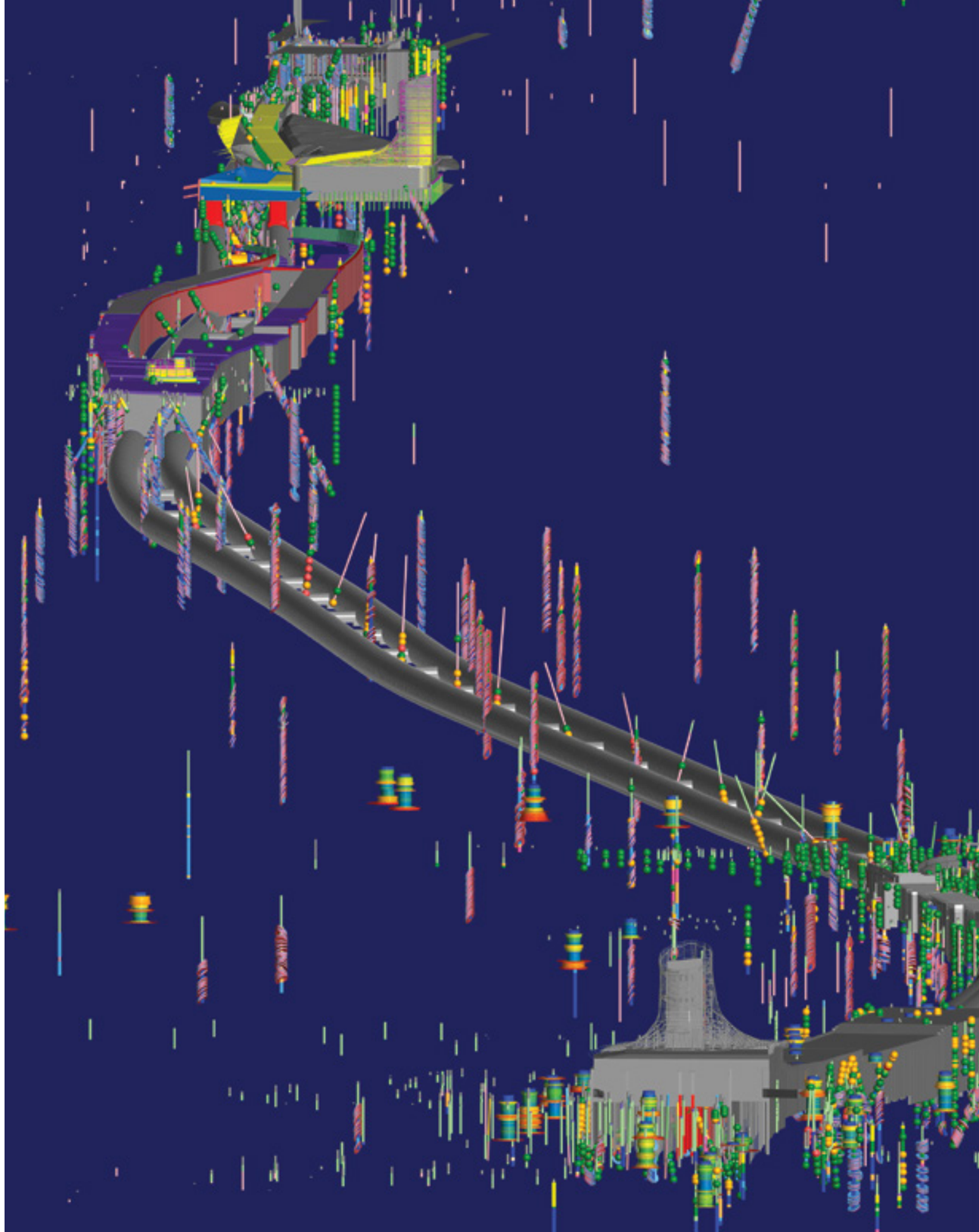
Spark and WSP

North East Link Central Package
Location: Melbourne, Victoria, Australia

Project Playbook: GeoStudio, Leapfrog Works, OpenRoads, PLAXIS, ProjectWise

Victoria's largest infrastructure project, the North East Link will improve connectivity in Melbourne's freeway network, removing 15,000 trucks from congested roads. Successful delivery of the project required Spark's engineering design team to bring in seven design consultancies, including WSP, who is responsible for modeling and communicating the complex geological site conditions and risks. To rapidly model, capture, visualize, and integrate the voluminous ground engineering data for multidisciplinary design evaluation, the team needed flexible, comprehensive geotechnical software and a connected data environment.

Using Leapfrog Works, PLAXIS, and ProjectWise, WSP developed, refined, and delivered 3D subsurface models that were integrated into the federated project model for design analysis and construction planning. By implementing a 3D geological model, the team saved approximately 46,000 work hours compared to traditional modeling and interpretation methods. Through comprehensive geotechnical modeling, the team optimized risk management and design compliance, saving AUD 6 million, and were able to recycle excavation materials, saving an additional AUD 10 million. The 3D geological models will be incorporated into the digital twin to support tunnel operation and emergency management.



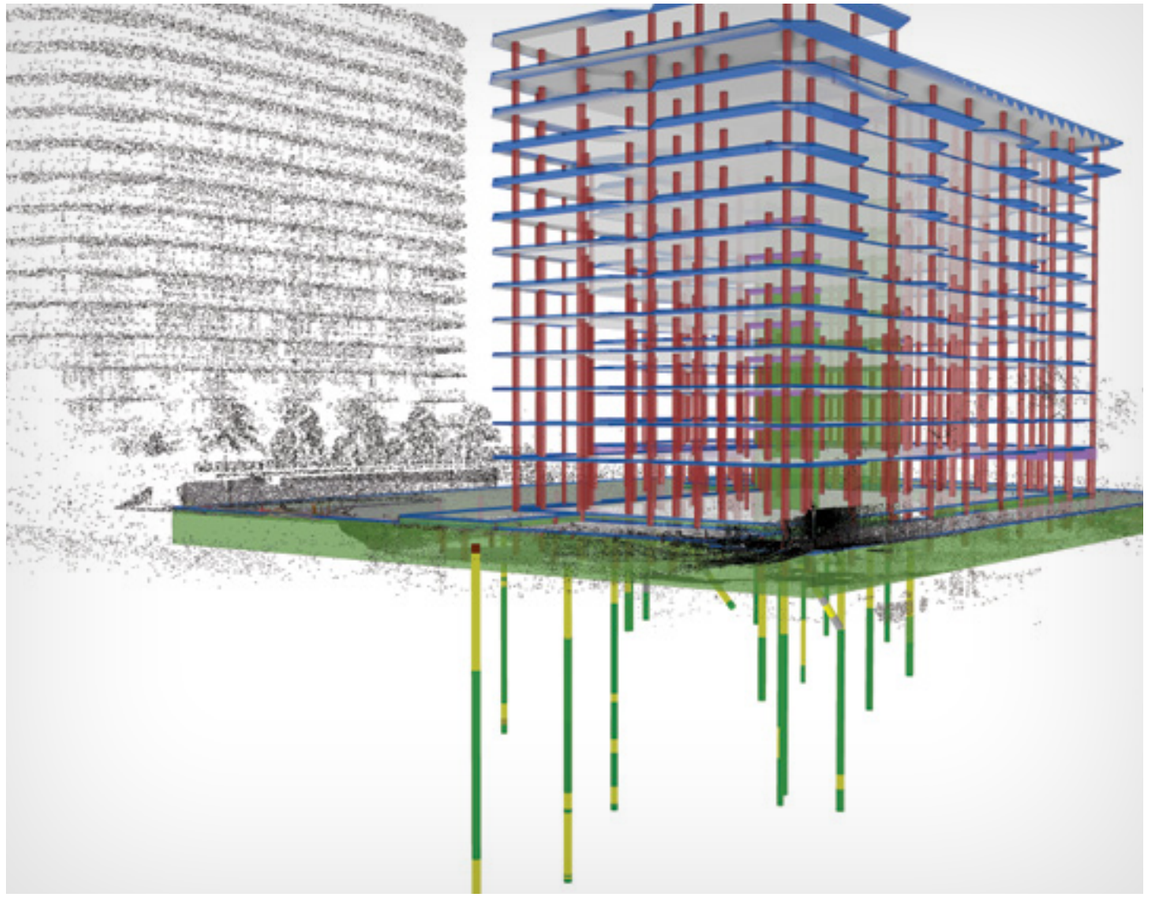
PT Hutama Karya (Persero)

Integrating Subsurface Model for Efficient Geotech Data Management in Trans Sumatra
Location: Pekanbaru, Riau, Indonesia

Project Playbook: iTwin Capture, Leapfrog Works, OpenBridge, OpenRoads, PLAXIS

Spanning 2,844 kilometers, the Trans Sumatra toll road is crucial for regional development, reducing travel times, facilitating trade and tourism, and enhancing connectivity. PT Hutama Karya plays a major role in strategic planning, design, and construction management, specifically regarding geotechnical data management. The complex terrain, diverse soil conditions, and project scale presented challenges with managing and integrating the voluminous geotechnical data. Hutama realized that they needed an advanced technology solution to streamline data workflows, enable 3D modeling, and support collaborative design processes.

Leveraging Bentley's Open applications with Seequent's Leapfrog Works and PLAXIS, Hutama established a collaborative, model-based design environment and single source of truth for comprehensive management of geotechnical data, integrating subsurface models for robust geotechnical assessments to ensure roadway safety. Along the 40-kilometer toll road section from Regat to Pekanbaru, Hutama optimized soil stabilization to avoid potential losses that saved USD 185 million. Working in a connected digital ecosystem increased productivity by 15%, saving 6,000 work hours. The digital geotechnical database provides an invaluable asset for ongoing infrastructure management and future regional development.



Dataforensics

USACE Ground to Cloud—Enterprise Data Management Migration
Location: Washington, District of Columbia, United States

Project Playbook: GeoStudio, Leapfrog Works, OpenGround, PLAXIS

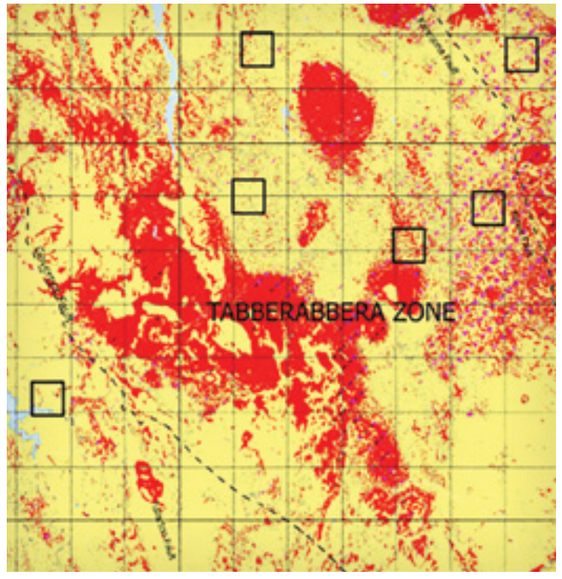
To improve efficiencies managing subsurface data for millions of linear feet of data stored in multiple disparate systems, the United States Army Corps of Engineers (USACE) engaged Dataforensics to help compile and migrate existing historical data into a standardized data management system.
The massive volume of data presented challenges with exporting it and creating a single source of truth. To move the agency to a new, cloud-based enterprise solution, Dataforensics needed to clean, standardize, and transfer data from the original system.

Dataforensics developed a data migration application to automate the process, dramatically decreasing the amount of time needed to migrate existing datasets into OpenGround, while improving data quality and robustness. Compared to manual migration process, the automated solution saved over 60,000 hours. Moving to OpenGround's cloud-based, standardized geotechnical data management system significantly improved efficiencies in time, cost, and collaboration across the supply chain. The enterprise solution reduces the carbon and environmental footprint by not having to re-drill boreholes at the same project location and moves USACE towards a digital-based rather than paper-based agency.

Tectonics, Petrology and Lithospheric Processes Research Group at the University of Melbourne

A Machine Learning Modeling Approach to Automated 3D Geological Mapping
Location: Melbourne, Victoria, Australia

Project Playbook: Leapfrog Geo, Oasis montaj



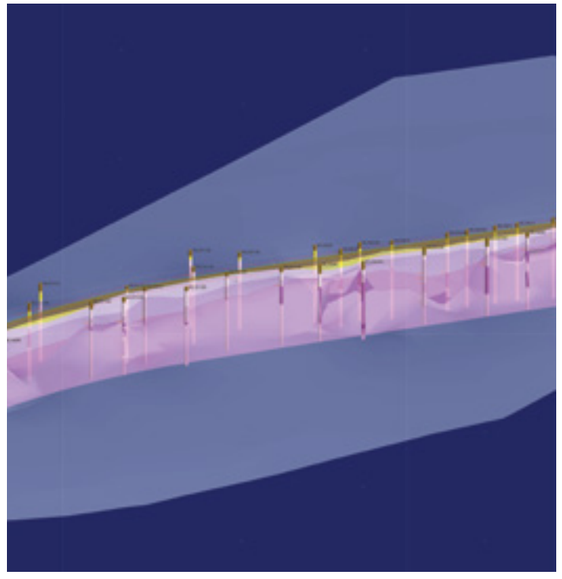
To enable more efficient and targeted mineral resource exploration and minimize negative impact on the environment, this project aims to develop a machine learning approach to automated geological modeling and mapping on a variety of scales. Conventional modeling and analysis methods proved time-consuming, and lacked flexibility, data integration capabilities, and accuracy. To construct detailed 2D and 3D geological models across different scales, the project team needed a comprehensive suite of advanced geospatial and modeling applications.

Leveraging interoperable geotechnical engineering applications facilitated seamless integration of various voluminous data types, enabling the team to construct detailed 3D geological models with Leapfrog Geo that accurately represented the subsurface structures, serving as a foundation for mineral prospectivity mapping. The digital workflows streamlined data processing and analysis, saved time constructing and refining the models, and reduced geophysical data processing time by 95%. By supporting the integration of machine learning algorithms, the technology enabled automation of geological mapping and resource analysis to precisely identify potential mineral deposits, minimizing environmental impact and risk of investment in non-promising areas.

Arup Singapore Pte Ltd

Advanced Engineering Study for Cross Island Line Phase 2
Location: Singapore

Project Playbook: Leapfrog Works, MicroStation, PLAXIS, ProjectWise



The Cross Island Line (CRL) is a mass rapid transit system set to relieve traffic congestion, promote community connectivity, and minimize carbon emissions. Arup is undertaking the advanced engineering study and delivering the reference design for CRL Phase 2 (CRL-2), an eight-car train line, spanning 14 kilometers with six underground stations. The large, complex, and multidiscipline underground project presented varying topography and excavation depths, as well as environmental concerns, Therefore, it requires comprehensive analysis, modeling, and stakeholder coordination. Previous conventional approaches proved repetitive and laborious, requiring Arup to seek an integrated digital solution.

Arup selected Leapfrog Works and PLAXIS to create a digital 3D ground model, perform geotechnical analysis, explore different tunnel alignments, and determine optimal earth retaining structures and construction methodologies. Working in an open, connected data environment streamlined and automated workflows, reducing resource hours by 67% to save an estimated 10% in costs. The successful digitization of CLR-2 serves as a benchmark to promote a higher level of performance and environmentally sustainable practices for future projects.

Shanghai CIMC TGE Gas Engineering Co., Ltd.

Analysis of the Deformation under Stress of Large Group Piles Foundation for Liquefied Gas Storage Tanks
Location: Jiaxing, Zhejiang, China

Project Playbook: PLAXIS

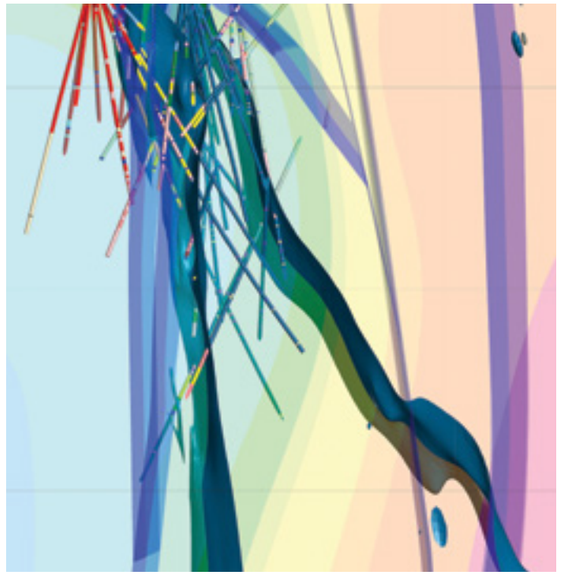
This project involved analyzing the deformation under stress of large group piles for a full-capacity liquefied gas storage tank located in fine sand and clay. The project team addressed two different conditions when performing the foundation settlement analysis. One hydrotested the tank over a four to six-week period with a tank load of 360 kilopascals, and the other was performed during the tank's design service life when the continuous pressure generated by the dead weight of the stored liquid during operation is 280 kilopascals.

The team selected PLAXIS to model the large-scale group piles and analyze the settlement, stress, and distribution of force in the pile bodies, proposing suggestions to optimize the design of the pile foundation. Based on the 3D model, they determined that the deformation and stress of the hydrotest load were more unfavorable than the permanent load. Working in a digital environment, they optimized the pile design to improve the safety of the tank by lengthening the foundation piles underneath the inner silo, while keeping the length of other piles unchanged.

Collective Mining

Apollo, from Grassroots to Discovery
Location: Supía and Marmato, Caldas, Colombia

Project Playbook: Seequent Central, Imago, Leapfrog Geo, MX Deposit



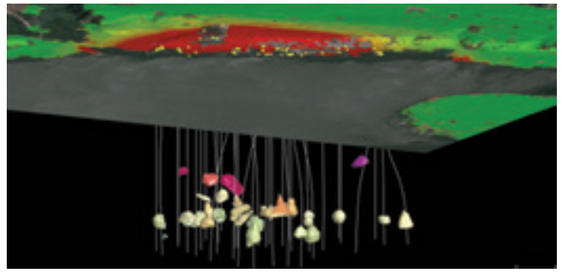
As part of their development efforts for the Guayabales project in Colombia, Collective Mining is exploring and processing surface and drilling samples in the Apollo Zone, where high-grade copper, gold, silver, and tungsten is being discovered on an immense scale. The mineral-rich area will be a key contributor to advancing the energy transition and reindustrialization of the country. As Collective progressed in their exploration, they sought to implement geotechnical technology to accelerate their efforts and more efficiently process the large number of surface samples and cores.

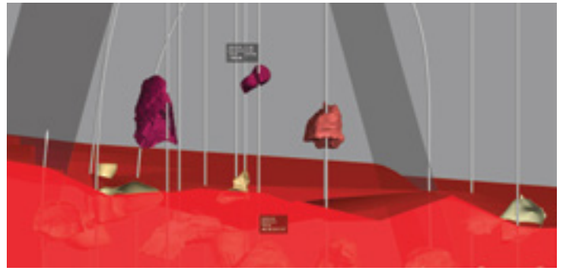
Leveraging MX Deposit, Imago, and Leapfrog Geo, Collective established a digital database of geotechnical samples and generated 3D models to define the exploration targets. Working in a connected digital platform allowed for better visualization of drilling results and real-time decision-making. The integrated geotechnical technology solution reduced the time to display close to 70,000 samples in a visual 3D model, saving close to USD 20,000 per year. Through new innovative digital workflows, Collective made a significant discovery at Apollo in less than three years.

Geological Survey of Brazil - SGB/CPRM

Application of 3D Modeling in Assessing the Stability of Underground Salt Mines in Maceió
Location: Maceió, Alagoas, Brazil

Project Playbook: Leapfrog Geo, Oasis montaj





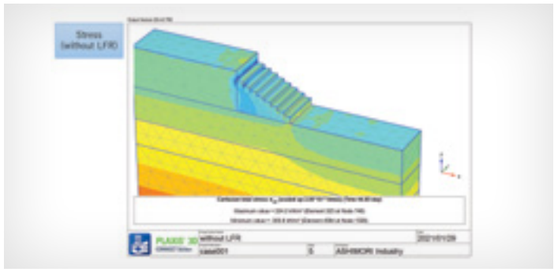
Past underground rock salt mining activities in Maceió, Alagoas, Brazil have resulted in the formation of large empty cavities the subsurface, causing pronounced subsidence and seismic tremors in the area, which pose health and safety risks to residents. Geological Survey of Brazil (SGB) was tasked with investigating the situation and developing a plan to isolate the most affected neighborhoods. They faced challenges with accurately modeling the salt mines and surrounding geology to effectively evaluate the stability and evolution of the cavities' displacement.

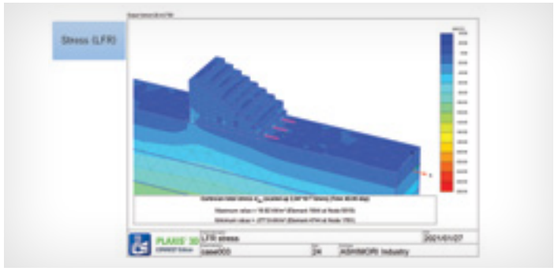
SGB selected Leapfrog Geo to model the geology of the area and generate 127 accurate 3D models of the salt mines from sonar images to assess the morphology of the cavities and identify the causes of the subsidence recorded in Maceió. The team used Oasis montaj to process data collected during geophysical surveys. The solution enabled SGB to measure vertical displacements up to 350 meters, providing crucial insight into the soil instability and subsidence caused by the cavities. The 3D modeling and investigation served as a solid basis for initiating USD 335 million in financial compensation to the city and 15,000 affected population.

Industrial Materials Technology Development Department, Ashimori Industry Co., Ltd.

Bang Saen Lower Beach Area Development Project
Location: Saen Suk, Mueang Conburi, Chonburi, Thailand

Project Playbook: PLAXIS





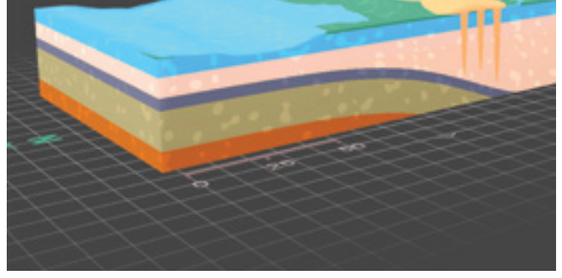
Located in a resort beach town in Thailand, this construction project involved evaluating the effectiveness of a block stacking revetment method as a countermeasure to wave erosion to ensure shore protection and enhance the scenery. The method involves stacking natural stones as steps spanning a total of 760 meters. With no specific country standards for ground-bearing capacity, and facing subsidence and site constraints in the tourist area, the project team needed comprehensive and reliable geotechnical analysis software to assess the stability and deformation of the soil.

The team selected PLAXIS to model and analyze the block stacking method, considering the amount of consolidation settlement and subsidence. Based on their analysis, they confirmed the construction method was effective for the soft ground conditions, avoiding the need for pile construction and the use of heavy machinery in the tourist beach town.

University of Canterbury

Bridging the Gap: Incorporating 3D Modeling into Undergraduate University Courses
Location: Christchurch, Canterbury, New Zealand

Project Playbook: Leapfrog Geo, Visible Geology



To promote geology as a career and upskill geoscience graduates in 3D modeling skills, the University of Canterbury initiated a project to equip students with work-ready skills to solve complex problems, supporting global social and environmental sustainability. The project required integrating modern digital techniques and 3D visualization in the classroom for practical and field-based tertiary teaching. However, the university realized they needed user-friendly, cost-effective software for introductory students to bridge the gap to using more complex programs.

The school selected Seequent's Visible Geology to integrate fundamental geological concepts in their introductory course, preparing students to use Leapfrog in the second-level companion course. Using the free, web-based software, students created simple, changeable examples of common geology scenarios. The solution has enabled the university to move from paper-based teaching methods to 3D digital modeling and visualization, supporting hands-on and field techniques. Incorporating innovative digital practices in their geology program, they have resisted the global downward geoscience enrollment trend with a 10% to 15% enrollment stabilization for 2024.

Hokaido University

Design of New Experiment Building
Location: Sapporo, Hokaido, Japan

Project Playbook: PLAXIS, STAAD

This project involved designing a building that will be used for experiments that require heavy equipment, generating impact loads. Located on unstable ground, the project presented site challenges in ensuring the structural integrity of the building. The project team needed integrated geotechnical and structural analysis technology to accurately model the ground and structure and optimize design.

The team selected STAAD to model the superstructure and imported it into PLAXIS, where they performed subsurface modeling and analysis to calculate the initial subsidence before importing the results back into STAAD for final analysis of structural integrity. This integrated workflow enabled them to save 80 hours of design time and obtain accurate analysis results to optimize design.

Expert Geophysics Limited

Developing Airborne Electromagnetic Technology for Detail Structural Mapping
Location: Aurora, Ontario, Canada

Project Playbook: Oasis montaj

This project aims to advance technology for airborne electromagnetic data survey, processing, and mapping to meet increasing demands for discovering critical mineral sources and support clean energy transition. Faced with technical limitations, depth constraints, inaccuracies, and inefficiencies of current geological survey methods, Expert Geophysics Limited (EGL) sought to develop an optimal airborne electromagnetic system. To increase the depth of investigation by one to two kilometers, broaden exploration range, improve sensitivity to geoelectrical boundaries, and successfully detect and map mineral deposits, EGL needed flexible and robust geotechnical data processing and analysis software.

Leveraging Oasis montaj, EGL processed, modeled, and mapped large, multisourced datasets from an increased depth and broader range, transforming airborne survey data into digital visuals for better decision-making and more targeted drilling. The digital solution optimized data integration and facilitated transparent stakeholder engagement, resulting in cost savings and higher quality deliverables. Compared to traditional ground surveys, 3D virtual mineral exploration makes complex geophysical information accessible and easier to understand, while minimizing environmental impact.

University of Miyazaki

Development of a Numerical Analysis Method to Predict Ground Deformation during the Extraction of Retaining Parts
Location: Miyazaki, Japan

Project Playbook: PLAXIS

This project aims to research the prediction of ground deformation during the extraction of temporary retaining boards. When the retaining board is pulled out, the ground loosens, deforming the surrounding ground and impacting nearby structures. One newer method to suppress ground deformation is filling the retaining board. However, this method has not been quantitatively evaluated and lacks analysis to predict ground deformation when extracting with conventional construction methods or using the new filling/extraction method. The University of Miyazaki is conducting the study and needed comprehensive geotechnical engineering analysis software.

The university team used PLAXIS to perform 3D finite element analysis, developing methods to reproduce the conventional extraction method and the simultaneous filling and extraction, confirming in both cases that the digital analysis value was close to the actual measured subsidence. In the future, the team will need to collect measured values under various conditions, compare them with analysis results using PLAXIS, and refine the reproduction method.

GRI

Digital Twin Observational Method for Shield Tunneling
Location: Japan

Project Playbook: PLAXIS

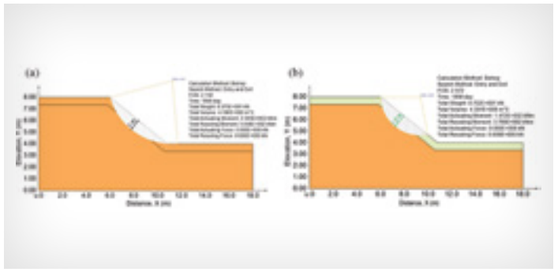
This project aims to establish a digital observation method to evaluate earth-pressure balance for shield tunneling. Typically, the ground characteristics are determined by boring with approximately one ground survey every 200 meters, and performing excavation based on the estimated strength of the ground. Osaka-based ground consultants GRI sought to establish a digital twin to perform inverse analysis to predict behavior during excavation.

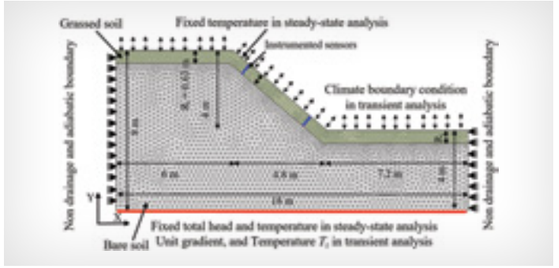
Leveraging PLAXIS, GRI developed a 3D model using assumed soil parameters and calibrated the model based on measured ground deformations, comparing the field data to the model prediction, and adjusting the parameters digitally until safe behavioral characteristics were achieved. Although still in the validation phase, the Bentley-based digital twin observation method is predicted to be the best method for ensuring optimal control of earth pressure and safely proceeding with tunnel excavation and construction works.

Hokkaido University

Effect Evaluation of Grass on Shallow Stability of Unsaturated Volcanic Soil Slope
Location: Sapporo, Hokkaido, Japan

Project Playbook: PLAXIS





This study aims to propose a numerical simulation approach, considering the effects of grass on hydro-thermal-mechanical properties and the shallow stability of grassed unsaturated soil slope. Initial investigations were based on field measurements of grass, with variations in soil water content, matric suction, and soil temperature. A series of tests were then performed to determine the influences of grass roots on shear strength behaviors of saturated soil. To validate this approach, the team needed geotechnical engineering software for finite element analysis.

They selected PLAXIS to perform numerical analysis and compare their field-measured results of the seepage and slope stability analyses with the digital simulation. Seequent's application saved 80 hours of time needed to obtain their findings. The good agreement regarding soil temperature and volumetric water content between simulation and field measurement indicates that the proposed approach is feasible to consider the influences of grass on the hydrothermal behaviors of unsaturated soil slope. The resulting higher values of safety factors of the grassed slope demonstrate that the grass is effective in resisting the shallow landslide-prone area.

Aurenne Group Mining

Enhancing Gold Resource Targeting with Integration of Central, Leapfrog Geo, and Imago
Location: Perth, Western Australia, Australia

Project Playbook: Seequent Central, Imago, Leapfrog Geo

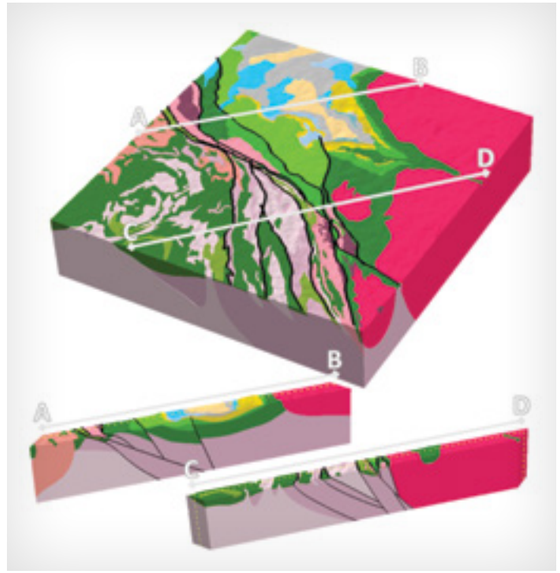
Having recently acquired this gold project, Aurenne aimed to develop the deposit into an operating gold mine with a resource starting point of 360,000 gold ounces, increasing to 500,000 within the first 12 months, and adding at a rate of 72,000 gold ounces annually thereafter.
With data scattered across numerous databases and no systems in place to manage drill hole design, validation, and collaboration, Aurenne realized that they needed flexible, integrated geological technology to optimize resource targeting.

Leveraging the interconnectivity of Imago, Seequent Central, and Leapfrog Geo, Aurenne established a mobile office, gathered field data, photographed the chips, and connected virtually via the cloud-based platform to update the geological model in real time. The integrated digital solution enabled the team to immediately review the drill hole path against the model, saving 706 hours compared to traditional resourcing methods, accelerating decision-making, and reducing plastic consumption. Working in a connected geological data management and analysis environment reduced the potential for redundant drillings by 12.5% and is expected to save AUD 504,000 over the course of one year.

Geological Survey of Brazil

From Geologic Map to 3D Model: A Case Study of Pará de Minas Sheet
Location: Belo Horizonte, Minas Gerais, Brazil

Project Playbook: Seequent Central, Leapfrog Geo, Oasis montaj



To provide more precise and detailed visualization of geological features for monitoring, preservation, and sustainable use of natural resources, this project aims to transform the Geological Survey of Brazil's (GSB) geological map of Pará de Minas into a 3D model. Geological information can be complex for residents and public administrators to grasp, generating uncertainty and affecting communication with stakeholders interested in exploiting the region's natural resources. To generate an accurate and accessible visual 3D model, the project team needed comprehensive, cloud-based geological technology capable of processing and integrating multiple types of data.

Leveraging Leapfrog Geo and Seequent Central, the team generated a 3D model and made it accessible to the general public. Having an accurate model available via an Internet link allows for faster transmission and improved clarity in terms of the geological information created. The integrated digital applications helped create an innovative, more accessible product for GSB, increasing visibility of the model and geological insight that can be used both as an educational resource and interface between the community, public authorities, and mining companies.

Shanghai Ou Yang Offshore Engineering Group Co., Ltd.

Huizhou No. 2 Offshore Wind Farm Development Project of China General Nuclear Power Group
Location: Huizhou, Guangdong, China

Project Playbook: PLAXIS

Located amid 173 kilometers of sea waters, 30 to 40 meters deep, the Huizhou Port offshore wind farm has a total installed capacity of 1,000 megawatts. Shanghai Ou Yang is installing turbines for the wind farm. As part of their efforts to ensure safe equipment operation, they needed to accurately predict the bearing capacity of the offshore platform's pile legs and shoes. Given the active geological movement in the sea area and complicated soil conditions, compounded by the large number of installations, Shanghai realized that traditional theoretical and empirical estimation methods would not suffice.

Shanghai selected PLAXIS to model and calculate the soil layers in the construction area, as well as the structure of the offshore platform's pile and legs. Using Seequent and Bentley's applications automated modeling workflows and improved evaluation efficiency by 20 times, reducing time for finite modeling calculation of foundation bearing capacity for over 50 installation locations from 100 hours to just five hours. The digital analysis is 24% more accurate than traditional methods and improved operational stability.

Hatch

Implementing OGC Technology - Piloting a Digital System in the Harshest of Conditions
Location: Baffin Island, Nunavut, Canada

Project Playbook: GeoStudio, iTwin, iTwin Capture, Leapfrog Works, OpenGround, PLAXIS

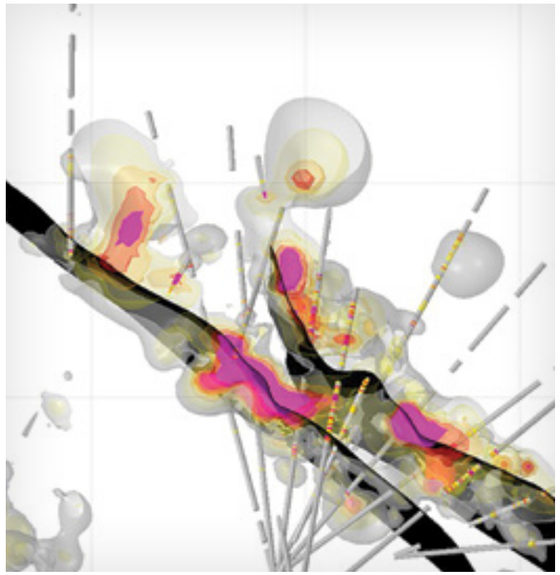
As part of their company-wide digital project delivery initiatives, Hatch enabled their geotechnical team to make a significant technology step change by selecting the Baffinland project as a pilot for utilizing Seequent's OpenGround software. Located within the Arctic Circle, the project presented dangerous conditions and complex ground structures, requiring multiple on-site teams to work a 24-hour schedule to meet the compressed project timeline. Hatch realized that they needed a comprehensive, connected digital platform to overcome the inefficiencies of previous manual and segregated digital workflows.

The real-world Baffinland project helped Hatch develop an accelerated implementation plan for using OpenGround, establishing the necessary configurations and workflows in four months, compared to their original 12-month to 18-month timeframe. Using Bentley software, the team developed smart templates to capture data on varying ground materials, saving approximately 40% to 50% in work hours.
The digital processes achieved a 60% productivity gain, avoided a potential 33% schedule slip, and supports Hatch's improved digital project delivery initiatives.

Nexa Resources

Increasing Resources by Interpreting Metal Ratios and Dynamic Anisotropy in Leapfrog
Location: Chincha, Inca, Peru

Project Playbook: Seequent Central, Leapfrog Geo



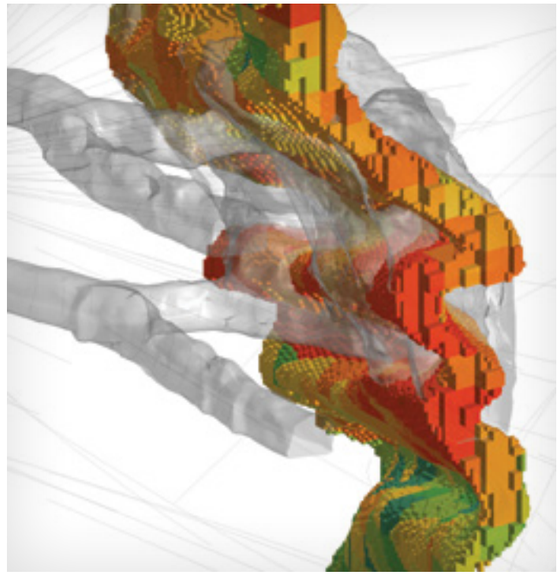
Cerro Lindo is a world-class volcanogenic massive sulfide deposit with an average production of 21,500 metric tons per day. To help identify the possible mineralization directions in the mine, the team initiated a modeling project based on metal ratios and dynamic anisotropy points. Given the irregular shape of certain bodies present in the deposit, traditional explicit modeling processes were not capable of adequately representing the interpolations made by the geology team.

Leveraging the structural trend feature in Seequent's Leapfrog Geo the team performed implicit modeling of the mineralized bodies, calculating metal ratios that allowed them to vectorize the potential mineralizing flow and generate plans that will assist in the search and estimation of samples to optimize the models. Working in the digital platform allowed for more realistic interpolation of the mineralization at Cerro Lindo. The software reduced modeling time, improved the interpolation process, and increased the volume of the model by 12%. Through automated geological modeling, the team increased the mine's resources without the need for drilling, minimizing environmental impact.

AngloGold Ashanti

Integrated Flow of Modeling and Estimation in Leapfrog Geo, Edge, and Central, Cuiabá Mine
Location: Sabará, Minas Gerais, Brazil

Project Playbook: Seequent Central, Leapfrog Geo, Leapfrog Edge



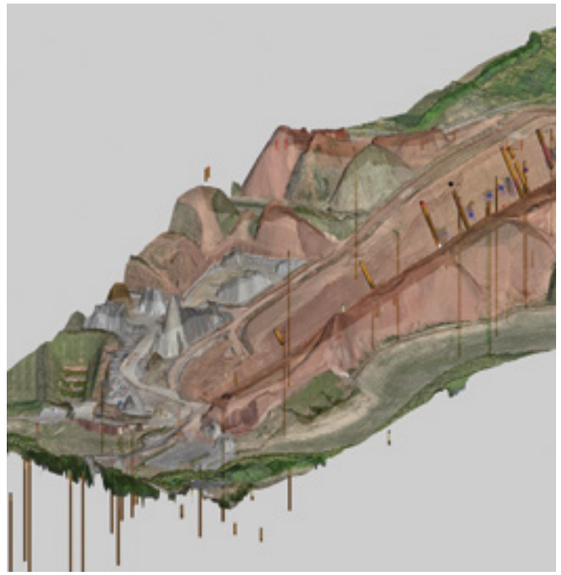
Brazilian gold producer AngloGold Ashanti initiated a project at their Cuiabá gold mine to simplify and automate model updates and resource estimation workflows. The goal was to digitally and accurately reproduce the mineral occurrence of the deposit, make planning more assertive, and make geological and geotechnical risk mapping more reliable to optimize operations. Previous processes lacked integration of modeling and resource estimation workflows, requiring time-consuming and error-prone manual model updates and migration between applications. AngloGold wanted to streamline complex model updates in an intuitive and integrated way within a cloud-based environment.

Leveraging Leapfrog Geo for modeling, Leapfrog Edge for resource estimation, and Seequent Central for cloud storage and information sharing, AngloGold established an integrated workflow that made their geology processes more reliable, reproducible, traceable, and dynamic. Working in a connected digital platform improved data exchange efficiency by 100% and reduced modeling time by 95%. The integrated lithological model helps maximize utilization of mineral resources and supports more sustainable, responsible, and safe mining practices.

Mott MacDonald

Intelligent Ground Models Support Sustainability and Value Engineering for High Speed 2
Location: Birmingham, England, United Kingdom

Project Playbook: Seequent Central, GeoStudio, Leapfrog Works, OpenGround, OpenRoads, PLAXIS, ProjectWise.



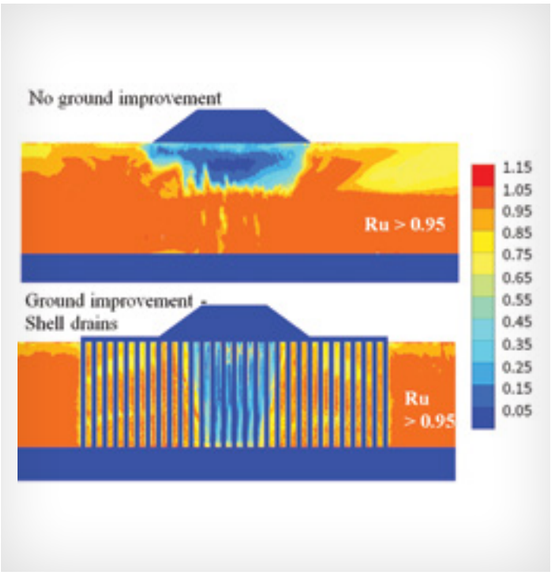
To help support sustainability, value engineering, risk management, and effective asset management on the phase one area north section of the HS2 railway, Mott MacDonald, as part of a design joint venture, initiated a project to build intelligent ground models. The large project scale and multidiscipline teams necessitated interoperable geotechnical applications and a cloud-based platform to integrate geotechnical models and data with the BIM railway design models and make them accessible to the geographically dispersed project teams.

Leveraging OpenGround, Leapfrog Works, and Seequent Central, Mott MacDonald established a single source of truth for ground investigation data, built 3D ground models, and shared them with the multiple teams and stakeholders. The BIM design models from OpenRoads were integrated with the geological models, improving risk management and design optimization. Working in a connected digital ecosystem reduced ground related issues by 10%, the construction period by up to six months, and the carbon footprint by 50%. The ground models will serve as intelligent digital twins during railway operations, estimated to save 10% in annual maintenance costs.

Architecture×Civil Engineering Inc.

Liquefaction Countermeasure Using Scallop Shells Enabled by PLAXIS: Numerical Simulation Aimed at Social Implementation
Location: Chuo, Osaka, Japan

Project Playbook: PLAXIS



This project studies using scallop shells as a recycled design method for dissipating pore water pressure during earthquakes to counteract liquefaction. Classified as industrial waste, scallop shells left out in the open cause environmental issues. To assist in validating the application of recycled crushed shells and proposing an effective design method for social implementation, the project team needed to evaluate the particle flotation and drainage performance of the lightweight material. Previous software lacked the modeling and numerical analysis capabilities to obtain the desired results.

Leveraging PLAXIS, the team modeled the drainage capabilities of the crushed shells and simulated their effect on ground liquefaction. Seequent and Bentley's application streamlined workflows and analysis, reducing testing and research expenses by approximately JPY 5 million and shortening the study's completion time by one year. The software made it possible to establish a design method for pore water pressure dissipation using crushed shells and verify it by numerical analysis. Utilizing the scallop shells to design, construct, and apply this crushed shell drain material will facilitate earthquake disaster prevention and climate change resilience.

Fireweed Metals

Macmillan Pass
Location: Whitehorse, Yukon, Canada

Project Playbook: Seequent Central, Imago, Leapfrog Geo, MX Deposit

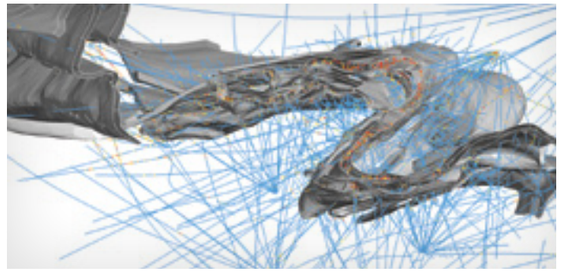
Located in eastern Yukon, the Macmillan Pass (Macpass) hosts large zinc-lead-silver deposits, emerging as a district-scale critical metals opportunity. Fireweed Metals owns the mining area and sought to improve collaboration with investors and the public without decreasing technical and geological productivity. Faced with managing multiple spreadsheets and a tremendous amount of core photos, Fireweed needed a digital solution that not only organized and shared their photos and data, but also provided a visual 3D spatial context for field and office personnel, as well as stakeholders.

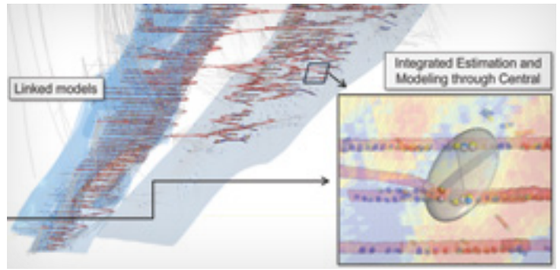
Leveraging Seequent Central, Imago, Leapfrog Geo, and MX Deposit, Fireweed established a cloud-based collaborative platform and single source of truth for all data, ensuring all geologists had access to the most current data, facilitating a unified approach to drill tracking, modeling, and reporting. The digital solution improved data availability by 20%, reducing lag times between receiving analytical results and reporting these in news releases. The creation of a 3D model of the mineral deposits on Fireweed's website provides stakeholders an interactive representation of the project.

Jaguar Mining Inc

Modeling and Estimation Processes Improvement
through Seequent Solutions
Location: Santa Bárbara and Conceição do Pará, Minais, Brazil

Project Playbook: Seequent Central, Leapfrog Geo





To modernize workflows at two of their active mines, saving time and improving process traceability in modeling and resource estimation, Jaguar Mining initiated a project to ensure accurate, timely model updates. Faced with challenges implementing estimation solutions at their Turmalina mine and modeling the structurally complex Pilar mine ore bodies, Jaguar needed integrated geological modeling, risk analysis, and data management applications.

Jaguar mining operations teams leveraged Leapfrog Geo, Leapfrog Edge, and Seequent Central for three months of testing, resulting in productivity gains, improved quality, and reduction in time and costs. At the Pilar mine, Jaguar reduced the time required to model ore bodies on a monthly basis by 50% while increasing the survey area by 100%. For resource estimation at the Turmalina mine, they improved processing time by 73% and reduced costs by BRL 65,000. Compared to previous workflows at both the mines, using these geological engineering applications revealed discrepancies of less than 1% in parameters of mass, average content, and metal contained, justifying the continued implementation of the integrated digitalized geological processes.

Hatch

New Caledonia Landslide Remediation
Location: Mont Dore, South Province, New Caledonia

Project Playbook: GeoStudio, Leapfrog Works, OpenGround, PLAXIS

When construction of a 2.2-kilometer critical access road in New Caledonia was halted due to a landslide, engineering and construction manager Hatch initiated a comprehensive stability assessment of the area, designing a remediation plan and validating continued construction along the planned alignment. Faced with technical, coordination, and site challenges, Hatch needed a collaborative digital geotechnical solution to avoid a costly and environmentally damaging alternative realignment.

Leveraging a suite of digital geotechnical applications, Hatch developed, modeled, and assessed the stability of the landslide area cut and slopes, developed the remediation design, and monitored construction progress of the existing alignment to manage potential of future failures. Working in an integrated, cloud-based geotechnical platform, they generated a visual 3D model during an active construction program, streamlining data collection and workflows among the global team. Their comprehensive analysis verified the benefits of continuing the alignment, saving 50% in costs and six to 12 months in time for an alternative concept. The solution reduced earthworks and travel for on-site surveys, saving approximately 17,000 tons in carbon emissions.

Beijing Institute of Architectural Design

No. 3 Office Building of Jingdong Group
Location: Beijing, China

Project Playbook: PLAXIS

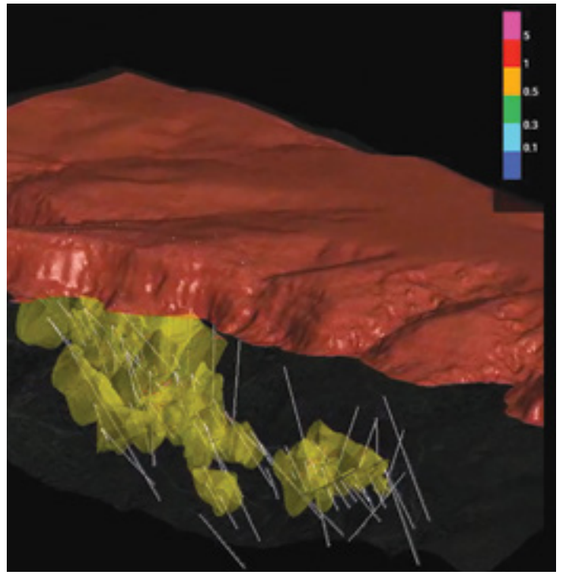
This project involves the design and construction of 12 17-story high rise buildings and underground garages. The large difference in height of the above-ground buildings presented challenges in ensuring the concrete would not crack due to the load variations during construction. The initial proposed solution would extend the construction time and increase costs. To determine an optimal foundation treatment scheme, the project team needed reliable geotechnical engineering technology.

Leveraging PLAXIS, the team performed structure-foundation-joint analysis, leading them to change the initial proposed foundation arrangement, successfully reducing the differential settlement caused by the varying loads of the different building heights. The new geotechnical design solution accelerated the construction schedule by 15% and reduced the volume of construction piles by 7%. By shortening the construction period and using less concrete for the piles, the team helped reduce the project's carbon emissions.

Cerrado Gold

Project Geology Chain of Custody
Location: Monte do Carmo, Tocantins, Brazil

Project Playbook: Seequent Central, Imago, Leapfrog Geo, MX Deposit



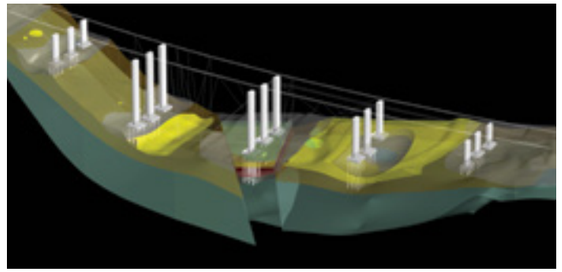
To improve mineral exploration, ensuring high-quality data collection, data accessibility, and cost-effective, timely execution, this project entailed creating a seamless process that integrates scheduling, execution, and outcomes. The project was originally initiated using handwritten collections of geological data. As time progressed, this manual method proved challenging, time consuming, and impractical. When increased drillings led to more voluminous data, the project team realized that they needed to refine and digitalize their workflows to optimize data collection, information sharing, and decision-making.

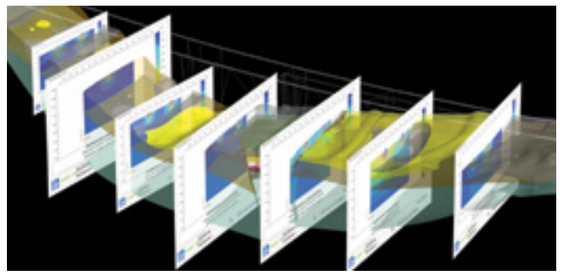
Leveraging Leapfrog Geo for geological modeling, MX Deposit for data collection and management, Imago for capturing core imagery, and Seequent Central as the cloud-based, collaborative platform, the team established integrated digital workflows, improving planning and communication between the geology and operations teams. By digitalizing previous manual processes, the team saved hundreds of hours performing drilling and logging tasks, and enhanced decision-making accuracy in drilling operations, estimated to save a total of USD 220,000 in costs. Working in a collaborative, digital environment helped improve natural resource utilization and reduce environmental impact.

Prof. Quick und Kollegen GmbH

Replacement Construction of the Viaduct Brunsbecke
Location: Hagen, North Rhine-Westphalia, Germany

Project Playbook: Leapfrog Works, PLAXIS





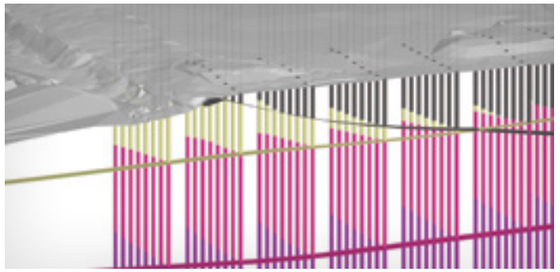
The Brunsbecke viaduct renewal project is part of a massive reconstruction initiative along Germany's A45 highway to renew 60 older bridges to improve traffic flow and safety. Prof. Quick und Kollegen was hired to determine a functional design foundation for the Brunsbecke bridge piers and test subsoil stability for construction, while ensuring the bridge remained operational throughout construction. The location amid a fault zone and the age of the bridge presented geotechnical challenges ensuring the stability of the bridge piers, compounded by data collection, integration, and exchange issues. The team realized that they needed to establish a connected digital data environment and single source of truth.

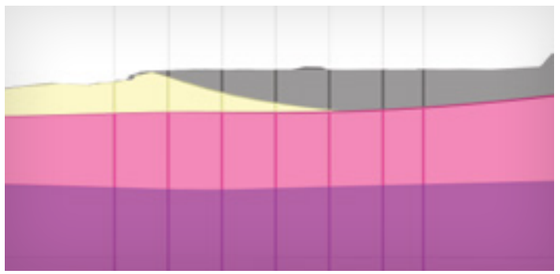
Prof. Quick und Kollegen selected Leapfrog Works and PLAXIS to create a geological digital twin and perform accurate excavation and stability safety calculations, testing different pier design foundations for feasibility and cost-effectiveness. The interoperability between Bentley's applications streamlined workflows and optimized data exchange, saving 45% in time. Working in an integrated digital environment further reduced modeling time by 95% and minimized environmental impact by 15% to 20%.

AtkinsRéalis

Sizewell C - Main Construction Area - Bulk Excavation
Location: Sizewell, England, United Kingdom

Project Playbook: GeoStudio, Leapfrog Works, OpenGround, ProjectWise





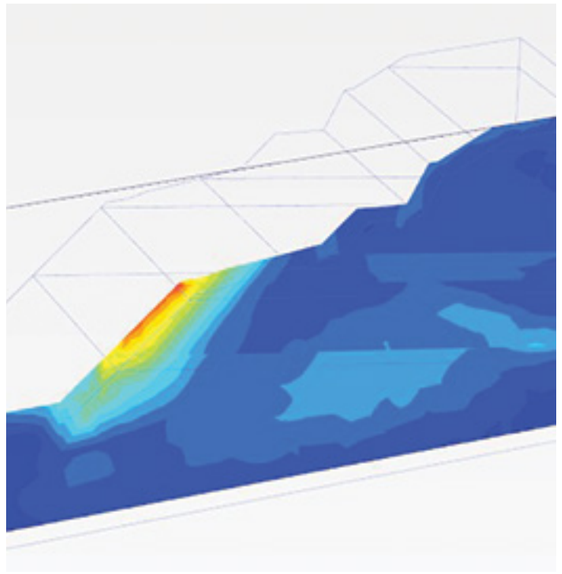
Located along the Suffolk coast, Sizewell C is a proposed nuclear power station that will generate 3.2 gigawatts of zero carbon electricity and power 6 million homes. AtkinsRéalis provided geotechnical design and excavation works to prepare the main development site for execution. The project required analyzing and determining safe gradients within a large 520-meter by 520-meter excavation site with varying geology, presenting data integration, modeling, and communication challenges. Previous manual and digital approaches lacked interconnectivity and the visualization and dynamic features necessary to deliver accurate geological assessments and avoid geotechnical risks.

AtkinsRéalis relied on OpenGround, Leapfrog Works, and GeoStudio to create a digital twin, perform slope stability analysis, and produce a detailed digital map of the geohazards. Working in an open, connected data environment and using ProjectWise for document control helped streamline and standardize workflows. Bentley's integrated solution reduced slope stability analysis time by 99.5% and saved approximately GBP 525,000 in costs when delivering a clean energy plant that will reduce annual carbon emissions by 9 million tons.

GSENC

Stability Review of Rock Slopes Using Jointed Rock Model
Location: Gangneungi, Gangwon, South Korea

Project Playbook: PLAXIS



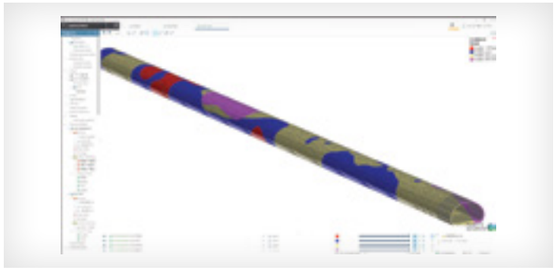
To effectively examine the stability of rock slopes amid Korea's numerous slopes with developed joints and faults, this project aims to digitalize the evaluation of slope safety factor based on joint and fault characteristics. The assessment needed to calculate safety factors during dry and rainy seasons, as well as consider potential earthquakes groundwater flow during rainfall. To achieve reliable results, the project team wanted to perform 3D numerical analysis and needed geotechnical engineering software capable of linking pore water pressure-stress-slope stability analysis within joint surfaces and faults.

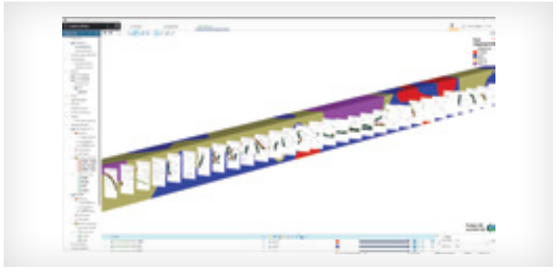
The team determined that PLAXIS could meet all project requirements, enabling 3D numerical analysis modeling that included the joint and fault features, rock slope formation, geological conditions, and the area's rainfall intensity. Based on digital modeling and analysis results, the team developed a reliable method that can quantitively assess the impact of increased water pressure and reduced safety factor due to rising groundwater levels during rainfall on the rock slopes. Applying 3D numerical analysis to domestic rock slopes is estimated to reap future economic benefits totaling KRW tens of billions.

BasisSoft Co.

Study on Utilization of Site Information in GeoBIM-based Tunnel Construction
Location: South Korea

Project Playbook: Leapfrog Works, MicroStation





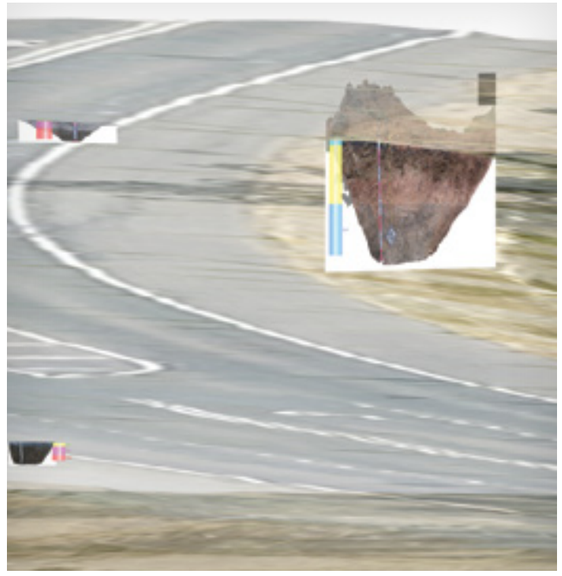
This project is one of the policy research topics assigned by the Korean Tunneling and Underground Space Association 2022. The purpose of the study is to update GeoBIM models using collectible information at the tunnel construction site and propose a process for creating the 3D models to be used during construction and maintenance. Faced with integrating and linking various data types from different sources, and establishing a system for design changes and construction based on the models, the project team needed an integrated geotechnical modeling and analysis solution.

Leveraging MicroStation and Leapfrog Works, the team was able to harness additional soil and site information during tunnel construction to develop a GeoBIM-based model of the tunnel structure and surrounding terrain. The model is useful throughout both construction and maintenance phases of tunneling projects and establishes a framework for proposing national policy.

Macquarie Geotechnical

Subsurface Reality Modeling for Enhanced Subsurface Insight
Location: New South Wales, Australia

Project Playbook: iTwin Capture, Leapfrog Works



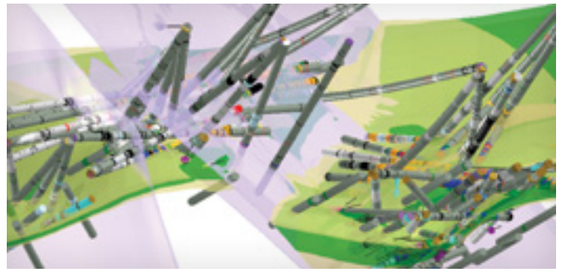
Australian ground investigation firm Macquarie Geotechnical selected two sample projects to demonstrate the importance of data capture and intuitive communication of subsurface information. One was a regional highway pavement investigation project with considerable variation in layer thickness, and the other was a greenfield rail project that exhibited shrink-swell behavior. Macquarie experimented with various applications to overcome the shortcomings of traditional geotechnical investigation approaches. However, these lacked the technical and interoperable features for seamless digital workflows.

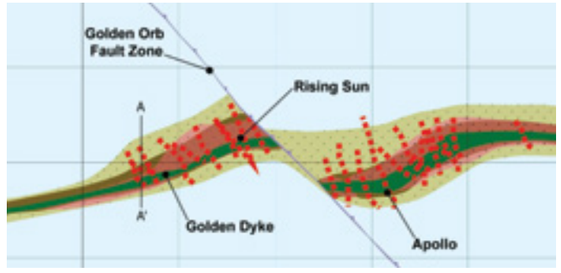
Macquarie selected iTwin Capture and Leapfrog Works to augment traditional geotechnical data and modeling with subsurface photogrammetry. Using Bentley and Seequent's integrated applications allowed for more accurate modeling and provided a visual, contextual understanding of the subsurface conditions for stakeholders in formats compatible with their civil design software. The detail captured in the models allowed fieldwork to progress without the need for key decision makers to be on site, estimated to save AUD 90,000 in time and travel costs. The reality modeling solution also saved approximately 600,000 cubic meters of quarried materials, achieving significant financial and carbon benefits.

Southern Cross Gold

Sunday Creek: High-grade Au-Sb Discovery at Clonbinane, Victoria
Location: Clonbinane, Victoria, Australia

Project Playbook: Seequent Central, Imago, Leapfrog Geo, MX Deposit





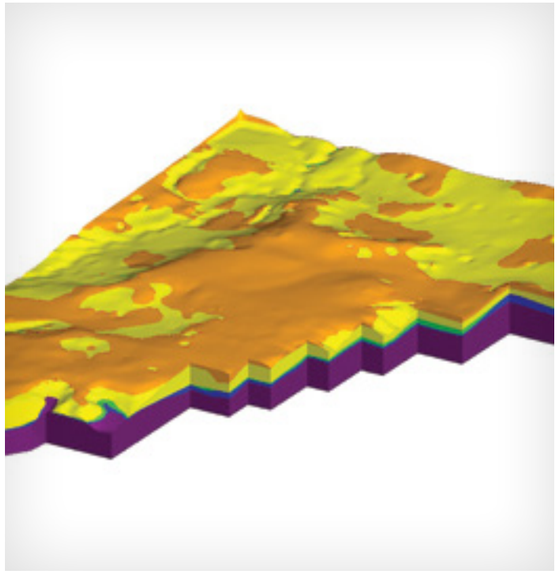
One of the new high-grade exploration discoveries in Australia, Sunday Creek contains the significant critical metal potential byproduct antimony. The project can provide a sustainable boost to the local and global economy, playing a key role in clean energy transition, offering a reliable source of antimony. Given the complex geology of the site and the dynamic nature of mining, drilling company Southern Cross Gold faced challenges getting information from the drill holes to streamline decision-making and optimize discovery success. They needed integrated technology to generate a 3D model and collaborative digital twin.

Leveraging MX Deposit, Imago, Leapfrog Geo and Seequent Central, Southern Cross developed a streamlined solution for gathering crucial data as drilling progresses, storing high resolution photos of the drill core, and modeling the subsurface geology based on the data and images. The integrated digital workflow ensures robust data for informed decision-making and facilitates clear communication with stakeholders. Working in a digitally connected environment improved collaboration across subsurface geology modeling by 80%, reduced errors by 90%, and saved more than AUD 60,000.

PT SMG Consultants Indonesia

Transformative Innovations in Southeast Sulawesi Nickel-Cobalt Exploration
Location: North Konawe, Southeast Sulawesi, Indonesia

Project Playbook: Imago, Leapfrog Geo, MX Deposit



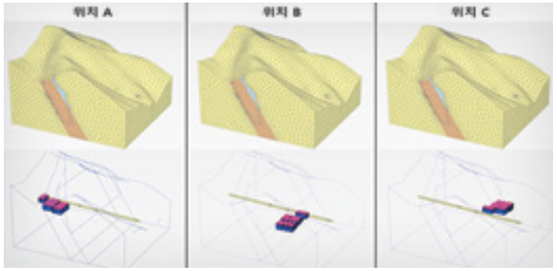
PT SMG Consultants sought to advance their digital solutions for their nickel mining and geological exploration projects. The goal was to optimize mining operations and contribute to the sustainable development of Indonesia's vital nickel resources. However, nickel deposits are often geologically complex and have several regulatory frameworks and environmental standards. The team sought advanced data management and modeling software to accurately characterize ore bodies.

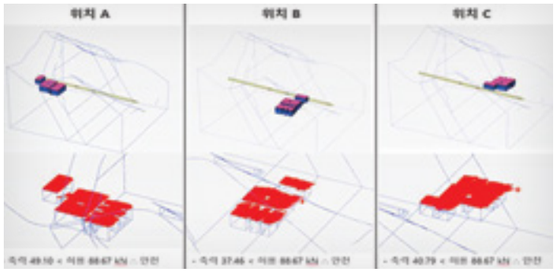
SMG Consultants chose Seequent's Imago, Leapfrog Geo, and MX Deposit to optimize their workflows. The applications provided advanced implicit modeling capabilities, secure data management features, and seamless integration between imaging, geological modeling, and resource estimation. Geological domaining, which used to take two to three weeks, now takes just two to three days. Repetitive tasks have been reduced by 75%, increasing employee productivity by 50%. Overall, drilling costs have decreased by up to USD 8 million and indirectly enhanced mining production operations by 25%.

Korea Institute of Civil Engineering and Building Technology

Verification of the Reinforcement Effect of an Underground Rock Crushing Chamber Using 3D Numerical Analysis
Location: Gangeung, Gangwon, South Korea

Project Playbook: PLAXIS





To mitigate the environmental impact of open-air limestone crushing plants, this project aims to design an underground rock crushing chamber in Gangwon. At 42,000 cubic meters, the size of the underground chamber necessitated ground reinforcement techniques. Located in mountainous terrain amid fault fracture zones, the project team needed geotechnical modeling and analysis software capable of addressing these factors to determine an optimal reinforcement technique.

Leveraging PLAXIS, the team modeled the topography, geology, and reinforcement effects, enabling them to assess the stability of the underground crushing chamber. By performing quantitative assessment of displacement in the large-scale chamber and the stress and force of the reinforcement materials, they were able to determine the most suitable location and optimize structural integrity, estimated to save KRW tens to hundreds of billions when designing domestic underground crushing chambers. Utilizing Bentley's comprehensive geotechnical engineering application yielded reliable results, expected to deliver more cost-effective and safer reinforcement designs in the future.

Representatives of Spark and WSP accept the award in the Subsurface Modeling and Analysis category of the 2024 Going Digital Awards.

SURVEYING & MONITORING

This category recognizes projects that demonstrate excellence in capturing the asset condition using reality modeling, mobile mapping, instrumentation, and sensor data management that enable better decision-making throughout the asset lifecycle by adding 4D digital context.

Winner: Going Digital Award in Surveying and Monitoring

Water Supplies Department

Digital Twin of the Ex-Sham Shui Po Service Reservoir
Location: Kowloon, Hong Kong SAR, China

Project Playbook: Bentley LumenRT, iTwin Capture, MicroStation, OpenBuildings

Built in 1904, the Ex-Sham Shui Po Service Reservoir formed part of the Kowloon Waterworks Gravitation Scheme until it was decommissioned in 1970. Given its historical background as a crucial water supply building, coupled with its iconic design and architecture, Land Surveying Section (LSS) was tasked with constructing a digital replica to preserve the historic nature of the structure that attracts numerous tourists. The project presented data capture, integration, and exchange challenges on a tight project timeline, requiring a unified platform to model and share the multisourced data with multiple stakeholders.

LSS utilized Bentley's iTwin applications to process drone-captured and scanned images into a mesh model and digital twin. Working in a cloud-based platform streamlined sharing voluminous data with multidiscipline stakeholders, improving data exchange efficiency by 30%. The automated and robust features of iTwin reduced data processing time by 20% and increased the model accuracy by 50%. The successful project serves as a pilot for using digital twins to preserve other historic Hong Kong sites.

Monir Precision Monitoring

31 Parliament Street Urban Infrastructure and Excavation Shoring Monitoring
Location: Toronto, Ontario, Canada

Project Playbook: iTwin Capture, iTwin IoT, MicroStation, OpenGround

To avoid shutting down a vital rail commuter line amid urban development, Monir Precision Monitoring was contracted to monitor displacement of the rail and shoring of the excavation during construction of a new 41-story, mixed-use, energy-efficient building. The strict monitoring guidelines for working within the corridor, moist ground conditions, and multilevel approvals required presented challenges, leading Monir to explore an integrated digital solution to overcome the limitations of previous monitoring solutions.

As a proof-of-concept project, Monir selected iTwin IoT to test incorporating a digital twin within their existing IoT monitoring processes to visualize and assess the site throughout the construction process. Using Bentley's platform for management and visualization of the instrumentation data increased operational efficiencies by 40%. The software helped save approximately 3,000 hours in on-site assessments and reduced the project timeline by six months. Compared to a myopic view using individual sensors, the digital twin solution provided a more holistic visual monitoring context relative to the entire project.

China First Metallurgical Group Co., Ltd.

Phase II and Phase III of Comprehensive Improvement Project for the Outlet Reach of Fuhuan River
Location: Wuhan, Hubei, China

Project Playbook: iTwin Capture

This water conservancy initiative will improve flood control capacity and the ecological environment of Changjiang New Town in Wuhan. The project presented complex terrain and strict environmental requirements, compounded by coordinating voluminous data and multiple stakeholders. Having tried several software applications to process and model the terrain data, the project team realized that they lacked the features and interoperability required to meet modeling accuracy and workflow efficiencies. The engineering firm needed a comprehensive data capture and modeling solution that supported collaboration, design, and construction.

The team selected iTwin Capture to create a refined 3D terrain model from aerial images and analyze excavation and construction works. Bentley's application delivered accurate modeling results and facilitated real-time information sharing, streamlining workflows to improve design precision by 30% and shorten the design cycle by 15 days. Through digital simulations, they optimized the construction scheme, reducing earthworks by 10% to minimize carbon emissions, while saving 25 days and CNY 550,000 during the construction period. The collaborative digital solution lays a solid foundation for sustainable development of the project.

Sougogiken Co., Ltd.

3D Digitalization of a World Heritage in Kyoto: Experiencing Ninnaji Temple through Virtual Reality
Location: Kyoto, Japan

Project Playbook: iTwin Capture, MicroStation

To provide visitors of Ninnaji Temple in Kyoto with a multilingual virtual reality experience and preserve its cultural heritage, Sougogiken participated in a project to digitalize the interior and exterior of the temple buildings on Kondo Hall grounds. Specifically, Sougogiken was responsible for creating 3D content. Faced with site and time constraints, they realized that they needed advanced reality modeling technology to meet the 3D deliverables on the short timeline.

Leveraging iTwin Capture and MicroStation, Sougogiken converted thousands of images per building—and non-existent decorative items from blueprints—into 3D models. Bentley's applications reduced mapping time by 70% and modeling time by 50% while delivering accurate, quality 3D models. The integrated digital solution provided excellent reproducibility to provide an optimal VR experience. Based on the success of the project, the entire project team expects iTwin Capture to be used in future restoration and conservation projects for historical cultural properties.

Sougogiken Co., Ltd.

3D Measurement and Content Creation for Daisho-in Temple, Miyajima, under a Sacred Fire Lit for More Than 1,200 Years
Location: Hatsukaichi, Hiroshima, Japan

Project Playbook: iTwin Capture, MicroStation

To provide tourists visiting the Daisho-in Temple in Hatsukaichi with a multilingual virtual reality experience and preserve the historic space as a place of worship for locals, the temple's abbot initiated a project to digitalize the buildings and artifacts on the temple grounds and in the surrounding town. Sougogiken was responsible for 3D content and aerial photography. Faced with site constraints, lack of original design drawings, and severe climate conditions, Sougogiken needed advanced reality modeling technology to meet the 3D deliverables on a short timeline.

Leveraging iTwin Capture and MicroStation, Sougogiken created high-quality, accurate 3D models of the buildings and artifacts. The triangulation and editing features of Bentley's applications eliminated time-consuming manual processes and optimized the output of ortho images and models. The integrated reality modeling solution reduced modeling time by three times compared to conventional methods, while maximizing reproducibility to ensure an optimal VR experience.

Chuanyeh Engineering Consultant Co., Ltd.

Design and Construction Technology Service of A1 Bridge Pier Protection Project of Shuangdong Viaduct, National Expressway No. 6
Location: Nantou, Taiwan

Project Playbook: iTwin Capture

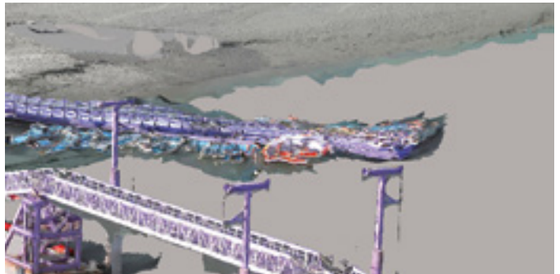
To ensure safety and minimize natural disaster occurrences arising from the erosion of bridge piers on the Shuangdong Viaduct, Taiwan's Ministry of Transportation initiated long-term protection measures of the bridge piers and foundation. Chuanyeh Engineering Consultant was retained to inspect the bridge as part of the design and construction works. Given the scope and site constraints of the project, traditional survey methods proved costly and time-consuming. To ensure designers, constructors, and the clients understood the evolution of the project, Chuanyeh needed a connected reality modeling solution to accurately model, simulate, and share their survey results.

Leveraging iTwin Capture, Chuanyeh processed aerial photos into 3D models, transforming 2D information into accurate visual reality meshes. Working in a connected reality data environment streamlined workflows, reduced design changes, and minimized wasting public funds. The digital reality technology eliminated frequent onsite surveys, shortening inspection times from two weeks to one day. Bentley's application provided holistic visual insight of the overall deterioration, optimizing design and construction solutions to reduce carbon emissions.

Geospatial Information Co.

Digital Island and Sea Garden Service Development Project - Sinan
Location: Shinan, Jeollanam, South Korea

Project Playbook: iTwin Capture



As part of the Jeonnam Digital Island and Marine Garden Service Development, Sinan's Purple Island has been selected as a local attraction to be modeled based on 3D data to create a virtual tourist experience. The digital twin initiative aims to promote local tourism through the digitalization of resources, developing a sustainable business model that will energize the local economy. Covering an area of 338,000 square meters, the project required an integrated technology solution to capture data and images and develop immersive 3D space.

The team used virtual reality sensors, drones, and scanners to collect data and images, as well as iTwin Capture to generate a digital twin for the Purple Island virtual experience. Using Bentley's application reduced modeling time by 70% and enabled the team to easily construct the metaverse.

Geospatial Information Co.

Digital Island and Sea Garden Service Development Project - Yeosu
Location: Yeosu, Jeollanam, South Korea

Project Playbook: iTwin Capture

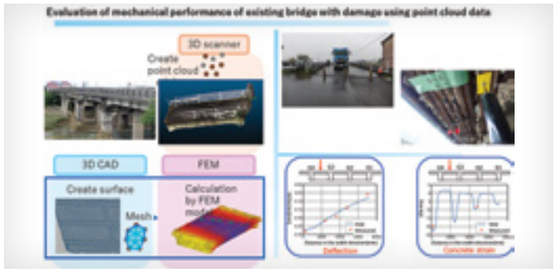
As part of the Jeonnam Digital Island and Marine Garden Service Development, Yeosu sites Odong-do Island and the Expo area have been selected as local attractions to be modeled based on 3D data to create a virtual tourist experience. The digital twin initiative aims to promote local tourism through the digitalization of resources, developing a sustainable business model that will energize the local economy. Covering an outdoor area of 558,000 square meters, and 180,000 square meters indoors, the project required an integrated technology solution to capture data and images and develop immersive 3D space.

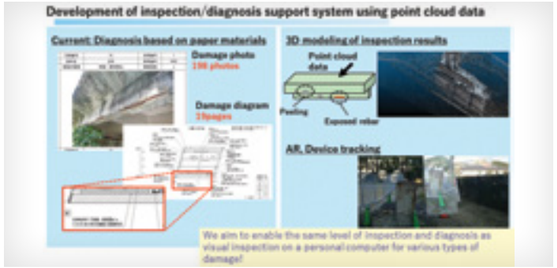
The team used virtual reality sensors, drones, and scanners to collect data and images to develop content for cruise ships, trekking tours, and island expos, as well as iTwin Capture to generate a digital twin and create a virtual experience. Using Bentley's application reduced modeling time by 50%. Based on the digital twin, the virtual tourist environment will reduce the carbon footprint.

Nagasaki University Cross-ministerial Strategic Innovation Promotion Program (SIP)

Evaluation of Load-bearing and Deformation Performance using 3D Data for Small-scale Bridges Managed by Local Governments, and Implementation in Periodic Inspection Work
Location: Nagasaki, Japan

Project Playbook: iTwin Capture





With aging bridge infrastructure in Japan deteriorating at a rapid pace, there is a need to strategically maintain, manage, and update infrastructure support structures to ensure public safety. Faced with no original design documentation and ineffective manual inspection methods, the project team sought to digitalize bridge maintenance and management methods and record age-related changes. They realized they needed comprehensive reality modeling technology capable of processing point cloud data into accurate 3D visual meshes.

The team used iTwin Capture to create 3D models from the captured data and evaluate the structural safety of the bridges, consider the state of progress of any damage, and determine any necessary design changes and remediation works. Bentley's application reduced design time by 50% and bridge maintenance and management costs by 25%. The digital reality modeling solution increased data integration efficiency by 50%, reduced inspection work by 80%, and provided visual insight for managers and citizens to better understand the need to maintain social infrastructure.

Geospatial Information Co.

Gokseong-gun Landslide Site Digital Twin Damage Record and Recovery Plan
Location: Gokseong, Jeollanam, South Korea

Project Playbook: iTwin Capture

This project involved constructing a high-resolution 3D model after a landslide in Gokseong to investigate the cause of the event and implement recovery plans. To overcome site accessibility issues and streamline damage investigation, the team needed a comprehensive reality modeling solution.

Leveraging iTwin Capture, the team created a digital twin of the area, enabling multiple experts to simultaneously assess the extent of damage and determine an optimal recovery plan. Using Bentley's application shortened the investigation time.

Nissin Co., Ltd.

Image of Completed Drainage Plant Facility
Location: Chuo, Hamamatsu, Shizuoka, Japan

Project Playbook: Bentley LumenRT, iTwin Capture, OpenRoads

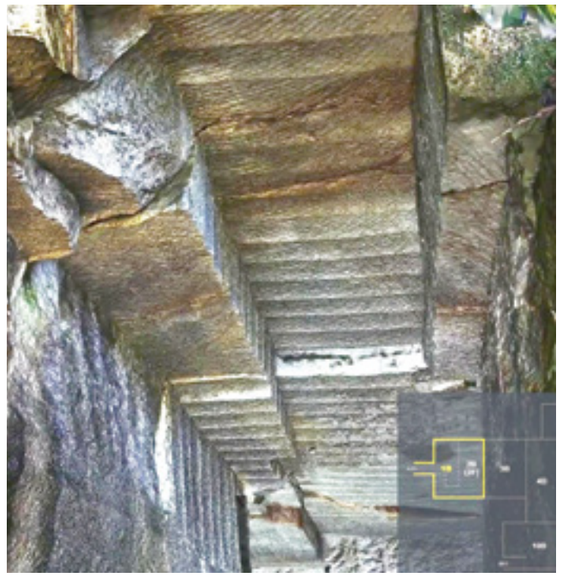
This project was initiated to enable the client, Hamamatsu City, to visualize the river entry and exit along with the newly constructed drainage facility located amid houses in the vicinity. The project team needed to survey and model the existing area and drainage plant and create a digital twin for the client to visualize and assess the layout of the drainage plant.

The team leveraged iTwin Capture to generate a reality mesh of the existing area from aerial and ground photos, imported it into OpenRoads to link with the drainage plant model, and used Bentley LumenRT to produce an animated rendering that provided a realistic visualization of the facility. Using Bentley's reality modeling applications significantly reduced resource hours and costs by eliminating the need to model existing buildings separately as previously required. The integrated digital solution reduced modeling time by 95% to create an accurate visual plant layout.

Infrastructure Renewal Engineering Co., Ltd.

Making History Accessible by 3D Visualization: The Quarry That Provided the Material for Modern Japan's Infrastructure Comes to Life in a 3D Video
Location: Shimoda, Shizouka, Japan

Project Playbook: iTwin Capture



Given the rapid dismantling and disappearance of privately-owned, undesignated cultural properties, Infrastructure Renewal Engineering (IRE) launched Japan's first private project to digitally reproduce and preserve these sites. The project involved capturing a huge stone cave on the mountain of Shimoda that was a former Izu quarry. With a goal to democratize historical study of the Izu stone industry and develop the quarry site as a new tourist destination in Shimoda, IRE realized that they needed a cost-effective and time efficient reality modeling solution.

Leveraging iTwin Capture, IRE processed captured images into high-definition 3D models, saving 50% of time compared to manual methods, and created video animations from the models. The detailed reproducibility of the stone colors, patterns, and inscriptions provides historians, learners, and the public with precise visual insight, witnessing a page of history. The project serves as a benchmark for educational and research institutions to use iTwin Capture in the future for 3D reproductions of historical heritage sites.

Aegea

Reality Capture: Surveying and Monitoring in the Sanepar-Aegea PPP
Location: Paraná, Brazil

Project Playbook: iTwin, iTwin Capture, MicroStation, OpenCities, ProjectWise

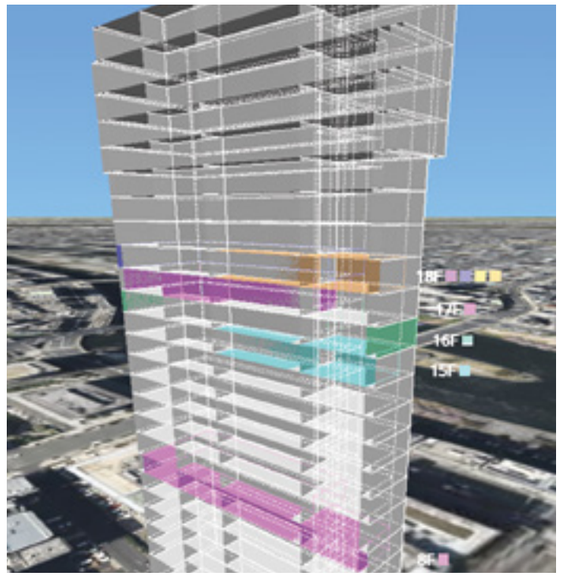
Aiming to guarantee an increasingly effective and sustainable water supply and wastewater collection service for the communities they serve, Aegea implemented their Infra Inteligente program based on advanced asset management practices and digital modeling. The project required capturing voluminous data and images of their concessionaire structures throughout Brazil. Given the magnitude of the data set and urgency for the digital inventory, Aegea needed an integrated and robust reality modeling solution.

Leveraging iTwin Capture with ProjectWise, Aegea processed drone captured images totaling 1,631 gigabytes of data into 3D models and shared more than four terabytes of documents, allowing office teams and stakeholders immediate access and insight into asset health to optimize decision-making for resource allocation and investment. Bentley's applications reduced modeling time by 95%, outperforming competing software products by 120%. The solution optimized data exchange by 50% and reduced operational inspection activities by 60%, minimizing carbon emissions associated with travel and manual onsite surveys. Based on the 3D models, Aegea will generate digital twins of their plants to view on virtual reality platforms.

Takenaka Corporation

Real-time Remote Monitoring Digital Twin of Demolition Worksites
Location: Chiyoda, Tokyo, Japan

Project Playbook: iTwin, iTwin IoT



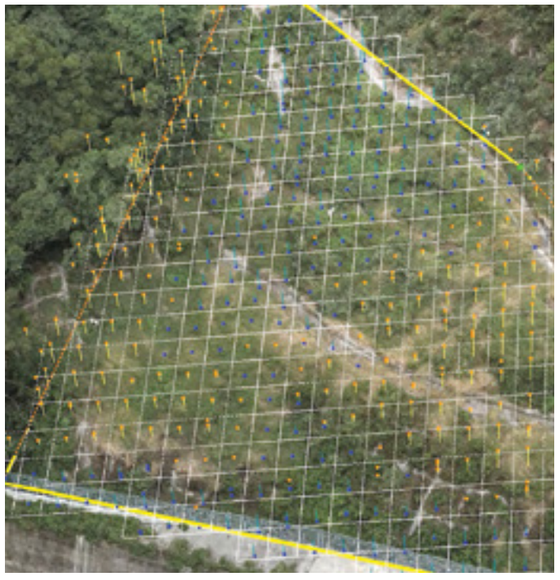
To address work progress and safety management during on-site construction works, this project aims to digitalize construction management tasks. The project team sought to develop a digital twin for industry-wide, real-time on-site monitoring using a high-rise construction project as a pilot. Faced with data hierarchy challenges and varying requirements across projects, the team needed comprehensive, flexible digital twin technology capable of integrating Internet of Things (IoT) data, updating the model in real-time, and customizing the approach for expanded use within the industry.

Leveraging iTwin, the team developed a 3D model of the building and performed building-wide data integration of work progress and environmental data from IoT sensors to provide a bird's-eye view of the overall onsite situation. Working in Bentley's digital twin platform, site managers remotely identified bottlenecks and safety risks in real-time to take immediate corrective action. The solution saved 3,200 hours along with costs associated with having daily onsite patrol people. The team plans to also incorporate management operations data into the digital twin and introduce their solution throughout the construction industry.

Dragonfly UAS Co., Ltd.

Side Slope Monitoring Project of Taiwan Railway Yilan Line at K12+233
Location: Yilan, Taiwan

Project Playbook: OpenPlant, iTwin Capture



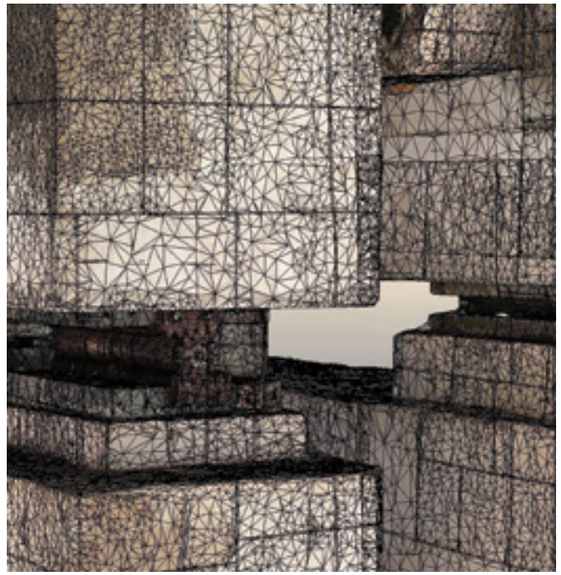
To ensure safe operations of the Taiwan Railway's Yilan Line, Dragonfly UAS initiated a project to monitor the stability of the steep hillside adjacent to it. The complex terrain and natural forces impacting the area presented survey challenges that traditional measuring instruments failed to accommodate. To timely and precisely capture and monitor the slope stability, Dragonfly needed a comprehensive reality modeling solution.

Leveraging iTwin Capture, Dragonfly surveyed and processed high-resolution aerial photos of the side slope into a detailed 3D model, capable of being updated in real time to monitor and track changes in displacement, cracks, and settlement of the slope. Bentley's application shortened the survey time from three weeks to one day. The 3D reality model accurately reflects the morphology and characteristics of the side slope, providing reliable data for monitoring and analysis.

Infraengineering Srl

Three-dimensional Modeling of the Structural Elements of Motorway Viaducts
Location: Pratola Peligna, L'Aquila, Italy

Project Playbook: iTwin Capture



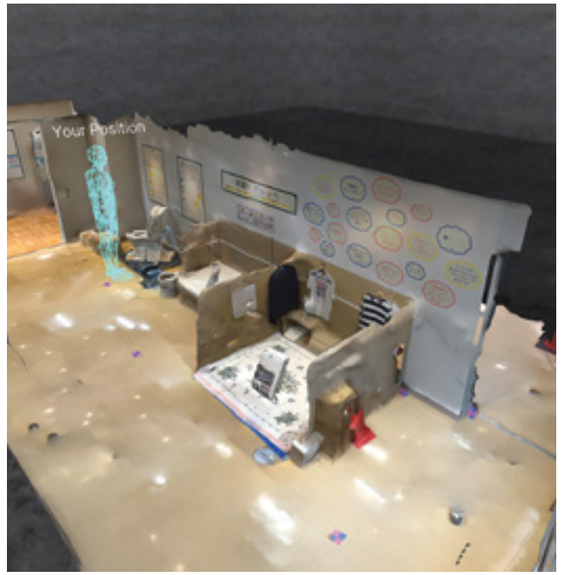
As part of the upgrading works ensuring seismic safety of five priority viaducts along Itay's A25 roadway connecting the Lazio and Abruzzo regions, Infraengineering is conducting a detailed survey of the current state of the bridge piers and creating a 3D model to serve as the basis for design calculations and structural plans. The motorway crosses a morphologically complex territory, making the survey difficult, costly, and risky using conventional survey methods. To capture and process the voluminous data and images for all pier elements, Infraengineering needed robust reality modeling technology.

Leveraging iTwin Capture, Infraengineering processed drone-captured data and images relating to 72 piers of the five viaducts into an accurate 3D scaled model of the bridge. Bentley's application allowed for the model to be exported in different formats, streamlining collaboration with stakeholders involved in designing the seismic structural upgrade. The digital reality capture solution saved 70% in time, enabling Infraengineering to deliver the model to the customer in just 15 working days, while saving EUR 63,000 in costs.

Yuhashi Laboratory, Shizuoka University

Vacant House Distribution Using 3D Modeling by Drone
Location: Chuo-ku, Hamamatsu, Shizuoka, Japan

Project Playbook: iTwin Capture



This project aims to build a platform for the acquisition of indoor and outdoor 3D point cloud data and the distribution of vacant house information, revitalizing the utilization of vacant homes in Japan. Faced with many homes lacking original design and construction documentation, the project team explored various data capture and modeling technology to achieve their digital deliverables.

Leveraging iTwin Capture, they processed drone-captured photographs into 3D point cloud data of the homes and surrounding areas. Bentley's application enabled them to successfully generate accurate reality meshes of the vacant homes and background features simultaneously. By releasing visual data on vacant homes, the team expects that local governments and nonprofit organizations will make use of such information in a way that will revitalize local communities.

Geospatial Information Co.

Yeongam Ancient Tombs Excavation Site
Location: Yeongam, Jeollanam, South Korea

Project Playbook: iTwin Capture

This project involved using photogrammetry to record and preserve the Yeongam Ancient Tombs cultural property excavation site. Given the site constraints, lidar scanning proved challenging. To accurately survey the site and generate a high-resolution video, the team required a comprehensive reality modeling solution.

Leveraging drones and ground photography, the team captured images of the project area, and, with iTwin Capture, processed the images into a high-resolution digital twin of the cultural heritage excavation site. Bentley's application reduced modeling time and saved costs.

Representatives of Water Supplies Department accept the award in the Surveying and Monitoring category of the 2024 Going Digital Awards.

TRANSMISSION & DISTRIBUTION

This category recognizes transmission and distribution projects that demonstrate digital advancements in the planning, design, analysis, construction, or operation of network systems.

Winner: Going Digital Award in Transmission and Distribution

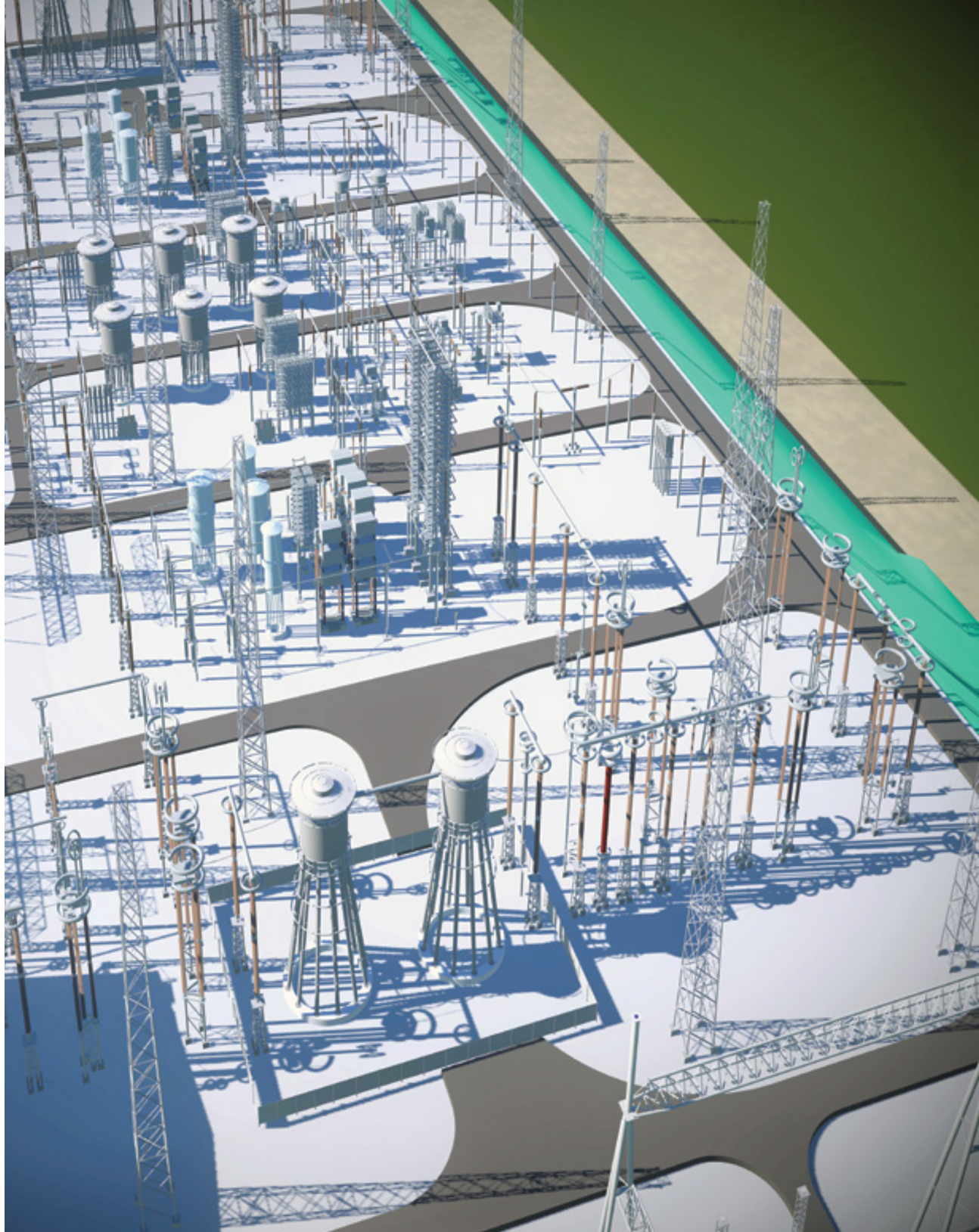
Southwest Electric Power Design Institute Co., Ltd.
of China Power Engineering Consulting Group

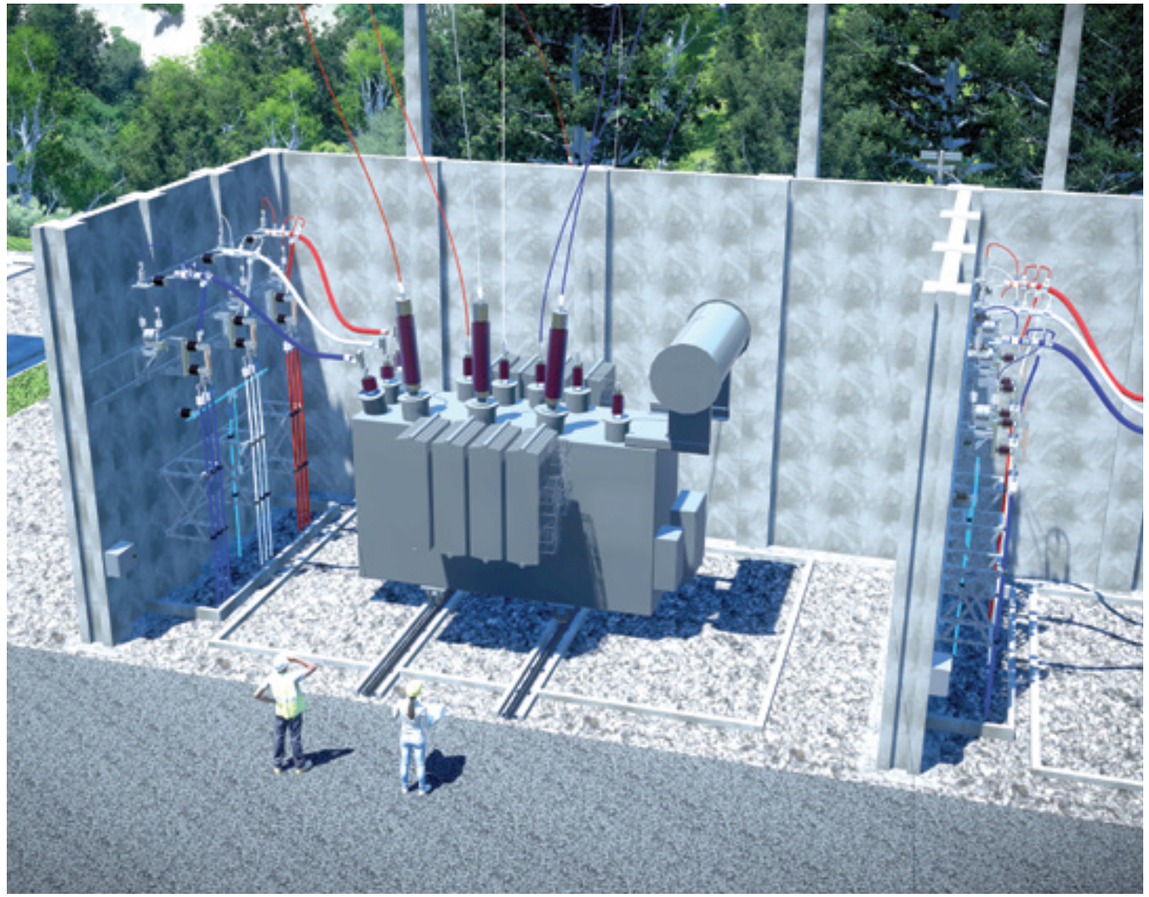
Butuo ±800-kV Converter Station
Location: Liangshan, Sichuan, China

Project Playbook: Bentley LumenRT, MicroStation, OpenBuildings, OpenSite, OpenUtilities Substation, ProjectWise, STAAD

Butuo ±800-kilovolt Converter Station will transmit electric energy generated by the Baihetan Hydropower Station to the economically developed areas of eastern China. The clean energy delivered will meet annual electricity demands for 75 million people, reducing coal consumption by 27 million tons. With an aim to apply lifecycle digital workflows, the project team needed integrated technology to streamline workflows, control project costs, and achieve digital deliverables.

Leveraging ProjectWise and Bentley Open applications, the team established a connected digital environment for collaborative multidiscipline design and construction management. Through 3D modeling and visual planning, they reduced total land used for the station by about 10 hectares to save CNY 45 million and reduce the project's carbon footprint. Working in an integrated digital ecosystem reduced design time by 30 days, shortened the construction period by 40 days, and saved approximately CNY 7 million in overall project costs. The interoperability of Bentley's applications helped save two days delivering the digital models for operations and maintenance.





COPEL Distribuição S.A.

Implementation of BIM Modeling for Medium- and High-voltage Substation Projects
Location: Curitiba, Paraná, Brazil

Project Playbook: Bentley LumenRT, MicroStation, OpenRoads, OpenUtilities, ProjectWise

Committed to advancing technology to provide sustainable energy solutions and increase the productivity and efficiency of design and construction teams, COPEL Distribuição piloted collaborative BIM modeling for one of their 138-kilovolt substation projects. The project required automating deliverables and integrating physical substation design with electrical design, as well as ensuring compatibility with other software applications used within the company.

After careful analysis, COPEL selected OpenUtilities Substation based on its interoperability with ProjectWise and MicroStation, which were already used by the company due to its ability to model the substation structure and electrical designs within one application. Extrapolating their results over a period of one year for 15 substation projects of 138 kilovolts, COPEL estimated a 30% reduction in project costs—an annual savings of USD 630,000. Using Bentley software facilitated real-time information sharing, streamlined multidiscipline design workflows, and ensured accurate material quantity takeoffs, avoiding rework and waste. The successful digitization of the pilot project ensures that future projects will be executed more quickly and sustainably, with better use of human and material resources.

Exo Inc.

Ohio Falls River Crossing Towers
Location: Louisville, Kentucky, United States

Project Playbook: iTwin Capture, Power Line Systems

Located on the Ohio River, the Ohio Falls Hydro Station includes two towers built in the 1920s supporting a transmission line crossing the river. Rather than building a new crossing in another location, the utility company plans to reuse these towers. To determine their structural integrity, the utility company engaged Exo to inspect them. Faced with constrained site access and a lack of available existing drawings, Exo needed an integrated modeling solution to model the existing structures and analyze their reusability.

Exo used iTwin Capture to process 250 gigabytes of drone-captured photos into a reality mesh model. By then creating a digital twin of the towers and power line, the team could virtually access and measure degrees of corrosion. Based on the digital twin, they evaluated structural loads to identify the appropriate remediation solution to ensure structural stability and determine an estimated life extension of the towers. The virtual assessment saved the utility company a potential 10 years of permitting delays and approximately 80 million dollars building a new tower crossing.

Pacific Gas & Electric

10K Electrical Wiring Undergrounding Project to Mitigate Risk of Catastrophic Wildfires
Location: California, United States

Project Playbook: ProjectWise

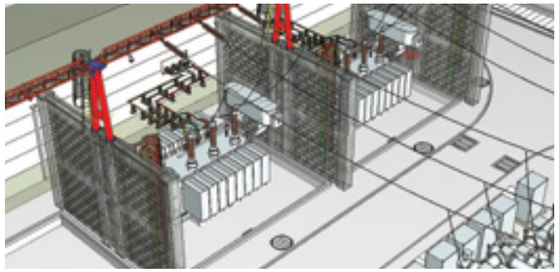
To mitigate the risk of catastrophic wildfires in Northern California caused by possible ignition points of their assets, Pacific Gas & Electric (PG&E) initiated a project to eliminate overhead power lines, burying them underground.
The project covers a large area where many kilometers of power lines are exposed to high winds that make it easy for wildfires to spark. To accommodate the data and information for multiple lines across various cities, as well as share that insight among the numerous geographically dispersed groups working on the project, PGE needed a collaborative digital project management platform to timely bury these assets.

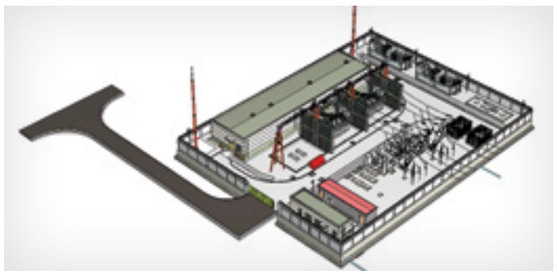
After trying multiple alternatives, PGE selected ProjectWise as a central repository to store and share data in a cloud-based platform. Bentley's application enabled them to build a standardized folder structure across all projects, update documents and data in real time, and ensure access to all team members. By streamlining workflows, improving coordination and collaboration, and eliminating rework, PGE's USD 4 million estimate to bury a wire has been steadily decreasing each year.

Cangzhou Tongxing Electric Power Design Co., Ltd.

110kV Substation Digital Delivery and Review Project at Gangqu No. 1
Location: Cangzhou, Hebei, China

Project Playbook: OpenBuildings, OpenRoads, Promis.e





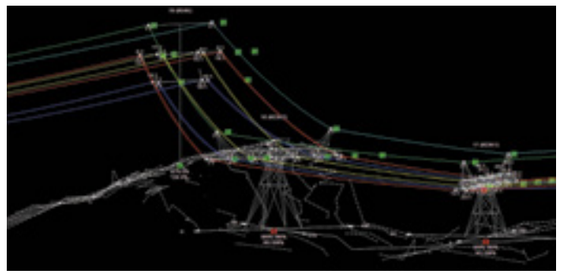
This 110-kilovolt/10-kilovolt substation project in Cangzhou, Hebei involves designing and constructing three 50 megavolt-ampere transformers, transmission lines and subsidiary production facilities, equipment, and connecting roadways. Cangzhou Tongxing Electric Power Design (CTE) is delivering the project on a tight schedule with strict 3D deliverable requirements, compounded by site constraints and coordinating a multidiscipline team. To overcome these challenges and deliver the project in accordance with State Grid requirements, CTE needed integrated substation design technology.

Leveraging Bentley's Open applications, CTE created 3D design models with structured data, simplifying analysis and calculation of engineering quantities to ensure accurate outputs. Working in a collaborative substation design environment improved data integration efficiency by 23% and shortened the design time by 10%, resulting in significant cost savings.
The 3D models were delivered in accordance with State Grid standards and will be used for intelligent construction management and substation maintenance and operations.

Tata Projects Limited

400kV D/C & M/C Kharghar - Vikhroli T/L
Location: Mumbai, Maharashtra, India

Project Playbook: Power Line Systems



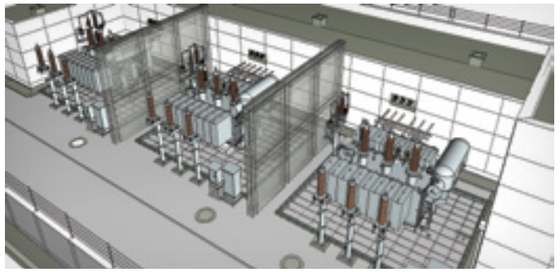
To ensure reliable power supply across Mumbai during peak demand, this transmission and distribution project will bring 4,000 megawatts of power to the city without adding more generation capacity to the city's network. Located in a dense urban area amid hilly terrain and environmentally sensitive zones, the project presented challenges routing the 36 kilometers of cable lines. Tata Projects is delivering the project and realized that they needed a comprehensive, user-friendly digital solution to accurately design the transmission lines.

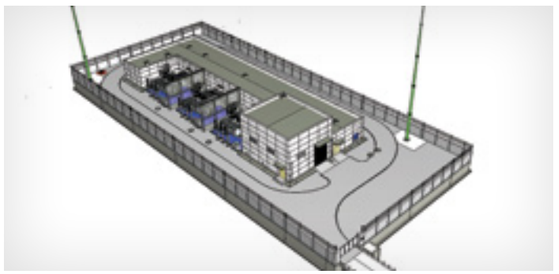
Leveraging PLS-CADD and PLS-GRID, Tata digitally simulated design scenarios to determine an optimal configuration that achieved electrical clearances, maintained right-of-way and falling distance requirements, and minimized environmental impact. Working in a collaborative design environment automated repetitive tasks and streamlined workflows, reducing resource hours by 25% and project costs by 10%. Using the 3D models to accurately estimate material quantities saved steel and concrete elements, reducing the project's carbon footprint by 10%. Through digital modeling and visualization, Tata provided stakeholders a clear and realistic project representation, enabling better understanding and decision making throughout the project lifecycle.

Xingtai Electric Power Engineering Co., Ltd.

3D Design Project of Eastern Renxian County
Location: Xingtai, Hebei, China

Project Playbook: OpenBuildings, OpenRoads, ProjectWise, Promis.e, ProStructures





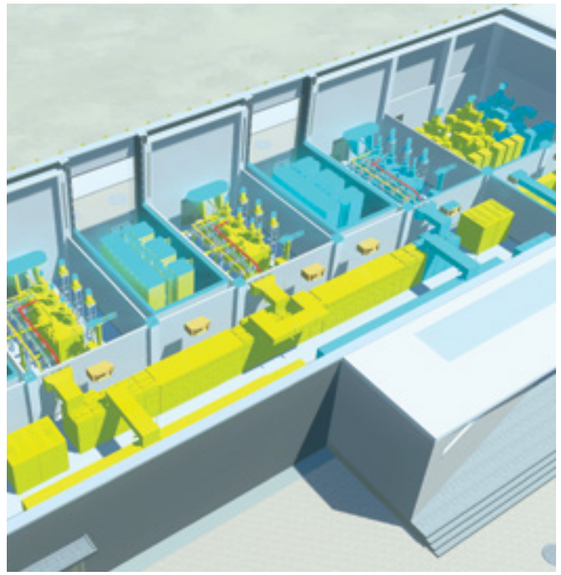
This project involves designing and constructing a substation in the Hebei province that includes three units of 50 megavolt-ampere transformers, three 110-kilovolt transmission lines, 36 10-kilovolt outgoing lines, a device building, and ancillary equipment.
The multidiscipline project presented coordination challenges, compounded by requirements to meet State Grid 3D standards for digital deliverables. To meet the multidiscipline engineering needs and digital specifications, the institute required an integrated digital substation design solution.

Leveraging ProjectWise and Bentley's Open applications, the institute established a connected substation design environment, streamlining data integration and design workflows, and ensuring quality management. Using Bentley's applications for 3D modeling and simulation improved installation efficiencies by 50%. Working in a collaborative modeling platform facilitated clash detection, reducing design errors and improving design accuracy, shortening the drawing review time by 50%. The 3D design model can be linked to the construction schedule to dynamically visualize and adjust the construction plan and project progress in real time.

Cangzhou Tongxing Electric Power Design Co., Ltd.

3D Design Project of Weizhuang 110kV Substation
Location: Cangzhou, Hebei, China

Project Playbook: Bentley LumenRT, OpenBuildings, OpenUtilities, ProStructures



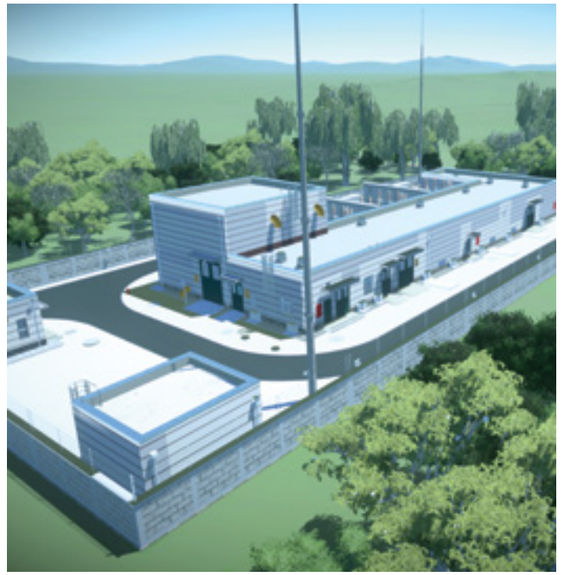
Located in Cangzhou, the Weizhuang 110-kilovolt substation features two main and two grounding transformers, two 110-kilovolt and 14 10-kilovolt outgoing cable lines, and four sets of capacitors. The project presented complex terrain and surrounding structures that needed to be considered in the design to ensure safety and reliability of the plant. To address these challenges, the team needed an integrated digital substation technology solution.

Leveraging Bentley's Open applications, the team designed the cable lines and substation building, realizing an accurate routing and layout to accommodate the topography and surrounding structures. The 3D digital solution facilitated integration of electrical and structural design, improving design quality and efficiency, reducing the need for on-site modifications during construction. Working in an integrated design platform improved coordination by 45% and reduced modeling time by 30% to shorten the design period by 40 days. By establishing a 3D digital context, the project minimized impact on the environment and has become a benchmark for intelligent engineering management.

Hengshui Electric Power Design Co., Ltd.

3D Digital Design of 110kV Indoor Substation in Park
Location: Hengshui, Hebei, China

Project Playbook: OpenBuildings, OpenRoads, ProjectWise, Promis.e, ProStructures



To help improve the power grid structure of urban areas in Jizhou and meet load growth demand, a new 110-kilovolt substation is being built. The project includes 3.7 kilometers of transmission lines and the construction of buildings, foundations, roadways, and pipelines. Faced with site constraints, coordinating multiple engineering disciplines, and massive data management, the project team needed integrated substation design technology.

The team used OpenRoads to establish a 3D digital model of the site, accurately fitting the inbound road in accordance with the terrain.

Using OpenBuildings Designer, they modeled the buildings, ancillary equipment, and underground structures, then performed collision detection to optimize site layout. Working in a collaborative design environment streamlined data management and modeling, improving data integration efficiency and exchange processes by 20% and 30%, respectively, and reducing modeling time by 12%. The 3D models are being used to simulate the construction process, facilitating digital management of the entire project, reducing on-site errors and saving significant time and costs.

Hengyang Yanneng Electric Power Survey, Design & Consulting Co., Ltd.

3D Digitized Design Project of Construction Drawing of Hengyang Jinlan Substation
Location: Hengyang, Hunan, China

Project Playbook: Bentley LumenRT, Bentley Raceway and Cable Management, iTwin Capture, OpenBuildings, OpenUtilities, ProStructures

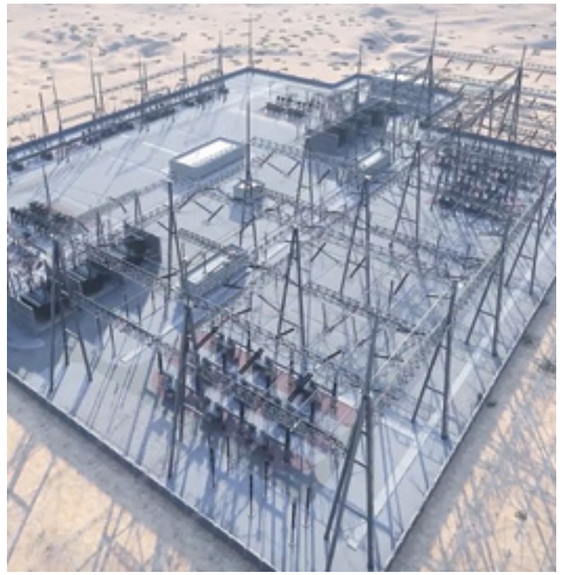
The Jinlan 110-kilovolt substation project extends and transforms the distribution network in Southwestern Hengyang, as well as increases the 35-kilovolt load power supply capacity in Xiangjiang District, improving and stabilizing power supply in the region. To accommodate the complex terrain and topography and coordinate the multiple engineering disciplines, the project team sought to implement lifecycle 3D digital design and information integration. They realized that they needed an integrated and advanced technology solution.

Leveraging Bentley's Open applications, the team established 3D BIM and coordinated design processes to achieve discipline management and optimize the substation layout. Working in an integrated digital design platform improved overall design efficiencies by 45% and enabled the project to realize intelligent, information-based management. Through advanced modeling and simulation, the team reduced modeling time by 55%, shortened the construction cycle by 35 days, and eliminated waste and repeated application of resources. The project provides a successful example of digitalization and sustainable development in Shanxi's power industry that is reproducible on other engineering projects.

Inner Mongolia Electric Power Survey and Design Institute Co., Ltd.

Application of Digital Design in the Wuda North 550kV Substation
Location: Wuhai, Inner Mongolia Autonomous Region, China

Project Playbook: Bentley LumenRT, Bentley Raceway and Cable Management, OpenBuildings, OpenRoads, ProjectWise, Promis.e, ProStructures



Located along the edge of a planned urban area, the Wuda North 550-kilovolt substation site has been built on currently vacant land with a natural sloping terrain of 2.5% at an elevation of approximately 1,120 meters. The multiple disciplines and various technology platforms presented collaboration and data integration issues, compounded by requirements to optimize resources. To overcome these challenges, the institute needed to establish a connected data and digital design environment.

Leveraging Bentley's integrated modeling applications with ProjectWise, they developed a collaborative substation design platform, streamlining workflows and optimizing the design scheme to shorten the design cycle and save space. Working in a coordinated 3D digital environment facilitated clash detection and accurate material quantities extractions, reducing the main building area by 47.47 square meters and the cable trench engineering quantity by 353 meters. The 3D substation model will be used to support future renovation works and equipment monitoring and maintenance.

Inner Mongolia Electric Power Survey and Design Institute Co., Ltd.

BIM Application in the Digital Design of Wanli 220kV Substation
Location: Ordos, Hohhot, China

Project Playbook: Bentley LumenRT, Bentley Raceway and Cable Management, MicroStation, OpenBuildings, OpenRoads, OpenUtilities, ProjectWise

Located at an altitude of 1,520 meters and covering a total construction area of 4,850 square meters, Wanli substation is the first fully indoor 220-kilovolt substation constructed by Ordos Power Supply Company. The project presented site constraints arranging the complex cable routing and coordination challenges among the multidiscipline team. The institute tried using traditional CAD software to resolve these issues, but found these lacked the necessary modeling, analysis, and project management capabilities. To achieve smart design and construction workflows, they realized that they needed a comprehensive, integrated technology solution.

Leveraging ProjectWise and Bentley's Open applications, they established a connected digital data environment. The 3D substation design solution optimized the design plan, shortening project completion time by 20% and saving approximately CNY 348,300 in land costs. Working in an integrated digital platform streamlined workflows and facilitated accurate simulations to simplify construction and minimize wastage, reducing cable material usage by 24%. The project is expected to reduce carbon emissions by 300 tons and save 10% in energy consumption.

State Grid Tianjin Electric Power Survey, Design & Consulting Co., Ltd.

Digital Design Project for the Tianjin Eco-city 220kV Substation Project
Location: Tianjin, China

Project Playbook: OpenBuildings, OpenRoads, ProjectWise, Promis.e, ProStructures

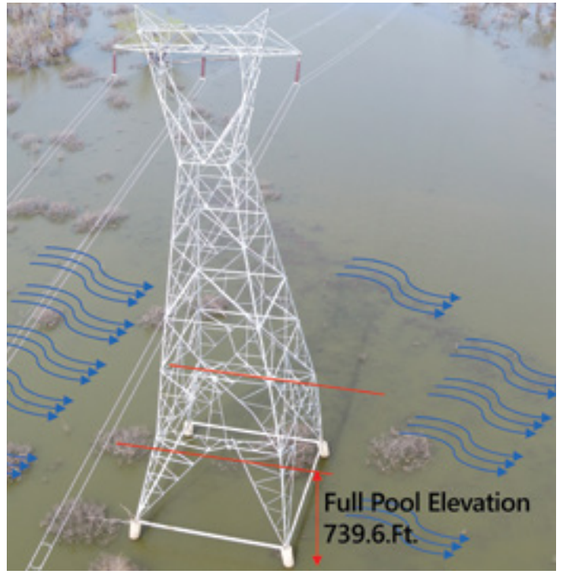
Aiming to achieve a comprehensive energy hub, this substation project includes construction of a data center station, microgrids, charging stations, a photovoltaic station, and a 5G communication base station that will ultimately provide transformation capacity of 960,000 kilovolt-amperes to ensure reliable power supply for surrounding industrial parks. With the 330-kilo-watt distributed photovoltaic power station producing 310,000 kilowatt hours of clean electric energy, the project will reduce carbon emissions by 260 tons. Given the project scale, complex grid structure, and multiple disciplines working on the project, the team needed an integrated digital design and construction management solution.

Leveraging ProjectWise and Bentley's open modeling applications, the team facilitated collaborative and refined 3D modeling, ensuring accuracy and consistency across civil, structural, and electrical design disciplines. Through coordinated modeling and simulation, the team reduced design errors and minimized risks of on-site changes. The integrated digital substation solution streamlined design and construction workflows, enabling them to deliver the project 10 days ahead of schedule and save CNY 1 million in costs.

Exo Inc.

Evergy Power Transmission Tower Stabilization
Location: Clinton, Missouri, United States

Project Playbook: iTwin Capture, Power Line Systems



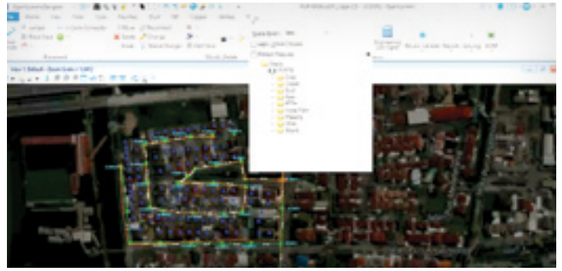
During a regular inspection, the team learned that a critical 161-kilovolt overhead transmission tower had been damaged during a recent flood. This particular line was serving power to several area hospitals that were at full capacity during the pandemic. Loss of power would have been catastrophic to the area. Exo was tasked with conducting a survey of the tower to assess its condition. However, the line needed to remain energized, requiring the team to find a safe but still efficient workflow.

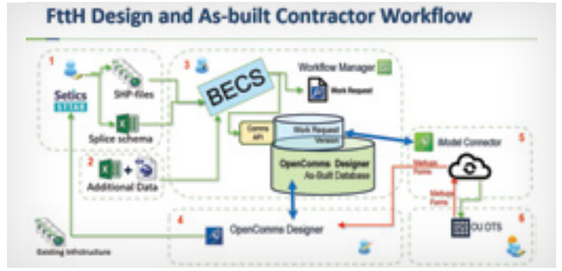
Exo selected Bentley's iTwin Capture to accurately survey the deflected shape of the structure. Meanwhile, Bentley's Power Line Systems was used to efficiently model the power lines and latticed steel support structures as a system. The applications allowed Exo to create a digital twin and design a stabilization solution so that the line could remain in service. By using Bentley applications, the team saved four to six weeks in surveying time. Exo saved lives by stabilizing the structure to avoid a potential long power outage during the pandemic.

PT iForte Solusi Infotek

Fiber to the Home (FTTH) Integrations & Automation with Multiple Systems with Bentley BECS
Location: Indonesia

Project Playbook: OpenComms





To meet growing demands for high-speed internet in Indonesia, iForte initiated a project to improve and expand the country's fiber to the home (FTTH) network through automated data workflows. The project requires multiple features, systems, and support from various stakeholders. To integrate and automate the equipment and processes, iForte realized that they needed comprehensive telecommunications technology and an open and secure data platform.

Leveraging OpenComms and Bentley Enterprise Connection Services (BECS), iForte developed a new data model for their FTTH business and synchronized the pre-existing fiber network management with the new FTTH architecture. Bentley's applications provided a comprehensive solution for designing, documenting, and maintaining outside plant and inside building networks, along with racks of equipment. The digital solution automated previous manual work, saving approximately USD 300,000 to 350,000. By expanding FTTH to millions of homes, the project supports the future digital direction of the country.

Baoding Jida Electric Power Design Co., Ltd.

Yejie 110kV Substation Digital Handover Project in Mancheng District, Baoding City
Location: Baoding, Hebei, China

Project Playbook: Bentley LumenRT, Bentley Raceway and Cable Management, OpenBuildings, OpenRoads, OpenUtilities, ProjectWise, Promis.e

To improve operating efficiency, reliability, and safety of the power grid, the Yejie 110-kilovolt substation is being upgraded to a digital facility. The scope of the works included digitizing the existing equipment as well as establishing a digital management platform and intelligent monitoring system for real-time data collection, transmission, and analysis. Faced with a complex equipment layout and coordinating multiple disciplines on a tight timeline, the project team found that initial engineering design and management software lacked data processing efficiencies, 3D modeling precision, and project management synergy.

The team selected OpenUtilities Substation and ProjectWise to generate 3D models and a digital twin of the substation and equipment, as well as establish a collaborative digital platform for real-time design updates and data sharing. Bentley's integrated technology accelerated accurate configuration of the digital substation and improved data management, reducing modeling time by 20% and enhancing data integration efficiencies by 60%. The digital substation helps precisely monitor and manage energy use, reducing the facility's energy consumption to save 80 tons of carbon emissions.

Representatives of Southwest Electric Power Design Institute Co., Ltd. of China Power Engineering Consulting Group accept the award in the Transmission and Distribution category of the 2024 Going Digital Awards.

WATER & WASTEWATER

This category recognizes projects that have demonstrated excellence and digital advancements in planning, modeling and analysis, design, construction, operation, or water infrastructure maintenance.

Winner: Going Digital Award in Water and Wastewater

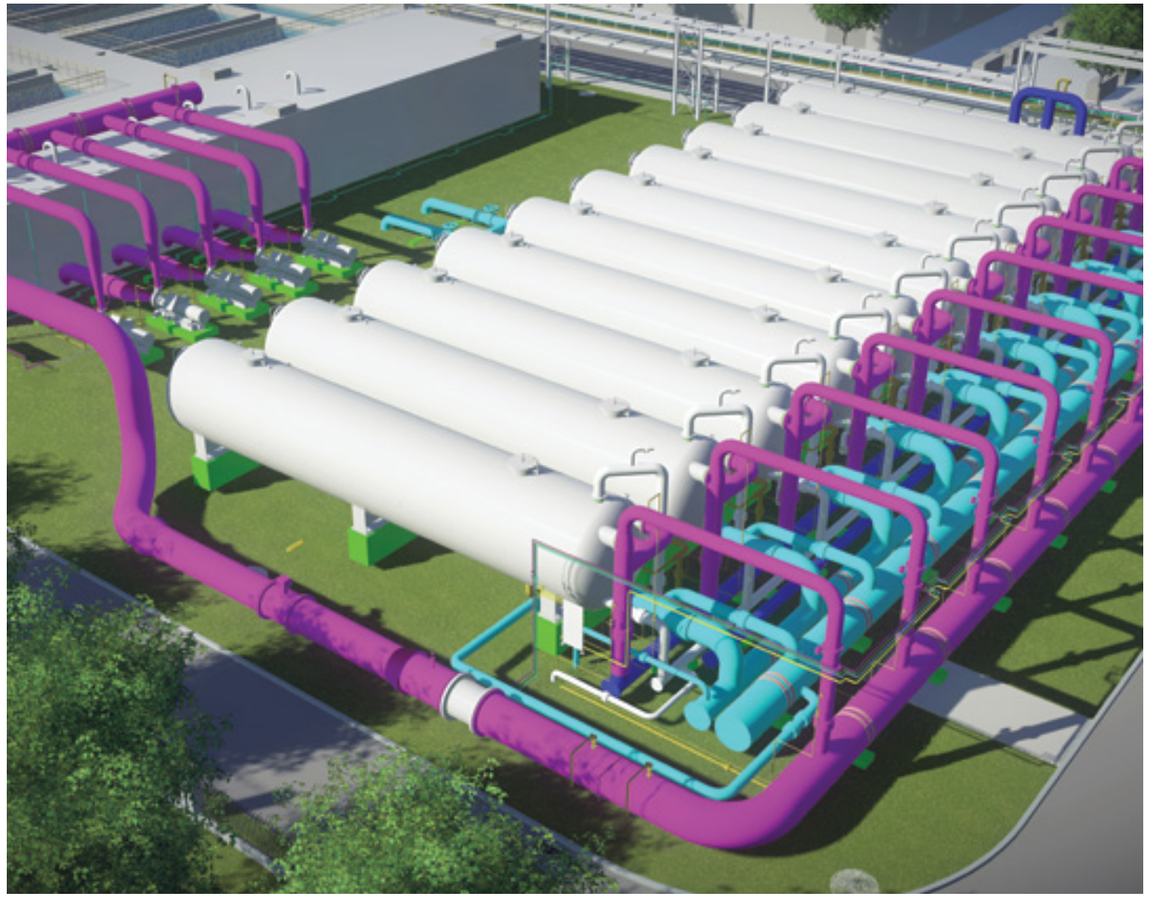
Companhia de Saneamento Básico do Estado de São Paulo - Sabesp

Integra 4.0
Location: São Paulo, Brazil

Project Playbook: OpenFlows

To ensure reliable access to clean water across 375 municipalities in São Paulo, Brazil, SABESP initiated a project to integrate water supply, sewage, and sanitation data in a single digital environment. Known as Integra 4.0, the program is an operational management model, combining business intelligence with AI for proactive network monitoring and maintenance to quickly identify and resolve system issues. Faced with land use, technical, and coordination challenges on a short timeline, SABESP integrated hydraulic modeling and analysis software to develop their systemic approach.

Leveraging OpenFlows applications, SABESP developed hydraulic models for their sewage and water supply systems. This enabled the creation of digital twins. Using real-time data for monitoring ensured integrated, accurate, and efficient management of water resources, as well as proactive maintenance of network infrastructure. Establishing an open, connected data environment has already resulted in a 30% reduction in overflows and backflows, ensuring pollution control of the Tietê river. Within a seven-month period, the digital twin saved approximately BRL 3.1 million in corrective maintenance, reduced corrective services by 30%, saved 2,800 hours of field work, and lowered carbon emissions.



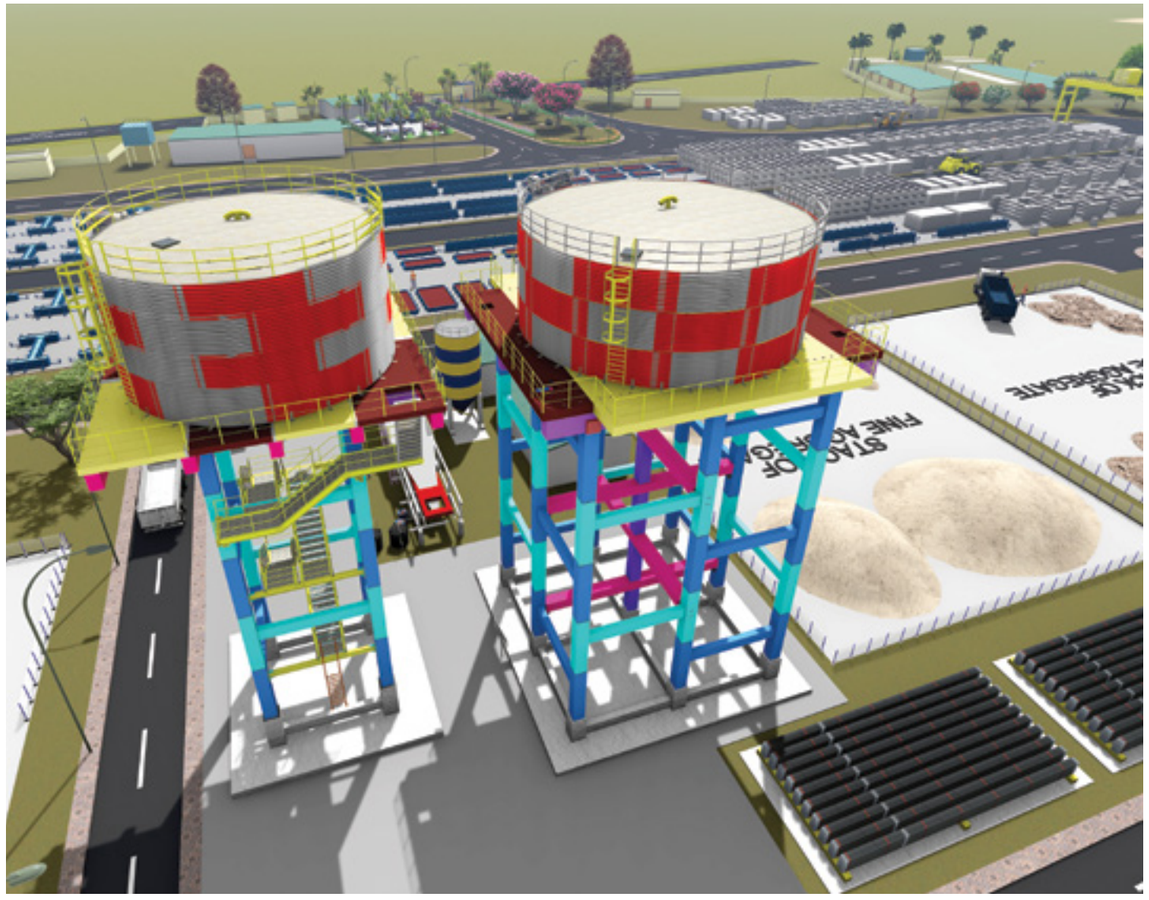
Beijing Shougang International Engineering Technology Co., Ltd., Wanhua Chemical (Penglai) Co., Ltd.

300,000 Tonnes/Day Seawater Desalination Project
of Wanhua Chemical (Penglai) Co., Ltd.
Location: Yantai, Shandong, China

Project Playbook: AutoPIPE, Bentley LumenRT, Bentley Raceway and Cable Management, MicroStation, OpenFlows, OpenPlant, OpenRoads, ProjectWise, SYNCHRO

The seawater desalination project of Wanhua Chemical aims to support an environmentally friendly, low-carbon chemical park and alleviate freshwater resource constraints, providing Pengali with 90 million tons per year of freshwater resources. Located on the seashore, the project presented poor geological conditions, compounded by complex desalination processes and equipment, along with data integration and exchange challenges. Therefore, the project team wanted to pilot BIM workflows to deliver the seawater desalination plant.

Leveraging ProjectWise, OpenPlant, and OpenFlows, they established a collaborative BIM environment, modeled the plant and equipment, and simulated and analyzed water hammer and pipeline stress to ensure the safety and reliability of the system. Bentley's integrated digital solutions streamlined workflows to improve design efficiency by 70% and shorten the design cycle by more than 50%. Working in a connected digital platform, they identified and resolved 247 design conflicts, saving 10% of materials to reduce engineering waste and shorten the construction period.
The 3D models provide the foundation for intelligent digital seawater desalination operations.



L&T Construction

Uttar Pradesh Tube Well Project under Jal Jeevan Mission
Location: Uttar Pradesh, India

Project Playbook: OpenFlows, STAAD

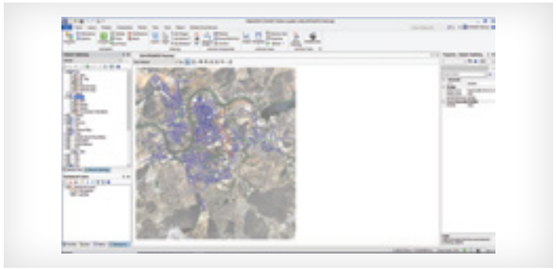
The Uttar Pradesh Tube Well aims to provide safe and adequate drinking water to rural households in India through 1.7 million household connections serving 6.8 million people. L&T Construction was tasked with designing and executing over 3,000 overhead tanks across scattered rural villages in a limited timeframe. To evaluate and determine an optimal construction method, L&T Construction needed an integrated BIM, structural, and hydraulic modeling solution.

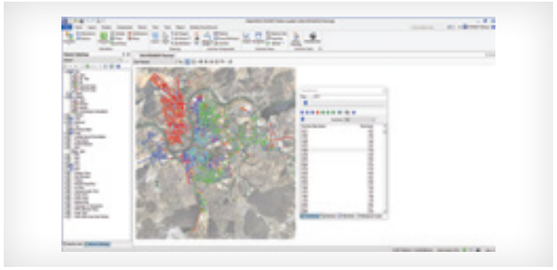
Utilizing 3D BIM technology with STAAD and OpenFlows, L&T Construction designed the distribution network and decided to use the precast method of construction for better quality control and risk management, compared to traditional on-site concrete pouring. Through digital modeling and analysis, the team streamlined and standardized design workflows and drawings for 600 design variants and saved 90% in construction time.
L&T Construction also reduced material waste and energy consumption, minimizing the project's environmental footprint. The project sets a benchmark for digitization of future rural infrastructure projects.

Companhia Pernambucana de Saneamento - COMPESA

Advanced Modeling for Optimal Chlorine Dosage in WTPs
Location: Afogados da Ingazeira, Pernambuco, Brazil

Project Playbook: OpenFlows





Much of the drinking water in the Brazilian state of Pernambuco comes from surface springs, which have a high concentration of iron, manganese, and organic matter. As a result, water treatment organization Companhia Pernambucana de Saneamento must use different methods of disinfection. The organization frequently performs checks of their systems at various points, but changing conditions can lead to errors in the use of disinfectant materials. To remedy the problem, COMPESA sought improved water analysis in the city of Afogados da Ingazeira.

Using OpenFlows, COMPESA created a simulation of the city's entire 120-kilometer water network. The simulation now indicates which points in the network have low levels of chlorine, enabling the organization to quickly remedy water content issues and keep water quality high. Better knowledge of current conditions allows engineers to make more precise purification adjustments, resulting in reduced chlorine use and cost savings. COMPESA plans to establish simulations for the entire state, which will reduce expenses by an estimated BRL 4,000 per year.

Sanepar - Paraná Sanitation Company

Continuous Improvement of Services and Reduction of Environmental Impacts and Social Benefits in Toledo
Location: Toledo, Paraná, Brazil

Project Playbook: OpenFlows

Water utility Sanepar wanted to improve its water services in the city of Toledo, home to 115,000 people. Over time, the water system developed high levels of losses, both low and high pressures, and intermittent supply. The organization worked for years to improve their Toledo system, and as time passed and technology progressed, they sought digital solutions that could better strengthen water services in that area.

After exploring potential applications, they adopted OpenFlows Water, as it enabled them to quickly create, analyze, and calibrate hydraulic models, and could easily integrate with geospatial and SCADA information. As a result of improved visibility into their water system that helped them detect leaks and regulate water pressure, Sanepar saved money while lowering energy consumption and carbon emissions. Between 2014 and 2023, customer complaints fell by 79.5%, and the loss rate per connection fell by 102.38 liters. The company now wants to use the model as a basis for a full digital twin, which would incorporate low-cost, real-time leak detection alerts.

Qingdao Yanbo Data Information Technology Co., Ltd.

Digital Twin System of Long-Distance Water Transfer Pipe Network for the Project of Transferring Water from Yellow River to the East Regions
Location: Qingdao, Shandong, China

Project Playbook: OpenFlows

The city of Qingdao frequently experienced water supply contractions. As a result, the local government decided to use the Yellow River as a new water source. This project, which would establish a dual-route reservoir, required building a 120-kilometer pipeline network. Qingdao Yanbo Data Information Technology Co., developer of the project, faced a long list of challenges and requirements for the complex project, including protection against water hammer, elevation differences, full lifecycle management, and reliability. They wanted to build a digital twin of the water system but needed insight into its future performance.

The organization determined OpenFlows Water would enable them to create a full hydraulic simulation of the proposed water system. The application enabled them to verify the desired pressure, then test conditions that could potentially cause water hammer events. With this insight, engineers could explore countermeasures to prevent damage and ensure continual service. This simulation supported the development of a digital twin of the full water system, enabling them to reduce energy, ensure reliability, and manage the full project lifecycle with the addition of a smart dispatching system.

Maynilad Water Services, Inc.

Early Energization of Poblacion Water Treatment Plant
Location: Muntinlupa, Philippines

Project Playbook: OpenFlows

Maynilad Water Services faced significant water supply constraints due to limitations in water availability. Despite ongoing efforts to mitigate the issue, the construction of a pivotal solution, the Poblacion Water Treatment Plant, faces challenges, notably in the timing misalignment between the treatment plant's progress and that of the distribution system. In response, the organization has proposed temporarily distributing water from the plant, requiring quick integration with the existing network. However, integrating various components poses its own set of hurdles, including optimizing pump capacities and network distribution.

Maynilad Water used OpenFlows Water to create a hydraulic model of the proposed plan. As a result, they reduced trial-and-error processes for scenarios from 75%, lowering the number of proposed scenarios from 12 to 3. The streamlined approach also decreased the frequency of issues encountered during tests of the system.

SYSTRA India

Global City, Gurugram
Location: Gurugram, Hariyana, India

Project Playbook: OpenFlows, OpenRoads, STAAD

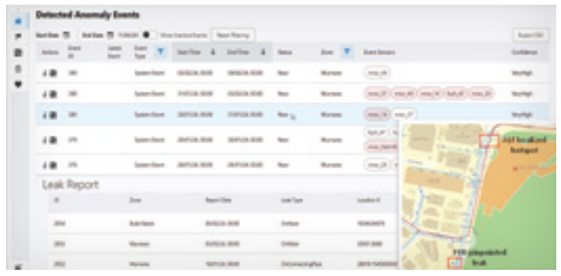
Global City is a 1,000-acre project in Gurugram, India that will include workspaces, residential towers, modern retail spaces, and green spaces, including water bodies. SYSTRA India was tasked with planning and designing the underground infrastructure for this project, including a potable water supply network, recycled water network, and sewer and storm water networks. With so many different networks all intertwined underground, it was essential to ensure that none of the networks clashed and that they were easily executable by the construction company. Therefore, SYSTRA India sought digital solutions.

SYSTRA India selected OpenFlows applications to develop optimized hydraulic models of the water, sewer, and storm networks. These models were then integrated into OpenRoads to detect and rectify utility clashes. By resolving these clashes early, the team reduced design time by 60%, compared to conventional 2D planning methods. Analyzing the virtual 3D model with Bentley applications also reduced on-site problems by 90%, reducing rework to directly save construction costs and time while reducing the project's overall carbon footprint.

PUB, Singapore's National Water Agency

High Fidelity Digital Twin-enabled Anomaly Detection and Localization in Singapore
Location: Singapore

Project Playbook: iTwin, OpenFlows



As part of their Smart Water Grid (SWG) program to monitor more than 6,000 kilometers of Singapore's pipeline, PUB initiated a grid anomaly detection and localization project for near real-time analysis of SWG monitoring data and detection and localization of anomaly events. While permanent sensors offer 24/7 monitoring, anomaly and leak detection practices still required biannual costly, labor-intensive network surveys. To make their anomaly and leak detection practice more cost effective, PUB sought a machine learning-based, data-driven approach.

Leveraging Bentley's iTwin and OpenFlows applications with AI and machine learning, PUB developed an integrated anomaly leak finder technology solution, using hydraulic models recalibrated daily with monitoring data to generate a high-fidelity digital twin. Since January 2024, it has led to the detection of two significant underground leaks, alerting PUB's leak detection crew and localizing the leaks to less than one kilometer. The intelligent digital twin solution shifted PUB's previous time-driven network surveillance schedule to data-driven, reducing total workforce costs, supporting proactive processes, and redefining the concept of high-fidelity digital twins for smart water grids.

SYSTRA India

Improvement of Existing Sewer Network, Chennai
Location: Chennai, Tamil Nadu, India

Project Playbook: OpenFlows

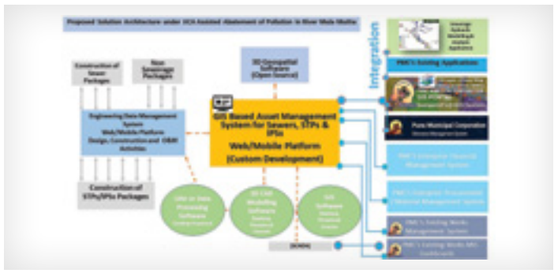
As the capital city of Tamil Nadu, Chennai is one of the largest metropolitan economies in India and also one of the most visited Indian cities. With a large population of both residents and tourists, the government sought to improve the existing sewerage system. SYSTRA India was tasked with analyzing existing network data for approximately 3,000 kilometers of sewer pipes, 230 pumping stations, and four sewerage treatment plans with a total capacity of 601 megaliters per day. This vast amount of data, coupled with multiple file types, meant that the team needed to find a digital solution.

SYSTRA India chose OpenFlows to analyze and optimize the network. They used the application to create models of each gravity network, varying from 20 to 2,000 conduits, by importing the shape files of all components. Because these files have many attributes, using the application's model builder helped incorporate only the most important attributes into the model. The team was then able to check for pre-defined and client-defined queries. The design was completed in January 2024.

NJS Engineers India Pvt. Limited

JICA Assisted Abatement of Pollution in River Mula Mutha in Pune
Location: Pune, Maharashtra, India

Project Playbook: AutoPLANT, Bentley LumenRT, GeoStudio, iTwin, OpenCities, OpenFlows, ProjectWise, STAAD



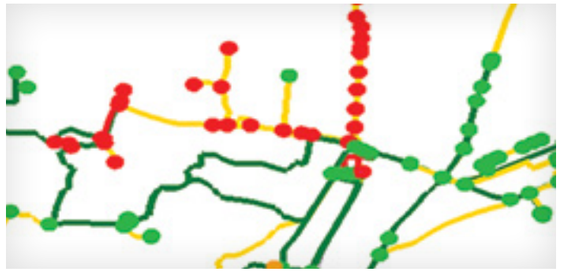
To improve the water quality of the Mula Mutha River in Pune, NJS Engineers was tasked with designing and overseeing construction of new sewers that meet the highest standards. The goal is to reduce pollution entering the river by collecting and properly treating sewage. However, the team had to assess the current conditions and provide recommendations for improvement within a very short time frame.

NJS Engineers used OpenFlows, OpenCities, and STAAD to import SCADA data into a digital model of the design. ProjectWise helped the design and construction teams review the design and provide recommendations while monitoring construction. Bentley applications helped save 30 resource months and reduced project costs by INR 240,000 as of April 2024.

NJS Engineers India Pvt. Limited

JICA Assisted Agra Water Supply Project
Location: Agra, Uttar Pradesh, India

Project Playbook: AutoPIPE, AutoPLANT, Bentley LumenRT, iTwin, OpenCities, OpenFlows, ProjectWise, STAAD



NJS Engineers was tasked with constructing aqueduct facilities in Agra to provide safe, reliable water. The team needed to extend existing water facilities by creating a 144 megaliters-per-day (MLD) advanced water treatment plant, a 370-MLD sediment tank, and a 130-kilometer transmission main, as well as rehabilitating two existing water treatment plants. The team realized that previous software didn't work in an integrated environment, causing them to search for another solution.

NJS Engineers chose Bentley applications to develop an online portal that contains all the GIS-based data, statistics, and other information. OpenFlows helped create the models, reducing large-scale drawings by 55% and INR 300,000 on the project. The applications also helped save 300 resource hours throughout the project and 160 resource months during construction. Completed in 2022, the project is making Agra a healthier, safer community.

NJS Engineers India Pvt. Limited

JICA Assisted Guwahati Water Supply Project
Location: Guwahati, Assam, India

Project Playbook: AutoPLANT, Bentley LumenRT, GeoStudio, iTwin, OpenCities, OpenFlows, ProjectWise, STAAD

Guwahati is the largest city in India's northeastern region. Therefore, NJS Engineers sought to provide a 24×7 potable water supply that covers 100% of its citizens, upgrading living standards. The team was tasked with constructing two intake wells, 30 kilometers of transmission mains, and a 1,155-kilometer distribution network. The organization realized that manual methods were no longer sufficient.

NJS Engineers used OpenFlows to review the hydraulics for the entire design on a uniform GIS platform, as well as conduct a surge analysis. ProjectWise helped the client receive and view the models, facilitating access to engineering data. OpenFlows allowed the organization to complete the redesign within a tight timeline while saving 4% in overall project cost. The surge analysis also helped save 1% in costs by removing unnecessary safety valves. By going digital, NJS Engineering saved 12,000 work hours.

Maynilad Water Services, Inc.

Leak Detection at Zobel Roxas/Osmeña using OpenFlows
Location: Makati, Manila, Philippines

Project Playbook: OpenFlows

In early 2023, Maynilad Water detected a leak in their primary line that runs along Zobel Roxas and Osmeña. The line has an average flow of over 128 million liters per day and serves over 500,000 customers. The leak was emitting 30 million liters per day, making it a high priority to fix. Five potential leak locations were found, but physically inspecting them would cost significant time and money. Therefore, Maynilad Water sought a hydraulic modeling solution to reduce the inspection locations.

Already familiar with Bentley applications, the team used OpenFlows to analyze the available flow and pressure data and create a simulation. They reduced the potential breakage points to one location, which was confirmed to be the correct location after a physical inspection. The team was then able to inform residents ahead of time to stock up on water ahead of the repair. OpenFlows reduced work hours in the field by 80% and saved PHP 9.88 million in inspection, repair, and fieldwork.

Maynilad Water Services, Inc.

Network Design using OpenFlows Water for Distribution of Direct Potable Reused Water
Location: Valenzuela, Metro Manila, Philippines

Project Playbook: OpenFlows

To manage the dwindling resources of fresh water and to rise to the challenges brought by climate change, Maynilad Water Services sought to find other sources of water. The team determined that water reclamation facilities could help and used the Parañaque Reclamation Facility as its pilot project. The main challenge was ensuring that the clean, potable water from this facility reached customers throughout the distribution network.

Already familiar with Bentley applications, Maynilad chose OpenFlows Water. Data collected from the field was used to calibrate the network model and provide projected changes in pressure and supply conditions. The ability to make updates in real time helped overcome the ever-changing requirements of the project. With its launch, the system provides an additional 10 million liters of water to Maynilad's network and an estimated annual revenue of USD 2.21 million in its influence area. Fueled by this success, the team plans to put up more new water facilities throughout its service area.

Basic Sanitation Company of the State of São Paulo

Operational Restructuring of Latin America's Most Economically Active Sector
Location: São Paulo, Brazil

Project Playbook: OpenFlows

Sabesp provides sewerage services in the city of São Paulo. The water network in the city's upscale Jardins district is aging, with a water loss rate of 34.1%, and requires constant engineering work. Additionally, the district experiences heavy traffic, contains infrastructure that can interfere with sewer systems, and is subject to restrictions, making it a complex area to perform construction work. Yet the organization had to determine how to improve water availability and quality while reevaluating energy use.

Sabesp used OpenFlows Water to create a hydraulic model of the water system in the area. With a holistic view, the organization could consolidate once-separate engineering projects to determine more effective ways to alleviate problems in the water system. Despite the complex conditions in Jarins, Sabesp finished modeling and calibration work within eight months, half the time needed if it were done manually. By reducing water shortage complaints and improving energy efficiency, the organization now saves BRL 385,720 per month while reducing carbon emissions by 4.54 tons per year.

Acueducto Metropolitano de Bucaramanga S.A. E.S.P.

Optimizing Water Distribution in the Face of the Climate Crisis: Loss Reduction and Energy Efficiency in Colombia
Location: Bucaramanga, Santander, Colombia

Project Playbook: OpenFlows

Acueducto Metropolitano de Bucaramanga operates and manages the drinking water system in Bucaramanga. In 2023, estimated water losses due to leaks in their system reached 914,72 cubic meters. In early 2024, the metro areas faced extreme weather and fires along the rivers that supply water to the city, highlighting the need to manage water resources more effectively without resorting to rationing water to residents in other cities in Columbia. Their solution was to create a hydraulic model of the water system, though calibrating the system with limited equipment proved challenging.

After exploring several options, the utility chose OpenFlows Water to model the water system. With it, they accurately and quickly modeled the behavior of the water system. By integrating it with other water applications, the team could use existing workflows while in the field and lower the time required to synchronize the collected data. OpenFlows helped them reduce the time needed to create the citywide model by 1,540 hours. With the system in place, Acueducto Metropolitano de Bucaramanga has lowered water loss by 7,000 cubic meters per month.

Larsen & Toubro Ltd.

Raw Water Treatment Plant, DM Water, Condensate Polishing Unit, Effluent Treatment Plant with ZLD and Sewage at Talcher (Talcher Fertilizers Limited)
Location: Loc Talcher, Odisha, India

Project Playbook: STAAD

As part of a coal gasification and ammonia-urea plant, Larsen & Toubro was tasked with developing a raw water treatment plant, which will incorporate demineralization, condensate polishing, and effluent treatment. The project site faced significant space restrictions due to nearby roads and drains, potential seepage from drainage posed the danger of collapsing a side wall, and the removal of ash at the project site caused significant changes in the ground profile, impacting the engineering schedule. Manual designs and calculations could not overcome the project's challenges.

Larsen & Toubro used STAAD.Pro to improve the overall efficiency of the project. Design teams could create a resilient foundation quickly, reducing the time needed to determine the optimal solution. They quickly created 3D designs for steel structures that could be easily extracted into third-party applications. The finished design eliminated the need for 1,759 metric tons of reinforcement material and 782 metric tons of structural steel, saving approximately 6,000 work hours. Accurate analysis, along with error detection and correction, significantly improved the quality of deliverables.

Aquatim SA

(Re)building the Hydraulic Model for the Water Distribution Network in Timișoara
Location: Timișoara, Timis, Romania

Project Playbook: OpenFlows

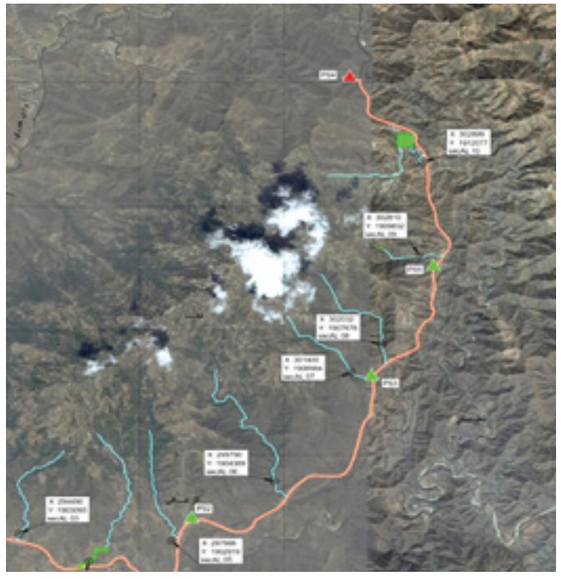
Aquatim SA was tasked with stepping up its hydraulic modeling for the water distribution network in Timișoara, located in western Romania. The USD 200,000 project involved modernizing its digital infrastructure by importing data into a model for easier visibility.

The team used OpenFlows to connect the main distribution network to the GIS system and extended the model. The application helped Aquatim integrate data seamlessly, speeding up model rebuilding by ensuring timely and efficient collaboration. The organization was able to reduce modeling time by 50%, with a 25% more efficient data federation process and a 75% more efficient data exchange process. By going digital, Aquatim saved 3,000 hours on the entire project. Expected completion in 2025, the project will ensure that all Timișoara's water network is operating at optimal efficiency.

National Water Company

Rehabilitation of Transmission Lines in Jazan
Location: Jazan, Saudi Arabia

Project Playbook: OpenFlows



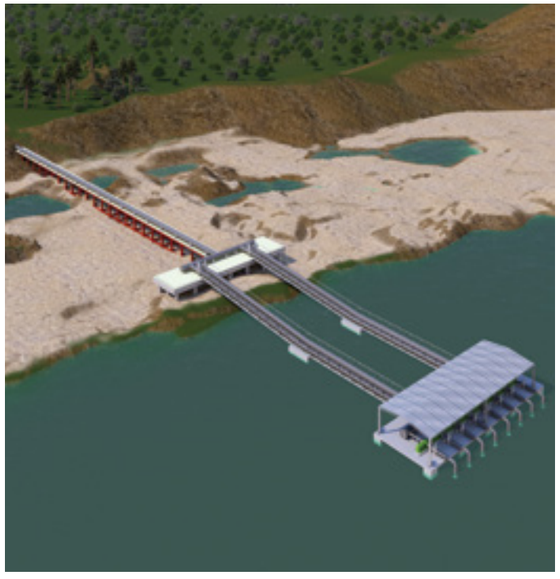
The National Water Company in Saudi Arabia wanted to conduct a modeling study for a pump station along a transmission main that delivers water to an end reservoir. The estimated USD 10 million project would analyze a 400-milimeter-diameter Ductile iron main line and a pump room with two working pumps that can direct flow into the transmission pipeline. The team was tasked with verifying the adequacy of the proposed surge protection of three bladder surge vessels, as well as whether to update a single air valve. The team sought to create an open, connected data environment for better visibility and collaboration.

The utility company used Bentley's OpenFlows applications to establish the connected data environment, which ensured that everyone had access to all the necessary information—even during the pandemic. The team then modeled the system, checked the steady state condition, and was able to solve problems early in the process. OpenFlows helped coordinate over 3 million documents totaling 5 terabytes of data, ensuring efficient collaboration among 500 project participants. The repository now provides the organization with an ongoing asset management plan.

L&T Construction, Water and Effluent Treatment IC

Sahibganj Water Supply Project
Location: Sahibganj, Jharkand, India

Project Playbook: OpenFlows, OpenRoads, PLAXIS, STAAD



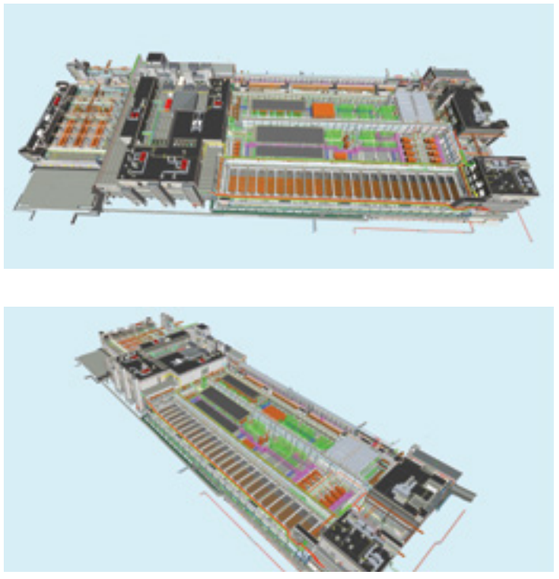
Sahibganj Water supply project will supply raw water from the Ganga River to Sundar Dam. This estimated INR 7.883 billion project includes a 2,000-kilometer pipeline network that will provide safe drinking water to the community. L&T Construction was tasked with constructing the mainline of the network in nine months, including structural analysis in just one month. Due to the undulating terrain and the river being the largest in India, the team know that traditional methods would not be sufficient.

After trying other applications and finding them too time-consuming, L&T Construction chose OpenFlows for hydraulic modeling. The application allowed the team to only input the most important information, reducing resource hours by 50%. STAAD's open platform allowed the team to automate workflows for developing repetitive structures, reducing workflows that would normally take 160 to 170 hours down to just 40 hours. The team submitted engineering plans ahead of schedule while still ensuring that all results were accurate.

UES Holdings Pte Ltd

Tuas Water Reclamation Plant
Location: Singapore

Project Playbook: OpenBuildings, OpenPlant, ProjectWise, SYNCHRO



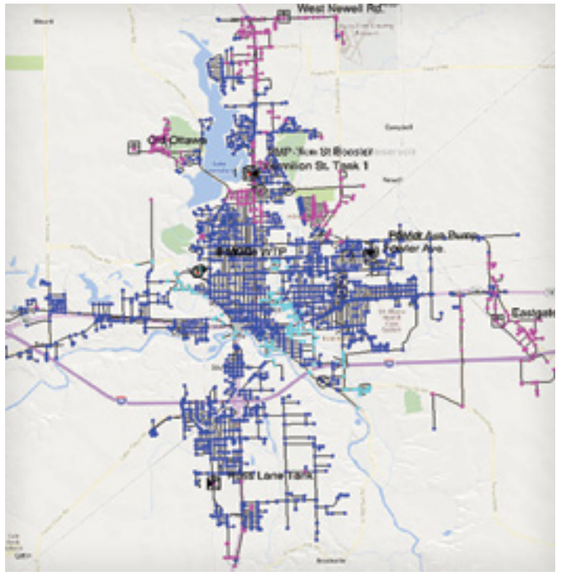
As part of efforts to meet Singapore's water needs, the country is developing the Deep Tunnel Sewerage System Phase 2, which includes the Tuas Water Reclamation Plant, a facility that can treat 800,000 cubic meters of water per day, along with a 30-kilometer south tunnel, 70 kilometers of link sewers, and 12 kilometers of deep-sea outfall. UES Holdings worked as the main contractor and subcontractor for the project, but needed to ensure their work was sustainable, energy-efficient, and resilient in the face of climate change.

UES Holdings determined that they could meet all project requirements by creating a digital twin of the project. They first modeled project elements with OpenBuildings and OpenPlant, incorporating all equipment information into the 3D models. Next, they simulated the construction process with SYNCHRO. Going digital helped them keep time and costs under control while ensuring sustainable development.

Aqua

Utilizing Bentley OpenFlows during Emergency Response in Danville, IL
Location: Danville, Illinois, United States

Project Playbook: OpenFlows



The Danville water system, which serves just under 20,000 connections, experienced rain followed by an extreme arctic blast in January 2024 that strained the treatment facility caused equipment malfunctions. As a result, water pressures fell significantly in parts of the city, causing sanitary issues. Aqua, owner and operator of Danville's water system, needed to determine which customers would be affected by water boil order, and then work with the Illinois Department of Environmental Protection on the recovery plan. They had to move quickly.

Aqua rapidly created a hydraulic model of Danville's system with OpenFlows Water. Creating a digital representation of the system revealed areas with low pressure and gave workers insight into areas that lacked data logging, preventing manual surveys and freeing the operations team to repair the treatment plant. The digital representation lowered the number of connections under boil orders to 2,076 and helped determine the time needed for system recovery. This information kept state officials and the public informed of the full impact of the problem, maintaining trust with both the public and the Department of Environmental Protection.

NJS Engineers India Pvt. Limited

Validation of Guwahati Sewerage Project DPR (JICA Assisted)
Location: Guwahati, Assam, India

Project Playbook: AutoPLANT, MicroStation, OpenCities, OpenFlows, PlantSight, ProjectWise, STAAD

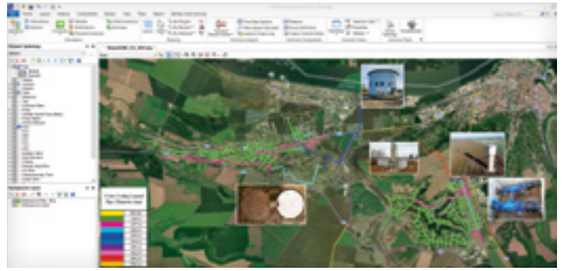
Despite being the largest city in the northeastern region of India, Guwahati did not have a sewerage system. The older parts of the city have storm drains that act as sewers, while newer parts have septic tanks but no soakage pits that are necessary to remove discharge. This situation could lead to the public health crisis, so NJS Engineers was tasked with creating an integrated sewerage system that involved five pumping stations, 18 lift stations, and a sewerage treatment plant. This complex system would be difficult to implement due to varying altitudes and needing to meet many environmental clearance standards.

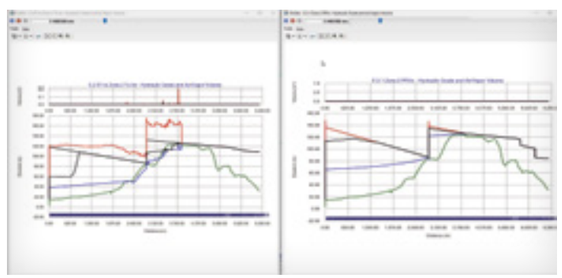
NJS Engineers used ProjectWise to develop overall transparency on the project, using digital twins created with OpenFlows to conceptualize the project to achieve maximum efficiency. Using Bentley applications helped improve collaboration while ensuring that all information shared was accurate and up to date. By going digital, NJS Engineers saved 2,200 work hours.

Engineerik

Water Supply Infrastructure Project for the Territory of Water Utility Silistra, Bulgaria
Location: Silistra, Bulgaria

Project Playbook: OpenFlows





To ensure a sustainable water supply to the villages in the Silistra area, engineering firm Engineerik was retained to reconstruct and optimize the water distribution network. As the system had aged, the project required them to reconstruct pipelines, build out service connections and meter chambers, and construct surge tanks and related facilities. At the same time, they needed to minimize water loss, improve pressure management, and boost cost-effectiveness. Engineerik explored potential hydraulic modeling software, though they lacked the capabilities required, including water hammer events.

The organization soon determined OpenFlows Water could help them address all project needs. They first created an accurate hydraulic model of the entire water distribution networks to analyze system behavior. They then tested out various scenarios that could impact the system, such as water hammer events, which helped them identify potential issues, prevent equipment damage, and ensure efficient operations. Efficient, user-friendly workflows helped Engineerik to shorten the project timeline by 30%, or two months. The improved system now dramatically reduces water losses and energy usage, lowering annual costs by EUR 120,000.

BIM Centre

Xinchuansha Pump Gate Hub Project of the Digital Twin Wusong River Project (Shanghai Section)
Location: Shanghai, China

Project Playbook: Bentley Descartes, Bentley LumenRT, iTwin Capture, MicroStation, OpenBuildings, OpenPlant, OpenRoads, ProjectWise, ProStructures, STAAD, SYNCHRO

To control flooding, improve water resource allocation, chart navigation, and improve the quality of water, the regional government moved to develop the largest pump gate hub project in the history of Shanghai's water conservancy construction. BIM Centre assumed design responsibilities for the two-way pumping station, restraining gate, and river improvements, though construction would be difficult due to the highly complex construction environment and the unusual shape of the pump gate and its complex façade.

BIM Centre determined 3D modeling and analysis with Bentley applications could help them overcome project challenges. Using MicroStation, ProStructures, and Bentley Open applications, they created a full digital twin of the project. They then tested the performance of the structure under varying conditions so that problems could be detected and resolved in advance. Digital workflows reduced calculation checking time by 80% and construction time by 15%, helping them to deliver each item five days ahead of schedule.

Representatives of Companhia de Saneamento Básico do Estado de São Paulo - Sabesp accept the award in the Water and Wastewater category of the 2024 Going Digital Awards.

Going Digital Award Winners

Scan here to explore previous winners, finalists, and nominees in our searchable catalog of *Infrastructure Yearbooks*.

FOUNDERS' HONORS

Chosen by Bentley's founders, Founders' Honors recognize exemplary projects, individuals, and organizations that reflect the company's mission of advancing the world's infrastructure for better quality of life.

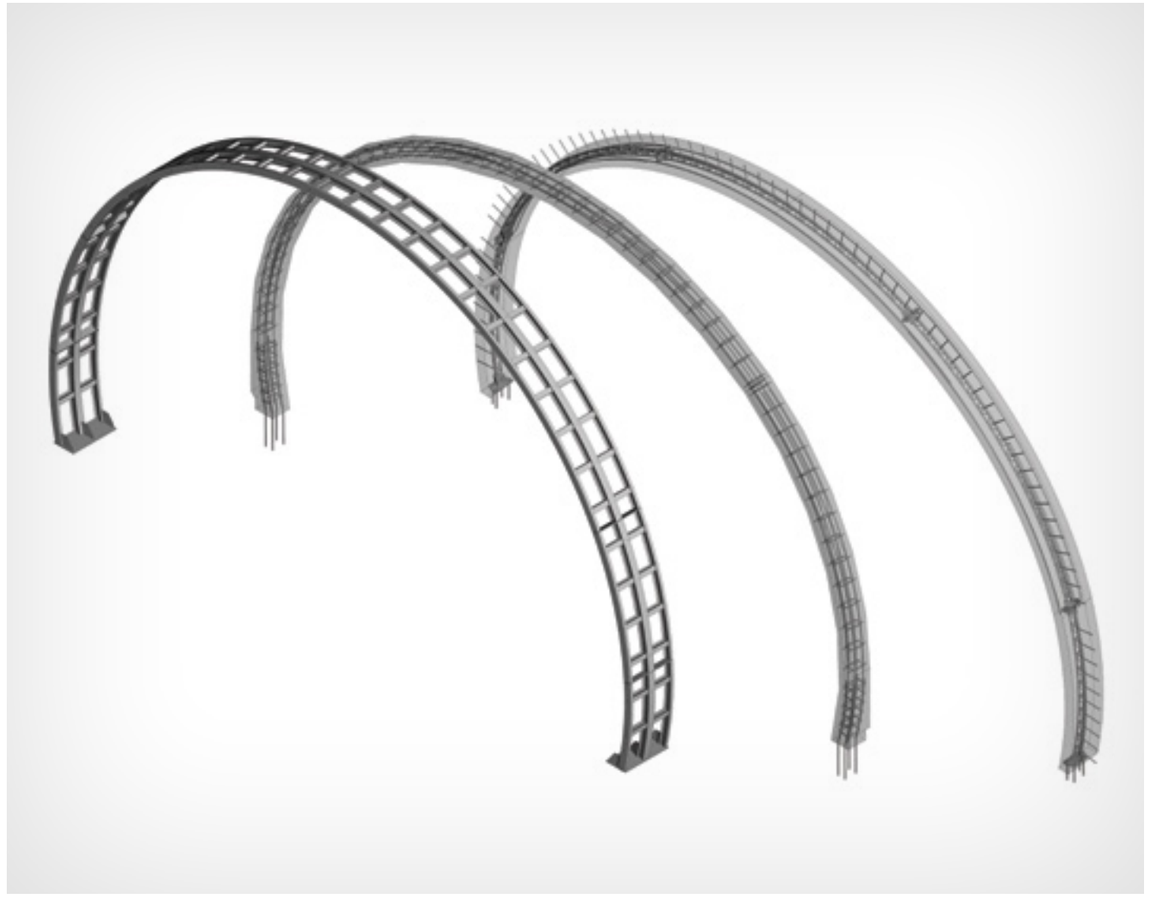
QK4, Inc.

Going Digital Survey with Bridging Kentucky
Location: Kentucky, United States

Project Playbook: Bentley Descartes, Bentley LumenRT, iTwin Capture, MicroStation, OpenRoads, ProjectWise

Bridging Kentucky focuses on improving the condition of over 1,000 deficient bridges across the state to enhance and ensure traveler safety and mobility. Given the volume, time, and geographic scale of the project, it was predicted to take over a decade and cost more than USD 7 million, requiring a new approach to land surveying and engineering. Leading land surveying for this project, QK4 wanted to implement a fully digital approach, integrating all survey data into accurate, intelligent 3D models, accessible to all teams working on multiple bridges simultaneously.

QK4 selected iTwin Capture, OpenRoads, and ProjectWise to digitally survey, model, and communicate 3D data for more than 700 bridges. Using Bentley's integrated applications, they delivered the project with almost a 90% reduction in time surveying the bridges, reducing survey costs by almost 50% to save Kentucky taxpayers more than USD 3 million. Bentley's collaborative and comprehensive technology solution helped QK4 create digital twins that design engineers can use for construction plans, setting new standards in bridge surveying, design, and construction.



Tecne Systra-Sws Advanced Tunneling Srl

Digital Implementation in Tunnel Assessment and Rehabilitation
Location: Italy

Project Playbook: Bentley LumenRT, Leapfrog, OpenTunnel, PLAXIS, ProStructures

To improve the safety of decades-old tunnels along Italy's Autostrada motorway, Tecne Systra-Sws Advanced Tunneling (Tecne) was hired to perform structural renewal and reinforcement works. The project included investigative surveys to evaluate existing tunnel conditions, as well as design demolition and reconstruction recommendations. With multiple disciplines working simultaneously, and the requirement to minimize impact on motorway traffic, Tecne sought an integrated digital 3D modeling and simulation platform accessible to all project participants.

Tecne selected OpenTunnel Designer and Bentley's geological, geotechnical, and structural modeling and analysis applications, establishing a connected data environment to create three comprehensive 3D models representing the existing conditions, demolition, and proposed works. The interoperable and automated features of Bentley software helped streamline workflows, accelerate optioneering and decision-making, and improve design efficiencies by 20%.
They also used the software to reduce modeling time by 21% to save approximately EUR 26.6 million in costs. The rehabilitations will extend the existing tunnel lifecycle, and the 3D design models provide the basis for developing a digital twin for future asset management.

Jacobs – Greenman Pedersen Inc. JV

Brooklyn Bridge-Montgomery Coastal Resilience
Location: New York City, New York, United States

Project Playbook: SYNCHRO

The Brooklyn Bridge Montgomery Coastal Resiliency project is a critical initiative designed to protect New York City from flooding and enhance the resiliency of communities at risk of storm surges. The project will serve as a benchmark for coastal resilience in the face of global warming and rising sea levels. Greenman-Pedersen (GP) is providing project and construction management services and faced challenges navigating the city's complex landscape and addressing the frequent changes in work sequence.

GP selected SYNCHRO for 4D construction planning and management, creating simulation videos for real-time visualization of potential clashes that simplified the complex work sequences and facilitated proactive problem-solving, reducing delays to keep the project on schedule. Using Bentley's application improved risk identification by 50%, compared to traditional methods, and shortened construction schedule review times by up to 24 hours. The advanced visualization and simulation features of SYNCHRO helped optimize construction sequencing, contrib-uting to the reduction in the overall carbon footprint of the project.

Arcadis

Cambridge South Infrastructure Enhancements
Location: Cambridge, United Kingdom

Project Playbook: iTwin, iTwin Capture, MicroStation, OpenBuildings, OpenRoads, ProjectWise, SYNCHRO

On the Cambridge South project, Arcadis is the primary design consultant, helping deliver a brand-new four-platform station, railway systems improvements, and access improvements to the Cambridge Biomedical Campus, Addenbrookes Hospital, and Hobson's Park. With early passenger numbers expected to increase to over 2 million by 2043, this station is essential and will improve the quality of life for the people who live and work in the area.

Arcadis chose Bentley applications to coordinate in a 3D environment and used clash detection to ensure everyone was aligned on the project. ProjectWise acted as the connected data environment for all phases of the project while OpenRoads created a parametric corridor that automatically updated, resulting in earthworks reuse increasing from 60% to 100%. MicroStation helped detect and resolve 26,539 clashes, saving significant time. By creating a 4D timeline of construction, the team reduced risk, site complexity, and construction time.

Guangdong Airport Authority, Central-South Architectural Design Institute Co., Ltd., China Airport Planning & Design Institute Co., Ltd., Civil Aviation East China (Zhejiang) Construction And Development Co., Ltd, Airport Construction Engineering Co., Ltd, CCCC Tunnel Engineering Company Limited, China Railway Beijing Engineering Group Co., Ltd., Hebei Construction Group Corporation Limited, China Huashi Enterprises Company Limited, Shanxi Mechanisation Construction Group Co., Ltd., Shanghai Baoye Group Corp., Ltd., PowerChina Airport Construction Company Limited, China Railway 19th Bureau Group 2nd Co., Ltd., The Construction of Guangzhou Baiyun International Airport Development Co., Ltd., Zhonghang Electricity System Engineering Co., Ltd., China Construction Eighth Engineering Division Corp., Ltd, Guangdong Construction Engineering Group Co., Ltd., China Construction Third Engineering Bureau Group Co., Ltd., Beijing Construction Engineering Group Co., Ltd.

Digital Innovation Application of Guangzhou Baiyun International Airport Phase III Expansion Project
Location: Guangzhou, China

Project Playbook: Bentley LumenRT, iTwin, iTwin Capture, MicroStation, OpenBridge, OpenBuildings, OpenPlant, OpenRoads, ProjectWise, ProStructures, SYNCHRO

The Guangzhou Baiyun International Airport Phase III Expansion Project is the largest reconstruction and expansion project in the history of the Chinese civil aviation airport construction. The CNY 53.77 billion project will increase passenger and cargo volume by 50% and 52%, respectively. During the construction of two new runways, a new terminal, and expansion for an existing terminal, and a comprehensive transportation center, the existing airport infrastructure had to remain in operation while meeting a tight deadline.

The project developers selected Bentley applications to establish digital construction methodology and deliver the complex project. They created 3D models of the full project, enabling teams to adhere to national standards for project qualities. With enhanced collaboration, they detected and resolved 3,200 clashes early in development, saving CNY 15 million in potential rework. In total, going digital helped teams improve design efficiency by 35%, and data management combined with digital construction rehearsals is expected to improve construction efficiency by 25%.

Communaute d'Agglomeration Pau Bearn Pyrenees - CAPBP

Multipurpose Urban Digital Twin of Communaute d'Agglomeration de Pau Bearn Pyrenees
Location: Pau, Pyrenees Atlantiques, France

Project Playbook: iTwin Capture, OpenCities

CAPBP initiated a digital twin project for France's Pau city to simulate and analyze complex urban design and planning issues, then communicate them with all stakeholders. The project involved producing a high-resolution reality mesh for 31 communes covering 370 square kilometers, and integrating the voluminous, multisourced data into a single digital twin accessible to planners, architects, businesses, and citizens. To create their accurate 3D city model and publish it for multiple users to access for a variety of purposes, CAPBP needed a comprehensive, cloud-based digital twin solution.

Using iTwin Capture and OpenCities Planner, CAPBP established an accurate digital twin and urban hub, scalable to multiple workflows and stakeholders. Combined with IoT data, Bentley's applications optimized data transparency and provided a universal platform to visualize and plan urban projects with greater precision, improving infrastructure management and promoting social sustainability. Working in a cloud-based environment with an immersive digital twin eliminated the production and sharing of static videos, saving almost EUR 200,000 annually, and reduced the cost of accessing city asset information by 95%.

Dublin Fire Brigade

Digital Twins for Emergency Response (DTER)
Location: Dublin, Ireland

Project Playbook: iTwin, iTwin Capture, OpenCities

Dublin Fire Brigade (DFB) provides fire, rescue, and emergency medical services for 1.6 million people. The staff of approximately 1,000 relies on pre-incident planning, which provides operational intelligence for making better decisions during emergencies. Traditionally, this information was prepared on paper forms, which limited the available information. DFB needed a planning solution that could unify data from multiple sources, instantly provide information to anyone on the field, and help users quickly navigate 3D models.

DFB determined iTwin technology could easily incorporate 3D models into a database and share them remotely, empowering incident commanders with a much better understanding of relevant building environments, no matter how large or complex. Bentley applications reduced the time needed to assemble the information for 3,000 high-risk sites, including detailed imagery captured by drones, from 7,500 hours to 1,500 hours. OpenCities Planner helped teams manage emergency incidents and assign workers to specific sectors. Trained officers can now find needed information in an average of 12 seconds, greatly improving response times and saving lives.

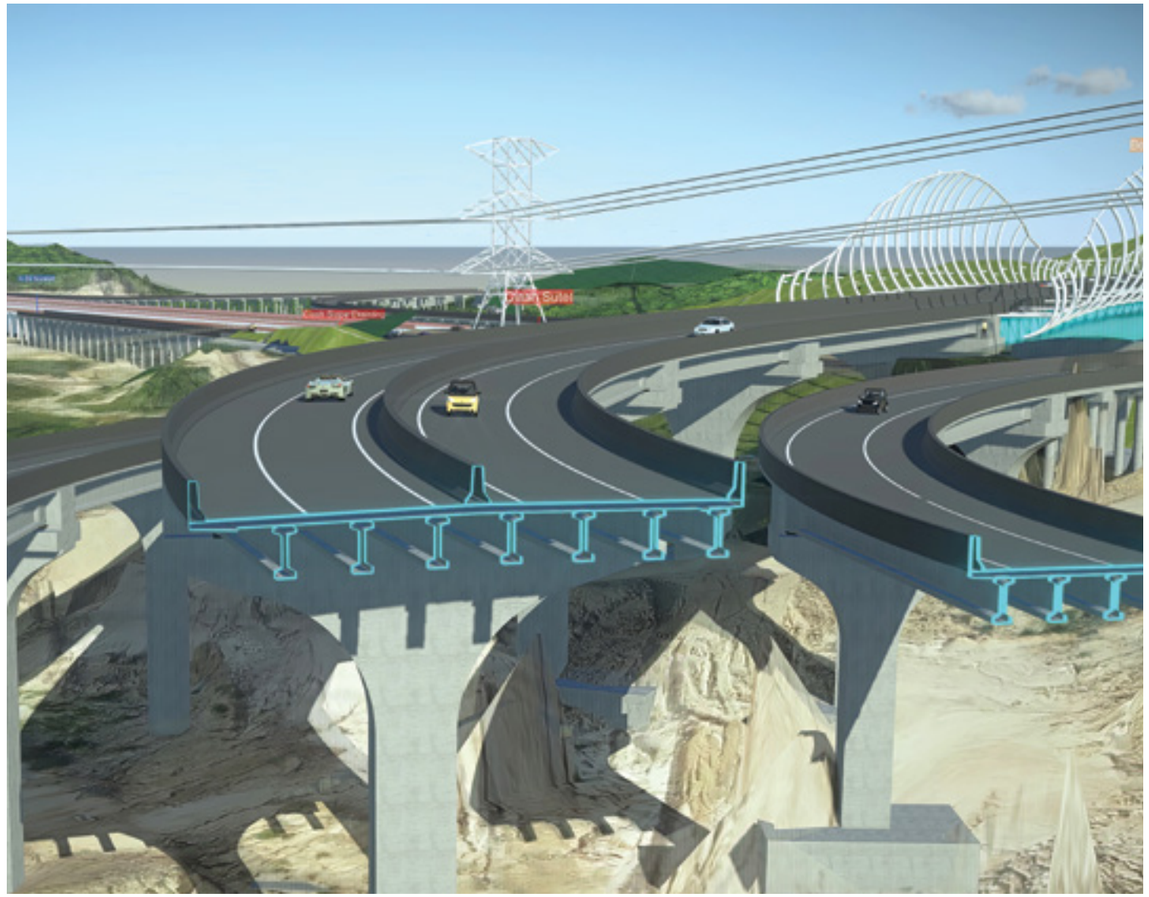
MCC Capital Engineering & Research Incorporation Limited

World's First Hydrogen Metallurgy Engineering Demonstration Project
Location: Zhangjiakou, Hebei, China

Project Playbook: AutoPIPE, AutoPLANT, Bentley LumenRT, iTwin, MicroStation, OpenBuildings, OpenPlant, OpenRoads, ProjectWise, ProStructures, STAAD, SYNCHRO

To reduce carbon emissions generated by iron and steel smelting, MCC was retained to design and deliver the world's first hydrogen metallurgy project. As a pioneer initiative, the project presented a large, complex engineering workload across various industries and disciplines, a compact layout, and high safety requirements on a short design cycle. To address these challenges, MCC sought a collaborative design and construction management approach and realized they needed to establish an open connected data environment.

They selected Bentley's design, construction management, and digital twin technology to streamline workflows and perform construction simulation, avoiding 216 potential clashes. The digital twin helped MCC complete the project in two years, shortening the construction period by 33.33%. Through virtual planning, they optimized the shaft furnace structure, saving CNY 4.3 million, while reducing annual carbon emissions by 800,000 tons. The successful digital twin project validates the use of hydrogen as a low-carbon solution for iron and steel production.



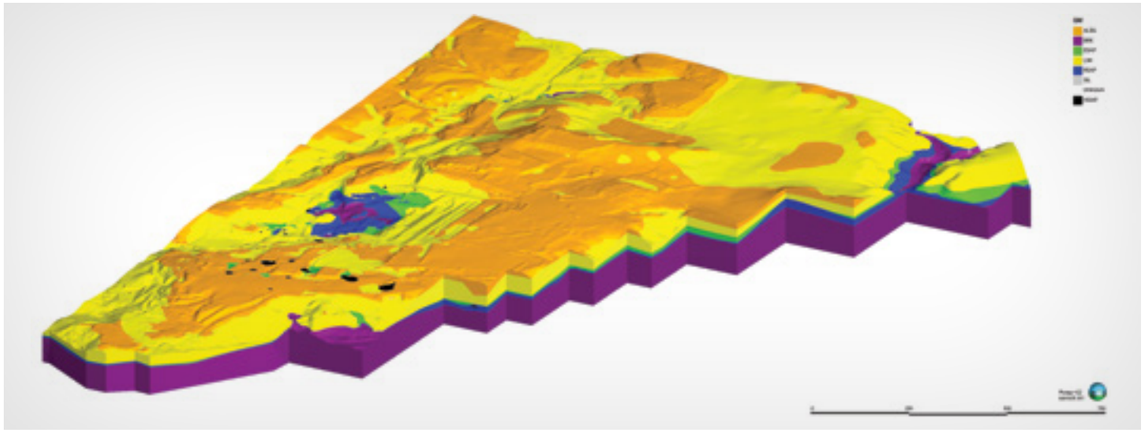
PT Wijaya Karya (Persero) Tbk

Nusantara Road and Highway Connectivity, New Capital City of Indonesia
Location: Balikpapan, East Kalimantan, Indonesia

Project Playbook: Bentley LumenRT, iTwin, iTwin Capture, MicroStation, OpenBridge, OpenRoads, OpenTunnel, PLAXIS, ProjectWise, SYNCHRO

As part of moving Indonesia's capital city to Nusantara, PT Wijaya Karya (WIKA) was tasked with constructing 57 kilometers of toll road, three long-span bridges, two helipads, two toll gates, and a seven-kilometer pile slab. When complete, the project will reduce travel time from two hours to 30 minutes. However, WIKA had to ensure that the roadway could withstand landslides while avoiding 10 transmission towers. To overcome these challenges, as well as orchestrate 33 work packages simultaneously, WIKA needed digital twin workflows.

WIKA used iTwin Capture Modeler to process 500 hectares of aerial survey data, then used OpenRoads to design the roadway and OpenBridge to manage the massive amount of structural data. By using iTwin Capture, the team increased the speed, accuracy, and consistency of processed data by 100%. Bentley's civil applications helped iterate design alternatives by 35% and increased the safety factor by 0.231, fulfilling the safety requirement. Not only did they save 667,708 working hours, they also reduced their carbon emissions by 51,000 tons.



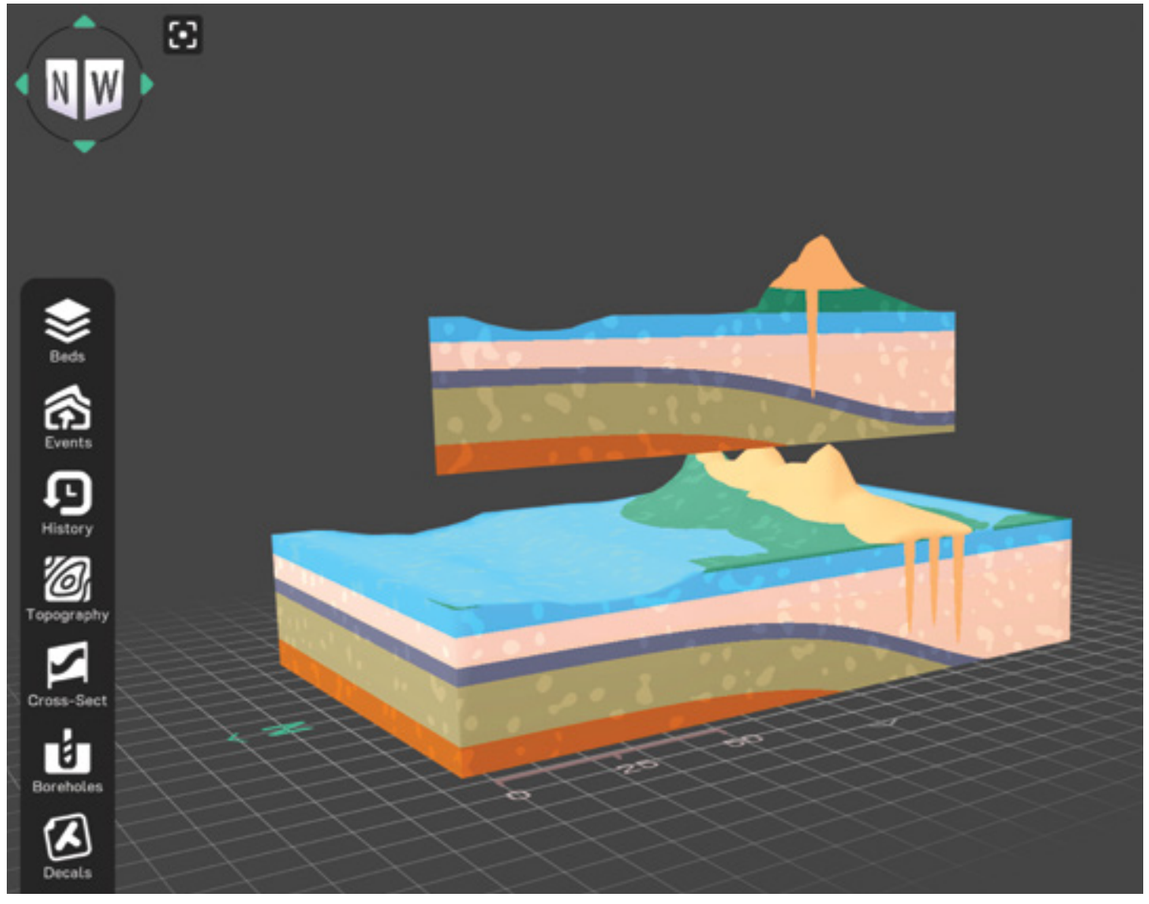
PT SMG Consultants Indonesia

Transformative Innovations in Southeast Sulawesi Nickel-Cobalt Exploration
Location: North Konawe, Southeast Sulawesi, Indonesia

Project Playbook: Imago, Leapfrog, MXDeposit

PT SMG Consultants sought to advance their digital solutions for their nickel mining and geological exploration projects. The goal was to optimize mining operations and contribute to the sustainable development of Indonesia's vital nickel resources. However, nickel deposits are often geologically complex, as well as have several regulatory frameworks and environmental standards surrounding them. Therefore, the team sought advanced data management and modeling software to characterize ore bodies accurately, as well as have robust security measures.

SMG Consultants chose Seequent's Imago, Leapfrog, and MXDeposit to optimize their workflows. The applications provided advanced implicit modeling capabilities, secure data management features, and seamless integration between imaging, geological modeling, and resource estimation. Geological domaining, which used to take two to three weeks, now takes just two to three days. Repetitive tasks have been reduced by 75%, increasing employee productivity by 50%. Overall, drilling costs have decreased by up to USD 8 million and indirectly enhanced mining production operations by 25%.



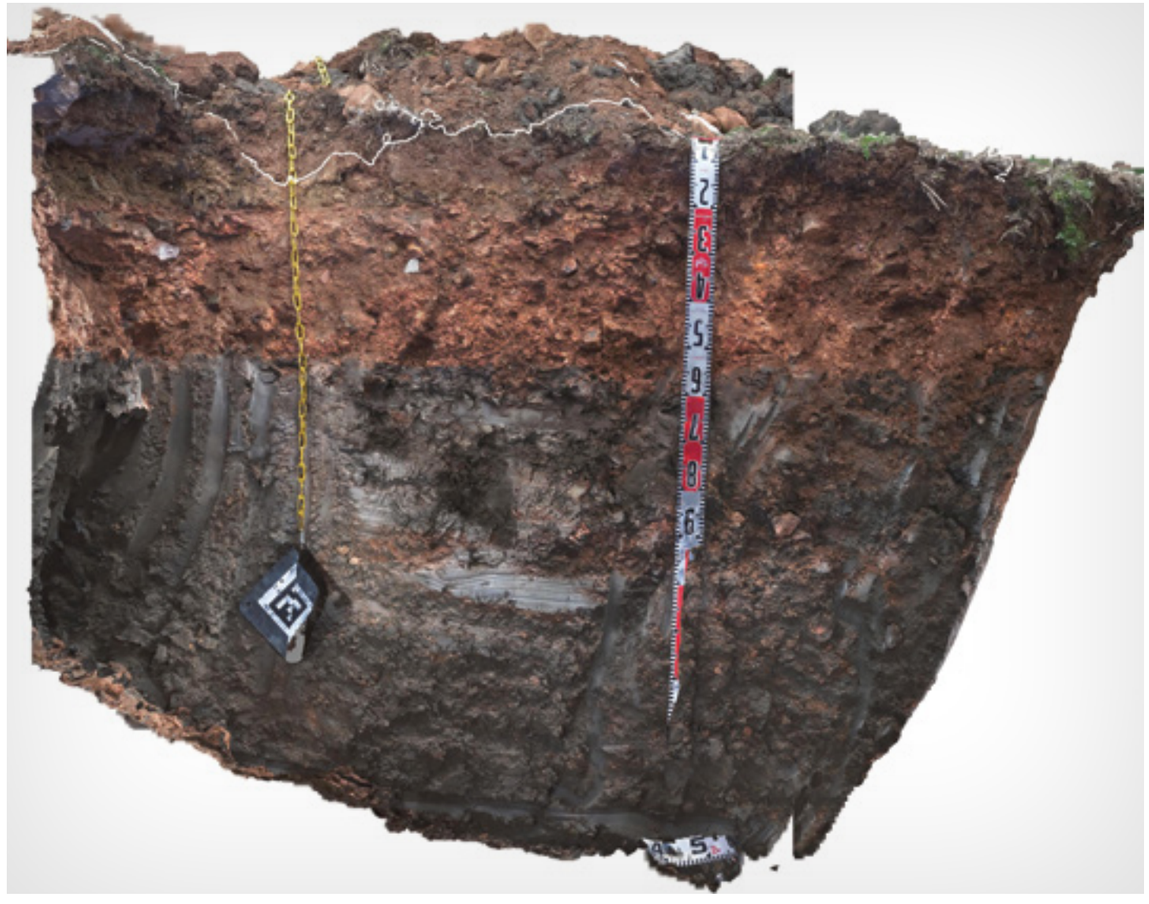
University of Canterbury

Bridging the Gap: Incorporating 3D Modeling into Undergraduate University Courses
Location: Christchurch, Canterbury, New Zealand

Project Playbook: Leapfrog, Visible Geology

To promote geology as a career and upskill geoscience graduates in 3D modeling skills, the University of Canterbury initiated a project to equip students with work-ready skills to solve complex problems, supporting global social and environmental sustainability. The project required integrating modern digital techniques and 3D visualization in the classroom for practical and field-based tertiary teaching. However, the university realized they needed a user-friendly, cost-effective software for introductory students to bridge the gap to using more complex programs.

The school selected Visible Geology to integrate fundamental geological concepts in their introductory course, preparing students to use Leapfrog in the second-level companion course. Using the free, web-based software, students created simple, changeable examples of common geology scenarios. The solution has enabled the university to move from paper-based teaching methods to 3D digital modeling and visualization, supporting hands-on and field techniques. Incorporating innovative digital practices in their geology program, they have resisted the global downward geoscience enrollment trend with a 10% to 15% enrollment stabilization for 2024.



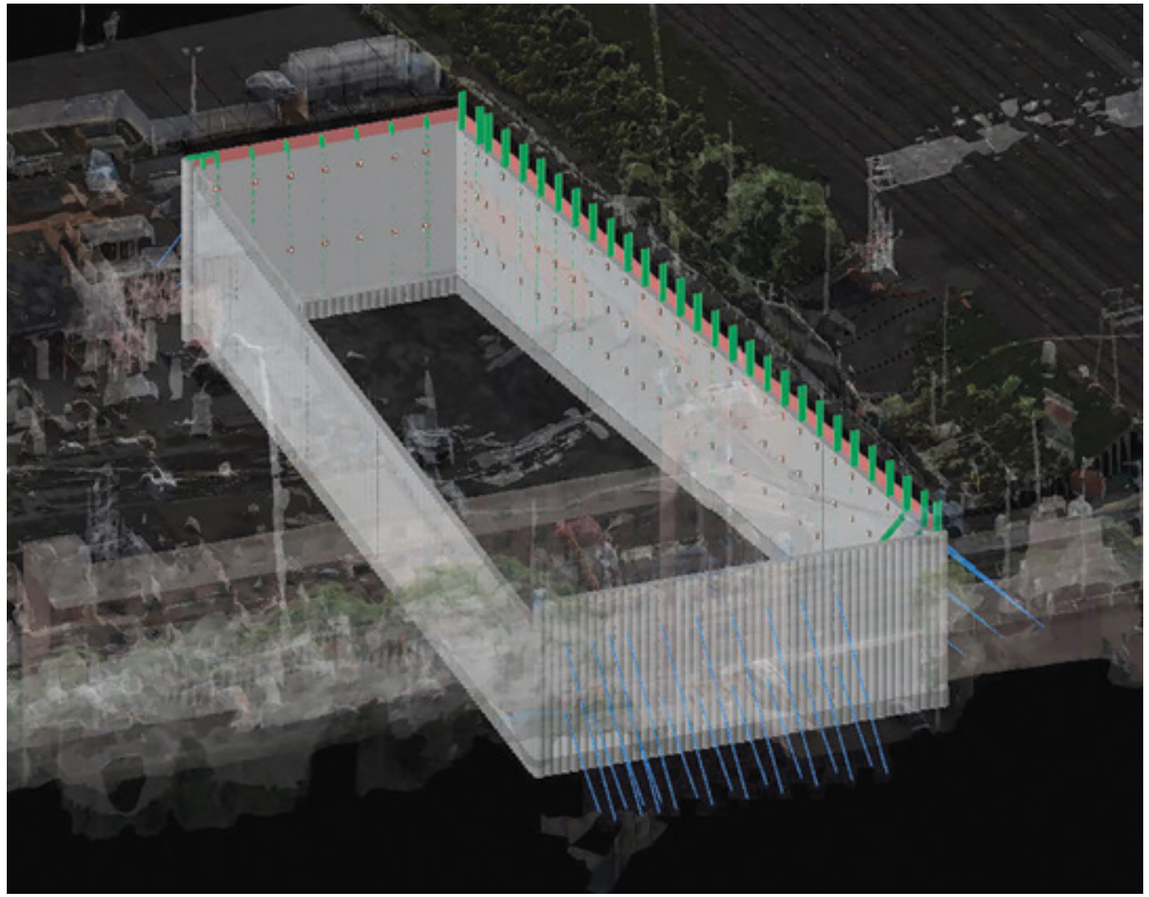
Macquarie Geotechnical

Subsurface Reality Modeling for Enhanced Subsurface Insight
Location: New South Wales, Australia

Project Playbook: iTwin Capture, Leapfrog

Australian ground investigation firm Macquarie Geotechnical selected two sample projects to demonstrate the importance of data capture and intuitive communication of subsurface information. One was a regional highway pavement investigation project with considerable variation in layer thickness, and the other was a greenfield rail project that exhibited shrink-swell behavior. Macquarie experimented with various applications to overcome the shortcomings of traditional geotechnical investigation approaches. However, these lacked the technical and interoperable features for seamless digital workflows.

Macquarie selected iTwin Capture and Leapfrog to augment traditional geotechnical data and modeling with subsurface photogrammetry. Using Bentley's integrated applications allowed for more accurate modeling and provided a visual, contextual understanding of the subsurface conditions for stakeholders in formats compatible with their civil design software. The detail captured in the models allowed fieldwork to progress without the need for key decision makers to be on site, estimated to save AUD 90,000 in time and travel costs. The reality modeling solution also saved approximately 600,000 cubic meters of quarried materials, achieving significant financial and carbon benefits.



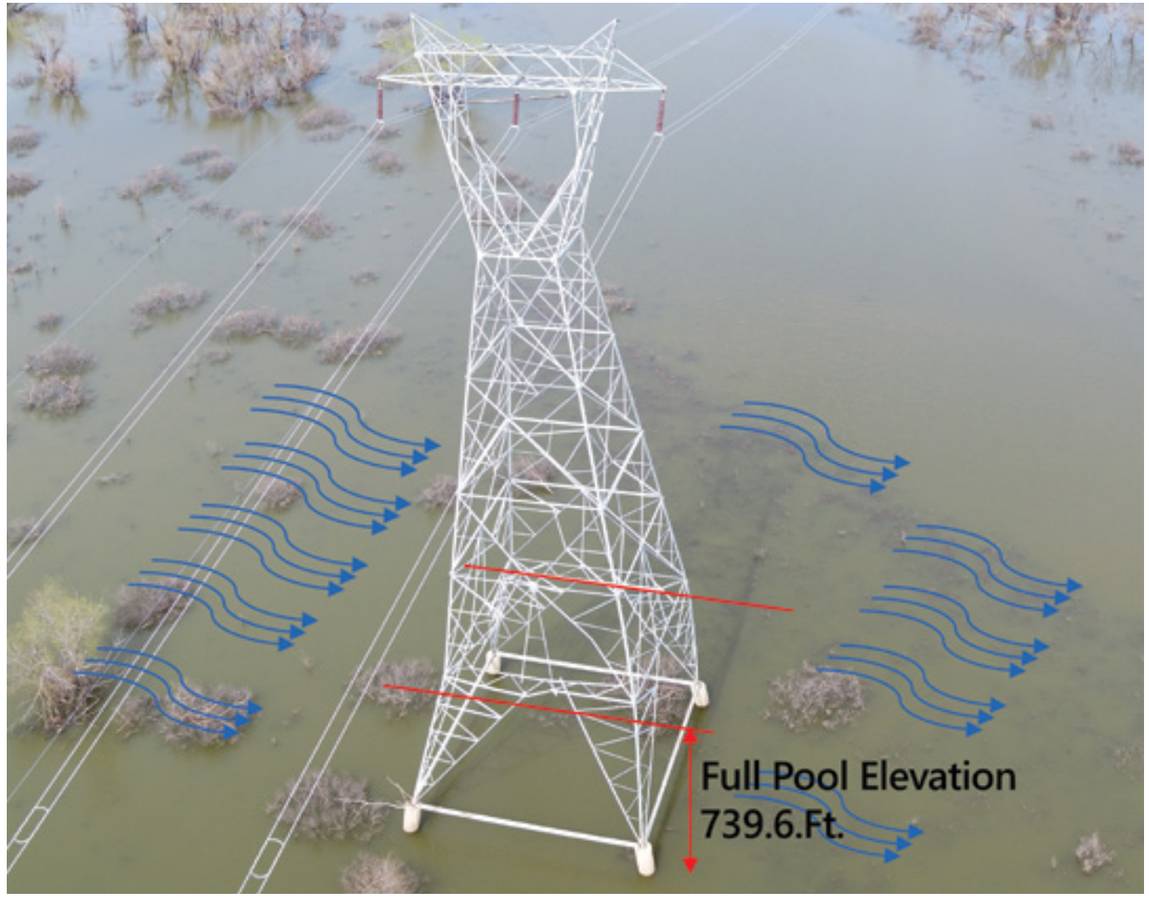
Monir Precision Monitoring

31 Parliament Street Urban Infrastructure
and Excavation Shoring Monitoring
Location: Toronto, Ontario, Canada

Project Playbook: iTwin Capture, iTwin IoT, MicroStation, OpenGround, sensemetrics

To avoid shutting down a vital rail commuter line amid urban development, Monir Precision Monitoring was contracted to monitor displacement of the rail and shoring of the excavation during construction of a condominium. The strict monitoring guidelines for working within the corridor, moist ground conditions, and multilevel approvals required presented challenges, leading Monir to explore an integrated digital solution to overcome the limitations of previous monitoring solutions.

As a proof-of-concept project, Monir selected iTwin IoT to test incorporating a digital twin within their existing IoT monitoring processes to visualize and assess the site throughout the construction process. Using Bentley's platform for management and visualization of the instrumentation data increased operational efficiencies by 40%. The software helped save approximately 3,000 hours in on-site assessments and reduced the project timeline by six months. Compared to a myopic view using individual sensors, the digital twin solution provided a more holistic visual monitoring context relative to the entire project.



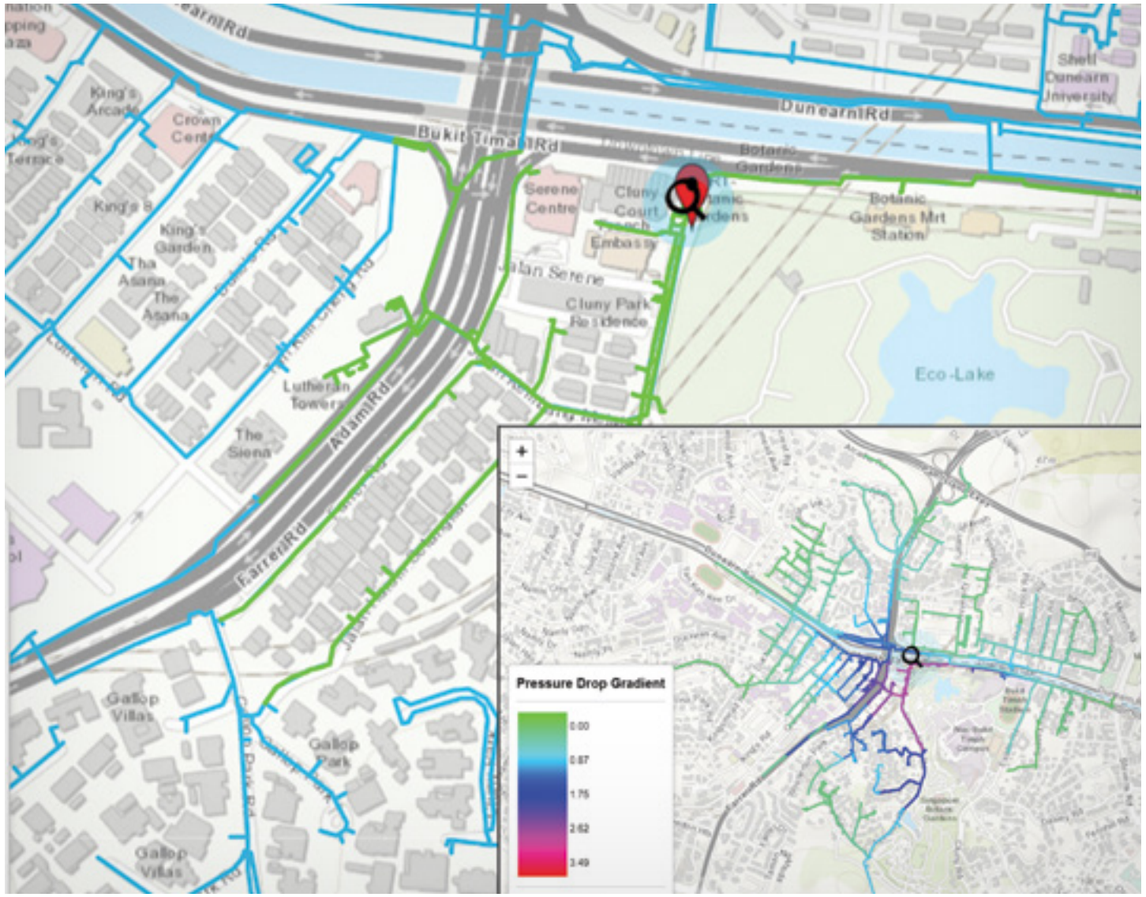
Exo Inc.

Evergy Power Transmission Tower Stabilization
Location: Clinton, Missouri, United States

Project Playbook: iTwin Capture, Power Line Systems

During a regular inspection, the team learned that a critical 161kV overhead transmission tower had been damaged during a recent flood. This particular line was serving power to several area hospitals that were at full capacity during the pandemic. Loss of power would have been catastrophic to the area. Exo was tasked with conducting a survey of the tower to assess its condition. However, the line needed to remain energized, requiring the team to find a safe but still efficient workflow.

Exo selected Bentley's iTwin Capture to accurately survey the deflected shape of the structure. Meanwhile, Power Line Systems was used to efficiently model the power lines and latticed steel support structures as a system. The applications allowed Exo to create a digital twin and design a stabilization solution so that the line could remain in service. By using Bentley applications, the team saved four to six weeks in surveying time. Exo saved lives by stabilizing the structure to avoid a potential long power outage during the pandemic.



PUB, Singapore's National Water Agency

High Fidelity Digital Twin-enabled Anomaly Detection and Localization in Singapore
Location: Singapore

Project Playbook: iTwin, OpenFlows

As part of their Smart Water Grid (SWG) program to monitor more than 6,000 kilometers of Singapore's pipeline, PUB initiated a grid anomaly detection and localization project for near real-time analysis of SWG monitoring data and detection and localization of anomaly events. While permanent sensors offer 24/7 monitoring, anomaly and leak detection practices still required biannual costly, labor-intensive network surveys. To make their anomaly and leak detection practice more cost effective, PUB sought a machine learning-based, data-driven approach.

Leveraging Bentley's iTwin and OpenFlows applications with AI and machine learning, PUB developed an integrated anomaly leak finder technology solution, using hydraulic models recalibrated daily with monitoring data to generate a high-fidelity digital twin. Since January 2024, it has led to the detection of two significant underground leaks, alerting PUB's leak detection crew and localizing the leaks to less than one kilometer. The intelligent digital twin solution shifted PUB's previous time-driven network surveillance schedule to data-drive-driven, reducing total workforce costs, supporting proactive processes, and redefining the concept of high-fidelity digital twins for smart water grids.

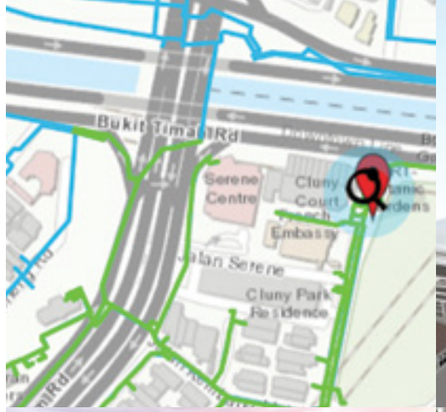
Maynilad Water Services Inc.

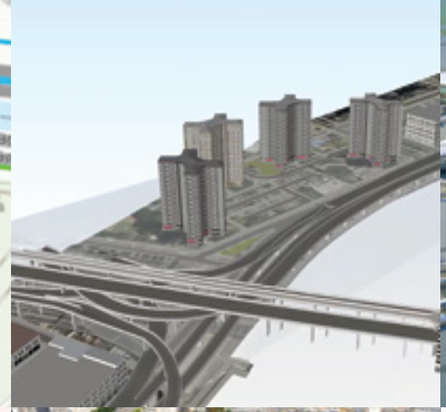
Network Design using OpenFlows Water for Distribution of Direct Potable Reused Water
Location: Valenzuela, Metro Manila, Philippines

Project Playbook: OpenFlows

To manage the dwindling resources of fresh water and to rise to the challenges brought by climate change, Maynilad Water Services sought to find other sources of water. The team determined that water reclamation facilities could help and used the Parañaque Reclamation Facility as its pilot project. The main challenge was ensuring that the clean, potable water from this facility reached customers throughout the distribution network.

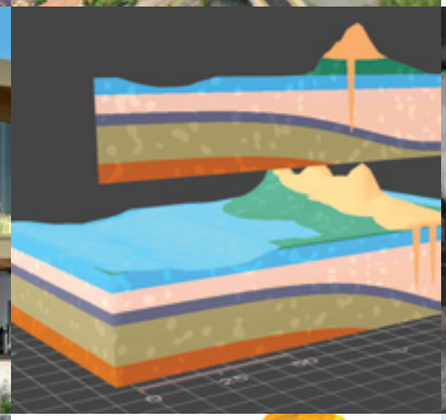
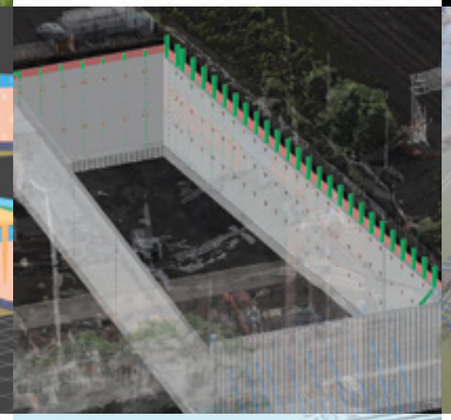
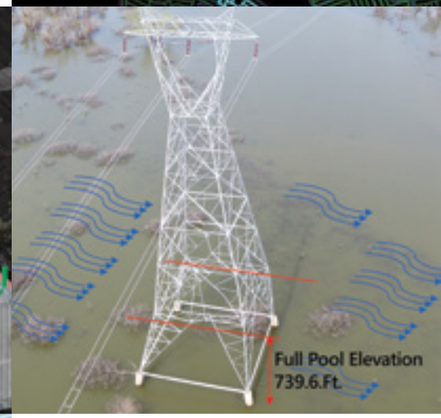
Already familiar with Bentley applications, Maynilad chose OpenFlows Water. Data collected from the field was used to calibrate the network model and provide projected changes in pressure and supply conditions. The ability to make updates in real time helped overcome the ever-changing requirements of the project. With its launch, the system provides an additional 10 million liters of water to Maynilad's network and an estimated annual revenue of USD 2.21 million in its influence area. Fueled by this success, the team plans to put up more new water facilities throughout its service area.

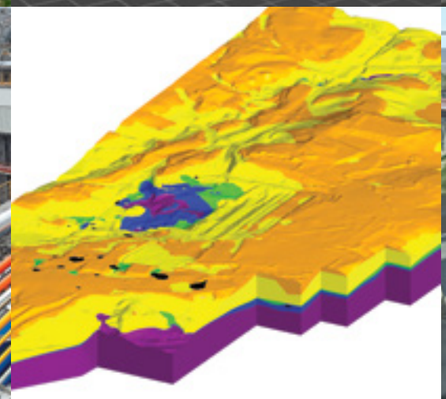








Founders' Honors

Scan here to learn more about the 2024 Founders' Honors.

MEET THE JURORS

There would be no Going Digital Awards without the valuable input of our independent jurors. Their experience, knowledge, and skills provide the insight needed to select the finalists and winners from among hundreds of project submissions.

FEATURED JURORS

In reflecting back on 20 years of the Going Digital Awards, we recognize the many years of service that these three jurors have dedicated to reviewing project submissions; a combined total of over 30 years.

Featured juror: Kevin Carmody

Structural Engineering

Partner and Group Publisher

Kevin Carmody has 20 years of experience in engineering industry publications. He serves as the group publisher of *Informed Infrastructure, Asian Surveying & Mapping, Earth Imaging Journal,* and *Geospatial1* for V1 Media. Carmody was previously director of print and e-media and associate publisher for *CE News* and *Structural Engineer* magazines at ZweigWhite, and was account executive for *Architectural Record* at McGraw-Hill Construction.

Featured juror: Monica Schnitger

Process and Power Generation

Schnitger Corporation
President and Principal Analyst

Monica Schnitger is an industry analyst that has developed market models and forecasts, as well as discussed industry trends and statistics for CAD/CAM, CAE, PLM, GIS, infrastructure, AEC, and plant design software since 1999. She holds a BS in Naval Architecture and Marine Engineering from MIT and an honors MBA from the F.W. Olin School of Management at Babson College.

Featured juror: Paul Wilkinson

Construction; Enterprise Engineering; Facilities, Campuses, and Cities

Extranet Evolution and pwcom
Senior Technology Consultant and Writer

Paul Wilkinson is a freelance British freelance technology writer and consultant, as well as a vice-chair of nima (formerly the UK BIM Alliance). Holding a first degree in public administration and a doctorate in criminology, Paul entered construction by accident, joining a firm of consulting engineers to work in a PR and communications role. After 11 years in multidisciplinary practices, and two years of freelance writing, he joined a software-as-a-service business in 2000, leaving in 2009.

Juror: Andy Barnes

Enterprise Enginering

Transport for Wales
BIM Manager

Andy Barnes initially came from a hands-on structural and marine engineering background, then transitioned into BIM management roles across the water and rail industries, which included establishing and deploying a global BIM component library solution. Andy is passionate about developing project delivery solutions and promoting the use of digital applications that will help teams deliver their projects in a more standardized and efficient way.

Juror: Rehana Begg

Process and Power Generation

Machine Design and Endeavor Business Media
Editor-in-Chief

As *Machine Design's* editor-in-chief, Rehana Begg is tasked with elevating the voice of the progressively multidiscipline engineer in the face of digital transformation and engineering innovation. Her B2B career has taken her from corporate boardrooms to plant floors and underground mining stopes, covering engineering, emergent technologies, automation, Industrial Internet of Things, software, and continuous improvement and strategy. Rehana holds a master's degree in journalism and an MBA focused on project management.

Juror: Christopher Bennett

Subsurface Modeling and Analysis

GHD
Senior Technical Director

Christopher Bennett is a senior technical director of engineering geology and a GHD principal with over 20 years of experience. A registered professional in geoscience (RPGeo), he specializes in difficult access investigations, geological mapping, 3D geological modeling, ground model design, dam foundation analysis, dam design and construction, dam foundation mapping, rock slope stability, and tunnel design and construction by TBM or drill and blast techniques. As the geology service line leader, he provides strategic and technical leadership to over 130 geologists and geoscientists at GHD.

Juror: Graeme Booth

Process and Power Generation

Net Zero Technology Centre
Head of Digital Technology

Graeme Booth is a chartered aeronautical engineer with over 25 years of experience in aerospace, power, and energy. He held previous roles as chief engineer (digital) at both Siemens and Doosan Babcock, where he led digital research, development, and implementation projects to enable advances in simulation and modeling, IoT applications, cloud-first thinking, and data analytics. He is head of digital technology at Net Zero Technology Centre, leading the strategy and thought leadership for data, digital systems, remote operations, robotics, and autonomous systems for current and future energy systems.

Juror: Scott Blair

Facilities, Campuses, and Cities

Engineering-News Record
Editor-in-Chief

Scott Blair serves as editor-in-chief of *Engineering News-Record,* including all editorial print and digital products, websites, videos, podcasts, and events, such as Best Projects, Newsmakers and the Award of Excellence, Top Young Professionals, Futuretech, and Groundbreaking Women in Construction. Scott frequently posts in-depth project tour videos and interviews with industry leaders on ENR's video channel. He is also a frequent speaker and moderator on topics such as diversity and inclusion, design and jobsite technology, construction means and methods, and marketing. Scott has spent more than 30 years working in almost every facet of media and publishing, including radio, film, television, digital media, music composition, newspapers, public speaking, and music direction.

Juror: Jonathan Bradley

Enterprise Engineering

Engineers Australia
Deputy Editor

Jonathan Bradley is deputy editor of create magazine, the journal for Engineers Australia, Australia's preeminent engineering body. Having previously covered the national water sector for the Australian Water Association's Water Source, Jonathan's writing encompasses the construction, robotics, aerospace, biomedical, defense, and renewable energy industries, and has appeared in *The Sydney Morning Herald, The Age, ABC News, SBS, and Billboard.*

Juror: Andy Chatha

Process and Power Generation

ARC
CEO

Andy Chatha provides leadership to ARC and guides its research and client activities. For over 40 years, Andy has provided advice and counsel to many leading energy and manufacturing companies around the world.

Juror: Aileen Cho

Construction; Roads and Highways

Engineering-News Record
Senior Editor of Transportation and Infrastructure

Aileen Cho is senior editor for transportation and infrastructure at *Engineering News-Record*. Her coverage of airports, ports, transit, highways, and bridges have won her a number of awards from business publications and engineering societies, including Neal Awards for Best Feature and Best Technical Article. She also co-hosts ENR's Critical Path podcast.

Juror: Matt Collins

Surveying and Monitoring

Geo Week News
Content Specialist

Matt Collins is a member of the editorial staff at *Geo Week News*. In his work, he covers new innovations, interesting case studies, and writes opinion pieces involving the geospatial and architecture, engineering, and construction industries and where they intersect. He has been covering a variety of industries in the digital media space for over a decade and has also contributed in recent years to *Commercial UAV News* and *WorkBoat Magazine*.

Juror: Pete Evans

Facilities, Campuses, and Cities

Architosh and Iowa State University
Architect and Educator

Pete Evans is an architect, industrial designer, and educator at Iowa State University with over 25 years of industry experience. He has written for and presented at national American Institute of Architects (AIA) events, including Technology and Practice (TAP), chaired the state AIA professional development work, published numerous articles for *Architosh,* is the co-jury member for *Architosh's* AIA BEST of SHOW awards program, and travels regularly to conferences around the world for Architosh as senior associate editor.

Juror: Carlos Femmer

Surveying and Monitoring

HDR Engineering, Inc.
Director of Data Aquisition

Carlos Femmer leads HDR's Data Acquisition Cross Sector and has over 20 years of experience managing teams that perform surveys for tens of thousands of miles of transmission lines, pipelines, railways, roadways, and bridges, as well as dams and spillways. With HDR, he has conducted the first commercial drone operations permitted at the Golden Gate Bridge, within the Grand Canyon, and at Naval Station Pearl Harbor. He has also led a comprehensive drone program development process for the Naval Facilities Engineering Systems Command.

Juror: Federico Foria

Bridges and Tunnels

ETS
Geotechnics, Geology, and Hydraulics Department Manager, Research and Development Manager

Federico Foria is the head of the geotechnics, geology, and hydraulics department and head of research and development in ETS (Italy). He is experienced in the design, maintenance, and management of infrastructures. In 2022, he was awarded by EFCA as the Best Future Leader in Europe and, in 2024, by RockMass Technologies as Top Innovator. He represents innovation and sustainability for infrastructures in national and international committees, as well as educational and outreach activities.

Juror: Tom Freyberg

Water and Wastewater

Aquatech Global
Content Director

An award-winning environmental journalist, Tom Freyberg has had articles and comments published in *The Times, The Guardian, CNN, The Grocer,* and WaterFront. He has spent nearly a decade traveling the globe and reporting on projects from Latin America to the Middle East and Southeast Asia. A graduate of the University of Exeter, Tom founded Atlantean Media in 2018 as a boutique digital content and media company. In addition to being the content director for Aquatech Global events, Tom is the co-creator and co-host of "The Stream with Will and Tom" podcast, together with Will Sarni, the host of online talk show QTalks by Qatium, as well as co-founder of KnowH2Ow, a marketing and communication training hub for water professionals.

Juror: Julianne Fuda

Bridges and Tunnels

New York State Department of Transportation
Director, Structures Design Bureau

Julianne Fuda is the director of the Structures Design Bureau within the NYSDOT Office of Structures. She oversees the final design of new and replacement bridge projects, as well as rehabilitations, throughout New York State. Julianne is a member of the AASHTO Committee on Bridges and Structures, serving on the Steel & Metals Committee, as well as the AASHTO Concrete Committee. She has over 15 years of bridge design experience in both the public and private sector as a designer, squad leader, and project engineer. Julianne graduated from Rensselaer Polytechnic Institute in Troy, New York with a BS in civil engineering and is a registered professional engineer in the State of New York.

Juror: Gavin Jenkins

Roads and Highways

Roads & Bridges Media
Senior Managing Editor

Gavin Jenkins is the senior managing editor of *Roads & Bridges Media.* Before taking on this role in 2021, Gavin was associate editor of *Pitt Med* magazine. He earned a master's in nonfiction writing from the University of Pittsburgh in 2016 and has written for *The New York Times, The Washington Post, The Atlantic,* and *Vice.*

Juror: Elizabeth Jordan

Rail and Transit

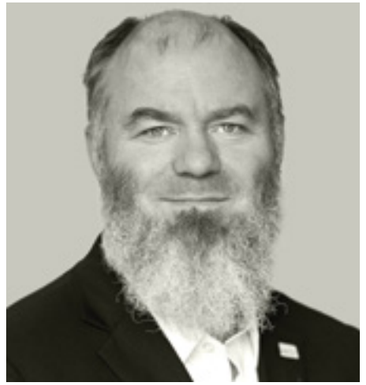
Global Railway Review
Editor

Elizabeth Jordan is the editor of international rail magazine *Global Railway Review.* With over five years' experience as an editor across infrastructure and building and electronics industries, specializing in highlighting the key topics and trends within those industries in her work, Elizabeth enjoys getting to know the individuals within the industry and understanding how best she can represent and write for them.

Juror: Andy Kaiyala

Construction

WSB
Vice President, Construction Technology and Controls



Andy Kaiyala is WSB's vice president of construction technology and project controls and leads the firm's digital construction management service. Prior to WSB, Andy spent his 25-year career bidding and building complex infrastructure projects across the United States and around the world. Six years ago, Andy became convinced that operationalizing a 3D design model for use during construction was our industry's future. He is only more convinced today and now works to bring successful digital adoption to those who build the work.

Juror: Danielle Kenneally

Rail and Transit

Chartered Institution of Civil Engineering Surveyors
Deputy Editor

Danielle Kenneally is the deputy editor for the Chartered Institution of Civil Engineering Surveyors and is responsible for the members' monthly journal, *Civil Engineering Surveyor,* as well as the annual Geospatial Engineering and Construction Law Review publications. Danielle is relatively new to the civil engineering industry but has worked as a journalist for a number of publications, most notably for newspapers in Guernsey and Scotland. She has a master's degree in journalism and holds National Council for the Training of Journalists accreditation.

Juror: Doug Lindquist

Structural Engineering

Haley & Aldrich
Principal Consultant,
Geotechnical Engineering

Doug Lindquist is a principal geotechnical engineer with Haley & Aldrich in Seattle. He is a leader, innovator, published author, frequent speaker, and recognized expert on seismic design for tall buildings and waterfront structures. He has over 25 years of experience with progressively increasing technical, administrative, and business development responsibilities. He has a broad range of consulting experience working on port, county, city, private development, transportation, litigation, and military projects with geotechnical, natural resources, and environmental components. Doug's projects have won multiple awards with the American Society of Civil Engineers, the American Institute of Architects, and the American Council of Engineering Companies (ACEC).

Juror: Alejandro Maceira Rozados

Water and Wastewater

iAgua
Founder

Alejandro Maceira Rozados is the founder of *iAgua,* a website and print communication platform for the water sector, and a water economics and hydrological planning consultant. He is also the director of *Smart Water* magazine. Rozados holds a business administration degree from the University of Santiago de Compostela and an MBA from the National University of Distance Education (UNED).

Juror: Ian McFarlane

Structural Engineering

Magnusson Klemencic Associates
Senior Principal

Ian McFarlane is a senior principal who has led the design of low-, mid-, and high-rise buildings, ranging from residential and office to innovative mixed-use developments. The leader of MKA's sustainability technical specialist team, Ian is advancing the industry toward more sustainable construction by lowering the embodied carbon in concrete, steel, and mass timber structures. He also leads the firm's concrete and foundations technical specialist teams, which includes leadership roles in developing national codes and standards for concrete through the American Concrete Institute and for foundations through the American Society of Civil Engineers.

Juror: Aaron Moniza

Roads and Highways

Foth
Senior Client Manager

Aaron Moniza is a senior client manager with Foth, where he serves as the National DOT Market lead. His over-20-year career has been spent building great relationships, always learning, and passionately delivering complex transportation infrastructure projects. Aaron believes that infrastructure is the foundation of a community's quality of life and loves the tangibility of his work. He holds an MBA and a BS in civil engineering from the University of Minnesota.

Juror: Christine Ow

Water and Wastewater

Bluefield Research
Digital Water Analyst

Christine Ow is a digital water analyst at Bluefield Research, a market intelligence firm focused on the global water industry. Born and raised in Singapore, water issues have always been close to Christine's heart. She has led and supported research reports on a variety of topics, including the role of financial investors in the market, metering, digital twins, and artificial intelligence. Christine has an MPA in environmental science and policy from Columbia University and a BA in political science from the University of California, Los Angeles.

Juror: Mark Reynaert

Transmission and Distribution

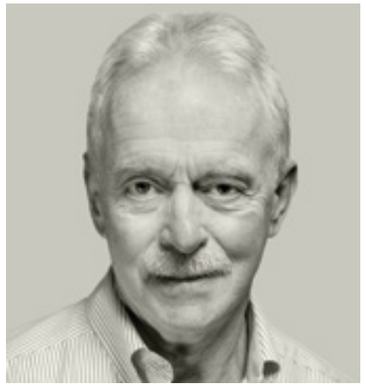
Infrastructure Ontario
Senior Consultant

Mark Reynaert is a seasoned telecom and construction expert with 20 years of experience in various management roles. His tenure was spent entirely in operations, repair and installation, engineering and construction, electronics, and rights-of-way and easements. Mark has negotiated and helped internet service providers implement new technical standards and utilize new technology and software to expedite aerial and buried projects throughout Canada.

Juror: Gene Roe

Surveying and Monitoring

MPN Components Inc
Founder

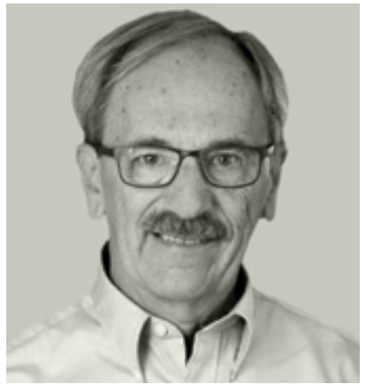


Gene Roe is the founder of MPN Components, Inc., a 25-year-old geomatics consulting firm specializing in applied geospatial data acquisition research and technology development. His formal training was in structural and marine geotechnical engineering with research in pavements and earthquake-induced liquefaction. He has been in the engineering survey and mapping business for over 50 years. Gene is the current chair of the ASTM E57 Committee for 3D Imaging Systems, which developed a widely adopted laser scanning data exchange format. His website, LiDAR News, is one of the leading online 3D lidar and laser scanning websites in the world.

Juror: Robert Schickel

Bridges and Tunnels

Informed Infrastructure
Editor



Robert Schickel is a retired professional engineer with 50 years of experience in planning, design, plan preparation, and construction management of transportation projects. His specialized expertise includes project and quality management, as well as technical and administrative guidance on transportation projects. Currently, Robert is an adjunct instructor at Valparaiso University, guiding senior civil and environmental engineering through their senior design project, and is the editor in residence for *Informed Infrastructure*.

Juror: Mark Tablante

Transmission and Distribution

Burns and McDonnell
Design Technology Director

Mark Tablante is the design technology director for Burns and McDonnell. He is responsible for the strategic integration of current and emerging technologies, as well as automation, within the transmission and distribution (T&D) global practice. Mark is part of a dedicated team that ensures that Burns and McDonnell remains at the forefront of T&D innovation, driving the company's success in an ever-evolving technological landscape.

Juror: David Taborda

Subsurface Modeling and Analysis

Imperial College London
Reader in Geomechanical Modeling

David Taborda is a reader in geomechanical modeling at Imperial College London. He specializes in the development of advanced soil models for practical use in geotechnical engineering, with his research interests including urban excavations, offshore foundations, and geothermal structures. He actively collaborates with industry in solving emerging challenges in geotechnical engineering, currently focusing on establishing data-driven methods for the intelligent design and management of infrastructure.

Juror: Mischa Wanek-Libman

Rail and Transit

Transdev U.S.
Director of Communications

Mischa Wanek-Libman currently serves as director of communications at Transdev U.S. She is a former journalist who spent more than 20 years covering transportation issues, including policy and regulatory impacts, emerging technology, construction projects, and engineering challenges.


W Broadway
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INDEX OF PROJECTS

Organized by
organization

Index of projects | By organization

A

ABM Knowledgeware Limited
Swatantrya Veer Savarkar Sea Link Project - Versova-Bandra Sea Link Project
Location: Mumbai, Maharashtra, India, 33

Abussaif Group
Medina Industrial City
Location: Medina, Saudi Arabia, 75

Acueducto Metropolitano de Bucaramanga S.A. E.S.P.
Optimizing Water Distribution in the Face of the Climate Crisis: Loss Reduction and Energy Efficiency in Colombia
Location: Bucaramanga, Santander, Columbia, 204

Aegea
Reality Capture: Surveying and Monitoring in the Sanepar-Aegea PPP
Location: Paraná, Brazil, 174

Amey
Core Valley Lines (CVL) Transformation - South Wales Metro, UK
Location: Cardiff, Wales, United Kingdom, 54

AngloGold Ashanti
Integrated Flow of Modeling and Estimation in Leapfrog Energy, Edge, and Central, Cuiabá Mine
Location: Sabará, Minas Gerais, Brazil, 154

Ansteel Mining Engineering Corporation
Refractory Ore Beneficiation Technology Upgrading Project of Donganshan Sintering Plant
Location: Anshan, Liaoning, China, 134

Aqua
Utilizing OpenFlows during Emergency Response in Danville, IL
Location: Danville, Illinois, United States, 207

Aquatim SA
(Re)building the Hydraulic Model for the Water Distribution Network in Timişoara
Location: Timişoara, Timis, Romania, 205

Arcadis
Advanced Analysis and Design of Flood Protection Structures through Automation
Location: New York City, Indianapolis, and Dallas; New York, Indiana, and Texas; United States, 124

Arcadis
Cambridge South Infrastructure Enhancements
Location: Cambridge, United Kingdom, 56, 217

Arcadis
Clapham Junction Station Congestion Relief Pedestrian Interchange Footbridge
Location: London, Wadsworth, United Kingdom, 57

Arcadis (As part of ASC)
HS2 Sections C2-C3
Location: Birmingham, England, United Kingdom, 55

Architecture×Civil Engineering Inc.
Liquefaction Countermeasure Using Scallop Shells Enabled by PLAXIS: Numerical Simulation Aimed at Social Implementation
Location: Chuo, Osaka, Japan, 155

Arup Singapore Pte Ltd
Advanced Engineering Study for Cross Island Line Phase 2
Location: Singapore, 146

AtkinsRéalis
Sizewell C - Main Construction Area - Bulk Excavation
Location: Sizewell, England, United Kingdom, 159

Aurecon
SH1 Papakura to Drury
Location: Auckland, New Zealand, 117

Aurenne Group Mining
Enhancing Gold Resource Targeting with Integration of Seequent Central, Leapfrog, and Imago
Location: Perth, Western Australia, Australia, 152

Avangrid
Preventive Maintenance Program Creation
Location: Rochester, New York, United States, 62

B

Balfour Beatty Vinci/Mott MacDonald SYSTRA DJV
HS2 Area North Main Works Civils Contract
Location: Birmingham, West Midlands, United Kingdom, 101

Baoding Jida Electric Power Design Co., Ltd.
Yejie 110kV Substation Digital Handover Project in Mancheng District, Baoding City
Location: Baoding, Hebei, China, 190

Baosteel Engineering & Technology Group Co., Ltd. (China Baowu Design Institute)
Full Lifecycle Digital Technology Application for Xinyu Iron & Steel Blast Furnace Low Carbon Oxygen Enrichment Project
Location: Xinyu, Jiangxi, China, 59

Basic Sanitation Company of the State of São Paulo
Operational Restructuring of Latin America's Most Economically ActiveSector
Location: São Paulo, Brazil, 204

BasisSoft Co.
Study on Utilization of Site Information in GeoBIM-based Tunnel Construction
Location: South Korea, 160

Beca Ltd. and Auckland Transport
Homai's Rail Innovation: Digital Pathways to Community Engagement
Location: Auckland, New Zealand, 101

Beichen Convention & Exhibition Investment Co. Ltd.
China National Convention Center Phase II
Location: Beijing, China, 72

Beijing Institute of Architectural Design
No. 3 Office Building of Jingdong Group
Location: Beijing, China, 157

Beijing Institute of Architectural Design
Swimming Center Project of Olympic Sports Park Area
Location: Hangzhou, Zhejiang, China, 78

Beijing Railway Construction Co., Ltd. of China Railway 6thBureau Group, Traffic Engineering Branch of China Railway 6th Bureau Group
Digital Application in the Double-Track Tunnel Project of Chongqing University Town
Location: Chongqing, China, 115

Beijing Shougang International Engineering Technology Co., Ltd., Wanhua Chemical (Penglai) Co., Ltd.
300,000 Tonnes/Day Seawater Desalination Project of Wanhua Chemical (Penglai) Co., Ltd.
Location: Yantai, Shandong, China, 196

BIM Centre
Xinchuansha Pump Gate Hub Project of the Digital Twin Wusong River Project (Shanghai Section)
Location: Shanghai, China, 209

Buchanan
How LEGION Changed Madrid through Pedestrian Simulation: Real Madrid Stadium
Location: Madrid, Spain, 74

Burgess & Niple, Inc.
Virgin River Gorge – Structure Health Monitoring
Location: Littlefield, Arizona, United States, 33

C

Cangzhou Tongxing Electric Power Design Co., Ltd.
110kV Substation Digital Delivery and Review Project at Gangqu No. 1
Location: Cangzhou, Hebei, China, 184

Cangzhou Tongxing Electric Power Design Co., Ltd.
3D Design Project of Weizhuang 110kV Substation
Location: Cangzhou, Hebei, China, 186

CBMI Construction
International Cement Engineering Construction Empowered by Intelligent Construction
Location: Kinere, Dakar, Senegal, 47

CCCC First Harbor Engineering Urban Transportation Engineering Co., Ltd.
Baise North-South Transit Highway (North Ring Road) Section I
Location: Baise, Guangxi Zhuang Autonomous Region, China, 113

CCCC First Harbor Southwest Engineering Company Ltd., CCCC Port Engineering Design & Consulting Company Ltd.
Bid Section III Project of Baise North-South Transit Line Highway (North Ring Road)
Location: Baise, Guangxi, China, 113

CCTEG Beijing Huayu Engineering Co., Ltd.
Digital Design and Delivery Project of Xinjie No. 2 Mine and Coal Preparation Plant in Taigemiao Mining Area, Xinjie, Inner Mongolia
Location: Ordos City, Inner Mongolia Autonomous Region, China, 88

CCTEG Wuhan Engineering Company
Xinjie No. 1 Mine Project in Taigemiao Mining Area, Xinjie
Location: Ordos, Inner Mongolia Autonomous Region, China, 63

C-design Partners Co., Ltd.
Former City Hall Branch Revitalization Project
Location: Kanagawa, Japan, 130

C-design Partners Co., Ltd.
Neko Coffee Sky Terrace Café – Creating a Multipurpose Space that Connects the Local Community
Location: Odawara, Kanagawa, Japan, 132

C-design Partners Co., Ltd.
Old Post Office Renovation Project
Location: Odawara, Kanagawa, Japan, 133

C-design Partners Co., Ltd.
Renovation Work Using STAAD for a Building Complex in Odawara City
Location: Odawara, Kanagawa, Japan, 134

C-design Partners Co., Ltd.
Seaside B&B Retrofitting Project
Location: Kanagawa, Japan, 136

CEC
Retention Pit with Piperack for Combined Cycle Cogeneration Power Plant
Location: Bangkok, Thailand, 135

CEC
Structural Engineering of a Project in Indonesia
Location: Djakarta, Karawang, Indonesia, 138

Cerrado Gold
Project Geology Chain of Custody
Location: Monte do Carmo, Tocantins, Brazil, 158

Changsha BIMcloud Information Technology Co., Ltd.
New-Phrase Operation Zone (ZOP) and Entrance Complex (CI) Construction Project of Chancay Comprehensive Port
Location: Canars, Lima and Huaral, Peru, 76

Chiappini, Cassano, Blacud Rotger, Segala, associate engineers
Structural Design of a Floating Facility for Loading Grain Barges in Fluvial Environments
Location: La Paz, Entre Ríos, Argentina, 137

China Construction Buer Curtain Wall & Decoration Co., Ltd.
Building T2 and T10 Curtain Wall Project of Shenzhen Metro Qianhai International Hub
Location: Shenzhen, Guangdong, China, 44

China ENFI Engineering Co., Ltd.
Digital Application Project of Expansion Project of Saindak Copper-Gold Mine in Pakistan
Location: Saindak, Quetta, Balochistan, Pakistan, 87

China ENFI Engineering Co., Ltd.
Digital Construction Project of Comprehensive Waste Treatment Facilities in Xiong'an New Area
Location: Beijing, China, 66

China First Metallurgical Group Co., Ltd.
Phase II and Phase III of Comprehensive Improvement Project for the Outlet Reach of Fuhuan River
Location: Wuhan, Hubei, China, 169

China Huanqiu Contracting & Engineering Co., Ltd.
Whole-process Digital Delivery of Guangxi Petrochemical's Refining-Chemical Integration Project
Location: Qinzhou, Guangxi Zhuang Autonomous Region, China, 62

China Railway First Survey and Design Institute Group Co., Ltd.
API Library and Common Toolkit for Spatial Positioning of Railway Lines
Location: Xi'an, Shaanxi, China, 99

China Railway No. 4 Engineering Group Co., Ltd.; Anhui Digital Intelligent Construction Research Institute Co., Ltd.
Comprehensive Application of BIM in the World's First One-tower Ground-anchored Slewing Cable Suspension Bridge
Location: Shanxi, China, 30

China Railway No. 10 Engineering Group Co.,Ltd. Jinan Survey and Design Institute
Application of BIM Technology in the High-speed Railway Tunnel Project of the Comprehensive Transportation Hub of Jinan Yaoqiang International Airport
Location: Jinan, Shandong, China, 30

China Road and Bridge Corporation, China Highway Engineering Consulting Corporation
Phnom Penh – Bavet Expressway
Location: Phnom Penh, Cambodia, 110

CHINT Group Co., Ltd.
Joint Frame Design Project for a Power Station in Philippines
Location: Caron, Palawan, Philippines, 131

Chuanyeh Engineering Consultant Co., Ltd.
Design and Construction Technology Service of A1 Bridge Pier Protection Project of Shuangdong Viaduct, National Expressway No. 6
Location: Nantou, Taiwan, 171

CNCEC SEDIN Engineering Co., Ltd.
KAN Ammonium Nitrate Project in Indonesia
Location: Bontang, Kalimantan Timur, Indonesia, 131

CNPC East China Design Institute Co., Ltd.
Structural Design for a Main Pipe Bridge of a Refinery in South China
Location: Bontang, Kalimantan Timur, Indonesia, 137

Collective Mining
Apollo, from Grasroots to Discovery,
Location: Supía and Marmato, Caldas, Colombia, 147

Communaute d'Agglomeration Pau Bearn Pyrenees - CAPBP
Multipurpose Urban Digital Twin of Communaute d'Agglomeration de Pau Bearn Pyrenees
Location: Pau, Pyrenees Atlantiques, France, 76, 219

Companhia de Saneamento Básico do Estado de São Paulo - Sabesp
Integra 4.0
Location: São Paulo, Brazil, 194

Companhia Pernambucana de Saneamento - COMPESA
Advanced Modeling for Optimal Chlorine Dosage in WTPs
Location: Afogados da Ingazeira, Pernambuco, Brazil, 198

COPEL Distribuição S.A.
Implementation of BIM Modeling for Medium- and High-voltage Substation Projects
Location: Curitiba, Paraná, Brazil, 182

CSCEC AECOM Consultants Co., Ltd.
Design, Construction and General Contracting of Western Zhenyuan Comprehensive Pipeline Network Renovation Project and Zhenyuan Dongxin Street Phase II Road Project
Location: Lanzhou, Gansu, China, 114

CSCEC Road and Bridge Group Co., Ltd.
Intelligent Construction of Baoding Lekai Street South Extension Project Based on BIM
Location: Baoding, Hebei, China, 32

D

DAR International for Engineering Consultancy
DAR Engineering's Digital/Enterprise Document Management System
Location: Saudi Arabia, 58

Dataforensics
USACE Ground to Cloud—Enterprise Data Management Migration
Location: Washington, District of Columbia, United States, 145

Delhi Metro Rail Corporation Limited
DMRC Phase IV Metro Extension
Location: New Delhi, India, 46

Delhi Metro Rail Corporation Limited
Enhancing Urban Connectivity-The Punjabi Bagh Interchange Station
Location: New Delhi, Delhi, India, 125

Department of Public Works and Highways (DPWH)
Digital Twin Implementation for NLEX-SLEX Connector Road Project
Location: Caloocan to Manila, Metro Manila, Philippines, 108

Design and Research & Development Center of CNOOC EnerTech Equipment Technology Co., Ltd.
Project of Adding Slots to WHPA Platform of Bozhong 19-4 Oilfield
Location: Tianjin, China, 133

DFW International Airport - Controls & Analytics
Transforming DFW Airport Program Delivery
Location: Texas, United States, 50

Dragonfly UAS Co., Ltd.
Side Slope Monitoring Project of Taiwan Railway Yilan Line at K12+233
Location: Yilan, Taiwan, 175

Dublin Fire Brigade
Digital Twins for Emergency Response (DTER)
Location: Dublin, Ireland, 73, 220

E

Engineerik
Water Supply Infrastructure Project for the Territory of Water Utility Silistra, Bulgaria
Location: Silistra, Bulgaria, 208

Exo Inc.
Evergy Power Transmission Tower Stabilization
Location: Clinton, Missouri, United States, 189, 227

Exo Inc.
Ohio Falls River Crossing Towers
Location: Louisville, Kentucky, United States, 183

Expert Geophysics Limited
Developing Airborne Electromagnetic Technology for Detail Structural Mapping
Location: Aurora, Ontario, Canada, 150

F

FANTAWILD Institute of Design Co., Ltd.
Yingtan Boonie Bears Water World Theme Park
Location: Xiamen, Fujian, China, 79

Fireweed Metals
Macmillan Pass
Location: Whitehorse, Yukon, Canada, 156

Five Technology, Inc.
Legal Disaster Prevention Equipment Management and Maintenance Project
Location: Minato, Tokyo, Japan, 75

Five Technology, Inc.
Real Estate Property Management & Asset Management
Location: Osaka, Japan, 77

G

GAI Consultants
GAI Consultants: Unprecedented Productivity and Collaboration
Location: Orlando, Florida, United States, 59

Geological Survey of Brazil
From Geologic Map to 3D Model: A Case Study of Pará de Minas Sheet
Location: Belo Horizonte, Minas Gerais, Brazil, 152

Index of projects | By organization

H

I

J

K

L

M

N

O

P

Pacific Gas & Electric
10k Electrical Wiring Undergrounding Project to Mitigate Risk of Catastrophic Wildfires
Location: California, United States, 184

PetroChina Company Limited Changqing Petrochemical Branch
Asset Performance Management Project of CNPC Changqing Petrochemical Branch
Location: Xianyang, Shaanxi, China, 87

PowerChina Huadong Engineering Corporation Limited
Research on the Key Digital Twin Technologies Based on BIM Technology in Full Lifecycle of the Project - Geographic Space Data Mapping Technology
Location: Huai'an, Jiangsu, China, 77

PowerChina Hubei Electric Engineering Co., Ltd.
Digital Twin Intelligent Operation and Maintenance Power Plant of PowerChina Xishui 160MW Fishery-Solar Complementary Project
Location: Xishui, Hubei, China, 89

PowerChina Zhongnan Engineering Corporation Limited
Shandong Energy Group Bozhong Offshore Wind Farm Site A Project
Location: Dongying, Shandong, China, 82

PrimeTech
Building N3 Test Chamber Piping Lines Using Reality Mesh
Location: Daejeon, Chungcheong, South Korea, 71

PrimeTech
Check Construction Site Status with Reality Mesh
Location: Incheon, South Korea, 72

PrimeTech
Obtain Drawings through Reverse Engineering of Facilities
Location: Ulsan, Gyeongsangbuk, South Korea, 89

Prof. Quick und Kollegen GmbH
Replacement Construction of the Viaduct Brunsbecke
Location: Hagen, North Rhine-Westphalia, Germany, 158

Proicere Digital
Sellafield Retreatment Plant (SRP) Project
Location: Seascale, Cumbria, United Kingdom, 38

Prointec
A6 Dungiven to Drumahoe Dualling Scheme
Location: Ireland, 112

Promet Montajes
Desalination Plant for Mining
Location: Tocopilla, Antofagasta, Chile, 45

PT Hutama Karya (Persero)
Integrating Subsurface Model for Efficient Geotech Data Management in Trans Sumatra
Location: Pekanbaru, Riau, Indonesia, 144

PT Hutama Karya (Persero)
Navigating the Complexities of Jakarta MRT Phase 2A CP203 with Digital Solutions
Location: Jakarta, South Jakarta, Indonesia, 41

PT iForte Solusi Infotek
Fiber to the Home (FTTH) Integrations & Automation with Multiple Systems with Bentley BECS
Location: Indonesia, 189

PT SMG Consultants Indonesia
Transformative Innovations in Southeast Sulawesi Nickel-Cobalt Exploration
Location: North Konawe, Southeast Sulawesi, Indonesia, 161, 223

PT Waskita Karya (Persero) Tbk
Jakarta-Cikampek II South Toll Road
Location: Karawang-Purwakarta, West Java, Indonesia, 116

PT Wijaya Karya (Persero) Tbk
Nusantara Presidential Complex, New Capital City of Indonesia
Location: Nusantara, Indonesia, 69

PT Wijaya Karya (Persero) Tbk
Nusantara Road and Highway Connectivity, New Capital City of Indonesia
Location: Balikpapan, East Kalimantan, Indonesia, 116, 222

PUB, Singapore's National Water Agency
High Fidelity Digital Twin-enabled Anomaly Detection and Localization in Singapore
Location: Singapore, 200, 228

Q

Qingdao Yanbo Data Information Technology Co., Ltd.
Digital Twin System of Long-Distance Water Transfer Pipe Network for the Project of Transferring Water from Yellow River to the East Regions
Location: Qingdao, Shandong, China, 199

Qingdao Yijia Architectural Design Co., Ltd.
A Paper Mill in Japan
Location: Tokyo, Japan, 126

QK4, Inc.
Going Digital Survey with Bridging Kentucky
Location: Kentucky, United States, 29, 214

S

Sanepar - Paraná Sanitation Company
Continuous Improvement of Services and Reduction of Environmental Impacts and Social Benefits in Toledo
Location: Toledo, Paraná, Brazil, 198

SCEGC Mechanized Construction Group Co., Ltd.
Xi'an International Football Centre
Location: Xi'an, Shaanxi, China, 51

SEPCOIII Engineering Consulting Institute
Internal Combustion Engine Power Generation Project
Location: Mandalay, Myanmar, 130

Shanghai CIMC TGE Gas Engineering Co., Ltd.
Analysis of the Deformation under Stress of Large Group Piles Foundation for Liquefied Gas Storage Tanks
Location: Jiaxing, Zhejiang, China, 147

Shanghai Construction No.4 (Group) Co., Ltd.
Shanghai Grand Opera House
Location: Shanghai, China, 50

Shanghai Investigation, Design & Research Institute Co., Ltd.
500MW Photovoltaic Power Plant in the Section I of the Pilot Project of Kubuqi Desert New Energy Base
Location: Ordos, Inner Mongolia Autonomous Region, China, 86

Shanghai Investigation, Design & Research Institute Co., Ltd.
Yanglin Pumped Storage Power Station
Location: Sanya, Hainan, China, 91

Shanghai Ou Yang Offshore Engineering Group Co., Ltd
Huizhou No. 2 Offshore Wind Farm Development Project of China General Nuclear Power Group
Location: Huizhou, Guangdong, China, 153

Skanska Costain Strabag JV
HS2 Main Works South PH-1
Location: London, United Kingdom, 31

SMEC
North East Link
Location: Melbourne, Victoria, Australia, 61

SMEC South Africa
Upgrade of National Route 3
Location: Durban, KwaZulu-Natal, South Africa, 118

Sougogiken Co., Ltd.
3D Digitalization of a World Heritage Site in Kyoto: Experiencing Ninnaji Temple through Virtual Reality
Location: Kyoto, Japan, 170

Sougogiken Co., Ltd.
3D Measurement and Content Creation for Daisho-in Temple, Miyajima, under a Sacred Fire Lit for More Than 1,200 Years
Location: Hatsukaichi, Hiroshima, Japan, 170

Southern Cross Gold
Sunday Creek: High-grade Au-Sb Discovery at Clonbinane, Victoria
Location: Clonbinane, Victoria, Australia, 161

Southwest Branch of CPECC
Thailand No. 7 Natural Gas Processing Plant Project
Location: Rayong, Thailand, 138

Southwest Electric Power Design Institute Co., Ltd. of China Power Engineering Consulting Group
Butuo ± 800kV Converter Station
Location: Liangshan, Sichuan, China, 180

Spark and WSP
North East Link Central Package
Location: Melbourne, Victoria, Australia, 142

SPL Powerlines UK
Midland Mainline Electrification
Location: Hertfordshire, Bedfordshire, Northamptonshire, Leicestershire, Nottinghamshire, Derbyshire, and South Yorkshire; United Kingdom, 94

State Grid Tianjin Electric Power Survey, Design & Consulting Co., Ltd.
Digital Design Project for the Tianjin Eco-city 220kV Substation Project
Location: Tianjin, China, 188

STRENG
Piscais Bridge
Location: Vila Real, Portugal, 117

SUDOP PRAHA a.s.
Smichov Station Terminal
Location: Prague, Czech Republic, 105

SYSTRA India
Etihad Rail: Detail Design of MBZ Station Link Roads
Location: Mohamed Bin Zayed City, Abu Dhabi, United Arab Emirates, 115

SYSTRA India
Global City, Gurugram
Location: Gurugram, Hariyana, India, 200

SYSTRA India
Improvement of Existing Sewer Network, Chennai
Location: Chennai, Tamil Nadu, India, 201

SYSTRA UK Ltd.
SafeByBIM - Collaborative Tool
Location: United Kingdom, 104

T

Taiwan BIM Technology Co., Ltd.
Ankeng Light Rail Transit System
Location: New Taipei City, Taiwan, 98

Takenaka Corporation
Real-time Remote Monitoring Digital Twin of Demolition Worksites
Location: Chiyoda, Tokyo, Japan, 175

Tata Consulting Engineers Limited
Engineering Design for Blast Furnace
Location: Hazira, Gujarat, India, 129

Tata Projects Limited
400kV D/C & M/C Kharghar - Vikhroli T/L
Location: Mumbai, Maharashtra, India, 185

Tecne Systra-Sws Advanced Tunneling Srl
Digital Implementation in Tunnel Assessment and Rehabilitation
Location: Italy, 28, 215

Tectonics, Petrology and Lithospheric Processes Research Group at the University of Melbourne
A Machine Learning Modeling Approach to Automated 3D Geological Mapping
Location: Melbourne, Victoria, Australia, 146

The Civil Engineering Group Corporation of China Construction Second Engineering Bureau Ltd.
Construction of the Third Bidding Section of the Baipeng Road-Xiaowan Interchange Project of the First Longitudinal Line
Location: Chongqing, China, 114

The Third Construction Co., Ltd. of CTCE Group, China Railway No. 4 Engineering Group Co., Ltd.
Qingdao Feng River Wetland Park Project
Location: Qingdao, Shandong, China, 49

Tianjin Tianhe-Cloud Building Engineering Technology Co., Ltd.
Building Infectious Diseases Wards and Other Renovation and Expansion Projects of Tianjin Haihe Hospital
Location: Tianjin, China, 71

Transport for London
OpenPaths CUBE and OpenPaths EMME Application in Transport for London's Multimodal Demand Forecasting
Location: London, England, United Kingdom, 103

Transport for London
The Elizabeth Line
Location: London, England, United Kingdom, 96

U

UES Holdings Pte Ltd
Tuas Water Reclamation Plant
Location: Singapore, 207

University of Canterbury
Bridging the Gap: Incorporating 3D Modeling into Undergraduate University Courses
Location: Christchurch, Canterbury, New Zealand, 149, 224

University of Miyazaki
Development of a Numerical Analysis Method to Predict Ground Deformation during the Extraction of Retaining Parts
Location: Miyazaki, Japan, 150

W

Water Supplies Department
Digital Twin of the Ex-Sham Shui Po Service Reservoir
Location: Kowloon, Hong Kong SAR, China, 166

Webuild s.p.a.
4D Modeling and Construction Management for Pedestrian Steel Bridge Construction in the New ENI HQ
Location: San Donato Milanese, Lombardia to Milano, Italy, 40

WISDRI Engineering and Research Incorporation Limited
Digital Innovative Applications throughout the Process of Iron and Steel EPC Projects
Location: Yuxi, Yunnan, China, 84

WISDRI Engineering and Research Incorporation Limited
Innovative Applications of BIM Design of the Pipeline and Cable for Vietnam HPDQ
Location: Wuhan, Hubei, China, 60

WISDRI Engineering and Research Incorporation Limited
Wuhan Gaoxin 4th Road Comprehensive Reconstruction Project
Location: Wuhan, Hubei, China, 111

Worley Services India Private Ltd
Fairley East (LCD 2) Project
Location: Kuala Belait, Belait District, Brunei, 46

WSB
11th Street Railroad Grade Separations
Location: Moorhead, Minnesota, United States, 98

WSB
I-10 Inner Katy Corridor, I-610 to West of I-45
Location: Houston, Texas, United States, 60

WSP
Oxford Station Phase 2C/2D
Location: Oxford, England, United Kingdom, 104

X

Xingtai Electric Power Engineering Co., Ltd.
3D Design Project in Eastern Renxian County
Location: Xingtai, Hebei, China, 185

Y

Yuhashi Laboratory, Shizuoka University
Vacant House Distribution Using 3D Modeling by Drone
Location: Chuo-ku, Hamamatsu, Shizuoka, Japan, 176

Yuzawa Kogyo Co., Ltd.
R2 Komu River Upstream Bank Protection
Location: Nirasaki, Yamanashi, Japan, 49

INDEX OF PROJECTS

Organized
by country

Argentina

Chiappini, Cassano, Blacud Rotger, Segala, associate engineers
Structural Design of a Floating Facility for Loading Grain Barges in Fluvial Environments
Location: La Paz, Entre Ríos, 137

Australia

Aurenne Group Mining
Enhancing Gold Resource Targeting with Integration of Seequent Central, Leapfrog, and Imago
Location: Perth, Western Australia, 152

Kent
Ampol Future Fuels Gasoline Desulfurization Project
Location: Brisbane, Queensland, 43

Macquarie Geotechnical
Subsurface Reality Modelling for Enhanced Subsurface Insight
Location: New South Wales, 160, 225

North Western Program Alliance (NWPA)
Using SYNCHRO Perform to Improve Efficiency and Drive Real-time Decision Making
Location: Melbourne, Victoria, 51

SMEC
North East Link
Location: Melbourne, Victoria, 61

Southern Cross Gold
Sunday Creek: High-grade Au-Sb Discovery at Clonbinane, Victoria
Location: Clonbinane, Victoria, 161

Spark and WSP
North East Link Central Package
Location: Melbourne, Victoria, 142

Tectonics, Petrology and Lithospheric Processes Research Group at the University of Melbourne
A Machine Learning Modeling Approach to Automated 3D Geological Mapping
Location: Melbourne, Victoria, 146

Brazil

Aegea
Reality Capture: Surveying and Monitoring in the Sanepar-Aegea PPP
Location: Paraná, 174

AngloGold Ashanti
Integrated Flow of Modeling and Estimation in Leapfrog Energy, Edge, and Central, Cuiabá Mine
Location: Sabará, Minas Gerais, 154

Basic Sanitation Company of the State of São Paulo
Operational Restructuring of Latin America's Most Economically ActiveSector
Location: São Paulo, 204

Cerrado Gold
Project Geology Chain of Custody
Location: Monte do Carmo, Tocantins, 158

Companhia de Saneamento Básico do Estado de São Paulo - Sabesp
Integra 4.0
Location: São Paulo, 194

Companhia Pernambucana de Saneamento - COMPESA
Advanced Modeling for Optimal Chlorine Dosage in WTPs
Location: Afogados da Ingazeira, Pernambuco, 198

COPEL Distribuição S.A.
Implementation of BIM Modeling for Medium- and High-voltage Substation Projects
Location: Curitiba, Paraná, 182

Geological Survey of Brazil
From Geologic Map to 3D Model: A Case Study of Pará de Minas Sheet
Location: Belo Horizonte, Minas Gerais, 152

Geological Survey of Brazil - SGB/CPRM
Application of 3D Modeling in Assessing the Stability of Underground Rock Salt Mines in Maceió
Location: Maceió, Alagoas, 148

Jaguar Mining Inc
Modeling and Estimation Processes Improvement through Seequent Solutions
Location: Santa Bárbara and Conceição do Pará, Minais, 156

Sanepar - Paraná Sanitation Company
Continuous Improvement of Services and Reduction of Environmental Impacts and Social Benefits in Toledo
Location: Toledo, Paraná, 198

Brunei

Worley Services India Private Ltd.
Fairley East (LCD 2) Project
Location: Kuala Belait, Belait District, 46

Bulgaria

Engineerik
Water Supply Infrastructure Project for the Territory of Water Utility Silistra, Bulgaria
Location: Silistra, 208

Cambodia

China Road and Bridge Corporation, China Highway Engineering Consulting Corporation
Phnom Penh – Bavet Expressway
Location: Phnom Penh, 110

Canada

Expert Geophysics Limited
Developing Airborne Electromagnetic Technology for Detail Structural Mapping
Location: Aurora, Ontario, 150

Fireweed Metals
Macmillan Pass
Location: Whitehorse, Yukon, 156

Hatch
Implementing OGC Technology - Piloting a Digital System in the Harshest of Conditions
Location: Baffin Island, Nunavut, 153

Monir Precision Monitoring
31 Parliament Street Urban Infrastructure and Excavation Shoring Monitoring
Location: Toronto, Ontario, 168, 226

Chile

Promet Montajes
Desalination Plant for Mining
Location: Tocopilla, Antofagasta, 45

China

Ansteel Mining Engineering Corporation
Refractory Ore Beneficiation Technology Upgrading Project of Donganshan Sintering Plant
Location: Anshan, Liaoning, 134

Baoding Jida Electric Power Design Co., Ltd.
Yejie 110kV Substation Digital Handover Project in Mancheng District, Baoding City
Location: Baoding, Hebei, 190

Baosteel Engineering & Technology Group Co., Ltd. (China Baowu Design Institute)
Full Lifecycle Digital Technology Application for Xinyu Iron & Steel Blast Furnace Low Carbon Oxygen Enrichment Project
Location: Xinyu, Jiangxi, 59

Beichen Convention & Exhibition Investment Co. Ltd.
China National Convention Center Phase II
Location: Beijing, 72

Beijing Institute of Architectural Design
No. 3 Office Building of Jingdong Group
Location: Beijing, 157

Beijing Institute of Architectural Design
Swimming Center Project of Olympic Sports Park Area
Location: Hangzhou, Zhejiang, 78

Beijing Railway Construction Co., Ltd. of China Railway 6th Bureau Group, Traffic Engineering Branch of China Railway 6th Bureau Group
Digital Application in the Double-Track Tunnel Project of Chongqing University Town
Location: Chongqing, 115

Beijing Shougang International Engineering Technology Co., Ltd., Wanhua Chemical (Penglai) Co., Ltd.
300,000 Tonnes/Day Seawater Desalination Project of Wanhua Chemical (Penglai) Co., Ltd.
Location: Yantai, Shandong, 196

BIM Centre
Xinchuansha Pump Gate Hub Project of the Digital Twin Wusong River Project (Shanghai Section)
Location: Shanghai, 209

Cangzhou Tongxing Electric Power Design Co., Ltd.
110kV Substation Digital Delivery and Review Project at Gangqu No. 1
Location: Cangzhou, Hebei, 184

Cangzhou Tongxing Electric Power Design Co., Ltd.
3D Design Project of Weizhuang 110kV Substation
Location: Cangzhou, Hebei, 186

CCCC First Harbor Engineering Urban Transportation Engineering Co., Ltd.
Baise North-South Transit Highway (North Ring Road) Section I
Location: Baise, Guangxi Zhuang Autonomous Region, 113

CCCC First Harbor Southwest Engineering Company Ltd., CCCC Port Engineering Design & Consulting Company Ltd.
Bid Section III Project of Baise North-South Transit Line Highway (North Ring Road)
Location: Baise, Guangxi Zhuang Autonomous Region, 113

CCTEG Beijing Huayu Engineering Co., Ltd.
Digital Design and Delivery Project of Xinjie No. 2 Mine and Coal Preparation Plant in Taigemiao Mining Area, Xinjie, Inner Mongolia
Location: Ordos City, Inner Mongolia Autonomous Region, 88

CCTEG Wuhan Engineering Company
Xinjie No. 1 Mine Project in Taigemiao Mining Area, Xinjie
Location: Ordos, Inner Mongolia Autonomous Region, 63

China Construction Buer Curtain Wall & Decoration Co., Ltd.
Building T2 and T10 Curtain Wall Project of Shenzhen Metro Qianhai International Hub
Location: Shenzhen, Guangdong, 44

China ENFI Engineering Co., Ltd.
Digital Construction Project of Comprehensive Waste Treatment Facilities in Xiong'an New Area
Location: Beijing, 66

China First Metallurgical Group Co., Ltd.
Phase II and Phase III of Comprehensive Improvement Project for the Outlet Reach of Fuhuan River
Location: Wuhan, Hubei, 169

China Huanqiu Contracting & Engineering Co., Ltd.
Whole-process Digital Delivery of Guangxi Petrochemical's Refining-Chemical Integration Project
Location: Qinzhou, Guangxi Zhuang Autonomous Region, 62

China Railway First Survey and Design Institute Group Co., Ltd.
API Library and Common Toolkit for Spatial Positioning of Railway Lines
Location: Xi'an, Shaanxi, 99

China Railway No. 10 Engineering Group Co.,Ltd. Jinan Survey and Design Institute
Application of BIM Technology in the High-speed Railway Tunnel Project of the Comprehensive Transportation Hub of Jinan Yaoqiang International Airport
Location: Jinan, Shandong, 30

China Railway No. 4 Engineering Group Co., Ltd.; Anhui Digital Intelligent Construction Research Institute Co., Ltd.
Comprehensive Application of BIM in the World's First One-tower Ground-anchored Slewing Cable Suspension Bridge
Location: Shanxi, 30

CNPC East China Design Institute Co., Ltd.
Structural Design for a Main Pipe Bridge of a Refinery in South China
Location: Jieyang, Guangdong, 137

CSCEC AECOM Consultants Co., Ltd.
Design, Construction and General Contracting of Western ZhenyuanComprehensive Pipeline Network Renovation Project and Zhenyuan Dongxin Street Phase II Road Project
Location: Lanzhou, Gansu, 114

CSCEC Road and Bridge Group Co., Ltd.
Intelligent Construction of Baoding Lekai Street South Extension Project Based on BIM
Location: Baoding, Hebei, 32

Design and Research & Development Center of CNOOC EnerTech Equipment Technology Co., Ltd.
Project of Adding Slots to WHPA Platform of Bozhong 19-4 Oilfield
Location: Tianjin, 133

FANTAWILD Institute of Design Co., Ltd.
Yingtan Boonie Bears Water World Theme Park
Xiamen, Fujian, 79

Guangdong Airport Authority, Central-South Architectural Design Institute Co., Ltd., China Airport Planning & Design Institute Co., Ltd., Civil Aviation East China(Zhejiang), Construction And Development Co., Ltd, Airport Construction Engineering Co., Ltd, CCCC Tunnel Engineering Company Limited, China Railway Beijing Engineering Group Co., Ltd., Hebei Construction Group Corporation Limited, China Huashi Enterprises Company Limited, Shanxi Mechanisation Construction Group Co., Ltd., Shanghai Baoye Group Corp., Ltd., PowerChina Airport Construction Company Limited, China Railway 19 TH Bureau Group 2nd Co., Ltd., The Construction of Guangzhou Baiyun International Airport Development Co., Ltd., Zhonghang Electricity System Engineering Co., Ltd., China Construction Eighth Engineering Division Corp., Ltd, Guangdong Construction Engineering Group Co., Ltd., China Construction Third Engineering Bureau Group Co., Ltd., Beijing Construction Engineering Group Co., Ltd.
Digital Innovation Application of Guangzhou Baiyun International Airport Phase III Expansion Project
Location: Guangzhou, 68, 218

Guiyang Aluminum Magnesium Design & Research Institute Co., Ltd.
Digital Delivery and Digital Twin Engineering of Baofeng Anode Materials
Location: Yinchuan, Ningxia Hui Autonomous Region, 88

Hangzhou Bole Digital Intelligence Technology Co. Ltd.
Onyear Betel Nut Processing Plant Project
Location: Xiangtan, Hunan, 90

Harbin Boiler Company Limited
The Steel Structure Design of Ultra-supercritical Boiler for Installing 2X1000MW Large Generator Sets and Closing Small Generator Sets at Jiangsu Huadian's Jurong Base
Location: Jurong, Jiangsu, 139

Heilongjiang Airports Management Group Co., Ltd., PowerChina Guiyang Engineering Corporation Limited, Shanxi Mechanization Construction Group Co., Ltd, Beijing Jinghang'an Airport Engineering Co., Ltd., Beijing Jiahe Construction Engineering Co., Ltd.
Harbin Taiping International Airport Phase II Expansion Project
Location: Harbin, Heilongjiang, 47

Hengshui Electric Power Design Co., Ltd.
3D Digital Design of 110kV Indoor Substation in Park
Location: Hengshui, Hebei, 186

Hengyang Yanneng Electric Power Survey, Design & Consulting Co., Ltd.
3D Digitized Design Project of Construction Drawing of Hengyang Jinlan Substation
Location: Hengyang, Hunan, 187

Hunan Provincial Communications Planning, Survey & Design Institute Co., Ltd.
Shunde Waterway Expansion and Upgrading Project
Location: Foshan, Guangdong, 32

Inner Mongolia Electric Power Survey And Design Institute Co.,Ltd.
Application of Digital Design in the Wuda North 550kV Substation
Wuhai, Inner Mongolia Autonomous Region, 187

Inner Mongolia Electric Power Survey and Design Institute Co.,Ltd.
BIM Application in the Digital Design of Wanli 220kV Substation
Location: Ordos, Hohhot, 188

JSTI Group Co., Ltd.
Application of BIM Technologies in Lianyungang City Ring Road
Location: Lianyungang, Jiangsu, 112

Linde Engineering APAC Co., Ltd.
A Refining and Chemical Integration Project
Location: Ningbo, Zhejiang, 126

Longyuan (Beijing) New Energy Engineering Design and Research Institute Co., Ltd.
Research on Key Technologies of Jacket Foundation for Offshore Wind Power Suction Tube
Location: Beijing, 135

MCC Capital Engineering & Research Incorporation Limited
Relocation and Upgrading Project of Dazhou Iron & Steel Group—Integrated Application of the BIM Technology of Ironmaking Unit in Design and Construction
Location: Dazhou City, Sichuan, 90

MCC Capital Engineering & Research Incorporation Limited
World's First Hydrogen Metallurgy Engineering Demonstration Project
Location: Zhangjiakou, Hebei, 85, 221

PetroChina Company Limited Changqing Petrochemical Branch
Asset Performance Management Project of CNPC Changqing Petrochemical Branch
Location: Xianyang, Shaanxi, 87

PowerChina Huadong Engineering Corporation Limited
Research on the Key Digital Twin Technologies Based on BIM Technology in Full Lifecycle of the Project - Geographic Space Data Mapping Technology
Location: Huai'an, Jiangsu, 77

PowerChina Hubei Electric Engineering Co., Ltd.
Digital Twin Intelligent Operation and Maintenance Power Plant of PowerChina Xishui 160MW Fishery-Solar Complementary Project
Location: Xishui, Hubei, 89

PowerChina Zhongnan Engineering Corporation Limited
Shandong Energy Group Bozhong Offshore Wind Farm Site A Project
Location: Dongying, Shandong, 82

Qingdao Yanbo Data Information Technology Co., Ltd.
Digital Twin System of Long-Distance Water Transfer Pipe Network for the Project of Transferring Water from Yellow River to the East Regions
Location: Qingdao, Shandong, 199

SCEGC Mechanized Construction Group Co., Ltd.
Xi'an International Football Centre
Location: Xi'an, Shaanxi, 51

Shanghai CIMC TGE Gas Engineering Co., Ltd.
Analysis of the Deformation under Stress of Large Group Piles Foundation for Liquefied Gas Storage Tanks
Location: Jiaxing, Zhejiang, 147

Shanghai Construction No.4 (Group) Co., Ltd.
Shanghai Grand Opera House
Location: Shanghai, 50

Shanghai Investigation, Design & Research Institute Co., Ltd.
500MW Photovoltaic Power Plant in the Section I of the Pilot Project of Kubuqi Desert New Energy Base
Location: Ordos, Inner Mongolia Autonomous Region, 86

Shanghai Investigation, Design & Research Institute Co., Ltd.
Yanglin Pumped Storage Power Station
Location: Sanya, Hzainan, 91

Colombia

Czech Republic

France

Germany

India

Indonesia

Ireland

Italy

Japan

Latvia

Malaysia

Myanmar

New Caledonia

New Zealand

Pakistan

Peru

Philippines

CHINT Group Co., Ltd.
Joint Frame Design Project for a Power Station in Philippines
Location: Caron, Palawan, 131

Department of Public Works and Highways (DPWH)
Digital Twin Implementation for NLEX-SLEX Connector Road Project
Location: Caloocan to Manila, Metro Manila, 108

Maynilad Water Services, Inc.
Early Energization of Poblacion Water Treatment Plant
Location: Muntinlupa, 199

Maynilad Water Services, Inc.
Leak Detection at Zobel Roxas/Osmeña using OpenFlows
Location: Makati, Manila, 203

Maynilad Water Services, Inc.
Network Design Using OpenFlows Water for Distribution of Direct Potable Reused Water
Location: Valenzuela, Metro Manila, 203, 229

Oriental Consultants Global Co. Ltd.
Metro Manila Subway Project
Location: Manila, 61

Portugal

STRENG
Piscais Bridge
Location: Vila Real, 117

Romania

Aquatim SA
(Re)building the Hydraulic Model for the Water Distribution Network in Timişoara
Location: Timisoara, Timis, 205

Saudi Arabia

Abussaif Group
Medina Industrial City
Location: Medina, 75

DAR International for Engineering Consultancy
DAR Engineering's Digital/Enterprise Document Management System, 58
Location: Saudi Arabia

National Water Company
Rehabilitation of Transmission Lines in Jazan
Location: Jazan, 206

Senegal

CBMI Construction
International Cement Engineering Construction Empowered by Intelligent Construction
Location: Kinere, Dakar, 47

Singapore

Arup Singapore Pte Ltd
Advanced Engineering Study for Cross Island Line Phase 2
Location: Singapore, 146

PUB, Singapore's National Water Agency
High Fidelity Digital Twin-enabled Anomaly Detection and Localization in Singapore
Location: Singapore, 200, 228

UES Holdings Pte Ltd
Tuas Water Reclamation Plant
Location: Singapore, 207

South Africa

SMEC South Africa
Upgrade of National Route 3
Location: Durban, KwaZulu-Natal, 118

South Korea

BasisSoft Co.
Study on Utilization of Site Information in GeoBIM-based Tunnel Construction
Location: South Korea, 160

Geospatial Information Co.
Digital Island and Sea Garden Service Development Project - Sinan
Location: Shinan, Jeollanam, 171

Geospatial Information Co.
Digital Island and Sea Garden Service Development Project - Yeosu
Location: Yeosu, Jeollanam, 172

Geospatial Information Co.
Gokseong-gun Landslide Site Digital Twin Damage Record and Recovery Plan Data
Location: Gokseong, Jeollanam, 173

Geospatial Information Co.
Sunchang CC Digital Twin Simulation
Location: Sunchang, Jeollanam, 78

Geospatial Information Co.
Yeongam Ancient Tombs Excavation Site
Location: Yeongam, Jeollanam, 177

GSENC
Stability Review of Rock Slopes Using Jointed Rock Model
Location: Gangneungi, Gangwon, 159

Hyundai Engineering
New Physical Modeling Method for Plant Steel Structures Using STAAD API
Location: Seoul, 122

Ire Information Technology
Building a Spatial Information Library for the Goyang Smart City Project
Location: Goyang, Gyeonggi, 70

Korea Institute of Civil Engineering and Building Technology
Verification of the Reinforcement Effect of an Underground Rock Crushing Chamber Using 3D Numerical Analysis
Location: Gangeung, Gangwon, 162

Korea Railroad Research Institute
Assessing the Social Benefits of the Implementation of the Autonomous Train Control System
Location: Uiwangi, Gyeonggi, 99

PrimeTech
Building N3 Test Chamber Piping Lines Using Reality Mesh
Location: Daejeon, Chungcheong, 71

PrimeTech
Check Construction Site Status with Reality Mesh
Location: Incheon, 72

PrimeTech
Obtain Drawings through Reverse Engineering of Facilities
Location: Ulsan, Gyeongsangbuk, 89

Spain

Buchanan
How LEGION Changed Madrid through Pedestrian Simulation: Real Madrid Stadium
Location: Madrid, 74

Hegoalde II JV
South Metropolitan Bypass, Phase 1B
Location: Bilbao, Vizcaya, 118

K2 Estudio de Ingeniería S.L.
Zumelegui Viaduct in Elorrio
Location: Elorrio, Vizcaya, 34

Navantia, S.A.
F-310 Program Class Fridtjof Nansen
Location: Ferrol, La Coruña, 58

Taiwan

Chuanyeh Engineering Consultant Co., Ltd.
Design and Construction Technology Service of A1 Bridge Pier Protection Project of Shuangdong Viaduct, National Expressway No. 6
Location: Nantou, 171

Dragonfly UAS Co., Ltd.
Side Slope Monitoring Project of Taiwan Railway Yilan Line at K12+233
Location: Yilan, 175

Kung Sing Engineering
Construction Project of Tamkang Bridge, New Taipei City
Location: New Taipei City, 31

Taiwan BIM Technology Co., Ltd.
Ankeng Light Rail Transit System
Location: New Taipei City, 98

Thailand

CEC
Retention Pit with Piperack for Combined Cycle Cogeneration Power Plant
Location: Bankok, 135

Industrial Materials Technology Development Department, Ashimori Industry Co., Ltd.
Bang Saen Lower Beach Area Development Project
Location: Saen Suk, Mueang Conburi, Chonburi, 148

Southwest Branch of CPECC
Thailand No. 7 Natural Gas Processing Plant Project
Location: Rayong, 138

United Arab Emirates

Northeast Electric Power Design Institute Co., Ltd. of the China Power Engineering Consulting Group
Dubai Hassyan 4 × 600,000 kW Clean Coal-fired Power Plant Project
Location: Dubai, 129

SYSTRA India
Etihad Rail: Detail Design of MBZ Station Link Roads
Location: Mohamed Bin Zayed City, Abu Dhabi, 115

United Kingdom

Amey
Core Valley Lines (CVL) Transformation - South Wales Metro, UK
Location: Cardiff, Wales, 54

Arcadis
Cambridge South Infrastructure Enhancements
Location: Cambridge, 56, 217

Arcadis
Clapham Junction Station Congestion Relief Pedestrian Interchange Footbridge
Location: London, Wadsworth, 57

Arcadis (As part of ASC)
HS2 Sections C2-C3
Location: Birmingham, England, 55

AtkinsRéalis
Sizewell C - Main Construction Area - Bulk Excavation
Location: Sizewell, England, 15

Balfour Beatty Vinci/Mott MacDonald SYSTRA DJV
HS2 Area North Main Works Civils Contract
Location: Birmingham, West Midlands, 101

J Murphy & Sons Ltd.
Beaulieu New Station – Use of 4D for Digital Rehearsal
Location: Anglia, 100

Jacobs
C1 Align MWWC for HS2
Location: Birmingham, West Midlands, 100

Jacobs
HS2 C1 MWCC
Location: London, England, 102

John Sisk & Son
Latitude Purple
Location: Leeds, England, 48

Lendlease
8 Bishopsgate
Location: London, 42

Longitude Consulting Engineers Limited
Automation of Assessment of Jack-up Rigs using SACS
Location: London, England, 127

Mott MacDonald
Continuing to Maximize Value from the Smart Object Library for the Environment Agency
Location: England, 57

Mott MacDonald
Intelligent Ground Models Support Sustainability and Value Engineering for High Speed 2
Location: Birmingham, England, 155

Network Rail
Oxford Railway Station
Location: Oxford, England, 103

Proicere Digital
Sellafield Retreatment Plant (SRP) Project
Location: Seascale, Cumbria, 38

Skanska Costain Strabag JV
HS2 Main Works South PH-1
Location: London, 31

SPL Powerlines UK
Midland Mainline Electrification
Location: Nottinghamshire, Derbyshire, and South Yorkshire, 94

SYSTRA UK Ltd.
SafeByBIM - Collaborative Tool
Location: United Kingdom, 104

Transport for London
OpenPaths CUBE and OpenPaths EMME Application in Transport for London's Multimodal Demand Forecasting
Location: London, England, 103

Transport for London
The Elizabeth Line
Location: London, England, 96

WSP
Oxford Station Phase 2C/2D
Location: Oxford, England, 104

United States

Aqua
Utilizing OpenFlows during Emergency Response in Danville, IL
Location: Danville, Illinois, 207

Arcadis
Advanced Analysis and Design of Flood Protection Structures through Automation
Location: New York City, Indianapolis, and Dallas; New York, Indiana, and Texas, 124

Avangrid
Preventive Maintenance Program Creation
Location: Rochester, New York, 62

Burgess & Niple, Inc.
Virgin River Gorge – Structure Health Monitoring
Location: Littlesfield, Arizona, 33

Dataforensics
USACE Ground to Cloud—Enterprise Data Management Migration
Location: Washington, District of Columbia, 145

DFW International Airport - Controls & Analytics
Transforming DFW Airport Program Delivery
Location: Texas, 50

Exo Inc.
Evergy Power Transmission Tower Stabilization
Location: Clinton, Missouri, 189, 227

Exo Inc.
Ohio Falls River Crossing Towers
Location: Louisville, Kentucky, 183

GAI Consultants
GAI Consultants: Unprecedented Productivity and Collaboration
Location: Orlando, Florida, 59

Jacobs - Greenman-Pedersen Inc. JV
Brooklyn Bridge - Montgomery Coastal Resilience
Location: New York City, New York, 43, 216

JMT
Digital Experience for I-95 Rappahannock River Crossing Construction Project
Location: Fredericksburg, Virginia, 26

Pacific Gas & Electric
10k Electrical Wiring Undergrounding Project to Mitigate Risk of Catastrophic Wildfires
Location: California, 184

QK4, Inc.
Going Digital Survey with Bridging Kentucky
Location: Kentucky, 29, 214

WSB
11th Street Railroad Grade Separations
Location: Moorhead, Minnesota, 98

WSB
I-10 Inner Katy Corridor, I-610 to West of I-45
Location: Houston, Texas, 60

Venezuela

Mitsubishi Heavy Industries Asia Pacific Private Limited
Complex Process Equipment Replacement Project
Location: Jose, Etado Anzoategui, 44

INDEX OF PROJECTS

Organized
by category

Bridge and Tunnels

ABM Knowledgeware Limited
Swatantrya Veer Savarkar Sea Link Project - Versova-Bandra Sea Link Project
Location: Mumbai, Maharashtra, India, 33

Burgess & Niple, Inc.
Virgin River Gorge – Structure Health Monitoring
Location: Littlefield, Arizona, United States, 33

China Railway No. 4 Engineering Group Co., Ltd.; Anhui Digital Intelligent Construction Research Institute Co., Ltd.
Comprehensive Application of BIM in the World's First One-tower Ground-anchored Slewing Cable Suspension Bridge
Location: Shanxi, China, 30

China Railway No. 10 Engineering Group Co.,Ltd. Jinan Survey and Design Institute
Application of BIM Technology in the High-speed Railway Tunnel Project of the Comprehensive Transportation Hub of Jinan Yaoqiang International Airport
Location: Jinan, Shandong, China, 30

CSCEC Road and Bridge Group Co., Ltd.
Intelligent Construction of Baoding Lekai Street South Extension Project Based on BIM
Location: Baoding, Hebei, China, 32

Hunan Provincial Communications Planning, Survey & Design Institute Co., Ltd.
Shunde Waterway Expansion and Upgrading Project
Location: Foshan, Guangdong, China, 32

JMT
Digital Experience for I-95 Rappahannock River Crossing Construction Project
Location: Fredericksburg, Virginia, United States, 26

K2 Estudio de Ingeniería S.L.
Zumelegui Viaduct in Elorrio
Location: Elorrio, Vizcaya, Spain, 34

Kung Sing Engineering
Construction Project of Tamkang Bridge, New Taipei City
Location: New Taipei City, Taiwan, 31

QK4, Inc.
Going Digital Survey with Bridging Kentucky
Location: Kentucky, United States, 29, 214

Skanska Costain Strabag JV
HS2 Main Works South PH-1
Location: London, United Kingdom, 31

Tecne Systra-Sws Advanced Tunneling Srl
Digital Implementation in Tunnel Assessment and Rehabilitation
Location: Italy, 28, 215

Construction

CBMI Construction
International Cement Engineering Construction Empowered by Intelligent Construction
Location: Kinere, Dakar, Senegal, 47

China Construction Buer Curtain Wall & Decoration Co., Ltd.
Building T2 and T10 Curtain Wall Project of Shenzhen Metro Qianhai International Hub
Location: Shenzhen, Guangdong, China, 44

Delhi Metro Rail Corporation Limited
DMRC Phase IV Metro Extension
Location: New Delhi, India, 46

DFW International Airport - Controls & Analytics
Transforming DFW Airport Program Delivery
Location: Texas, United States, 50

Heilongjiang Airports Management Group Co., Ltd., PowerChina Guiyang Engineering Corporation Limited, Shanxi Mechanization Construction Group Co., Ltd, Beijing Jinghang'an Airport Engineering Co., Ltd., Beijing Jiahe Construction Engineering Co., Ltd.
Harbin Taiping International Airport Phase II Expansion Project
Location: Harbin, Heilongjiang, China, 47

Italferr S.p.A.
Digital Solutions for Monitoring the Progress of Large Infrastructure Projects
Location: Italy, 45

Jacobs - Greenman-Pedersen Inc. JV
Brooklyn Bridge - Montgomery Coastal Resilience
Location: New York City, New York, United States, 43, 216

John Sisk & Son
Latitude Purple
Location: Leeds, England, United Kingdom, 48

Kent
Ampol Future Fuels Gasoline Desulfurization Project
Location: Brisbane, Queensland, Australia, 43

Lendlease
8 Bishopsgate
Location: London, United Kingdom, 42

MaRS Planning & Engineering Services Pvt. Ltd.
30 MLD Common Effluent Treatment Plant
Location: Ahmedabad, Gujarat, India, 42

MaRS Planning & Engineering Services Pvt. Ltd.
National Rail and Transportation Institute (NRTI)
Location: Vadodara, Gujarat, India, 48

Mitsubishi Heavy Industries Asia Pacific Private Limited
Complex Process Equipment Replacement Project
Location: Jose, Etado Anzoategui, Venezuela, 44

North Western Program Alliance (NWPA)
Using SYNCHRO Perform to Improve Efficiency and Drive Real-time Decision Making
Location: Melbourne, Victoria, Australia, 51

Proicere Digital
Sellafield Retreatment Plant (SRP) Project
Location: Seascale, Cumbria, United Kingdom, 38

Promet Montajes
Desalination Plant for Mining
Location: Tocopilla, Antofagasta, Chile, 45

PT Hutama Karya (Persero)
Navigating the Complexities of Jakarta MRT Phase 2A CP203 with Digital Solutions
Location: Jakarta, South Jakarta, Indonesia, 41

SCEGC Mechanized Construction Group Co., Ltd.
Xi'an International Football Centre
Location: Xi'an, Shaanxi, China, 51

Shanghai Construction No.4 (Group) Co., Ltd.
Shanghai Grand Opera House
Location: Shanghai, China, 50

The Third Construction Co., Ltd. of CTCE Group, China Railway No. 4 Engineering Group Co., Ltd.
Qingdao Feng River Wetland Park Project
Location: Qingdao, Shandong, China, 49

Webuild s.p.a.
4D Modeling and Construction Management for Pedestrian Steel Bridge Construction in the New ENI HQ
Location: San Donato Milanese, Lombardia to Milano, Italy, 40

Worley Services India Private Ltd.
Fairley East (LCD 2) Project
Location: Kuala Belait, Belait District, Brunei, 46

Yuzawa Kogyo Co., Ltd.
R2 Komu River Upstream Bank Protection
Location: Nirasaki, Yamanashi, Japan, 49

Enterprise Engineering

Amey
Core Valley Lines (CVL) Transformation - South Wales Metro, UK
Location: Cardiff, Wales, United Kingdom, 54

Arcadis
Cambridge South Infrastructure Enhancements
Location: Cambridge, United Kingdom, 56, 217

Arcadis
Clapham Junction Station Congestion Relief Pedestrian Interchange Footbridge
Location: London, Wadsworth, United Kingdom, 57

Arcadis (As part of ASC)
HS2 Sections C2-C3
Location: Birmingham, England, United Kingdom, 55

Avangrid
Preventive Maintenance Program Creation
Location: Rochester, New York, United States, 62

Baosteel Engineering & Technology Group Co., Ltd. (China Baowu Design Institute)
Full Lifecycle Digital Technology Application for Xinyu Iron & Steel Blast Furnace Low Carbon Oxygen Enrichment Project
Location: Xinyu, Jiangxi, China, 59

CCTEG Wuhan Engineering Company
Xinjie No. 1 Mine Project in Taigemiao Mining Area, Xinjie
Location: Ordos, Inner Mongolia Autonomous Region, China, 63

China Huanqiu Contracting & Engineering Co., Ltd.
Whole-process Digital Delivery of Guangxi Petrochemical's Refining-Chemical Integration Project
Location: Qinzhou, Guangxi Zhuang Autonomous Region, China, 62

DAR International for Engineering Consultancy
DAR Engineering's Digital/Enterprise Document Management System
Location: Saudi Arabia, 58

GAI Consultants
GAI Consultants: Unprecedented Productivity and Collaboration
Location: Orlando, Florida, United States, 59

Italferr S.p.A.
Business Process Enhancement and Advanced Project Management
Location: Rome, Italy, 56

Mott MacDonald
Continuing to Maximize Value from the Smart Object Library for the Environment Agency
Location: England, United Kingdom, 57

Navantia, S.A.
F-310 Program Class Fridtjof Nansen
Location: Ferrol, La Coruña, Spain, 58

Oriental Consultants Global Co. Ltd.
Metro Manila Subway Project
Location: Manila, Philippines, 61

SMEC
North East Link
Location: Melbourne, Victoria, Australia, 61

WISDRI Engineering and Research Incorporation Limited
Innovative Applications of BIM Design of the Pipeline and Cable for Vietnam HPDQ
Location: Wuhan, Hubei, China, 60

WSB
I-10 Inner Katy Corridor, I-610 to West of I-45
Location: Houston, Texas, United States, 60

Facilities, Campuses, and Cities

Abussaif Group
Medina Industrial City
Location: Medina, Saudi Arabia, 75

Beichen Convention & Exhibition Investment Co. Ltd.
China National Convention Center Phase II
Location: Beijing, China, 72

Beijing Institute of Architectural Design
Swimming Center Project of Olympic Sports Park Area
Location: Hangzhou, Zhejiang, China, 78

Buchanan
How LEGION Changed Madrid through Pedestrian Simulation: Real Madrid Stadium
Location: Madrid, Spain, 74

Changsha BIMcloud Information Technology Co., Ltd.
New-Phrase Operation Zone (ZOP) and Entrance Complex (CI) Construction Project of Chancay Comprehensive Port
Location: Canars, Lima and Huaral, Peru, 76

China ENFI Engineering Co., Ltd.
Digital Construction Project of Comprehensive Waste Treatment Facilities in Xiong'an New Area
Location: Beijing, China, 66

Communaute d'Agglomeration Pau Bearn Pyrenees - CAPBP
Multipurpose Urban Digital Twin of Communaute d'Agglomeration de Pau Bearn Pyrenees
Location: Pau, Pyrenees Atlantiques, France, 76, 219

Dublin Fire Brigade
Digital Twins for Emergency Response (DTER)
Location: Dublin, Ireland, 73, 220

FANTAWILD Institute of Design Co., Ltd.
Yingtan Boonie Bears Water World Theme Park
Location: Xiamen, Fujian, China, 79

Five Technology, Inc.
Legal Disaster Prevention Equipment Management and Maintenance Project
Location: Minato, Tokyo, Japan, 75

Five Technology, Inc.
Real Estate Property Management & Asset Management
Location: Osaka, Japan, 77

Geospatial Information Co.
Sunchang CC Digital Twin Simulation
Location: Sunchang, Jeollanam, South Korea, 78

Guangdong Airport Authority, Central-South Architectural Design Institute Co., Ltd., China Airport Planning & Design Institute Co., Ltd., Civil Aviation East China(Zhejiang), Construction And Development Co., Ltd, Airport Construction Engineering Co., Ltd, CCCC Tunnel Engineering Company Limited, China Railway Beijing Engineering Group Co., Ltd., Hebei Construction Group Corporation Limited, China Huashi Enterprises Company Limited, Shanxi Mechanisation Construction Group Co., Ltd., Shanghai Baoye Group Corp., Ltd., PowerChina Airport Construction Company Limited, China Railway 19 TH Bureau Group 2nd Co., Ltd., The Construction of Guangzhou Baiyun International Airport Development Co., Ltd., Zhonghang Electricity System Engineering Co., Ltd., China Construction Eighth Engineering Division Corp., Ltd, Guangdong Construction Engineering Group Co., Ltd., China Construction Third Engineering Bureau Group Co., Ltd., Beijing Construction Engineering Group Co., Ltd.
Digital Innovation Application of Guangzhou Baiyun International Airport Phase III Expansion Project
Location: Guangzhou, China, 68, 218

Ire Information Technology
Building a Spatial Information Library for the Goyang Smart City Project
Location: Goyang, Gyeonggi, South Korea, 70

Kaunas University of Technology Centre for Smart Cities and Infrastructure
Digital Twin for KTU Buildings Operational Carbon and Climate Monitoring and Improvement
Location: Kaunas, Lithuania, 73

Kokusai Kogyo Co., Ltd.
3D Modeling of the Most Complicated Underground City in Japan: Conquering the Shibuya Train Station and Shopping Mall Complex
Location: Shibuya, Tokyo, Japan, 70

Kyoto Institute of Technology
Kyoto Institute of Technology Point Cloud Data Video of Matsugasaki Campus
Location: Sakyo, Kyoto, Japan, 74

PowerChina Huadong Engineering Corporation Limited
Research on the Key Digital Twin Technologies Based on BIM Technology in Full Lifecycle of the Project - Geographic Space Data Mapping Technology
Location: Huai'an, Jiangsu, China, 77

PrimeTech
Building N3 Test Chamber Piping Lines Using Reality Mesh
Location: Daejeon, Chungcheong, South Korea, 71

PrimeTech
Check Construction Site Status with Reality Mesh
Location: Incheon, South Korea, 72

PT Wijaya Karya (Persero) Tbk
Nusantara Presidential Complex, New Capital City of Indonesia
Location: Nusantara, Indonesia, 69

Tianjin Tianhe-Cloud Building Engineering Technology Co., Ltd.
Building Infectious Diseases Wards and Other Renovation and Expansion Projects of Tianjin Haihe Hospital
Location: Tianjin, China, 71

Process and Power Generation

CCTEG Beijing Huayu Engineering Co., Ltd.
Digital Design and Delivery Project of Xinjie No. 2 Mine and Coal Preparation Plant in Taigemiao Mining Area, Xinjie, Inner Mongolia
Location: Ordos City, Inner Mongolia Autonomous Region, China, 88

China ENFI Engineering Co., Ltd.
Digital Application Project of Expansion Project of Saindak Copper-Gold Mine in Pakistan
Location: Saindak, Quetta, Balochistan, Pakistan, 87

Guiyang Aluminum Magnesium Design & Research Institute Co., Ltd.
Digital Delivery and Digital Twin Engineering of Baofeng Anode Materials
Location: Yinchuan, Ningxia Hui Autonomous Region, China, 88

Hangzhou Bole Digital Intelligence Technology Co. Ltd.
Onyear Betel Nut Processing Plant Project
Location: Xiangtan, Hunan, China, 90

MCC Capital Engineering & Research Incorporation Limited
Application of the Digital and Intelligent Construction Technology in the 2.7 Million-ton Project of Eastern Steel
Location: Kemaman, Terengganu, Malaysia, 86

MCC Capital Engineering & Research Incorporation Limited
Relocation and Upgrading Project of Dazhou Iron & Steel Group—Integrated Application of the BIM Technology of Ironmaking Unit in Design and Construction
Location: Dazhou City, Sichuan, China, 90

MCC Capital Engineering & Research Incorporation Limited
World's First Hydrogen Metallurgy Engineering Demonstration Project
Location: Zhangjiakou, Hebei, China, 85, 221

PetroChina Company Limited Changqing Petrochemical Branch
Asset Performance Management Project of CNPC Changqing Petrochemical Branch
Location: Xianyang, Shaanxi, China, 87

PowerChina Hubei Electric Engineering Co., Ltd.
Digital Twin Intelligent Operation and Maintenance Power Plantof PowerChina Xishui 160MW Fishery-Solar Complementary Project
Location: Xishui, Hubei, China, 89

PowerChina Zhongnan Engineering Corporation Limited
Shandong Energy Group Bozhong Offshore Wind Farm Site A Project
Location: Dongying, Shandong, China, 82

PrimeTech
Obtain Drawings through Reverse Engineering of Facilities
Location: Ulsan, Gyeongsangbuk, South Korea, 89

Shanghai Investigation, Design & Research Institute Co., Ltd.
500MW Photovoltaic Power Plant in the Section I of the Pilot Project of Kubuqi Desert New Energy Base
Location: Ordos, Inner Mongolia Autonomous Region, China, 86

Shanghai Investigation, Design & Research Institute Co., Ltd.
Yanglin Pumped Storage Power Station
Location: Sanya, Hainan, China, 91

WISDRI Engineering and Research Incorporation Limited
Digital Innovative Applications throughout the Process of Iron and Steel EPC Projects
Location: Yuxi, Yunnan, China, 84

Rail and Transit

Balfour Beatty Vinci/Mott MacDonald SYSTRA DJV
HS2 Area North Main Works Civils Contract
Location: Birmingham, West Midlands, United Kingdom, 101

Beca Ltd. and Auckland Transport
Homai's Rail Innovation: Digital Pathways to Community Engagement
Location: Auckland, New Zealand, 101

China Railway First Survey and Design Institute Group Co., Ltd.
API Library and Common Toolkit for Spatial Positioning of Railway Lines
Location: Xi'an, Shaanxi, China, 99

INECO
Master Design Stage RBDTD-LV-DS3 Design & Construction Supervision Estonian/Latvian-Vangazi
Location: Latvia, 97

Italferr S.p.A.
Methods for the Feasibility Analysis of Design Alternatives in Railway Projects
Location: Italy, 102

J Murphy & Sons Ltd.
Beaulieu New Station – Use of 4D for Digital Rehearsal
Location: Anglia, United Kingdom, 100

Jacobs
C1 Align MWWC for HS2
Location: Birmingham, West Midlands, United Kingdom, 100

Jacobs
HS2 C1 MWCC
Location: London, England, United Kingdom, 102

Korea Railroad Research Institute
Assessing the Social Benefits of the Implementation of the Autonomous Train Control System
Location: Uiwangi, Gyeonggi, South Korea, 99

Network Rail
Oxford Railway Station
Location: Oxford, England, United Kingdom, 103

SPL Powerlines UK
Midland Mainline Electrification
Location: Hertfordshire, Bedfordshire, Northamptonshire, Leicestershire, Nottinghamshire, Derbyshire, and South Yorkshire; United Kingdom, 94

SUDOP PRAHA a.s.
Smichov Station Terminal
Location: Prague, Czech Republic, 105

SYSTRA UK Ltd.
SafeByBIM - Collaborative Tool
Location: United Kingdom, 104

Taiwan BIM Technology Co., Ltd.
Ankeng Light Rail Transit System
Location: New Taipei City, Taiwan, 98

Transport for London
OpenPaths CUBE and OpenPaths EMME Application in Transport for London's Multimodal Demand Forecasting
Location: London, England, United Kingdom, 103

Transport for London
The Elizabeth Line
Location: London, England, United Kingdom, 96

WSB
11th Street Railroad Grade Separations
Location: Moorhead, Minnesota, United States, 98

WSP
Oxford Station Phase 2C/2D
Location: Oxford, England, United Kingdom, 104

Roads and Highways

Aurecon
SH1 Papakura to Drury
Location: Auckland, New Zealand, 117

Beijing Railwa y Construction Co., Ltd. of China Railway 6th Bureau Group, Traffic Engineering Branch of China Railway 6th Bureau Group
Digital Application in the Double-Track Tunnel Project of Chongqing University Town
Location: Chongqing, China, 115

CCCC First Harbor Engineering Urban Transportation Engineering Co., Ltd.
Baise North-South Transit Highway (North Ring Road) Section I
Location: Baise, Guangxi Zhuang Autonomous Region, China, 113

CCCC First Harbor Southwest Engineering Company Ltd., CCCC Port Engineering Design & Consulting Company Ltd.
Bid Section III Project of Baise North-South Transit Line Highway (North Ring Road)
Location: Baise, Guangxi, China, 113

China Road and Bridge Corporation, China Highway Engineering Consulting Corporation
Phnom Penh – Bavet Expressway
Location: Phnom Penh, Cambodia, 110

CSCEC AECOM Consultants Co., Ltd.
Design, Construction and General Contracting of Western Zhenyuan Comprehensive Pipeline Network Renovation Project and Zhenyuan Dongxin Street Phase II Road Project
Location: Lanzhou, Gansu, China, 114

Department of Public Works and Highways (DPWH)
Digital Twin Implementation for NLEX-SLEX Connector Road Project
Location: Caloocan to Manila, Metro Manila, Philippines, 108

Hegoalde II JV
South Metropolitan Bypass, Phase 1B
Location: Bilbao, Vizcaya, Spain, 118

JSTI Group Co., Ltd.
Application of BIM Technologies in Lianyungang City Ring Road
Location: Lianyungang, Jiangsu, China, 112

Prointec
A6 Dungiven to Drumahoe Dualling Scheme
Location: Ireland, 112

PT Waskita Karya (Persero) Tbk
Jakarta-Cikampek II South Toll Road
Location: Karawang-Purwakarta, West Java, Indonesia, 116

PT Wijaya Karya (Persero) Tbk
Nusantara Road and Highway Connectivity, New Capital City of Indonesia
Location: Balikpapan, East Kalimantan, Indonesia, 116, 222

SMEC South Africa
Upgrade of National Route 3
Location: Durban, KwaZulu-Natal, South Africa, 118

STRENG
Piscais Bridge
Location: Vila Real, Portugal, 117

SYSTRA India
Etihad Rail: Detail Design of MBZ Station Link Roads
Location: Mohamed Bin Zayed City, Abu Dhabi, United Arab Emirates, 115

The Civil Engineering Group Corporation of China Construction Second Engineering Bureau Ltd.
Construction of the Third Bidding Section of the Baipeng Road-Xiaowan Interchange Project of the First Longitudinal Line
Location: Chongqing, China, 114

WISDRI Engineering and Research Incorporation Limited
Wuhan Gaoxin 4th Road Comprehensive Reconstruction Project
Location: Wuhan, Hubei, China, 111

Structural Engineering

Ansteel Mining Engineering Corporation
Refractory Ore Beneficiation Technology Upgrading Project of Donganshan Sintering Plant
Location: Anshan, Liaoning, China, 134

Arcadis
Advanced Analysis and Design of Flood Protection Structures through Automation
Location: New York City, Indianapolis, and Dallas; New York, Indiana, and Texas; United States, 124

C-design Partners Co., Ltd.
Former City Hall Branch Revitalization Project
Location: Kanagawa, Japan, 130

C-design Partners Co., Ltd.
Neko Coffee Sky Terrace Café – Creating a Multipurpose Space that Connects the Local Community
Location: Odawara, Kanagawa, Japan, 132

C-design Partners Co., Ltd.
Old Post Office Renovation Project
Location: Odawara, Kanagawa, Japan, 133

C-design Partners Co., Ltd.
Renovation Work Using STAAD for a Building Complex in Odawara City
Location: Odawara, Kanagawa, Japan, 134

C-design Partners Co., Ltd.
Seaside B&B Retrofitting Project
Location: Kanagawa, Japan, 136

CEC
Retention Pit with Piperack for Combined Cycle Cogeneration Power Plant
Location: Bangkok, Thailand, 135

CEC
Structural Engineering of a Project in Indonesia
Location: Djakarta, Karawang, Indonesia, 138

CHINT Group Co., Ltd.
Joint Frame Design Project for a Power Station in Philippines
Location: Caron, Palawan, Philippines, 131

Chiappini, Cassano, Blacud Rotger, Segala, associate engineers
Structural Design of a Floating Facility for Loading Grain Barges in Fluvial Environments
Location: La Paz, Entre Ríos, Argentina, 137

CNCEC SEDIN Engineering Co., Ltd.
KAN Ammonium Nitrate Project in Indonesia
Location: Bontang, Kalimantan Timur, Indonesia, 131

CNPC East China Design Institute Co., Ltd.
Structural Design for a Main Pipe Bridge of a Refinery in South China
Location: Jieyang, Guangdong, China, 137

Delhi Metro Rail Corporation Limited
Enhancing Urban Connectivity-The Punjabi Bagh Interchange Station
Location: New Delhi, Delhi, India, 125

Design and Research & Development Center of CNOOC EnerTech Equipment Technology Co., Ltd.
Project of Adding Slots to WHPA Platform of Bozhong 19-4 Oilfield
Location: Tianjin, China, 133

Harbin Boiler Company Limited
The Steel Structure Design of Ultra-supercritical Boiler for Installing 2X1000MW Large Generator Sets and Closing Small Generator Sets at Jiangsu Huadian's Jurong Base
Location: Jurong, Jiangsu, China, 139

Hokaido University
Comparison of H Steel Web Section Area
Location: Sapporo, Hokaido, Japan, 128

Hyundai Engineering
New Physical Modeling Method for Plant Steel Structures Using STAAD API
Location: Seoul, South Korea, 122

Kyowa Design Co., Ltd.
Thermal Stress Analysis of Plant Piping Using Bentley Solutions
Location: Yokohama, Kanagawa, Japan, 139

L&T Construction
Construction of Sewage Treatment Plant 30MGD Capacity at Chandigarh
Location: Chandigarh, Punjab, India, 128

Linde Engineering APAC Co., Ltd.
A Refining and Chemical Integration Project
Location: Ningbo, Zhejiang, China, 126

Longitude Consulting Engineers Limited
Automation of Assessment of Jack-up Rigs using SACS
Location: London, England, United Kingdom, 127

Longyuan (Beijing) New Energy Engineering Design and Research Institute Co., Ltd.
Research on Key Technologies of Jacket Foundation for Offshore Wind Power Suction Tube
Location: Beijing, China, 135

Neutral Design Co., Ltd
Application for Building Approval Using STAAD.Pro
Location: Kitaueno, Taito, Japan, 127

Northeast Electric Power Design Institute Co., Ltd. of the China Power Engineering Consulting Group
Dubai Hassyan 4 × 600,000 kW Clean Coal-fired Power Plant Project
Location: Dubai, United Arab Emirates, 129

Nippoh Engineering
Nippoh Creates an Era of New Carbon-neutral Steam Turbine Piping Design
Location: Japan, 132

Oil and Natural Gas Corporation Ltd (ONGC)
Structural Adequacy (SIA) of Fixed Offshore Platforms for Proposed Additional Facilities
Location: India, 136

Qingdao Yijia Architectural Design Co., Ltd.
A Paper Mill in Japan
Location: Tokyo, Japan, 126

SEPCOIII Engineering Consulting Institute
Internal Combustion Engine Power Generation Project
Location: Mandalay, Myanmar, 130

Southwest Branch of CPECC
Thailand No. 7 Natural Gas Processing Plant Project
Location: Rayong, Thailand, 138

Tata Consulting Engineers Limited
Engineering Design for Blast Furnace
Location: Hazira, Gujarat, India, 129

Subsurface Modeling and Analysis

AngloGold Ashanti
Integrated Flow of Modeling and Estimation in Leapfrog Energy, Edge, and Central, Cuiabá Mine
Location: Sabará, Minas Gerais, Brazil, 154

Architecture×Civil Engineering Inc.
Liquefaction Countermeasure Using Scallop Shells Enabled by PLAXIS: Numerical Simulation Aimed at Social Implementation
Location: Chuo, Osaka, Japan, 155

Arup Singapore Pte Ltd
Advanced Engineering Study for Cross Island Line Phase 2
Location: Singapore, 146

AtkinsRéalis
Sizewell C - Main Construction Area - Bulk Excavation
Location: Sizewell, England, United Kingdom, 159

Aurenne Group Mining
Enhancing Gold Resource Targeting with Integration of Seequent Central, Leapfrog, and Imago
Location: Perth, Western Australia, Australia, 152

BasisSoft Co.
Study on Utilization of Site Information in GeoBIM-based Tunnel Construction
Location: South Korea, 160

Beijing Institute of Architectural Design
No. 3 Office Building of Jingdong Group
Location: Beijing, China, 157

Cerrado Gold
Project Geology Chain of Custody
Location: Monte do Carmo, Tocantins, Brazil, 158

Collective Mining
Apollo, from Grasroots to Discovery
Location: Supía and Marmato, Caldas, Colombia, 147

Dataforensics
USACE Ground to Cloud—Enterprise Data Management Migration
Location: Washington, District of Columbia, United States, 145

Expert Geophysics Limited
Developing Airborne Electromagnetic Technology for Detail Structural Mapping
Location: Aurora, Ontario, Canada, 150

Fireweed Metals
Macmillan Pass
Location: Whitehorse, Yukon, Canada, 156

Geological Survey of Brazil
From Geologic Map to 3D Model: A Case Study of Pará de Minas Sheet
Location: Belo Horizonte, Minas Gerais, Brazil, 152

Geological Survey of Brazil - SGB/CPRM
Application of 3D Modeling in Assessing the Stability of Underground Rock Salt Mines in Maceió
Location: Maceió, Alagoas, Brazil, 148

GRI
Digital Twin Observational Method for Shield Tunneling
Location: Japan, 151

GSENC
Stability Review of Rock Slopes Using Jointed Rock Model
Location: Gangneungi, Gangwon, South Korea, 159

Hatch
Implementing OGC Technology - Piloting a Digital System in the Harshest of Conditions
Location: Baffin Island, Nunavut, Canada, 153

Hatch
New Caledonia Landslide Remediation
Location: Mont Dore, South Province, New Caledonia, 157

Hokaido University
Design of New Experiment Building
Location: Sapporo, Hokaido, Japan, 149

Hokaido University
Effect Evaluation of Grass on Shallow Stability of Unsaturated Volcanic Soil Slope
Location: Sapporo, Hokkaido, Japan, 151

Industrial Materials Technology Development Department, Ashimori Industry Co., Ltd.
Bang Saen Lower Beach Area Development Project
Location: Saen Suk, Mueang Conburi, Chonburi, Thailand, 148

Jaguar Mining Inc
Modeling and Estimation Processes Improvement through Seequent Solutions
Location: Santa Bárbara and Conceição do Pará, Minais, Brazil, 156

Korea Institute of Civil Engineering and Building
Technology Verification of the Reinforcement Effect of an Underground Rock Crushing Chamber Using 3D Numerical Analysis
Location: Gangeung, Gangwon, South Korea, 162

Macquarie Geotechnical
Subsurface Reality Modelling for Enhanced Subsurface Insight
Location: New South Wales, Australia, 160, 225

Mott MacDonald
Intelligent Ground Models Support Sustainability and Value Engineering for High Speed 2
Location: Birmingham, England, United Kingdom, 155

Nexa Resources
Increasing Resources by Interpreting Metal Ratios and Dynamic Anisotropy in Leapfrog
Location: Chincha, Inca, Peru, 154

Index of projects | By category

Prof. Quick und Kollegen GmbH
Replacement Construction of the Viaduct Brunsbecke
Location: Hagen, North Rhine-Westphalia, Germany, 158

PT Hutama Karya (Persero)
Integrating Subsurface Model for Efficient Geotech Data Management in Trans Sumatra
Location: Pekanbaru, Riau, Indonesia, 144

PT SMG Consultants Indonesia
Transformative Innovations in Southeast Sulawesi Nickel-Cobalt Exploration
Location: North Konawe, Southeast Sulawesi, Indonesia, 161, 223

Shanghai CIMC TGE Gas Engineering Co., Ltd.
Analysis of the Deformation under Stress of Large Group Piles Foundation for Liquefied Gas Storage Tanks
Location: Jiaxing, Zhejiang, China, 147

Shanghai Ou Yang Offshore Engineering Group Co., Ltd
Huizhou No. 2 Offshore Wind Farm Development Project of China General Nuclear Power Group
Location: Huizhou, Guangdong, China, 153

Southern Cross Gold
Sunday Creek: High-grade Au-Sb Discovery at Clonbinane, Victoria
Location: Clonbinane, Victoria, Australia, 161

Spark and WSP
North East Link Central Package
Location: Melbourne, Victoria, Australia, 142

Tectonics, Petrology and Lithospheric Processes Research Group at the University of Melbourne
A Machine Learning Modeling Approach to Automated 3D Geological Mapping
Location: Melbourne, Victoria, Australia, 146

University of Canterbury
Bridging the Gap: Incorporating 3D Modeling into Undergraduate University Courses
Location: Christchurch, Canterbury, New Zealand, 149, 224

University of Miyazaki
Development of a Numerical Analysis Method to Predict Ground Deformation during the Extraction of Retaining Parts
Location: Miyazaki, Japan, 150

Surveying and Monitoring

Aegea
Reality Capture: Surveying and Monitoring in the Sanepar-Aegea PPP
Location: Paraná, Brazil, 174

China First Metallurgical Group Co., Ltd.
Phase II and Phase III of Comprehensive Improvement Project for the Outlet Reach of Fuhuan River
Location: Wuhan, Hubei, China, 169

Chuanyeh Engineering Consultant Co., Ltd.
Design and Construction Technology Service of A1 Bridge Pier Protection Project of Shuangdong Viaduct, National Expressway No. 6
Location: Nantou, Taiwan, 171

Dragonfly UAS Co., Ltd.
Side Slope Monitoring Project of Taiwan Railway Yilan Line at K12+233
Location: Yilan, Taiwan, 175

Geospatial Information Co.
Digital Island and Sea Garden Service Development Project - Sinan
Location: Shinan, Jeollanam, South Korea, 171

Geospatial Information Co.
Digital Island and Sea Garden Service Development Project - Yeosu
Location: Yeosu, Jeollanam, South Korea, 172

Geospatial Information Co.
Gokseong-gun Landslide Site Digital Twin Damage Record and Recovery Plan Data
Location: Gokseong, Jeollanam, South Korea, 173

Geospatial Information Co.
Yeongam Ancient Tombs Excavation Site
Location: Yeongam, Jeollanam, South Korea, 177

Infraengineering Srl
Three-dimensional Modeling of the Structural Elements of Motorway Viaducts
Location: Pratola Peligna, L'Aquila, Italy, 176

Infrastructure Renewal Engineering Co., Ltd.
Making History Accessible by 3D Visualization: The Quarry That Provided the Material for Modern Japan's Infrastructure Comes to Life in a 3D Video
Location: Shimoda, Shizouka, Japan, 174

Monir Precision Monitoring
31 Parliament Street Urban Infrastructure and Excavation Shoring Monitoring
Location: Toronto, Ontario, Canada, 168, 226

Nagasaki University Cross-ministerial Strategic Innovation Promotion Program (SIP)
Evaluation of Load-bearing and Deformation Performance using 3D Data for Small-scale Bridges Managed by Local Governments, and Implementation in Periodic Inspection Work
Location: Nagasaki, Japan, 172

Nissin Co., Ltd.
Image of Completed Drainage Plant Facility
Location: Chuo, Hamamatsu, Shizuoka, Japan, 173

Sougogiken Co., Ltd.
3D Digitalization of a World Heritage Site in Kyoto: Experiencing Ninnaji Temple through Virtual Reality
Location: Kyoto, Japan, 170

Sougogiken Co., Ltd.
3D Measurement and Content Creation for Daisho-in Temple, Miyajima, under a Sacred Fire Lit for More Than 1,200 Years
Location: Hatsukaichi, Hiroshima, Japan, 170

Takenaka Corporation
Real-time Remote Monitoring Digital Twin of Demolition Worksite
Location: Chiyoda, Tokyo, Japan, 175

Water Supplies Department
Digital Twin of the Ex-Sham Shui Po Service Reservoir
Location: Kowloon, Hong Kong SAR, China, 166

Yuhashi Laboratory, Shizuoka University
Vacant House Distribution Using 3D Modeling by Drone
Location: Chuo-ku, Hamamatsu, Shizuoka, Japan, 176

Transmission and Distribution

Baoding Jida Electric Power Design Co., Ltd.
Yejie 110kV Substation Digital Handover Project in Mancheng District, Baoding City
Location: Baoding, Hebei, China Baoding, Hebei, China, 190

Cangzhou Tongxing Electric Power Design Co., Ltd.
110kV Substation Digital Delivery and Review Project at Gangqu No. 1
Location: Cangzhou, Hebei, China, 184

Cangzhou Tongxing Electric Power Design Co., Ltd.
3D Design Project of Weizhuang 110kV Substation
Location: Cangzhou, Hebei, China, 186

COPEL Distribuição S.A.
Implementation of BIM Modeling for Medium- and High-voltage Substation Projects
Location: Curitiba, Paraná, Brazil, 182

Exo Inc.
Evergy Power Transmission Tower Stabilization
Location: Clinton, Missouri, United States, 189, 227

Exo Inc.
Ohio Falls River Crossing Towers
Location: Louisville, Kentucky, United States, 183

Hengshui Electric Power Design Co., Ltd.
3D Digital Design of 110kV Indoor Substation in Park
Location: Hengshui, Hebei, China, 186

Hengyang Yanneng Electric Power Survey, Design & Consulting Co., Ltd.
3D Digitized Design Project of Construction Drawing of Hengyang Jinlan Substation
Location: Hengyang, Hunan, China, 187

Inner Mongolia Electric Power Survey And Design Institute Co.,Ltd.
Application of Digital Design in the Wuda North 550kV Substation
Location: Wuhai, Inner Mongolia Autonomous Region, China, 187

Inner Mongolia Electric Power Survey and Design Institute Co.,Ltd.
BIM Application in the Digital Design of Wanli 220kV Substation
Location: Ordos, Hohhot, China, 188

Pacific Gas & Electric
10k Electrical Wiring Undergrounding Project to Mitigate Risk of Catastrophic Wildfires
Location: California, United States, 184

PT iForte Solusi Infotek
Fiber to the Home (FTTH) Integrations & Automation with Multiple Systems with Bentley BECS
Location: Indonesia, 189

Southwest Electric Power Design Institute Co., Ltd. of China Power Engineering Consulting Group
Butuo ± 800kV Converter Station
Location: Liangshan, Sichuan, China, 180

State Grid Tianjin Electric Power Survey, Design & Consulting Co., Ltd.
Digital Design Project for the Tianjin Eco-city 220kV Substation Project
Location: Tianjin, China, 188

Tata Projects Limited
400kV D/C & M/C Kharghar - Vikhroli T/L
Location: Mumbai, Maharashtra, India, 185

Xingtai Electric Power Engineering Co., Ltd.
3D Design Project in Eastern Renxian County
Location: Xingtai, Hebei, China, 185

Water and Wastewater

Acueducto Metropolitano de Bucaramanga S.A. E.S.P.
Optimizing Water Distribution in the Face of the Climate Crisis: Loss Reduction and Energy Efficiency in Colombia
Location: Bucaramanga, Santander, Columbia, 204

Aqua
Utilizing OpenFlows during Emergency Response in Danville, IL
Location: Danville, Illinois, United States, 207

Aquatim SA
(Re)building the Hydraulic Model for the Water Distribution Network in Timişoara
Location: Timişoara, Timis, Romania, 205

Basic Sanitation Company of the State of São Paulo
Operational Restructuring of Latin America's Most Economically ActiveSector
Location: São Paulo, Brazil, 204

Beijing Shougang International Engineering Technology Co., Ltd., Wanhua Chemical (Penglai) Co., Ltd.
300,000 Tonnes/Day Seawater Desalination Project of Wanhua Chemical (Penglai) Co., Ltd.
Location: Yantai, Shandong, China, 196

BIM Centre
Xinchuansha Pump Gate Hub Project of the Digital Twin Wusong River Project (Shanghai Section)
Location: Shanghai, China, 209

Companhia de Saneamento Básico do Estado de São Paulo - Sabesp
Integra 4.0
Location: São Paulo, Brazil, 194

Companhia Pernambucana de Saneamento - COMPESA
Advanced Modeling for Optimal Chlorine Dosage in WTPs
Location: Afogados da Ingazeira, Pernambuco, Brazil, 198

Engineerik
Water Supply Infrastructure Project for the Territory of Water Utility Silistra, Bulgaria
Location: Silistra, Bulgaria, 208

L&T Construction
Uttar Pradesh Tube Well Project under Jal Jeevan Mission
Location: Uttar Pradesh, India, 197

L&T Construction, Water and Effluent Treatment IC
Sahibganj Water Supply Project
Location: Sahibganj, Jharkand, India, 206

Larsen & Toubro Ltd.
Raw Water Treatment Plant, DM water, Condensate Polishing Unit, Effluent Treatment Plant with ZLD and Sewage at Talcher (Talcher Fertilizers Limited)
Location: Loc Talcher, Odisha, India, 205

Maynilad Water Services, Inc.
Early Energization of Poblacion Water Treatment Plant
Location: Muntinlupa, Philippines, 199

Maynilad Water Services, Inc.
Leak Detection at Zobel Roxas/Osmeña using OpenFlows
Location: Makati, Manila, Philippines, 203

Maynilad Water Services, Inc.
Network Design Using OpenFlows Water for Distribution of Direct Potable Reused Water
Location: Valenzuela, Metro Manila, Philippines, 203, 229

National Water Company
Rehabilitation of Transmission Lines in Jazan
Location: Jazan, Saudi Arabia, 206

NJS Engineers India Pvt. Limited
JICA Assisted Abatement of Pollution in Mula Mutha in Pune
Location: Pune, Maharashtra, India, 201

NJS Engineers India Pvt. Limited
JICA Assisted Agra Water Supply Project
Location: Agra, Uttar Pradesh, India, 202

NJS Engineers India Pvt. Limited
JICA Assisted Guwahati Water Supply Project
Location: Guwahati, Assam, India, 202

NJS Engineers India Pvt. Limited
Validation of Guwahati Sewerage Project DPR (JICA Assisted)
Location: Guwahati, Assam, India, 208

PUB, Singapore's National Water Agency
High Fidelity Digital Twin-enabled Anomaly Detection and Localization in Singapore
Location: Singapore, 200, 228

Qingdao Yanbo Data Information Technology Co., Ltd.
Digital Twin System of Long-Distance Water Transfer Pipe Network for the Project of Transferring Water from Yellow River to the East Regions
Location: Qingdao, Shandong, China, 199

Sanepar - Paraná Sanitation Company
Continuous Improvement of Services and Reduction of Environmental Impacts and Social Benefits in Toledo
Location: Toledo, Paraná, Brazil, 198

SYSTRA India
Global City, Gurugram
Location: Gurugram, Harlyana, India, 200

SYSTRA India
Improvement of Existing Sewer Network, Chennai
Location: Chennai, Tamil Nadu, India, 201

UES Holdings Pte Ltd
Tuas Water Reclamation Plant
Location: Singapore, 207

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