

Bentley[®]
Advancing Infrastructure



Project Summary

Organization
CADDs Group

Solution
Mining and Offshore Engineering

Location
Dampier, Western Australia, Australia

Project Objectives

- To develop a standardized design solution to increase safety at mining facilities.
- To improve workflow processes to optimize design accuracy and production and reduce costs.
- To decrease design and fabrication time for the guarding system.

Products Used

AssetWise[®] ALIM, ContextCapture, Descartes, MicroStation[®], OpenBuildings[™] Designer, ProSteel, ProStructures

Fast Facts

- CADDs used Bentley's 3D and reality modeling applications to design and pilot its innovative, modular guarding system for RTIO, optimizing worksite safety.
- The use of point clouds and reality meshes enhanced investigation and visualization of on-site infrastructure, facilitating accurate representation of the as-built environment.

ROI

- Bentley's digital, standardized design solution saved CADDs an estimated AUD 24 million across all RTIO mining sites.
- MicroStation, OpenBuildings Designer, and ContextCapture helped achieve a 10% reduction in design and fabrication costs.
- Altering the designs within the 3D model space saved 12 weeks otherwise associated with on-site installation modifications.

CADDs Group Optimizes Safety of Iron Ore Facilities with Innovative Guarding System Design

Bentley Applications Accelerate Site Investigations and Reduce Costs by 30%

A Need for Standardization

Rio Tinto Iron Ore (RTIO) operates a world-class network of integrated iron ore mine and port facilities across the Pilbara region of Western Australia. At the forefront of safety innovation, RTIO engaged CADDs Group to conduct site guarding audits for all 17 iron ore plants, complete site verification for high risk assets, and replace or update those assets to optimize workforce safety. The estimated AUD 80 million project required CADDs to obtain data and documentation of existing infrastructure at all sites and complete the guarding work within the plants' scheduled 12-week shutdown cycles. CADDs needed to review its workflows and develop a digital, standardized design approach to complete the project on time since the network comprised brownfield sites with dated infrastructure.

Prior to this project, CADDs would send a team of drafters to the site to create 2D drawings of the existing facilities. From these 2D drawings, designers would create 3D as-built models. The team used these often-inaccurate models to design and fabricate the new guarding, which was expensive because unique components were required for every install. Furthermore, once on site for the install, CADDs usually found that the new guarding did not fit, resulting in time-consuming, costly rework. Realizing that these manual processes were insufficient, CADDs sought to digitalize workflows to optimize site investigation and develop a modular design that was standardized, easy to install, eliminated on-site welding, and allowed for condition monitoring.

Reality Modeling Improves As-built Accuracy

CADDs' objective was to increase safety and accuracy while reducing costs and design and fabrication time for the RTIO project. The organization first addressed the challenge of creating accurate as-built 3D models. The team invested in 3D laser scanning to capture the site and imported the point clouds into MicroStation and Descartes for processing to create usable, digital reference files for existing on-site structures. This capability improved modeling accuracy, and with Bentley applications the team could quickly transfer even the largest point cloud files.

The team introduced ContextCapture for the Dampier, Parker Point site audit, sending surveyors to the location equipped with digital cameras for data acquisition. The photogrammetric investigation identified 700 issues that required rectification due to missing or damaged guards, poor deflection, excessive gaps, or insufficient signage. Using Bentley's reality modeling application enabled the creation of a multiresolution reality mesh from the captured images, reducing reliance on expensive 3D scanning and accelerating design time. The software allows for easier modeling and a detailed visual representation of existing on-site infrastructure, optimizing accuracy within the as-built environment.

OpenBuildings Designer Facilitates Modular Design Solution

With an accurate representation of on-site equipment, CADDs had reliable as-built models to determine an optimal design solution to fit the infrastructure and meet the time constraints for installation. The team used OpenBuildings Designer for intelligent 3D modeling to design its innovative, modular guarding system. The application allows for the use of custom components in a dynamic modeling environment. The two major components of the guarding system are the posts and mesh panels that are designed in varying standard sizes depending on the application and the plant environment. These components are connected by pins at different points. In OpenBuildings Designer, each of the components can be modeled as a smart component and CADDs could adjust each guarding design in the 3D model space to verify compliance with the appropriate standard. Using simulated models, the team performed strength testing to meet deflection requirements. The 3D models were critical in identifying suitable connection points for guard post locations, potential clash points, and determining proximity to dangerous areas to optimally place the guarding.

In addition, using the 3D model enabled CADDs to clearly communicate design intent to RTIO and make any requested changes from the client directly within the model, prior to issuing prefabrication drawings. RTIO approved the final

“Bentley products aren’t just engineering capabilities, they are the backbone of a workflow that allow us to confidently keep as many people safe as possible.”

*– Brendan Jarvis,
Systems and
Processes Manager,
CADDs Group*

**Find out about Bentley
at: www.bentley.com**

Contact Bentley

1-800-BENTLEY (1-800-236-8539)
Outside the US +1 610-458-5000

Global Office Listings

www.bentley.com/contact

model of the new system and CADDs piloted it at the Parker Point site. The new design eliminates welding, allowing for easy on-site assembly while reducing material usage. Being a modular system where all components can be ordered in bulk and are connectable and removable, repairs or upgrades can be quickly done on site without removing the guarding. CADDs is continuing to refine the guarding system, incorporating condition monitoring and mesh install features. As the company develops these new components, they are added to the component library in OpenBuildings Designer and assigned to the 3D model to ensure they are included in the material lists and delivered to the sites as part of the guarding package.

Integrated Technology Delivers Benefits

At the pilot Parker Point facility, CADDs installed over 12 separate guarding units totaling more than AUD 1 million without any issues or postponement to the next shutdown cycle. “This would not have been feasible using traditional methods,” said Brendan Jarvis, systems and process manager at CADDs. The detailed review process in the model space saved 12 weeks otherwise associated with installation modifications on site. Bentley’s integrated 3D and reality modeling applications helped save a significant amount of materials and consumables, reducing costs by 30%, estimated to save AUD 24 million across all 17 sites, while minimizing environmental impact.

Integrating laser scanning for data capture and point clouds into the model space eliminated the need for scaffolding during on-site investigation to save more than AUD 1,000 of the overall AUD 80 million project cost, and 24 days in site inspection time. Incorporating ContextCapture with the point cloud technology further reduced site inspection costs and optimized visual representation of the existing infrastructure. Leveraging Bentley’s technology, CADDs achieved a 10%

reduction in design costs during the pilot and expects that to grow as the company continues to build its OpenBuildings Designer library of components. “Using a combination of primarily ContextCapture and OpenBuildings Designer, we were able to deliver this design, fabrication, and install on time and under budget,” said Jarvis.

Connected Digital Platform Drives Industry Success

Recognizing that traditional fractured design and construction processes were insufficient, CADDs used the RTIO guarding project as an opportunity to review collaboration and workflow methods and develop a connected digital platform to optimize production. As site-based professionals producing solutions for site, CADDs needed to ensure design mobility among the team and stakeholders. Using Bentley’s 3D BIM and reality modeling applications, CADDs implemented a data-centric approach to deliver the RTIO project. The digital technology solution enabled the company to close the gap between stakeholders, reduce costs, minimize waste, and eliminate rework.

Having required deliverables for each discipline on a digital platform allows CADD to record and retain data, models, and design information. This integrated workflow also permits the organization to respond to design issues in real-time, enhancing quality control and mitigating risks of costly on-site errors during installation. Implementing collaborative, sustainable workflows using Bentley software, CADDs developed its innovative, cost-effective patented guarding system. The new modular design improves on-site safety at mining facilities and reaches a wider market than has previously been possible with Bentley technology as the foundation for its workflow processes. “Our Sentry guarding systems have changed the way our clients look at keeping people safe; it is now the industry standard and it would not have been possible without Bentley products,” stated Jarvis.