



Project Summary

Organization

D&H Steel Construction

Solution

Structural Engineering

Location

Waitakere, Auckland, New Zealand

Project Objectives

- Detail and fabricate structural steel and metal work.
- Create an accurate model as the primary source of information for coordinating trades.
- Complete on time, without errors.

Products Used

ProSteel

Fast Facts

- D&H Steel Construction used the ProSteel spiral macro to generate pipe templates that reduced fit-up during fabrication.
- To ensure an accurate fit, D&H Steel modeled the precast deck panels and provided the geometry to the precaster.
- Using the ProSteel bridge model as a base, D&H Steel modeled, detailed, and fabricated a series of jigs that were used to form the spiral.
- The ProSteel model provided 3D visualization and clash checking to help with problem solving during the detailing process.

ROI

- Delivering accurate shop drawings and jigs significantly reduced workshop man-hours.
- Modeling the bridge cut the time needed to detail the structure by more than half relative to traditional 2D drawings.
- Assuring accuracy meant that no time was lost during on-site erection.

ProSteel Halves Detailing Time on D&H Steel Construction Project

D&H Steel Loses No Time Erecting Double-spiral Footbridge across Waterway and Motorway Thanks to Accurate ProSteel Model

Westgate Footbridge Challenge

D&H Steel Construction is one of New Zealand's largest structural steel fabricators involved in a wide range of projects throughout New Zealand and the Pacific Islands. The company has a wealth of knowledge and experience designing, fabricating, and erecting structural steel for commercial building projects, industrial process plants, bridges, and infrastructure. The Westgate Footbridge over SH16 in Waitakere, Auckland, New Zealand, was a NZD 5 million design-build project commissioned by Auckland City Council, with HEB Structures as the main contractor, Aurecon providing design services, and D&H Steel detailing and fabricating the steel.

“Once we understood the complex geometry, ProSteel allowed us to model accurately. Detailed connections and irregular shapes were no problem. ProSteel was fundamental to the success of this project.”

– Mike Thompson, CAD Manager,
D&H Steel Construction

The complex structure is comprised of two individual spans: an approach bridge that is a triangular, helical truss comprising both left- and right-handed spirals; and a motorway span formed using two tapered trusses, with a parallel truss forming the deck. D&H Steel Construction overcame the unique challenges of detailing and fabricating the spiral trusses by applying Bentley's ProSteel 3D modeling environment for structural steel and metal work. ProSteel was capable of detailing all parts, despite a unique span geometry with a low level of repeatability.

No Two Parts Alike

The Westgate Footbridge links a local community to a shopping center, sports complex, public library, and other

community facilities that had been cut off by a motorway extension. The motorway section spans eight lanes of SH16; and the 100-meter approach ramp follows a creek, which gave the footbridge its double-spiral shape. This design configuration minimized the environmental impact on the protected waterway, but it also presented significant challenges, including:

- A truss comprising both a left- and right-handed helix
- Pylon foundations with different orientations
- A high volume of unique parts to model
- Complex connections between trusses, and between pylons and trusses
- Helical trusses with no flat faces off which to build
- Need for jigs to build the spirals and control the truss profile
- Coordinating the precast deck units and the helical trusses
- Producing shop drawings that adequately described the truss assemblies
- Ovation of pipes during rolling meant branches needed to be scalloped
- Each baseplate needed to be tailor made to suit the cast hold-down bolts

Fabricating the Double Spiral

Fabricating such a large spiral was a technical challenge. Using the bridge model as a base, D&H Steel Construction modeled, detailed, and fabricated a series of jigs that were then used to form the spiral and ensure the ends of the truss sections were accurate.

The bridge truss spans were assembled in D&H Steel's workshop on the 10-ton jig, which could be adapted for each of the 20-meter spans. This facilitated the accuracy of the development cuts at both ends of the brace pipes and cross members, and ensured that the cords and the end-plate splice connections fit perfectly.

“Essentially, with an accurate jig, the bridge built itself,” said Mike Thompson, CAD Manager, D&H Steel Construction. “There wasn't enough space in the workshop to trial fit the truss sections, but using a jig, accuracy was assured and all sections fit on site.”

“ProSteel handled the complex detailing very well. Basically, if you can model it, you can make a shop drawing out of it.”

*– Mike Thompson,
CAD Manager
D&H Steel Construction*

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Each truss diagonal was a marginally different length. ProSteel allowed D&H Steel to model these accurately and produce accurate pipe templates from the model that reduced fit-up during fabrication. Once holding-down bolts were cast on-site the team received survey dxf files from the client, which were then imported into the model to accurately detail the pylon baseplates.

Model to Shop Drawings

The ProSteel model became the information hub for project participants. It was the primary source of accurate information and allowed the team to coordinate the precast concrete, foundations, handrails, throw screens, and pedestrian lighting.

The contractor chose to form the deck using precast panels with in situ topping. The precast panels were cast to match the spiral shape of the bridge. To ensure an accurate fit, the panel geometry was modeled and provided to the precaster. The precast mold was then checked against the model. This helped reduce the on-site risk.

The Bentley solution also allowed D&H Steel Construction to accurately model the bridge profiles and cross sections, produce pipe rolling information, specify all truss diagonals, and produce pipe templates. The output baseplate DXF files could

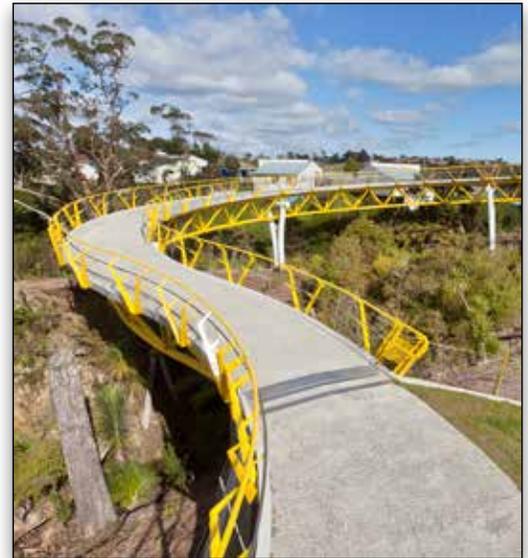
be cut and drilled, minimizing the risk of errors. By coordinating the ProSteel model with other trades as well as with the site survey information, D&H Steel was able to provide 3D visualization and clash checking that helped problem-solve during the detailing process.

Thompson noted: “ProSteel handled the complex detailing very well. Basically, if you can model it, you can make a shop drawing out of it.”

Accuracy Saves Time

Delivering accurate shop drawings and jigs significantly reduced workshop man-hours. Modeling the bridge cut the time needed to detail the structure relative to traditional 2D drawings by more than half. The assured accuracy meant no lost time on-site during erection. The precast units fitted perfectly, so other trades also benefitted from coordination in the model.

The ability to view and measure the fabricated elements from any orientation meant the project team could quickly and easily provide additional information to the workshop when requested. These time savings resulted in significant cost savings and reduced project delivery time, particularly because on-site rework was not required.



Bentley software enabled D&H Steel Construction to accurately model the bridge profiles, cross sections, and specify all truss diagonals.