Record long free-span to traverse Sydney's western water border

Nepean River Pedestrian and Cyclist Bridge, Western Sydney

A new pedestrian and cyclist bridge is well underway to cross the Nepean River, the major waterway that skirts the edge of Sydney, with a 200-metre steel truss that is believed will be the longest free-span steel structure of its type in Australia.

The new bridge is intended to provide a safe crossing for pedestrians and cyclists over the river and improve connections to existing and future shared use paths such as the Great River Walk.

The original concept design considered a curved design, but was revised to be based on a straight triangular truss with a gentle vertical curve during the detailed design phase to provide a large span with generous width and unique structure that will be an attractive landmark for the area.

A representative from NSW Roads and Maritime Services (RMS) Greater Sydney Program Office said the long single span virtually dictated steel as the medium other than a suspension or cable stay option and that the final decision hinged on crossing of a listed international rowing course demanding a clear single span across the Nepean, as well as a working within a limited site area and budget.

"The straight truss bridge option has helped to keep the overall cost down when compared to the original curved design with its more efficient structural design reducing the amount of steel needed by 20 percent with the bonus of a lower carbon footprint and energy usage during construction," the representative said.

The steelwork component comprises the large pipe-based truss structure (516 tonnes), decking (156 tonnes) and box girders (61 tonnes).

"The straight option also facilitates an easier fabrication process with less welding and more similar pieces of steel, reduces bridge self-weight loads and lowers onsite safety risks during erection," he said.

"Large member sizes and intricate joint design of the steelwork will help distinguish the structure."

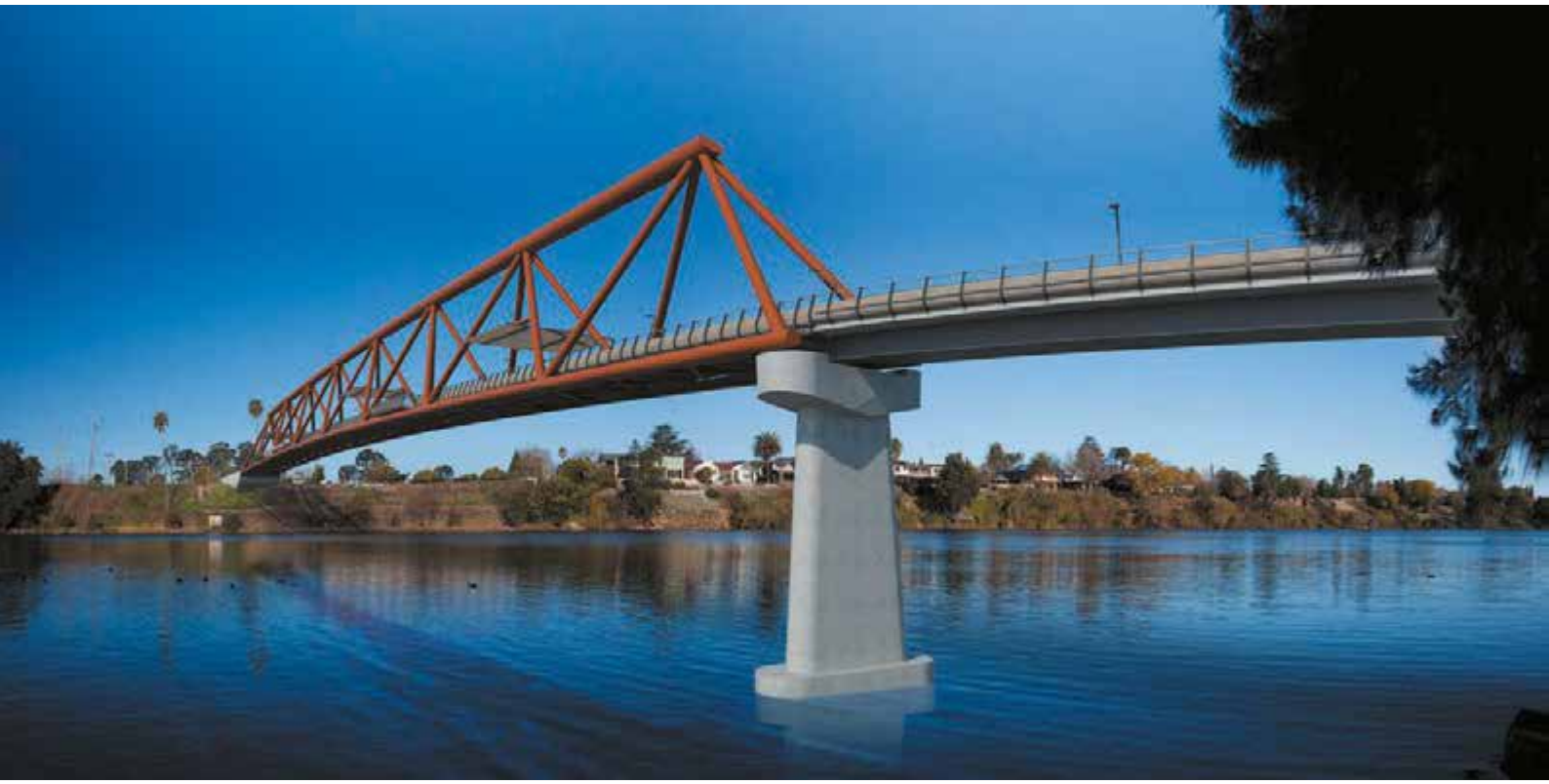
He said that the structural engineering and design were also worked out to facilitate ample maintenance access, including service access rails in the construction, specification of long-life elements to minimise required maintenance and design to allow controlled access by Underbridge Inspection and Maintenance Truck (Mobi).

"The necessary focus on quality on this project has required a steel fabricator that can provide a high level of performance and tight tolerances for a structure of this size so the specifications for steel supply and construction were written with the new AS/NZS 5131 (Structural Steelwork Fabrication and Erection) standard as the technical foundation to the bridge build," he said.

"Engaging with a steel contractor independently certified to the associated NSSCS compliance scheme has been very important for the fabricator having the capability, resources and expertise to fabricate a structure of this size and complexity.

"It has also been rewarding that the steel supplier, fabricator and contractor have all worked well with RMS to achieve the objectives."

Civmec Construction & Engineering was the chosen contractor to undertake the complex fabrication, trail assembly, surface treatment, logistics and onsite assembly of this signature bridge project.



Civmec's expansion on the East Coast and particularly the recent acquisition of the Forgacs shipyard in Tomago allowed Seymour Whyte to take advantage of an existing largescale fabrication facility which would allow the crucial trial fit to be undertaken under cover.

As the steelwork package got fully underway, the fabrication site became successfully certified to Construction Category 3 (CC3) of the National Structural Steelwork Certification Scheme (NSSCS) applicable for more complex structures like bridges. Along with the company's main plant in Perth, the Tomago facility is one of only a few to attain the CC3 distinction throughout Australia since the creation of the NSSCS.

Fabrication Manager at Civmec Tomago, **Michael Tartaglia** affirmed that the company's commitment to the newly published steel fabrication Standard AS/NZS 5131 and associated third-party certification was crucial.

"With quality as the overriding consideration on this project, we use an internally developed enterprise resource planning platform, Civtrac which utilises bar codes and real-time analysis to track materials from start to finish," he said

"Civtrac improves planning and resource allocation while reducing labour and material waste and allows us to manage every aspect of the project lifecycle and capture data throughout all phases of project delivery from fabrication through to onsite installation.

"This provides our clients with transparency across their entire project, with rigorous configuration management, detailed collection and retention of Objective Quality Evidence (OQE) and the implementation of innovative and best practice solutions which utilise state-of-the-art technology and equipment."

In line with their history in Henderson, Civmec invested in advanced equipment for the project including a HGG CNC Pipe Cutting Machine at Tomago capable of cutting pipe from 50mm to 1500mm in all intricate shapes and sizes specifically for the cutting of the CHS truss structure of the bridge. The facility's new Fronius Magnatech Pipeliner II is also being used to make pipe-to-pipe and pipe-to-fitting welds allowing a broader workpiece size ranging from 168 to 1524mm, improving productivity by increasing the duty cycle and producing welds of consistent quality.

The considerable temporary works structures in Tomago comprise 120 tonnes of jigs, necessary as a safeguard of dimensional accuracy. The jigs are set out for fabrication to build the first half of the bridge, then flipped around to build the second half in the same jigs using the same set out points.

The various components are sent to Penrith and have already included the movement of the widest load ever to be transported through Sydney. The logistics operation has to date included a number of night moves and required the shutdown of a section of the M2 Highway from Pennant Hills Road to the M7. The high degree of planning and coordination required input from road owners, logistics companies, RMS and various government bodies.

The final bridge structure is being assembled in the 65-metre long workshop which has been purpose-built by Civmec for the site assembly of the bridge sections and includes two brand new 20-tonne gantry cranes. The complexity of the onsite assembly also required the fabrication and installation of engineered collapsible access platforms. In general, the structural steel of the bridge is being assembled in eight bays, 25 metres long by eight metres wide with each bay split by bottom floor and top truss due to the height restrictions with assembly, fabrication, welding, blasting and painting of the various activities associated with the fabrication of the truss segments.

As this edition goes to press, abutment works have been carried out as well as pier construction on the western bank and temporary pier construction in the river, which includes piling work and the temporary workshop facility on the eastern bank. Construction work for the bridge started in mid-2016 and is expected to take about two years to complete.

PROJECT TEAM

Client and Project Manager: Roads and Maritime Services NSW

Prime Contractor: Seymour Whyte Constructions

ASI Steel Fabricator: Civmec Tomago

ASI Steel Distributors: BlueScope Distribution (Tomago), Liberty OneSteel Metalcentre (Mayfield)

ASI Steel Manufacturers: BlueScope, OneSteel