New crossing build time abridged

Collie River Bridge, Treendale WA

A steel-intensive approach has facilitated the installation of a major new crossing over the Collie River in the South-Western region of Western Australia from terrain not able to support heavy cranes and has cut almost two months from the construction time.

Expected to be completed early 2018, the bridge will provide a convenient connection between the Treendale and Kingston subdivisions in Australind, Millbridge Private Estate in Millbridge and the Parkridge Estate in Eaton, and is expected to halve the travel time between the commercial precincts of Dardanup and Harvey shires to 10 minutes.

There were many challenges faced during the design phase of this bridge with the site being a greenfield and ground conditions not allowing heavy crane/machinery haulage being the biggest drivers in the decision-making process. Carrying out construction within a residential area meant that managing adverse social impacts was also a priority.

To ensure that community disturbance was maintained at a minimum and due to the poor ground conditions on the southern side of the river, it was decided to incrementally launch the bridge superstructure from the northern side of the river. The bridge superstructure consists of steel beam girders prefabricated and delivered to site and placed on the launching pad. The reinforced concrete deck was then cast on top of the beams along with the guardrails installed prior to launching the bridge superstructure from the bank out over the piers.

Launching girders with the concrete deck cast is not commonly done in Australia and this structure is only the second of its kind for Main Roads WA.

Sixteen millimetre-thick CHS steel formwork was used as the sacrificial steel pile casings for the 914mm diameter concrete support piles, driven to the required river depth before being augured to allow construction of the reinforced concrete infill.

The beams for the bridge were fabricated by ASI member, Civmec's main facility at Henderson in Perth, which was the first facility in the State to be certified to the higher Construction Category 3 of the National Structural Steelwork Compliance Scheme (NSSCS) for work on more complex structures.

The girder sections were transported along Forrest Highway to access the bridge site via a temporary road.

Usually with a bridge of this type, the steel beams are pushed out over the piers and concrete deck poured when the steel beams are in place but for this bridge, pouring the deck prior to launch meant a much more efficient construction process.

One of the main reasons for adopting this bridge type and construction method was the very poor ground conditions on the southern side of the river. The soil does not have sufficient strength to support a large crane that would be necessary to lift beams into place.

Most of the flood plain to the south of the existing river is underlain by up to 10 metres of very soft to soft alluvium deposits from shallow depths. The stability of the site under heavy cranes required to lift girder segments was deemed to be problematic unless significant ground improvement was undertaken, although north of the river is underlain with stronger soils.

By launching the bridge superstructure from the northern side of the river, large cranes were not required to work on the southern side.

Apart from the first 26 metres of the leading span, the superstructure was launched with the in-situ concrete deck cast and guardrail installed to reduce post-launch construction activities. The leading 26 metres formed the 'launch nose' which was required to reduce tip deflections and control cracking of the in-situ concrete deck by minimising the self-weight of the cantilever.

Steel beams were more favourable mainly due to their significantly lighter weight, ability to span longer lengths without support and

being easier to launch than concrete beams, lowering the expense of piles and pile caps required to support the superstructure.

According to Delivery Manager Structures - Metropolitan and Southern Regions at Main Roads Western Australia **Nimal Jayasekera**, the use of the adopted steel beam approach saved around six to eight months from the project time.

"If a concrete launch beam was used, we would probably need another pier or two (due to shorter spans) as well as extra time such as for stressing cables and formwork," he said.

"Collie River has remained open during construction, minimising disruption to the public, whereas alternative construction methods such as a 'stick build' would have required temporary access over the river to deliver and erect beams."

He said that conventional 'stick build' construction was also less desirable as it significantly increases the construction work to be undertaken at heights and above water, including construction of the bridge deck, and welding and painting girder splices, increasing safety risks.

And for the associated girder segments for that approach to be transported through Treendale, he said a full-length causeway (or temporary structure) across Collie River would have been required to lift in segments for spans 1 and 2, and deliver segments for Spans 3 to 6.

He said that the most significant factors for the selection of Civmec as the steel contractor were price, followed by experience and reputation.

The scope of Civmec's involvement encompassed shop detailing, fabrication of girders, non-destructive testing and surveying, surface treatment, transport of girders to site, onsite field welded splices and field splice coating touch ups.

Overall, Civmec supplied 734 tonnes of steelwork for the project comprising 702 tonnes of plate, 13 tonnes of hollow sections and 19 tonnes of hot rolled components.

Civmec Proposals Manager, **Rod Bowes** said the 40 by 43 metre girders were fabricated and surface treated in halves due to their length, which were then joined in the workshop prior to loadout to site.

"A jig was fabricated so the girder segments could be rotated 180 degrees on a set of rollers to allow for down-hand welding on the underside of all internal stiffeners and top flanges," he said.

"The jig we fabricated helped us with the overall production of the bridge as we were able to monitor the quality and production all in one place and not rely of other contractors."

Steel fabrication commenced in January and completed with field splices undertaken in May.

PROJECT TEAM

Clients: Western Australian Government, Shires of Harvey and Dardanup

Project Management: Main Roads Western Australia

Structural Engineering: AECOM

Builder: BMD Constructions

ASI Steel Fabricator: Civmec Construction & Engineering

ASI Steel Distributor: BlueScope Distribution

ASI Steel Manufacturer: BlueScope