



Perry Bridge.

New Zealand's first pedestrian and cycle network arch bridge to be constructed.

Holmes Consulting LP provided a number of innovative engineering solutions to their clients - overcoming the complex technical challenges presented by the long slender crossing, including footfall vibration and arch buckling phenomena. They also conceived a novel launch solution to enable the bridge to be transported across the river during construction.

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The Te Awa River Ride is a 70km cycleway along the Waikato River from Ngaruawahia to Karapiro. Part of this project was the delivery of the Perry Bridge - a crossing for the cycleway over the Waikato River near Horotiu.

Perry Bridge is one of only four network arch bridges in New Zealand, and is the only one designed solely for pedestrian and cyclist use in the country. It boasts the longest length for this type of bridge in New Zealand, with a very long and slender design spanning 130m at just 3m in width.

Situation

The Perry Bridge section of the Te Awa River Ride provided a means to avoid the river frontage near the AFFCO meat processing plant. Holmes' client Emmetts Civil Construction wanted to submit a competitive structural alternative to the originally proposed timber suspension bridge being considered by the council and Te Awa River Ride Charitable Trust.

Their successful pitch was a visually striking yet highly efficient structural steel form which minimised the cost of materials and construction, while reducing environmental impacts during erection. However, while this design was hugely innovative it posed many technical challenges to deliver the design safely and fit for use.

In addition, a key challenge to overcome was how to install the structure over the Waikato river without disturbing it's river bed.

Solution

Holmes' unique design provided the opportunity for Te Awa to capture the public's imagination - giving them a platform to foster engagement with local schools, artists and other stakeholders in the process.

Holmes overcame technical challenges by leveraging advanced modelling and full non-linear analysis to assess potential buckling of the slender arch chords, and for detailed assessment of lateral pedestrian vibration performance.

As a result they introduced steel tube arch chords braced together by folded channel vierendeel plan bracing and inclined towards each other to add stiffness and stability. The deck was longitudinally post tensioned and integrally connected to the abutments with no joints or bearings. The steel UB stringer beams and fabricated T-section transoms along with precast concrete deck panels were made fully composite and continuous using in-situ stitches.

The deck was supported from the arch by high strength steel hanger rods inclined and crossed in a network pattern for greater structural efficiency.

Holmes also conceived a novel solution to install the bridge and minimise environmental impact by launching the bridge across the river by sliding the leading end along tensioned cables. To their knowledge it's the first time this had been done for this type of structure.

Result

The network arch solution for the Perry Bridge provided Te Awa with a landmark structure said by Holmes Senior Project Engineer Tim Brook to have been "strongly supported by the community and key stakeholders, and far exceeding initial expectations for the basic functional river crossing it was first earmarked to be."

Holmes' smart cable launch concept worked within their client's budget, allowing Emmetts to use more of their own plant and materials for the steel erection, and removing program risk, as well as reducing risk of failure or accident.

"Today, the Perry Bridge is considered one of the best features of the Te Awa Great River Ride by locals and visitors to the region."

Client: Emmetts Civil Construction for Waikato District Council & Te Awa River Ride Charitable Trust

Duration: Jul 2016 – Nov 2017

Location: Horotiu, Waikato

Project value: NZD\$2.4 million

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