KURILPA BRIDGE

BAULDERSTONE
BRISBANE QLD

A WORLD-FIRST BALANCING ACT

Everything about Brisbane's Kurilpa Bridge is a finely tuned balancing act, from the tensegrity structure itself to the construction process, managed by Baulderstone Queensland.

A world-first in design and engineering terms, the bridge combines tension and compression elements in such a way some of the main supports appear to be floating. An estimated 550 tonnes of structural steel, including approximately 6.8 kilometres of spiral strand cable are incorporated into the pedestrian and cycleway which spans the Brisbane River between the Southbank Arts precinct and North Quay in the CBD.

With a total length of 425 metres and a midspan of 128 metres, the bridge rests on piled foundations driven and drilled into the bedrock of the river, first passing through around 12 metres of mud and gravel. Its span is 11 metres above the water level of the river, and provides a 6.5 metre wide passage between the handrails at deck surface level. An estimated 1,500 cubic metres of concrete were used in elements such as the piers at both ends and the marine piles.

The Queensland Government is spending $63.3m on the project which is being managed by the Department of Public Works, with Baulderstone appointed as the Contractor working in conjunction with Cox Rayner Architects and ARUP Engineers.

To achieve this extraordinary civic infrastructure feat took 25 Baulderstone Queensland staff, and fifty separate subcontractors and suppliers ranging from crane companies to barges. Project Manager Paul Stathis estimated 1,100 individual site inductions were carried out, and that at any one time there were 65 people active on-site. "There were a lot of specialists involved," he said.

Construction commenced with site establishment in October 2007, with completion due September 2009. The main construction phases were the land piles, the marine piles, the Tank Street approach piers substructure, the superstructure of the bridge, the main river pier piles and caps, the tensegrity bridge superstructure, the finishes and finally, landscaping at South Bank.

"Special accesses had to be put in for the construction process at North Quay for the main river pier," explained Paul Stathis.

"We used a temporary cantilevered steel access for the piling rig, this was then transformed and modified to be the falsework for the pilecap soffit formwork. A lot of innovative ideas like that were used in this project."

Numerous barges were involved, both for construction works including pile driving, steel erection and general construction material handling.

In addition, feeder barges were utilised to deliver supplies including structural steel and precast concrete elements, steel reinforcement and cables.

The design of piers and marine piling had to be made strong enough to withstand the impact of a barges sent out of control by a major flood event.

Timing was critical, as the project was undertaken as a fixed lump sum contract. With labour one of the biggest overheads, this meant absolutely meeting the schedule for each stage. In addition, rising costs for steel meant that we had a short time to lock in sufficient design for procurement.

Timing was also vital in terms of minimising disruption to traffic on some of Queensland's busiest roads. This required detailed traffic management plans and a great deal of liaison on the part of the project team, including daily communication with a multitude of bodies including the DMR, the Brisbane City Council, the Riverside Expressway Interfacing Authority, Brisbane Metropolitan Transport Management Centre, Brisbane River Harbourmasters and Emergency Services. "There has been a great deal of stakeholder management and approvals required," said Paul Stathis.

A Voluntary Impact Statement was carried out before works commenced, which resulted in mitigation plans for marine impacts, such as silt booms around key working areas in the river.

Baulderstone has previous experience on other Brisbane River Bridge icons, namely the William Jolly Bridge, the Victoria Road Bridge and the Story Bridge. Other major projects currently being completed by Baulderstone include the Gibson Island Water Treatment Plant, the Wesley Hospital, the Prince Charles Hospital, the Gatton and Townsville Prisons.

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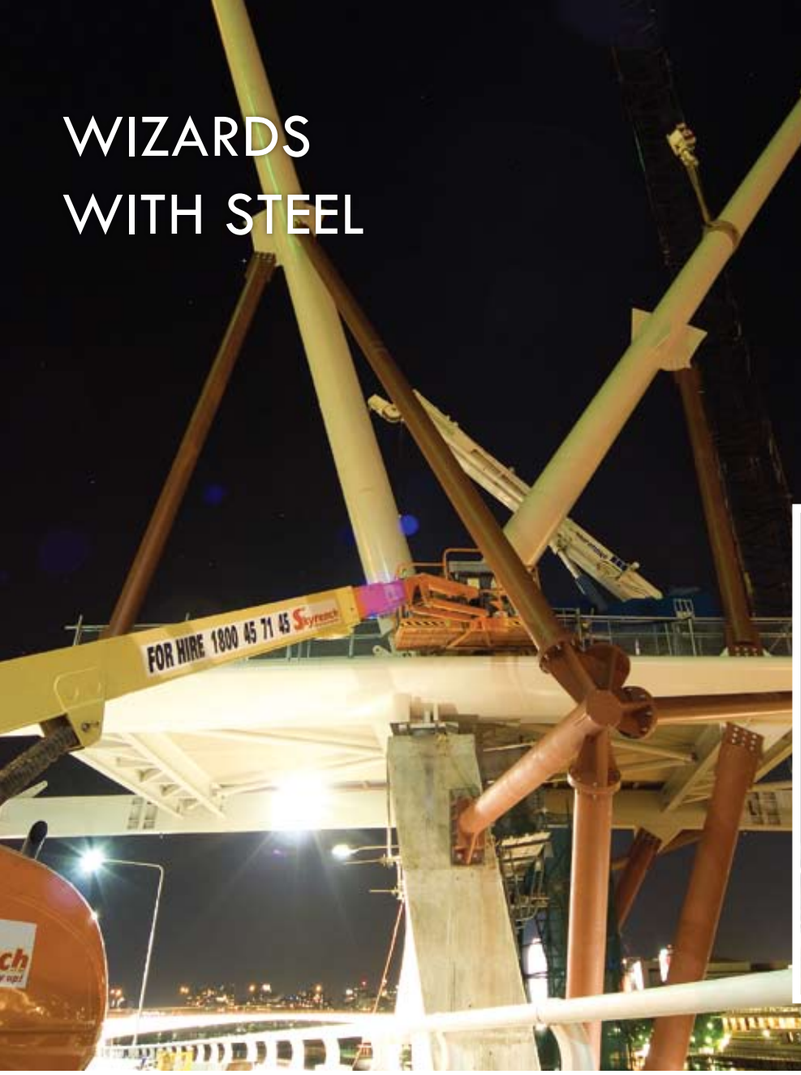
WIZARDS WITH STEEL



Turning hundreds of tonnes of steel into components for a functional bridge is a big task at the best of times. When the bridge has been designed to be artistic, asymmetrical and generally spectacular, like Kurilpa Bridge, it becomes a massively complex fabrication job.

Luckily, Beenleigh Steel Fabrications are experts when it comes to turning designs into beams, trusses, struts, bracing, cables and even arty fiddly bits. They've been in the steel fabrication trade for 28 years, and have a highly skilled workforce of 120 at their Crestmead and Rocklea Workshops as well as on-site riggers and boilermakers.

For Kurilpa pedestrian bridge, they supplied and installed both permanent and temporary steel elements, using a Smithbridge barge for over water parts of the job.

"The bridge consists of 900 high x 450 wide box-beams with aerodynamic fairings attached totalling approximately 305 tonnes, which we fabricated from 4, 12, 16, 20 and 25 Gr350 plate," explained Director and Project Supervisor Frank Boyes.

"There are also 1500 wide x 8400 long floor support trusses totalling approximately 130 tonnes, 14 tonnes of 1680D x 7.1CHS floor bracing, vertical masts ranging from 18m to 30 m long which used 170 tonnes of steel and around 35 tonnes of horizontal flying struts ranging from 17m to 24m. We also installed steel cables with varying diameters from 16 dia to 80 dia at lengths from 20m to 80m, and canopy framing comprising 250 X 150 X 6RHS portal frames, 150UC30 and 460UB82 rafters, 1140D X 6.0 CHS pyramids and 75 X 5EA purlins. In addition, around 130 tonnes of temporary steelwork was supplied and installed for use during the construction process, and dismantled when the bridge was completed."

All up the bridge contains around 12,000 individual parts weighing in total approximately 800 tonnes. Two key subcontractors were involved in working on this hefty structural steel consignment.

Online Drafting Services provided the workshop drawings for the project. This was an intensive process due to the complexity of most of the connections and the random nature of the structure's design geometry. They used Prosteel 3D to model the bridge, enabling easy fine tuning of the structural details as the project progressed, and allowing the idiosyncrasies of the geometry to be addressed on a connection by connection basis.

Tranzblast Coating Services treated all the steelwork for the project at their 4 hectare site at Carole Park. They applied a three coat system of Interzinc 52 primer, followed by an intermediate coat of Interguard 475HS and a top coat of Interfine 878. Tranzblast have worked on some other outstanding steel projects including Queensland Tennis Centre, Robina Stadium, Brisbane's new inner city Bus Stations and Griffith University Pedestrian Bridge at Smith Street Gold Coast.

Beenleigh Steel Fabrications have been responsible for some of Queensland's most noteworthy and award-winning steelwork, including the Queensland Tennis Centre, the new Ipswich Courthouse and Watch house and police station, Queensland Cultural centre, Cairns International Airport, Brisbane's International Airport Extension, Brisbane Convention and Exhibition Centre, Logan Hyperdome, Movieworld Oxenford, Millennium Library, Queensland Conservatorium of Music, Boggo Road Busway and Suncorp Stadium. And when the Gabba was damaged in the disastrous storms of 2008, they were the company called in to fix it.

They have also fabricated, delivered and erected structural steel for projects further afield, including the Sydney Superdome and the Observation Lift Structure at Sydney Casino.

Their suite of services includes project management, contract administration, workshop detaling drawings, surface treatment, transport infrastructure planning, erection of structural steel and supply of cranage, riggers and doggers. Their lifting equipment includes 200T Lattice Boom crane on tracks, 100T All Terrain Demag crane, 70T P&H Lattice Boom Crane, 60T All-Terrain Demag crane, 40T P&H Lattice Boom crane, 35T All-Terrain Demag crane, 20T Rough Terrain which was used on Kurilpa Bridge to assist bridge assembly, 20T Franna crane, Minicranes, Scissorlifts, and Snorkelift Articulating Telescoping Boom Platform.

In addition, Beenleigh Steel Fabrications can handle any pre-cast concrete erection requirements, a service they have provided to projects including Townsville Army Aviation Works, Townsville International Airport, Suncorp Stadium, Skilled Stadium and all stages of the Gabba.

They have a quality management system which conforms to ISO 9002, and strive to deliver a competitive price with finest quality to their clients.

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