BRIDGING THE GAP

DEVELOPER : Main Roads WA
MAIN CONSTRUCTION COMPANY : Georgiou Group
PROJECT COST : $52 million

The new Mandurah Traffic Bridge was built to accomodate increased traffic due to the areas population growth. Featuring four traffic lanes, and a separate pedestrian and cyclist walkway, the unique curved design makes a landmark statement across the estuary and pays homage to the community's iconic Old Mandurah Bridge.

The $52 million Mandurah Traffic Bridge project saw the replacement of the existing two lane Mandurah traffic bridge with a modern alternative. The new bridge manages increasing traffic with four traffic lanes, and features a separate pedestrian and cyclist walkway to the north side of the new bridge, fishing platforms and boardwalks accessible from the eastern and western foreshores.

Georgiou, one of Australia's leading building and civil construction companies, was chosen by Main Roads WA to demolish the old bridge and construct the new structure. The scope of work also included the approaches, associated road and footpath works, public artwork and landscaping. The company secured the contract based on their extensive experience and their impressive track record developing infrastructures and engineering solid road networks across Australia.

Prior to bringing Georgiou on board, the City of Mandurah engaged in a significant period of public consultation with the community. The old bridge, which opened in 1953, was an iconic fixture in the area and held great sentimental value within the community.

"Prior to the official tender process the City of Mandurah communicated regularly with the local authority and had a good understanding of what was important to the people who use the bridge every day. That proved invaluable over the course of the project and ensured a positive level of local interaction," explained Anthony Deurloo, Project Manager at Georgiou.

The bridge is also a pivotal part of Mandurah's infrastructure and a key component of the project was to ensure continuous traffic flow throughout the entire construction period. The solution was to construct the new bridge alongside the old one.

"It was a unique situation to have our building site located side by side with live traffic, it was a challenge to maintain traffic flow whilst not endangering the public and pedestrians or our construction team," said Anthony.

The design of the new bridge is complex and the construction was challenging. The structure is curved in three directions – it's curved in elevation, in plan and, in cross-section, it has a curved soffit.

"It was a technical build. The casting bed framework we created was an extrapolation of the constant curve and the tolerances that we had to construct to, were very tight. The cross section of the bridge is also rare, it's asymmetrical as it features a lowered pedestrian footpath on one side. From an engineering point of view, it's been rewarding and satisfying but rather difficult," added Anthony.

The bridge was built using the incremental launch method, meaning individual concrete segments were constructed on the western shore, by pouring the concrete into a casting bed formwork. These were then jacked section by section to eventually reach the eastern shore. As the bridge extended across the estuary, the launch nose at the front rested on each of the piers in turn. Two lanes of the new bridge opened to the public in September 2017 and with all four lanes fully operational by Christmas 2017. Final completion of all the work is expected in late January 2018.

Community has played a large role in this project and prior to commencing demolition, Georgiou and the City of Mandurah opened the bridge one last time and hosted a farewell party. "The whole project has been very well received locally and a big part of that was our consistent messaging. We brought the community along for the journey each step of the way."

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Below Power On Cabling provided specialised drilling services to access utilities located within the riverbed.

Below Custom Mageba RESTON®POT bearings were used on the bridge to control transfer of loads between the superstructure and the substructure.

Specialists in directional and vertical drilling, Power On Cabling were chosen to lay the gas and water pipes for the Mandurah Traffic Bridge Replacement project. Unlike the old bridge, the utility pipes do not run alongside the structure, instead they sit deep within the river bed. Power On Cabling were the only company in the state with the right expertise and equipment to drill under the estuary.

Cameron Swift, General Manager at Power On Cabling explained, "Our Ditch Witch JT100 directional drill was the only piece of equipment capable of completing this job to the required depth of 18m. We started in May 2016 and finished the works in October 2016."

Even with this advanced machinery, the process was complex due to the nature of the project. "The drill rod is required to be consistently monitored. Usually we use a hand held tracker to monitor drill rod location, scan for its location, depth and mark it on the ground. Working underwater required a complex telemetry unit which could read the signal of the drill rod under the ground beneath the estuary," said Cameron.

Although it is a complex undertaking, there are many benefits of this approach. The size of the pipes, a 225mm gas pipe and two 630mm water pipes for this project, is a factor. When placed underneath the ground they are not exposed to hazards such as pedestrians, traffic accidents or bridge failures.

It is also a more cost effective method. "Placing the pipes underground allows us to use polyethylene. It's a thick material that's soft but really strong. It costs a lot less to install than steel and is better for the environment," said Cameron.

Power On Cabling operate across Western Australia and are currently working on a combined utility project renewing gas and water mains in the City of Fremantle for Water Corporation and ATCO Gas Australia.

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The bespoke pot bearings used across the new Mandurah Bridge were designed and supplied by Mageba (Australia). The company is a subsidiary of Mageba, one of the world's leading suppliers of structural bearings, expansion joints and other high quality products and services for the transport infrastructure and building construction sectors.

The company were awarded the contract by Georgiou based on their strong global reputation. "We won the project based not only on price but on the proven quality of our product across international projects. We were also able to impress with our onshore design and testing capabilities," said Virendra Ghodke, General Manager of Mageba (Australia).

Once the brief for the pot bearings was received, the team began the design stage. The company boasts a suite of their own trademarked products and the Mageba RESTON®POT bearings were utilised for the new Mandurah Bridge along with POM sealing chains, as now made mandatory by AS5100.4 – 2017. This system ensures the controlled transfer of loads between a structure's superstructure and its substructure. The structural steel versions are custom designed for each project.

The bearings were manufactured in the company's factory in Shanghai. After production was complete, they underwent testing in the Mageba (Australia) NATA accredited testing facility in Sydney before being delivered to site.

The bridge is designed to be earthquake resistant which presented a challenge. "Some of the bearings required external uplift restraints. The design meant we could not make use of frictional assistance to transfer the horizontal loads. Therefore, the load combinations in this project were rare," explained Virendra.

"Our designers in Sydney worked alongside our designers in Switzerland to overcome the issue. We inject this globalisation into all of our client projects – bringing global experience to local problems."

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