Sitra Bridges Replacement

Client: Bahrain Ministry of Works
Contractor: Gamuda
Location: Manama, Bahrain
Products: Rapidshor / Superslim / GTX Beams / Kwikstage

The BD 64 million Ministry of Works funded Sitra Bridges infrastructure project is set to cut travel time and congestion in one of the busiest parts of the island. Including a 3-level grade-separated intersection at Umm Al-Hassam, a first for Bahrain, the project has transformed journeys for thousands of island residents.

As one of the most important traffic links in the country’s road network, linking Sitra and Manama in Bahrain, the previous Sitra Bridges had reached the end of their service life and could no longer cope with increased traffic volumes.

The dual two-lane roads and the at-grade junctions, therefore needed to be replaced by a dual three lane highway, complete with a 3-level grade-separated intersection at Umm Al-Hassam. This new configuration was designed to provide excess capacity for the heavy morning and afternoon rush hour traffic loads, which exceed 6,000 vehicles per hour.

In order to maintain traffic flow and services, the new bridges and utility conduits were built alongside the existing ones and switched out on completion. For main contractor Berhad Gamuda, the key to achieving these goals was to ensure the formwork and shoring was up to the challenge. Following a competitive tender process, RMD Kwikform was awarded the formwork and shoring contract to assist in the construction bridges and flyover sections. Key to successful creation of the new dual three lane highway, was marrying the needs of the tight programme and budget, with the requirement for minimum disruption to the existing road network. For RMD Kwikform’s engineering team, in order to achieve these goals, practical yet safe design solutions were required.

It was the trust and interaction with main Berhad Gamuda that was so important as Shekhar explains: “The scope of the project was to build a brand new dual three-lane highway, a 3-level grade-separated intersection at Umm Al-Hassam and at-grade signalized intersections at the entrance to Nabib Saleh Island and at North Sitra. What Berhad Gamuda were looking for was an equipment supplier that could support them both technically and logistically to supply formwork and shoring solutions to key parts of the project.

“With East to South and North to South flyovers making up a large proportion of the new highway and underpasses used in other areas, the range of equipment required was significant. Special parts and complex detailing also required specific engineering attention. With over 1,050 tons of equipment
used over a three year period, the scale of project management and delivery
required a huge amount of planning and onsite support, in the form of
RMD Kwikform Site Assistance Technicians all of which helped the project
programme time. “For RMD Kwikform there were various phases to the project,
one was the 12m high, 1.2m thick Umm Al-Hassam Underpass walls, which
were created using a single sided climbing formwork system. This was then
followed by the use of Rapidshor shoring in a modular format as backpropping
to transfer the additional loads applied on to the underpass slab from the
flyover deck supports.

But it was the flyovers themselves that required the most equipment and
engineering support. Both the East to South and North to South flyover bridge
deck falsework required the use of complex side forms in order to achieve the
design requirements. With Rapishor shoring supporting Superslim Primary
and GTX Secondary beams used for the complex bridge deck, complete with
wedge shaped side forms, the varying width of the flyover
decks were achieved.

Shekhar: “When we looked at the deck design and overall structure in
layman’s terms it varied in both cross section and length. Therefore in order
to achieve this complex shape, we had to design special hinge connections
that could cater for the various slopes of side forms and interconnect with the
overall Rapidshor support system. Each hinge had to be robust enough to
be reused multiple times from one structure to the next, across both of the
flyovers. They also had to be flexible enough to cope with varying heights of the
Rapishor system from 4m to 14m.

“With the length of the East to South flyover measuring 390 linear metres,
with six spans from abutment to abutment and the length of East to North
flyover measuring 185 linear metres, with 5 spans from abutment to abutment,
a total of 475 linear metres of flyover had to be constructed to complete the
project.”

In addition to the flyover and underpass systems used, RMD Kwikform also
supplied over 280 tons of side form formwork consisting of combination
of Kwikstage, Rapidshor Support with Soldier and Special Shaped Steel
Walers to support GTX Beams and plywood to form Complex Profile for the
construction of the Marine bridges. Shekhar concluded: “In all the success
of the project came down to designing simple modular support systems that
were complemented by specially designed parts that made the erection and
dismantling process simple, safe and time efficient. Through working closely
with the main contractor and our support with training and supervision onsite
we were able to achieve the goals to create a modern and sustainable project
with a built in life of over 120 years.”