

The Senqu River Bridge in Lesotho under construction – the structural steel girders were assembled in the temporary launching yard, prior to the sections being launched across the gorge by incremental hydraulic jacking

# Incrementally launched Senqu River Bridge



**Giuseppe De Simone Pr Eng**  
Contracts Director  
Stefanutti Stocks Civils  
Giuseppe.DeSimone@stefstocks.com

## INTRODUCTION

A 140 m long bridge over the Senqu River, outside the town of Mount Moorosi in Lesotho, was constructed by Stefanutti Stocks Civils for the Lesotho Roads Directorate and will soon be handed over to the client.

The Senqu River, which becomes the Orange River when it enters South Africa, originates high in Lesotho's Maluti Mountains. Although upstream dams assist in regulating flow, the vast catchment area of the river results in unpredictable water levels.

Currently the local community is ferried across the river by means of row boats, but this method is cumbersome, unreliable and dangerous. This bridge will not only provide a safe and efficient passageway for travellers and locals crossing the river, but will also link communities who have thus far been isolated from regular contact with one another.

The project commenced in 2014 and included:

- Permanent cased oscillator piling to abutments and piers
- Construction of eastern and western abutments
- Construction of reinforced concrete piers
- Assembly and incremental launch of steel girders
- Construction of an in-situ concrete slab, walkway and parapets

- Construction of 1.9 km of surfaced road
- Construction of visitors' lookout points.

## UNIQUE CHALLENGES

Given the risks associated with fluctuating water levels and seasonal flooding, all piling activities were scheduled for completion during a dry season. The project programme therefore had to be adjusted to allow for realistic geotechnical investigations in the river, while foundation construction had to be timed to coincide with the dry season.

From the outset it was clear that building a bridge over the Senqu River would have to be done with due consideration of the weather, i.e. seasonal timing would be crucial. Major challenges that the site teams had to manage during the project, often on a day-to-day basis, were high rainfall with associated elevated water levels, and freezing temperatures and snow. The teams also had to contend with unplanned sluice gate openings from dams upstream of the bridge site, resulting in work disruptions.

Despite these challenges, the young site team enjoyed an epic adventure while constructing a bridge in a beautiful part of Africa, where they were working in tune with nature and all its quirks. Office jockeys, eat your hearts out!

The bridge construction involved the installation of a temporary causeway across the river to facilitate access to all pier and abutment locations, while allowing the unabated natural flow of the river.

The piling for the foundations was executed by Stefanutti Stocks Geotechnical and involved the installation of 900 mm

and 1 100 mm diameter raked permanent cased oscillator piles throughout the bridge foundations. The piles were socketed into the rock layer underlying the bridge site.

Reinforced concrete abutments and piers were constructed, with the temporary launching yard located directly behind the abutment once a mechanically stabilised retaining wall had been completed to hold the abutment fill.

Due to the size of the girders, structural steel members were fabricated off-site and moved to site using specialised transport. The assembly of the structural steel girders, with associated bracing, was done in the temporary launching yard, prior to the sections being launched across the gorge using an incremental hydraulic jacking technique.

Once the structural steel girders were located in their final positions, the construction of the 250 mm in-situ concrete deck could commence.

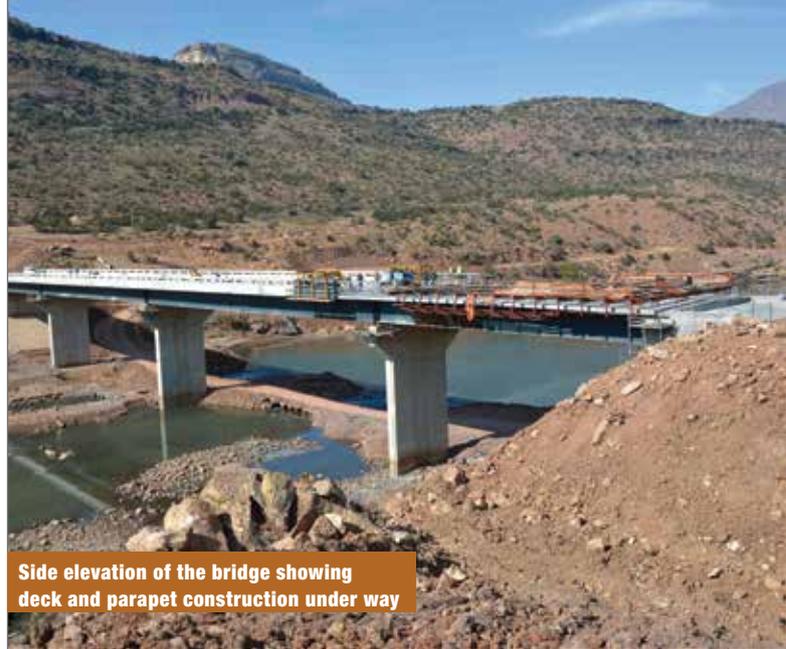
The purpose-designed deck formwork system proved to be very efficient, and assisted the site team with achieving a regular cycle time during the casting of the seven deck sections. After completion of the deck, the in-situ parapets, walkways, joints, jockey slabs, etc, were constructed.

### IN CLOSING

The Senqu River Bridge project has presented a unique combination of challenges – the most demanding of which were the adverse weather, remote location and unpredictable river levels – but the engineers and construction professionals, with their never-say-die attitude and their inherent desire to succeed, have constructed a landmark structure that will benefit the local communities for generations to come. □

#### KEY PROJECT STATISTICS

Concrete	1 860 m <sup>3</sup>
Rebar	325 ton
Structural steel	250 ton
Piles: 900 mm	144 m
Piles: 1 100 mm	98 m



Side elevation of the bridge showing deck and parapet construction under way



The construction of the 250 mm in-situ concrete deck in progress

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