LOADTEST
O-Cell® Technology, Bridges over the Zambezi River, Mozambique

Project:	**Tete Bridge**
Location:	Tete, Mozambique
Client:	Mota Engil
Foundation Contractor:	Trevi Spa.

Map showing planned route of new bridge over the Zambezi river

Installation of pile cage with O-cell assembly

O-Cell Pile test in progress

Lateral test in progress

The partly built bridge over the Zambezi, to be completed in Sept 2014

Project Overview

Tete is the capital city of Tete Province in Mozambique. It is located on the Zambezi River and is the site of only one of three bridges across the river in the entire country. A Swahili trade centre before the Portuguese colonial era, Tete continues to dominate the west-central part of the country and region and is the largest city on the Zambezi.

As part of this project, three preliminary pile load tests were required; two on one side of the river and the third on the opposite bank. One of the piles was also to be tested laterally. Minimizing disruption and impact on the environment was of the utmost importance for the whole project. Traditional top-down static load testing for the 20 MN tests with either the construction of anchor piles and reaction beams or erection of kentledge would have been extremely difficult. Loadtest provided an alternative solution in the form of bi-directional testing using O-cell technology.

Load testing program

In ground conditions where the end bearing may be comparable or greater than the friction, the O-cell may be located at or near the bottom of the pile and the test will then measure end bearing and skin friction directly and independently. Three single-level O-cell tests were performed on 1200 mm piles installed by Trevi Spa. The piles were constructed using bentonite slurry to depths of 56.5, 50.2 and 25.2 metres. Sister bar vibrating wire strain gauges were placed at levels along the pile allowing the load distribution of skin friction to be determined along the pile shaft.

The purpose of the lateral test was to confirm the suitability of the parameters estimated from the site investigation and to validate the design assumptions. In addition to lateral pile head movement, an inclinometer string comprising several gauges were installed inside the pipework fitted during pile construction. These were monitored to provide inclination measurements along the pile shaft as the load was applied. These measurements were then used in the calculation of bending moment and to determine the lateral deflection profile along the pile shaft.

Summary

By placing the O-cell at a strategic elevation in the shaft, Loadtest was able to assess the governing geotechnical parameters, as well as isolate end bearing and total skin friction load-displacement characteristics so that the foundation design could be optimised. These tests provided evidence of the technical and economic benefits of O-cell technology, especially in remote locations, and the advantage the method can have by minimizing disruption to the environment.