
# FUGRO
# O-CELL TECHNOLOGY AT DANUBE BRIDGE, HUNGARY

**Overcoming challenging conditions, Fugro successfully tested two piles for a new bridge over the Danube River in Hungary using its proprietary Osterberg Cell (O-cell®) bi-directional testing.**

**Client: HBM kft (Soletanche Bachy)**
**Period: 2017**
**Location: Hungary**
**Consultant: Geoterra**

The 600-metre cable-stayed structure will replace an obsolete lifting bridge and will improve connectivity between the towns of Komárom in Hungary and Komarno in Slovakia. Due for completion in 2019, it is being built for Hungary's National Infrastructure Development Company.

## Project summary

Fugro worked closely with the Hungary-based consultant, Geoterra, to undertake tests for the client, HBM kft (Soletanche Bachy), during December 2017 and January 2018.
In order to verify and optimise the foundation design, two preliminary test piles were required. Since the piles were located near the centre of the Danube, the use of conventional reaction systems or dead weight Kentledge loading systems to perform the testing was considered impractical. Fugro's O-cell method of loading was chosen as the ideal static loading test, using the pile itself to provide the reaction for the test within the pile shaft.

The O-cell is a hydraulically driven, calibrated, sacrificial jacking device installed within the foundation unit that derives all reaction from within the soil and/or rock system itself. Working in two directions, upward against skin friction and downward against end-bearing and skin friction, the O-cell automatically separates the

*The 600m bridge will improve road connectivity between Hungary and Slovakia (photo: Pont-Terv engineering consultants).*

resistance data. By virtue of its installation within the foundation member, the O-cell load test is not restricted by the limits of overhead structural beams and tie-down/ anchor piles.

**Bored test piles**

HBM constructed two 19.2 to 20.0 metres long (measured from the river bed) bored test piles with a 1500 mm diameter supported by bentonite slurry. Each contained a single 540 mm diameter O-cell which enabled a potential test loading of up to 20 MN to be applied.

The piles were installed from a jack-up barge with a permanent casing of 13.0 metres placed into the strata below the river bed to above high-water level.

Strain gauges were placed along the 28.5-metre-long piles to assess load distribution. The challenges of pile construction mid-river required measures including concrete delivery by barge and use of a mix that gave workability for five hours.

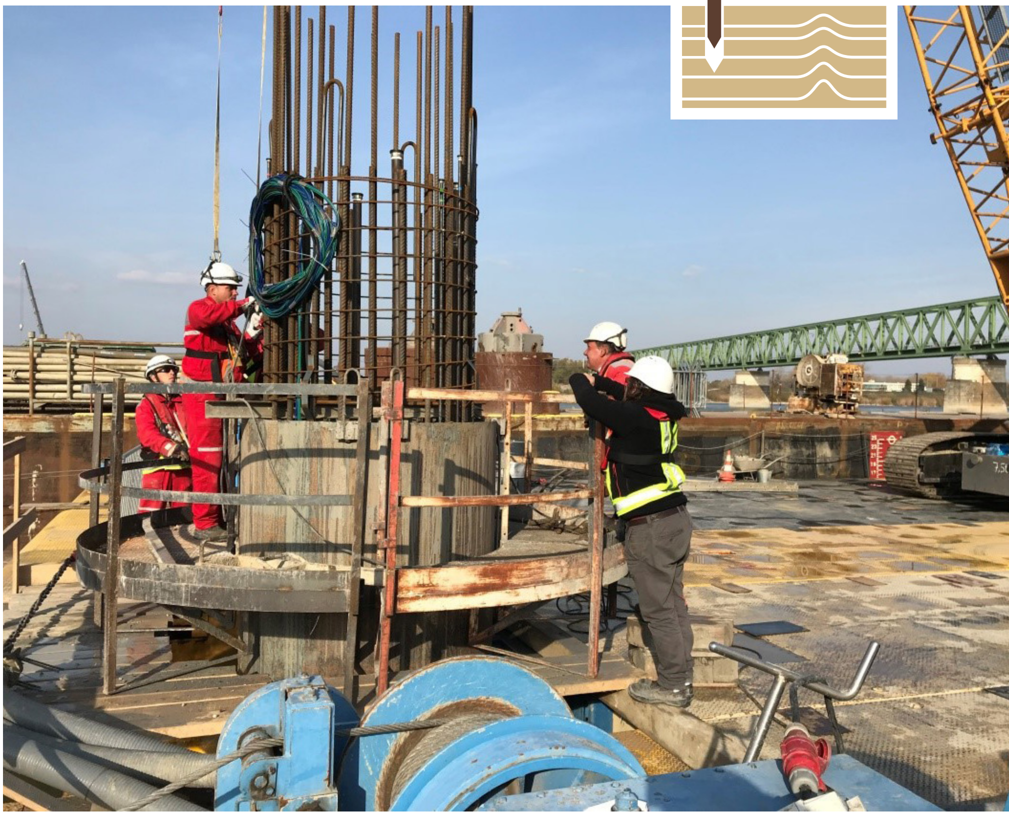
Results were analysed using the Cemsolve® pile settlement analysis programme to determine the ultimate skin friction capacities and end bearing characteristics, with the pile head load/ movement prediction achieved by combining the results in Cemset®.

**Conclusions**

What was at first considered an extremely challenging task of performing a static load test over water - with loading up to 20 MN - was made significantly easier by Fugro's expert application of O-cell bi-directional testing. This method gave the bridge design team confidence in design values and the knowledge that the piles met their specified settlement criteria.

Following the success of O-cell for these foundation pile tests, Fugro specialists have gone on to complete three similar tests at the Komárom end of the bridge.

The O-cell method is suitable for testing any size and capacity of drilled shaft or pile at land or marine sites. Typical test loads exceed 50MN, with more than 200MN achieved on a number of bridge projects.



Installation of one of the test piles.

Concrete was delivered to the mid-river site by barge.

Pile under test.

Pile after installation.

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