

FUGRO Elbtower Project, Germany

Fugro LOADTEST have performed Osterberg-cell® tests on the deepest piles in Hamburg.

Client: BAUER Spezialtiefbau GmbH
 Period: July 2019
 Location: Hamburg, Germany
 Piling Contractor: BAUER Spezialtiefbau GmbH



PROJECT SUMMARY

Fugro has successfully completed a comprehensive full scale load-testing programme on Germany's longest bored piles as part of the foundation design verification for the planned Elbtower construction in Hamburg, Germany. On completion, the 244 m high Elbtower will be the third tallest skyscraper in Germany and forms part of a 157 hectare megaproject to redevelop the former harbour and industrial areas in the Hafen City district of Hamburg.



Full scale static load testing using Osterberg-cells was planned as the method is specifically appropriate for the test loads required and on piles of this size and bearing capacity. The results allow confirmation and potentially optimisation of their foundation design without the need for costly and time-consuming installation of the reaction piles used in conventional load testing.



Several instrumentation systems were fitted on the deepest ever bored piles in Germany, which had concreted lengths of over 110 m. The instrumentation included an O-cell® loading assembly capable of 64 MN; fibre optics and vibrating wire strain gauges distributed along the length of the piles to assess the mobilised

CASE STUDY



Reaction. The piles were also fitted with the longest ever Thermal Integrity Profiling strings to verify the structural integrity of the constructed piles.

Located on relatively soft ground near the Elbe river, the Elbtower will rest on long piles to transfer the load to a deep load-bearing soil. Deep foundation contractor BAUER Spezialtiefbau GmbH constructed four bored test piles up to 111.4 m long and of 1850 mm diameter.

Utilizing the SONICaliper® a full 360-degree profile was provided, allowing the bore diameter to be assessed together with the verticality and total volume.

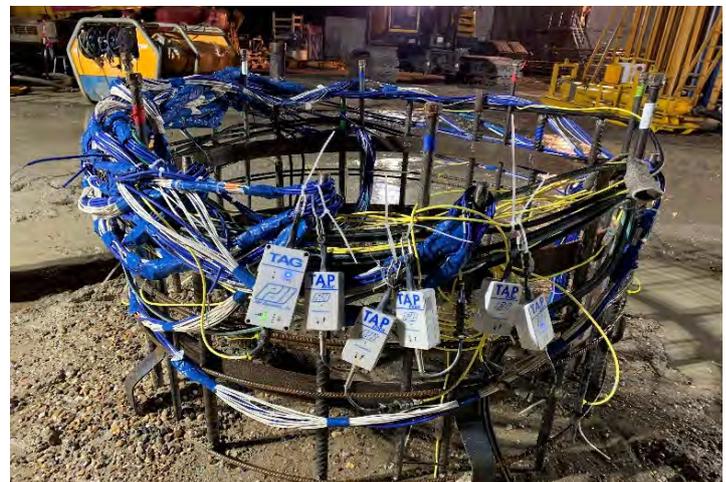
Fugro provided unique load-testing and measurement technology for the pile-testing programme.



Pile reinforcement installation with O-cell® assembly

TEST RESULTS

The test revealed both the upwards behaviour of the skin friction above the O-cell® assembly, and the downward skin friction and end bearing characteristics under loading. To assess the behaviour of the piles there was sufficient movement to allow Cemsolve® load movement analysis to be used to determine the ultimate end bearing load and stiffness which, together with Cemset® allowed a pile head load / settlement prediction to be made.



Thermal Integrity Profiling loggers

CONCLUSIONS

The O-cell® tests were able to safely mobilise the end bearing and also the skin friction, revealing the geotechnical behaviour of the pile. These results were critical for the tower foundation designers.

The bi-directional load-testing results and comprehensive pile instrumentation provided by Fugro will help the design firm to understand the ground's deformation behaviour and the piles' bearing capacities to design a safe and cost-effective foundation design for the Elbtower.



Fugro Loadtest: Static Load test in progress