Case study

# Bi-directional O-cell® testing for safely mobilising high test loads in deep piles

**Project**
Light House Tower

**Contractor:**
Per Aarsleff A/S

**Piling Company:**
Per Aarsleff A/S

**Location**
Aarhus, Denmark

**Period**
2018

**Services**
O-Cell® load tests
Thermal Integrity Test
Sonicaliper®

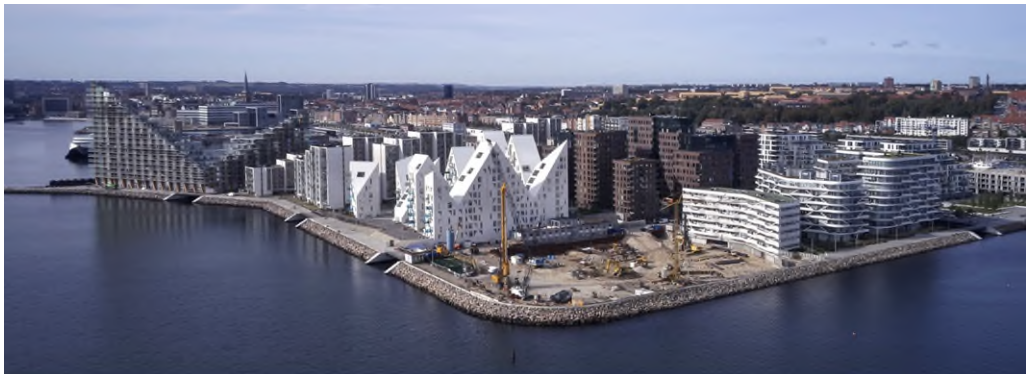
**Long term assessment also made of potential consolidation with a constant load held for 30 days**

The Light-house Tower located in Aarhus will be Denmark's tallest residential tower with a height of 143 m. In order to verify and improve the design of the foundations of the project, two preliminary test piles were required.

## Challenge

Due to the limited information on load bearing capacity of the founding strata, the acquisition of high-quality data was crucial to solve the puzzle faced by the designers and contractors. The contractors required two pile tests and for the test load to also be held for a period of 30 days to observe the influence of consolidation of the land fill on the long term behaviour of the foundations.

To verify the goemetry of the test pile bores, a full 3D Sonicaliper assessment was performed and a comprehensive thermal integrity profile generated as the concrete cured.



Light House tower construction site

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## Solution

The preliminary test piles were 1860 mm and 2000 mm diameter and 70 m long. Top of concrete was left at the design cut-off level of 7.4 m below platform level thus negating the requirement of testing overburden and removing the values from the results or the use of a complicated double sleeve system to minimise the friction in this zone.

The loading arrangement comprised two 690 mm O-cells placed at the same elevation in each test pile,capable of providing a total gross test load of 70 MN at rated pressures.

Strain gauges were placed at 8 levels along the shaft of the pile to assess load distribution and mobilised skin friction values during the test. Both Sonicaliper profiling and Thermal Integrity Profiling (TIP) were carried out as part of the QA test requirements.

To evaluate any long term consolidation, prior to the full scale loading test, the pile was loaded to 8 MN and maintained constant for 30 days while all aspects of the instrumentation were monitored continuously and controlled remotely with minimal personnel attendance.

Reinforcement with O-cell during installation

## Conclusion

The O-cell® tests were able to safely mobilise the high load required on a small site without the need for a traditional top down loading reaction system.

The geotechnical parameters obtained from the tests were crucial for the designers, allowing a better understanding and optimization of the foundation design and the long term potential settlement.

The Osterberg methodology allowed the application of a constant load and continuous acquisition of data during one month providing detailed analysis of the potential long term consolidation effects on the design.

O-cell® test in progress. The steel beam is for reference only