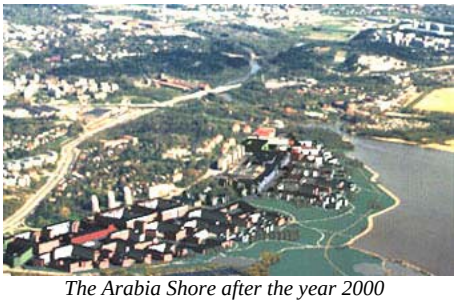
O-cell® Technology in Helsinki, Finland

A unique problem required a unique testing solution.

Summary:
Development along the coastline North of Helsinki centre will provide much needed accommodation and living facilities in the area.



The Arabia Shore after the year 2000
©Photograph: Helsinki City.

Reclamation of this land was started after WWII using a variety of fill material over unstable glacial deposits. The area suffers continuous settlement. Mix in place ground treatment has been used in some areas and a variety of driven pile types and sizes installed.

Pile design has been carried out relying on end bearing, but with the such significant consolidation, ensuring long term suitability of the base capacity was the ambition of the static load testing program.

Loadtest & Skanska Tekra OY came up with a solution using bi-directional testing. The pile could be tested after installation and then re-tested at intervals of 6 months and 1 year to determine the change in the ground conditions with time, without interrupting progress on site.

Project:
Pile testing was required on two of the driven steel tube piles on one of the sites in this development. Dynamic load testing (DLT) a common test method used on driven piles in Scandinavia, would not give the required solution to the problem of loading over time, nor the full load-settlement behaviour of the pile base.

The expected base capacity was greater than 4MN, but with less than 2 MN of skin friction available, anchor piles for a top-down static load test was ruled out. Kentledge would be impractical to use over an extended time period and with huge ground settlements predicted would be unstable in the short term.

Conveniently, by integrating the pile into the structure prior to testing, additional reaction could be obtained to mobilise the end bearing required.

O-cell® test assembly welded to steel hanging cage prior to installation into the driven steel tube.

Bi-directional load test arrangement:
Two 530mm driven steel piles were selected as the test piles. These were driven to set with a loose driving shoe that would allow the 330mm O-cell® to load the soil directly below the base.

The O-cell arrangement was lowered onto the tube base using a steel cage as a hanging framework. The tube was then concreted to provide O-cell assembly connection to the tube.

Instrumentation cables, steelwork and telltale tubing were then protected whilst the foundation slab was constructed with the piles incorporated into the structure.

The test piles were incorporated into a piled slab as part of a road foundation allowing easy access for the re-testing of the piles after the final road construction.

Pile Test:

The testing was to coincide with a seminar on ground improvement techniques. The seminar marquis was to cover the whole test area and provide seating and facilities for the seminar.

As the seminar progressed, one of the piles was tested ‘live’ and the delegates were kept informed of the test results with real time updates.

O-cell® test in progress in the foreground while presentations were made.

Since all reactions for bi-directional testing are applied at cell level and are safely locked within the pile there was no question of any safety issue. The test beam provided a stable reference for gauges and is not part of the loading system.

Conclusions:
Bi-directional testing provided a solution to a testing problem even where the reaction was insufficient. Due to the small testing footprint, testing could take place after the structure was completed without disruption to construction program.

Client:
Helsinki City
Foundation Contractors:
Skanska Tekra OY

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