

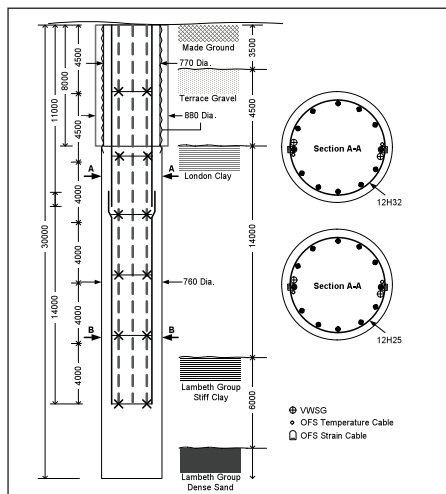


Assessing pile performance and design

The challenge

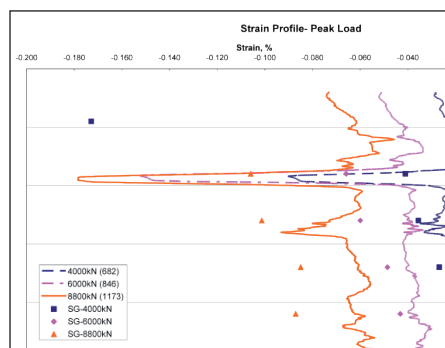
The engineering consultancy Wentworth House Partnership wanted to perform Static Pile Load Testing on a bored pile at a construction site in London. They asked CSIC to install fibre optic strain sensors to:

- generate a continuous strain profile and capture the behaviour of the pile during load testing, in terms of end bearing and skin friction from the surrounding soil layers
- provide information about the load transfer through the top eight metres of the pile which were surrounded by an isolating layer to take account of the future construction of a new basement



The approach

CSIC installed two fibre optic cables on the test pile, one for measuring strain and the other temperature. The two cables were installed side-by-side to enable the removal of any unrelated temperature effects. A loop of protected fibre optic cable was attached to the bottom of the reinforcement cage to provide a 'zero strain' reference point. Sensing cable was then fastened along the entire height of the cage, pre-stressed to 1000µ. Conventional 'sister bar' strain gauges were installed for comparison. The strain results obtained from the fibre optic sensors were consistently lower than those recorded by the sister bars which – when converted to load – consistently reported loads much higher than those applied at the top of the pile, raising doubts about their validity.



The benefits

Distributed fibre optic strain sensing:

- creates a full strain profile that provides valuable insights into pile behaviour not revealed by conventional instrumentation systems
- offers a simple and cost effective tool for detecting complex interaction scenarios, abnormalities and compromised quality
- increases the degree of confidence in the pile design – supporting more efficient, less costly designs

