

Generating continuous strain data during O-cell loading of deep piles

The challenge

Contractors working on the site for the new Francis Crick Institute near St Pancras, London required comprehensive strain profiles for a large diameter, 40m long test pile. An Osterberg Cell (O-cell) was being used for the load test, an approach that applies load to the bottom of a pile to provide a clearer picture of the mobilised shaft and base resistance. The contractors decided that:

- conventional, single-point strain gauges (VWSGs) were unlikely to produce enough data to accurately assess pile performance
- fibre optic technology should therefore be used in order to create a continuous data profile

The approach

CSIC installed fibre optic strain and temperature sensing cables on both sides of the reinforcement cage to the top of the O-cell. Conventional strain gauges were also fitted at five different levels for comparison. Loading of the pile was carried out in stages, with a peak load at 8330kN, before the pile experienced excessive settlement. The load recorded by one of the VWSGs was significantly higher than the applied load and was initially ignored as unrepresentative. Cross comparison with the continuous strain profile provided by the fibre optic system, however, confirmed the result to be valid and was later discovered to be related to changes in the soil layers.

The benefits

The continuous strain sensing profile generated by the fibre optic system:

- provided a high degree of confidence in the test data
- revealed the validity of apparently anomalous results produced by conventional strain gauges which might otherwise have been ignored
- reduced the apparent requirement for a highly conservative pile design, saving time and money



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