

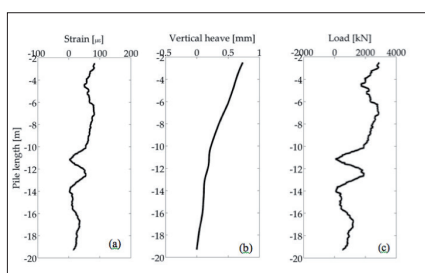


Assessing pile foundations for reuse

The challenge

Reuse of a building's foundations following demolition offers huge commercial and environmental benefits – provided that their performance is not compromised. CSIC used fibre optic strain sensors at the site of an eight-storey, 1980s office block in Bevis Marks, London to:

- monitor the effect of demolition on the building's pile foundations and surrounding soil
- make a comprehensive assessment of their suitability for reuse



The approach

The fibre optic technology used for this project was Brillouin Optical Time Domain Reflectometry (BOTDR) – capable of sampling 1m averaged strain, every 5 cm with an accuracy of $50 \mu\epsilon$. Fibre optic cables were attached to a flexible pile that was then embedded into a hollow core, drilled through the entire length of the pile, prior to demolition. The instrumented core was grouted to ensure full fixity between the instrumented pipe and the existing pile. The fibre optic instrumentation generated a continuous strain profile, along the entire length of the pile, at different stages of demolition. Fibre optic cables were also installed in an adjacent borehole to capture ground heave during demolition. Together, these outputs provided vital information about the performance of the existing pile and hence its suitability for reuse.

The benefits

BOTDR offered significant advantages compared with conventional strain gauges:

- continuous and full-length strain profile data during the demolition stages
- information about the behaviour of an existing pile and the shaft friction from the surrounding soil along the entire length of the pile during unloading (demolition) and reloading (construction) stages
- the results at this site provided vital information about the strains that developed on an existing pile during demolition and eventually enabled all the existing piles to be reused, leading to huge reductions in terms of costs and materials