

Cantilever Shoring Piles with Prestressing Strands: An Experimental Approach

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Abstract : Underground space is becoming a necessity nowadays, especially in highly congested urban areas. Retaining underground excavations using shoring systems is essential in order to protect adjoining structures from potential damage or collapse. Reinforced Concrete Piles (RCP) supported by multiple rows of tie-back anchors are commonly used type of shoring systems in deep excavations. However, executing anchors can sometimes be challenging because they might illegally trespass neighboring properties or get obstructed by infrastructure and other underground facilities. A technique is proposed in this paper, and it involves the addition of eccentric high-strength steel strands to the RCP section through ducts without providing the pile with lateral supports. The strands are then vertically stressed externally on the pile cap using a hydraulic jack, creating a compressive strengthening force in the concrete section. An experimental study about the behavior of the shoring wall by pre-stressed piles is presented during the execution of an open excavation in an urban area (Beirut city) followed by numerical analysis using finite element software. Based on the experimental results, this technique is proven to be cost-effective and provides flexible and sustainable construction of shoring works.

Keywords : deep excavation, prestressing, pre-stressed piles, shoring system

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