

## The Behaviour of Laterally Loaded Piles Installed in the Sand with Enlarged Bases

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**Abstract :** Base enlargement in piles was invented to enhance pile resistance in downward loading, but the contribution of an enlarged base to the lateral load resistance of a pile has not been fully exploited or understood. This paper presents a laboratory investigation of the lateral capacity and deformation response of small-scale steel piles with enlarged bases installed in dry sand. Static loading tests were performed on 24 model piles having different base-to-shaft diameter ratios. The piles were installed in a box filled with dry sand, and lateral loads were applied to the pile tops using a pulley system. The test piles had shaft diameters of 20 mm, 16 mm, and 10 mm; base diameters of 900 mm, 700 mm, and 500 mm. As a control, a pile without base enlargement was tested to allow comparisons with the enlarged base piles. Incremental maintained loads were applied until pile failure approached while recording pile head deflections with high-precision dial gauges. The results showed that the lateral capacity increased with an increase in base diameter, albeit by different percentages depending on the shaft diameters and embedment length in the sand. There was always an increase in lateral capacity with increasing embedment length. Also, it was observed that an enlarged pile base had deflected less at a given load when compared to the control pile. Therefore, the research demonstrated the benefits of lateral capacity and stability of enlarging a pile base.

**Keywords :** pile foundations, enlarged base, lateral loading

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