EFFECT OF PILE-END ON UPLIFT CAPACITY OF PIPE PILES IN SAND

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ABSTRACT

Shaft resistance is a major design parameter for friction piles supporting compressive loads and for piles and ground anchors supporting tension loads.Transmission towers, harbor structures, and offshore platforms are examples where piles are used. Steel pipe piles are widely used in offshore projects and in harbor structures.They are also used as cylindrical anchors. Pipe piles can be placed with open or closed end and there is a concern regarding the effect of this end condition on the shaft capacity of such piles. An experimental program using large-scale model pipe piles in sand was conducted to investigate the effect of pile end on its shaft resistance behavior under uplift loads. The piles had an embedded length of about 2 m and were installed by three different methods (driving, jacking, and a reference undisturbed method with negligible lateral displacement) into a sand deposit in a large test pit (3x3x3 m in size). The sand bed was prepared by first fluidizing the sand with an upward flow of water and then letting it settle into a loose deposit.The piles were installed in the sand bed either at this loose state or after densifying the sand bed to a dense state by vibration. The results show that the initial sand density is the single most significant factor affecting uplift capacity. The effect of pile end (open or closed) depends on the initial sand density. It appears to be more important in dense sand. For driven piles, it is not a factor. Pile head displacement at failure varied from 5 to 10 mm. Plug length and its development in open-ended piles is affected by the method of installation. Jacked piles are plugged faster than driven ones. Initial sand density did not affect plug length in general.