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Comparison of the Behavior for Free Standing Pile Group and Piles of Piled Raft

Abstract- The intended task of this paper is studying the behavior of free standing pile groups and piles of piled raft driven in clayey soil under axial loading. The raft-piles interaction is investigated as well through the two series of tests. Each one of these series includes twelve tests, the two series are conducted with the same configuration, spacing, size of piles and undrained shear strength of soil except that in the free standing group there is a gap of about (20-25 mm) between the raft and the soil surface to have the applied load transferred to the piles only in order to compare the behavior of piles in the two cases. Three grades of undrained shear strength (c_u) of clayey soil are selected which are (20 or 40 or 60 kPa) and the configuration of the pile groups used in all tests is (2 x 2). Two different pile lengths (L) are selected (300 and 450 mm). These lengths represent the slenderness ratio (L/D) of (10) and (15) respectively, so that the center-to-center spacing between the piles (S) used are (3D) and (5D). It is observed that piles exhibited a very high stiffness at initial loading stages till the settlement is about 0.5mm, beyond this level, even for a small increment in the load, the pile settled rapidly, which means that once the friction is overcome the piles failed instantaneously. In addition, most of the load capacity of piles is mobilized at settlement of around (1 – 2 mm), corresponding to (5 %) of pile diameter. Moreover, the increasing the undrained shear strength of clay from (20 to 60 kPa) has no significant effect on the load transfer mechanism of piles in the two cases. It can be concluded that the load capacity of the free standing pile group is about equal to the piles in piled raft case, indicating that the interaction effect is not significant, therefore, it is suggested to apply an efficiency factor (α_G) of (1) in designing the piled - raft foundation in clayey soil when calculating for pile load share.

Keywords- model test, free-standing piles, end bearing, skin friction, clay.

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