

Influence of P-Y Curves on Buckling Capacity of Pile Foundation

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Abstract : Pile foundations are one of the most preferred deep foundation system for high rise or heavily loaded structures. In many instances, the failure of the pile founded structures in liquefiable soils had been observed even in many recent earthquakes. Recent centrifuge and shake table experiments on two layered soil system have credibly shown that failure of pile foundation can occur because of buckling, as the pile behaves as an unsupported slender structural element once the surrounding soil liquefies. However the buckling capacity depends on largely on the depth of soil liquefied and its residual strength. Hence it is essential to check the pile against the possible buckling failure. Beam on non-linear Winkler Foundation is one of the efficient method to model the pile-soil behavior in liquefiable soil. The pile-soil interaction is modelled through p-y springs, different author have proposed different types of p-y curves for the liquefiable soil. In the present paper the influence two such p-y curves on the buckling capacity of pile foundation is studied considering initial geometric and non-linear behavior of pile foundation. The proposed method is validated against experimental results. Significant difference in the buckling capacity is observed for the two p-y curves used in the analysis. A parametric study is conducted to understand the influence of pile diameter, pile flexural rigidity, different initial geometric imperfections, and different soil relative densities on buckling capacity of pile foundation.

Keywords : Pile foundation , Liquefaction, Buckling load, non-linear py curve, Opensees

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