7th National Congress on Civil Engineering, 7-8 May 2013
University of Sistan and Baluchestan, Zahedan, Iran

Numerical Modeling of End Bearing Capacity of Drilled Shafts in Sand:Case Study

Ali Hasanzadeh[1], Issa Shooshpasha[2]

1- M.Sc. student of geotechnical engineering, Babol Noshirvani University of Technology
2- Assistant Professor, Babol Noshirvani University of Technology

a_hasanzade64@yahoo.com

Abstract

The prediction of the axial capacity of piles has been a challenge since the beginning of the geotechnical engineering profession.The geotechnical axial capacity of a single pile can be estimated by summing the shear stresses along the shaft, adding the bearing capacity of the pile toe. In this paper, a modeling procedure is carried out to numerically analyze the end bearing capacity of drilled shafts in sand.Then, the numerical results are compared with the available pile load test. It is seen that numerical results are in good agreement with the results of pile load test. The variation of the end bearing capacity of drilled shafts versus embedment depth is also studied. Numerical results show that with increase in pile embedment depth, the end bearing capacity increases. However, the rate of increase becomes smaller as the pile embedment depth increases.

Keywords: Drilled shaft, Numerical modeling, Finite Element Method, End bearing capacity, Sand

1. INTRODUCTION

In geotechnical engineering practice, deep foundation are generally used in situations where spread or mat footings are not the best choice. There are different types of deep foundations. Drilled shafts are a common type of deep foundations that have gained wide acceptance in recent years. This is due to the many of their advantages over other types of deep foundations. The construction of drilled shafts generates less noise and vibration. In many cases, a single drilled shaft can replace a cluster of piles eliminating the need (and cost) for a pile cap. The bearing capacity of drilled shafts is identified as being the area of greatest uncertainty in foundation design. The capacity of drilled shafts is developed from a combination of side shear and end bearing. The side shear is related to the shear strength of the soil and the end bearing is analogous to shallow foundation bearing capacity with a very large depth of footing. However, it too is affected by construction induced disturbances.

The end bearing capacity of drilled shafts can have an important role in their design and geometrical dimensions. In some projects, drilled shafts are designed primarily based on the magnitude of the end bearing capacity. The estimation of end bearing capacity of drilled shafts in cohesionless soils are often estimated using empirical, semi-empirical and theoretical methods. For example, end bearing capacity is estimated by using standard penetration test (SPT) results obtained at the site where drilled shafts will be constructed [1].
However, in this paper, a modeling procedure is performed to numerically predict the end bearing capacity of drilled shafts in sand. The numerical prediction of end bearing capacity of drilled shafts obtained in this study is compared with the results of a pile load test. The influence of pile embedment depth on the bearing capacity and the failure zone around the pile tip are also discussed. The computer program, Plaxis, is used for all of the numerical analyses performed in this study.

2. VALIDATION

Numerical modeling was accomplished by the Plaxis V8 program. Plaxis is a 2D finite element code and is available commercially to conduct analysis of deformation and stability for a variety of geotechnical problems. The program can be used in plane strain as well as in axissymetric modeling. Plaxis consists of four main parts: input, calculation, output, and curves. In this study, Plaxis is used for determination of the end bearing capacity of drilled shafts in sand.