

Bearing Capacity of Footings Near Slopes

Ali Ramazan Burujerdi ^{1✉}, Morteza Jiryaei Sharahi^{1, 2}

¹ M.Sc. Geotechnical Engineering, Department of Civil Engineering, Qom University of Technology, Qom, Iran.

² Assistant Professor, Department of Civil Engineering, Qom University of Technology, Qom, Iran.

✉ Corresponding author's Email: RamazanBorujerdi.a@qut.ac.ir

ABSTRACT:

Sloping ground near the footings have an adverse effect on their performance. Slope increases the settlements of the footings and while it reduces their bearing capacity. In the present paper, a footing with rough base has been considered for the analysis. The bearing capacity factors have been determined with the consideration of resistance of soil above the foundation level. A simple limit equilibrium method has been used to evaluate bearing capacity. The parameters considered for the analysis include the distance between edge of slope and center of footing, slope angle and foundation depth. It is observed from the analysis that bearing capacity reduces as distance between footing and the edge of the slope decreases. Increase in slope angle cause the reduction in the bearing capacity.

Key words: Bearing capacity, Footings, Limit equilibrium method, Slopes.

ORIGINAL ARTICLE
Received 11 Jul. 2018
Accepted 09 Nov. 2018

1- Introduction

A foundation is a part of the structure which transmits the load of the structure and substructure onto the underlying soil. Foundations are commonly divided into two categories; shallow and deep foundations. Shallow foundations are most commonly used foundation which are having depth to width ratio less than one. In general, shallow foundations are more economical to construct compared to deep foundations and generally used when underlying strata having sufficient bearing capacity and structure having low weight [1]. Analysis and design of a shallow foundation is simple compared to deep foundation design. Failure of a shallow foundation may occur in two ways; first by shear failure of the soil supporting the foundation, and second by excessive settlement of foundation [2]. Shallow foundation passes some disadvantages like excessive settlements, limited capacity, and design problems in irregular and sloping ground. Moreover it cannot perform well under pull-out, torsion and moment loading. Quite often, structures are built near the slopes or on the slopes due to either land limitation or due to any other specific reason, such as construction of bridges, for architectural purposes. Ultimate bearing capacity of the foundations is significantly affected by the presence of the slope [3]. The bearing capacity of the foundation is a primary concern in the field of foundation engineering and accurate determination of bearing capacity on slopping ground is a challenging task for an engineer [4]. The geotechnical design of foundations near the crest or on the slope of a slope includes the consideration of various factors such as slope angle, depth ratio, angle of internal friction and crest distance between foundation and slope edge. There are different methods available for estimation of bearing capacity of foundation on slopes. Bearing capacity analysis of foundations can be made by using four approaches; slip-line methods, limit equilibrium methods, limits analysis methods and numerical methods. [4-19] have determined the bearing capacity of foundation on slopping ground using various methods. Limit equilibrium analysis are very popular in foundation engineering to determine the bearing capacity. Limit equilibrium method has been used in present study.