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studies on the load carrying capacity of shallow foundation resting over geogrid-reinforced sand under eccentric load

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Abstract

Several works have been done relating to the estimate of the ultimate bearing capacities of shallow foundations, supported by geogrid reinforced sand. Few experimental studies have been made on the evaluation of bearing capacity of shallow foundations on geogrid-reinforced sand under eccentric load.The purpose of this paper is to conduct few model tests in the laboratory by using square surface foundation over the reinforced sand bed.are observed which are plotted to get load-settlement curves for each set up. The load-settlement curve for each test is plotted to determine the ultimate bearing capacity. Parametric studies have been made to evaluate the influence of load eccentricity on bearing capacity of the foundation.The ultimate bearing capacity of eccentrically loaded square footings can be computed by knowing the ultimate bearing capacity of square footing under central load and a reduction factor(R_{kR}) for reinforced condition. The reduction factor is developed based on the results of laboratory model tests on geogrid reinforced soil.

Keywords: shallow foundations , geogrid , reinforced , eccentrically load, square footing .

1. INTRODUCTION

This Foundation is an integral part of a structure whether it may be a building, bridge and dam etc. The function of the foundation is to receive the load from the superstructure and transmit it to the underlying soil or rock.

Soil is used as a construction material for various civil engineering structures. Structure on a ground with adequate bearing capacity is one of the basic requirements for the stability of a structure. Most of the studies for bearing capacity calculation are based on the foundation under vertical and central load. However in some cases due to bending moments and horizontal thrusts transferred from the superstructure, structures like retaining walls, abutments, waterfront structures, industrial machines and portal framed buildings are often subjected to eccentric load. This may be due to (a) moments with or without axial forces (b) the oblique loading and (c) their location near the property line etc [1]. When the load is transferred at the base of the footing, movement of the soil particles in the horizontal and vertical direction occurs. For the footings under eccentric loading, the two edges settle by different amounts, causing the footing tilt. The amount of tilt and the pressure at the base depend upon the value of eccentricity width ratio (e/B) [2]. since the soil is poor in tension, such situation cannot develop; hence, the footing loses contact with the soil and tilting of the footing occurs. Due to eccentric loading, the footing tilts and the pressure below the footing does not remain uniform [3]. The tilt of footing increases with an increase in the eccentricity and the bearing capacity reduces. Many times reinforcing materials like geogrid, geotextile, geonet etc. are inserted into the granular materials to improve the bearing capacity of poor sub-soil [4].

Over the last two decades the use of geogrids for soil reinforcement has increased greatly because geogrids are dimensionally stable and combine feature such as high tensile modulus
(low strain at high load), open geogrid structure, positive shear connection characteristics, light weight, and long service life [5].