Geophysical Research Abstracts
Vol. 16, EGU2014-888, 2014
EGU General Assembly 2014

EVALUATION OF STRIP FOOTING BEARING CAPACITY BUILT ON THE ANTHROPOGENIC EMBANKMENT BY RANDOM FINITE ELEMENT METHOD

Joanna Pieczynska-Kozlowska
Wroclaw University of Technology, Institute of Geotechnics and Hydrotechnics, Wroclaw, Poland
(joanna.pieczynska-kozlowska@pwr.wroc.pl)

One of a geotechnical problem in the area of Wroclaw is an anthropogenic embankment layer delaying to the depth of 4-5m, arising as a result of historical incidents. In such a case an assumption of bearing capacity of strip footing might be difficult. The standard solution is to use a deep foundation or foundation soil replacement. However both methods generate significant costs. In the present paper the authors focused their attention on the influence of anthropogenic embankment variability on bearing capacity. Soil parameters were defined on the basis of CPT test and modeled as 2D anisotropic random fields and the assumption of bearing capacity were made according deterministic finite element methods. Many repeated of the different realizations of random fields lead to stable expected value of bearing capacity. The algorithm used to estimate the bearing capacity of strip footing was the random finite element method (e.g. [1]).

In traditional approach of bearing capacity the formula proposed by [2] is taken into account.

$$q_f = c' N_c + qN_q + \ 0.5\gamma\overline{B}N_\gamma \tag{1}$$

where: q_f is the ultimate bearing stress, $c$is the cohesion, $q$is the overburden load due to foundation embedment, γ is the soil unit weight, $B$is the footing width, and N_c, N_q and N_γ are the bearing capacity factors. The method of evaluation the bearing capacity of strip footing based on finite element method incorporate five parameters: Young's modulus (E), Poisson's ratio (ν), dilation angle (ψ), cohesion (c), and friction angle (ϕ). In the present study *E*, ν and ψ are held constant while c and ϕ are randomized. Although the Young's modulus does not affect the bearing capacity it governs the initial elastic response of the soil. Plastic stress redistribution is accomplished using a viscoplastic algorithm merge with an elastic perfectly plastic (Mohr - Coulomb) failure criterion.

In this paper a typical finite element mesh was assumed with 8-node elements consist in 50 columns and 20 rows. Footings width B occupies 10 elements, 0.1 x 0.1 meter size. The footings are placed at the center of the mesh. Figure 1 shows the mesh used in probabilistic bearing capacity analysis.

Figure 1- Mesh used in analyses

REFERENCES

1. Fenton, G.A., Griffiths, D.V., (2008) Risk Assessment in Geotechnical Engineering, John Wiley & Sons, New York,
2. Terzaghi, K. (1943). Theoretical Soil Mechanics, New York: John Wiley & Sons.