

Three-Dimensional Finite Element Analysis of Geogrid-Reinforced Piled Embankments on Soft Clay

Authors : Mahmoud Y. Shokry, Rami M. El-Sherbiny

Abstract : This paper aims to highlight the role of some parameters that may be of a noticeable impact on numerical analysis/design of embankments. It presents the results of a three-dimensional (3-D) finite element analysis of a monitored earth embankment that was constructed on soft clay formation stabilized by cast in-situ piles using software PLAXIS 3D. A comparison between the predicted and the monitored responses is presented to assess the adequacy of the adopted numerical model. The model was used in the targeted parametric study. Moreover, a comparison was performed between the results of the 3-D analyses and the analytical solutions. This paper concluded that the effect of using mono pile caps led to decrease both the total and differential settlement and increased the efficiency of the piled embankment system. The study of using geogrids revealed that it can contribute in decreasing the settlement and maximizing the part of the embankment load transferred to piles. Moreover, it was found that increasing the stiffness of the geogrids provides higher values of tensile forces and hence has more effective influence on embankment load carried by piles rather than using multi-number of layers with low values of geogrid stiffness. The efficiency of the piled embankments system was also found to be greater when higher embankments are used rather than the low height embankments. The comparison between the numerical 3-D model and the theoretical design methods revealed that many analytical solutions are conservative and non-accurate rather than the 3-D finite element numerical models.

Keywords : efficiency, embankment, geogrids, soft clay

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