

Numerical Analysis of Prefabricated Horizontal Drain Induced Consolidation Using ABAQUS

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Abstract : This paper deals with the numerical analysis of Prefabricated Horizontal Drain (PHD) induced consolidation of clayey deposits, using ABAQUS. PHDs are much like Prefabricated Vertical Drains (PVDs) installed in horizontal layers, used mainly for enhancing the consolidation of clayey fill embankments, and dredged mud deposits. The efficiency of the system depends mainly on the spacing and layout of the drain. Hence, two spacing related parameters are defined, namely WH (width to horizontal spacing ratio) and VH (vertical to horizontal spacing ratio), and the finite element models are developed based on plane strain unit cell conditions under various combinations of these parameters. The analysis results, in terms of degree of consolidation (U), are compared with the established theories. Based on the analysis, a set of equations are proposed to analyse the PHD induced consolidation. The proposed method is found to be reasonably accurate. Further, the effect of PHDs at different spacing ratios, in accelerating consolidation of a clayey embankment fill is analysed in terms of pore pressure dissipation rate, and settlement. The PHD is found to accelerate the rate of pore pressure dissipation by more than 50%, thus reducing the time for final settlement significantly.

Keywords : ABAQUS, consolidation, plane strain, prefabricated horizontal drain

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