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Research

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Studying Performance of PVDs on Consolidation Behavior of soft Clayey Soils Using EFM, Mahshahr Oil Storages

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ABSTRACT

The main problem with saturated fine-grained soils is the slowness of consolidation procedure and the occurrence of large soil settlements. Generally, to expedite consolidation procedure, preloading method would be used along with prefabricated vertical drains. Soil improvement process under this condition would be subjected to design method and vertical drains' modeling. In the current paper and to understand the consolidation behavior of clayey soils improved with vertical drains, a parametric study has been performed by PLAXIS 2D finite element software. The results are indicative of an increase in average consolidation degree from 74 to 84% after a period of 6 months through the reduction of vertical drains' distances from 4.5 to 1.5m. Moreover, it became clear that an increase would be made in the rate of settlement, consolidation, and dissipation of excess pore water pressure through increase made in length and diameter of vertical drains and increase of their discharge capacity. Also, it became specified that increase of diameter is less effective on the expedition of consolidation procedure compared to that of distance reduction among drains.

Keywords: Soil improvement, Prefabricated vertical drain, Radial consolidation, PLAXIS 2D, Preloading

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1. Introduction

Population increase and urban sprawl, creation of new residential, as well as industrial and technological progresses have made an increase in humans' requirement to more optimum use of lands to construct roads, factories, installations, and etc. [1-3]. On the other hand, with consideration of a limited number of high-grade lands around cities and industrial zones, using alluvial lands with a low level of shear strength and high level of compressibility shows an increasing trend [4-6]. Nowadays, there are various methods of soil improvement including vibro-compaction, stone columns, deep soil mixing, deep dynamic compaction, explosive compaction, compaction grouting, sand compaction pile (SCP), micro piles, soil

replacement, soil improvement with lime and cement, electro-osmosis method, high-pressure injection, preloading and etc. The selection of optimum methods from among existing methods depends on various factors such as type of soil, depth of improvement required, costs, availability of facilities, and material required for the implementation of the concerned method, as well as previous experiments [7-10]. From among the above methods, preloading is one of the simple and economical methods to increase resistivity indicators of saturated fine-grained soils. From among the advantages of this method, reference could be made to the simplicity of implementation, measurement, and control of the ground