



Physical Model Test for Soft Soil With or Without Prefabricated Vertical Drain with Loading

Do Huu Dao ^{a*}, Nguyen Thi Phuong Khue ^a, Phan Khac Hai ^b

^a University of Science and Technology, University of Da Nang, Da Nang City, Vietnam.

^b Department of Civil Engineering, National Kaohsiung University of Science and Technology, Kaohsiung City, Taiwan.

Received 14 June 2018; Accepted 19 August 2018

Abstract

The paper builds a physical model of testing in the laboratory with the parametric tempered glass box $0.5 \times 0.5 \times 1.2$ m (length $\times$ width $\times$ depth) containing saturated clay to study the settlement and consolidation when loading increased gradually over time. The research covers herein to present the monitoring of settlement and pore water pressure, settlement calculation, numerical simulation using PLAXIS software V8.2 based on the results of soil physical and mechanical tests before and after loading in case of having or not prefabricated vertical drain (PVD). In case of no PVD, the calculation and numerical simulation using the soil parameters before loading have the differential settlement from the monitoring data, approximately 3.86 mm (10.45%), 0.41 mm (1.11%) respectively. Meanwhile, the deviation in the case using data after loading is about 2.29 mm (6.20%), 0.21 mm (0.56%) respectively. In case of PVD, the calculation and numerical simulation with the testing result of before loading deviation from the settlement monitoring by subsidence meter is 2.91 mm (7.88%), 44.42 mm (120.28%), calculation and simulation with the testing result of after loading deviation is 0.80 mm (2.17%), 1.26 mm (3.41%). In the case of having PVD, the difference in calculation, subsidence observation, and numerical simulation between the mechanical properties before and after loading is significant, when using the mechanical data after loading then the results are quite close to the subsidence of observation and simulation rather than before loading.

Keywords: Physical Model; Settlement; Soft Soil; Prefabricated Vertical Drain; Numerical Model.

1. Introduction

The method of soft soil treatment by PVD with loading is widely used around the world and Vietnam because of its advantages such as stable material supply sources, cost-saving, effectiveness and low environment impact, etc. Many scientists have concentrated on studying PVD with the laboratory models, field observations and numerical simulation.

Hansbo (1979) [1], Atkinson and Eldred (1981), Rixner et al., (1986), Long and Covo (1994) [2] gave the equation of converting the equivalent diameter of PVD. The deformation impact and limited water drainage capability of PVD were published by Chai and Miura (1999, 2000), Chai et al., (2004) [3]. The most recent results, for example, belonged to Bo (2004) [4], (2010) [5] indicated the effect of laboratory test results on water drainage capability of PVD. Since the material filter might get some working faults during and after construction, the finer or clayey soils are able to get into the filter. Furthermore, the vast majority settlement of soil foundation causes PVD does not work well because of large deformation. These reasons have said much effect on PVD performance either in short-term or long-term uses such a reduction of drainage ability.

* Corresponding author: dhdao@dut.udn.vn

 <http://dx.doi.org/10.28991/cej-03091116>

➤ This is an open access article under the CC-BY license (<https://creativecommons.org/licenses/by/4.0/>).

© Authors retain all copyrights.