THESIS INFORMATION

Title:	**STUDY ON THE METHOD TO CALCULATE THE SETTLEMENT OF THE SOFT SOIL IMPROVED BY SOIL CEMENT COLUMNS**
PhD. Student:	**Nguyen-Tan-Bao-Long**
Major:	**Underground Engineering**
Major Code:	**62580204**
Training Institute:	**University of Technology, VNU-HCMC**
Scientific Supervisors:	**Associate Prof. Dr. Le-Ba-Vinh**
	Associate Prof. Dr. Vo-Phan

Today, Soil-cement technology has been very popular and high effectiveness in the soft-soil treatment. However, theory to calculate settlement for the soft soil improved by soil cement columns is not much, specially in Vietnam. Therefore, the research into the analytic method to calculate settlement for the soft soil improved by soil cement columns is very necessary. Nowadays, in the settlement calculation for the soft soil improved by soil cement columns, settlement S_1 of the soft soil block improved by soil cement columns is usually calculated by the basic theory of elasticity through Hooke' law. This calculation is very simple, because it ignores the shearing resistance of the soft soil. Besides, the calculation settlement as function of time for the soft soil improved by soil cement columns is very difficult.

Therefore, many authors on the world had proposed theory to calculate settlement for the soft soil improved by soil cement columns arccording to various approachs, example Baker, Alen, Alamgir,....The first matter which author have proposed in this thesis is the method to calculate final settlement, include the shearing resistance of the soft soil. The second matter which author have proposed in this thesis is the method to calculate settlement as function of time for the soft soil improved by soil cement

columns, include the soil cement permeability. After that, the author verify the proposed analytic methods by field experiment and fine elements method.

Furthermore, arccording to the standard of Viet Nam TCVN 9403:2012, in the calculation settlement S_1 of the soft soil block improved by soil cement columns, E_c is the elastic modulus of soil cement columns. Nowadays the elastic modulus is assumed from the unconfined compression test because this test is simple and popular. However that calculation is unappropriate because on site the soil cement columns bear horizontial earth pressure, while the unconfined compression test is unconfined test. That is reason cause the difference between the elastic modulus of soil cement columns from triaxial test and the elastic modulus of soil cement columns from the unconfined compression test. Many tests had been assumed the difference is very significant. For this reason, the third matter which author have proposed in this thesis is the correlation between the elastic modulus of soil cement columns from triaxial test and the elastic modulus of soil cement columns from the unconfined compression test.

The new contributions of The thesis:

1. The proposed formula to calculate the settlement S_1 of of the soft soil block improved by soil cement columns which takes into account the shearing resistance of the soft soil as follows:

$$S_1 = \frac{qH}{aE_C + (1-a)E_S}\left(1 - \frac{\eta H}{2}\right)$$

The calculated results from the proposed formula have error with the field experiment results is less than 8,76%.

2. The proposed method to calculate the settlement as function of time for the soft soil improved by soil cement columns have error with the field experiment results is less than 16%.

3. Base on the results from the triaxial test and the unconfined compression test, author proposed the correlation between the elastic modulus of the soil cement columns

from the triaxial test with the elastic modulus of the soil cement columns from the unconfined compression test as follows:

$$(E_{col})_{nén3trục} \approx (1,65 \div 3,7)(E_{col})_{nénđơn}$$

Scientific Supervisors: **PhD. Student**

Associate Prof. Dr. Le-Ba-Vinh **Nguyen-Tan-Bao-Long**

Associate Prof. Dr. Vo-Phan