Comparison of Rowe cell and oedometer test to determine peat soil consolidation parameters

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Abstract. Many problems occur when building infrastructure on peat soil. That problem is large settlement. To know large settlement can do the testing. The consolidation test it consist of testing using a row cell and oedometer. The purpose of the two tools are different. This cell rowe tool can knowing the saturation value of sampling. Loading on this test with hydrostatic pressure. While oedometer cannot knowing the value of saturation, but the loading used can be static and cyclic loads. In this research take the sample used in Rawa Pening. The type of soil used in this area is peat soils. The method is use two tool and then comparison. From the results of the research implication the value of soil ability (Cc) and the coefficient of speed consolidation (Cv).

In testing with rowe cell, the average soil Cc value was 0.499 and the Cv value was 256.89 cm² per minute. Average soil pore cavity (e) of 15.00. Whereas in the evaluation with an oedometer, the soil Cc value was 0.64 and the Cv value was 154.54 cm² per minute. The average soil pore cavity (e) is 0.77. From the results of testing prove a greater density index with rowe cell test.

1. Introduction

Rawa Pening is one of the peat land areas in Semarang, Central Java. Rawa Pening contains peat soil derived from plant roots that have weathered and is a problem that often occurs in the geotechnical field, because it has a low shear strength value, high water content, and low bearing capacity. Rawa Pening is located in the lake basin of Merbabu Mountain, Telomoyo Mountain and Ungaran Mountain. This shallow lake is located upstream of the Tuntang river.

Therefore, the construction to be built in this area will be built quite large. Fixing, overcoming problems that need to be done analyzing the settlement that occurred. One of them can use testing to obtain soil subsidence parameters such as Cc and Cv. Furthermore, the reduction coefficient obtained can be made as a soil parameter for research on soil improvement in the area. In this study, the coefficient values were obtained from testing using Rowe Cell and Oedometer.

1.1. Literature review

The following literature reviews are related to this experiment:

Bo et al presents various tests for the measurement of consolidation parameters. Consolidation testing in the laboratory uses an Oedometer and Rowe Cell. Duraisamy Y, B B K Huat, dan R Muniandy explained that the cement column succeeded in reducing the compressibility of fibrous peat tested using Rowe Cell consolidating testing [1]. Fantaziu C dan Musat V describing estimates for assessing different building subsidence in clay can be developed using special laboratory tests using different techniques in standard oedometer testing [2]. Butarbutar use an oedometer consolidation tool in examining the
physical properties, classification, compression index and the coefficient of consolidation of peat soils in gradual loading [3]. Huat B B K, Asadi A, and Kazemian S using Rowe cell consolidation testing to determine the behavior of organic soil and peat soil compression. Gofar N and Sutejo Y, 2007 states that the behavior of peat compaction can be analyzed based on data obtained from consolidation testing using rowe cell with measurement of excess pore pressure. Secondary compression of the Middleton peat was investigated using oedometer shows on undisturbed specimens.

Hacker J use Rowe cells in conducting sludge consolidation testing to determine the characteristics of sludge. Sing W L, Hashim R, and Ali F H, conduct research with simulation before loading on peat without stabilization and peat that has been stabilized by loading using standard oedometer consolidation [5]. Huat B B K, Kazemian S, Prasad A dan Barghchi M conducted research using a mixture of cement in peat soil using rowe cell testing on specimens that had been curing for 28 days, to assess the nature of its compression [4].

2. Methodology
The methods are using rowe cell and oedometer test. The soil is peat from Rawa Pening, Semarang. Peat soil molded for consolidation. From the result, rowe cell and oedometer are comparison. The steps are shows on Figure 1.

The equipment used for research are as follows:
The standard testing consolidated Rowe cell is based on ASTM D2435-89. The consolidated Rowe cell represents total pressure applied with hydraulic pressure. The tools are useful to know the settlement
results of peat soil. The test used sample with size of the ring Rowe Cell. Testing was conducted with 5 times loading, which is 0.25 to 4 bars of the manometer.

The testing standard of oedometer is based on ASTM D2435. The Oedometer Test will consolidated. This type of the test is static pressure.

3. Result and discussion

On Figure 8 shows the Cc value of rowe cell testing. Sample 1, sample 2 and sample 3 are peat soil. Sample 1 has large Cc value. The lower value of Cc is sample 3. The reason is time to molded of peat soil not same and have water content are not different.

The consolidation test in rowe cell has 5 pressure loading are 0.25, 0.50, 1.00, 2.00, 4.00 and 8.00. Rowe cell conclude Cv t90. Pressure loading between 0.25 until 0.50 has significant dropped. The Figure 9 is chart of Cv t90 value with rowe cell test.
The consolidation oedometer test on 3 sample have void ratio higher is 1.5 in sample 1. The shape of Cc on pressure loading 0.25 until 8.00 almost straight line shown by Figure 10.

The Figure 11 shows Cv t90 of oedometer consolidation test. The consolidation has line not irregular significant, because the peat soil changes easily. The factor influence are air, water and pressure when the sample tested.
The Figure 12 shows comparison Cc value and Cv t90 Value with consolidation rowe cell and oedometer. The rowe cell has significant value of consolidation parameter. The rowe cell testing can applicable in building. The investigation building consolidation with rowe cell can be used. The rowe cell has accuracy of pressure loading on soil sampling. But in project usually using oedometer test, because easy to testing.

4. Conclusion
In this research obtained the ability of soil (Cc) and coefficient consolidation (Cv). In rowe cell testing, the average of soil Cc is 0.499 and Cv value is 256.89 cm² / minutes. Void ratio (e) is 15.00. While consolidation parameter with oedometer test, Cc value is 0.64 and Cv value is 154.54 cm² / minutes. Void ratio of oedometer test is 0.77. The implication is comparison of rowe cell and oedometer. Then, the equipment can result of consolidation peat soil for construction. So, the result of this test approving the density index and compression is large with oedometer than rowe cell test.

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