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Characteristics Study Effects of Cement Addition on Overboulder Asbuton Treated Soft Soil

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1 INTRODUCTION

Soil cement defined as "a mixture of soil and measured amounts of Portland cement and water, compacted to a high density." Soil cement can be further defined as a material produced by blending, compacting, and curing a mixture of soil/aggregate, Portland cement, possibly other cementitious materials, and water to form a hardened material with specific engineering properties.

In this study, one of the materials used was Overboulder Asbuton which has a pozzolanic properties. It is used as a stabilizer agent of soft soil. Overboulder occurred naturally when limestone reacts with bitumen in the topsoil layer of asbuton itself, making it a waste material which could be used as stabilizer material, due to its lime content with low bitumen content at about below 2%. The objective of this research was to analyze the effect of cement and 15% Overboulder Asbuton addition to soft soil as a pozzolanic agent and certain curing time to its Unconfined Compressive Strength and CBR value at certain curing time.

2 LITERATURE STUDY

Stabilization of clay soils can be brought about by mixing with cement. This results in the formation of gelatinous products within the interstices of the soil which crystallize as the hardening process develops. The strength of the stabilized soil is developed as the cement hydrates.

The clay soil stabilization mechanism for the calcium-based stabilizers portland cement and lime is reviewed. These materials modify soil properties through cation exchange, flocculation and agglomeration, and pozzolanic reaction. Additionally, cement provides hydration products, which increase the strength and support values of the subgrade materials as well as enhance the permanence of the treatment. Comparative laboratory and field performance studies by others, focusing on stabilization of clay soils with portland cement or lime, are critically reviewed.

Additionally, durability of cement and lime as stabilizers is reviewed, including wetting and drying, freezing and thawing, leaching, and long-term field performance (Jan, 1999).

Numerous works have been published on cement stabilized soil, among which by Bofinger, Dunlop et. al., George, Lilley and William, Ola, and William (Bofinger, 1979; Dunlop, 1975; George, 1970; Lilley, 1973; Ola, 1974; William, 1986).

Over Boulder asbuton dominated by calcium content of 79.64% and silicon content of 9.63%, so that in the composition contained by these minerals can be used as pozzolanic material that can function as a binder and filler from soft soil material that can increase the bearing capacity of the material (Dhani, 2018).

3 MATERIALS AND METHODS

In order to provides detail of materials used in the experimental study, laboratory investigation program was carried out to evaluate the basic properties and mechanical properties of the untreated soil and stabilized soil, in this case, soft soil stabilized by overboulder and cement. Soft soil was stabilized by cement and overboulder with persentation based to dry density of each mix. The Asbuton Overboulder material was brought from Buton Island and sampled at Lawele with coordinate 5 ° 13'53.56 "S and 122 °58'0.40" E.

Fig. 1. Overboulder in its natural form.

4 RESULT AND DISCUSSION

According to laboratory analyzes, the plastic limit value is 46,35% and the plasticity index is 14,40%. Based on the Unified Soil Classification System, the soil type is classified as MH (high plasticity silt). Soil grains are dominated by a silt fraction of 34,55% and clay of 30,25%. By overall properties result, soil used in this study is a fine-grained soil. The results of the tests on the physical and mechanical characteristics of the overboulder indicate that the overboulder asbuton is classified as SP/sand with poor quality. Sand has no liquid limits, plastic limits and shrinkage limits except for the fine grains that might attached to the bigger grains of overboulder.

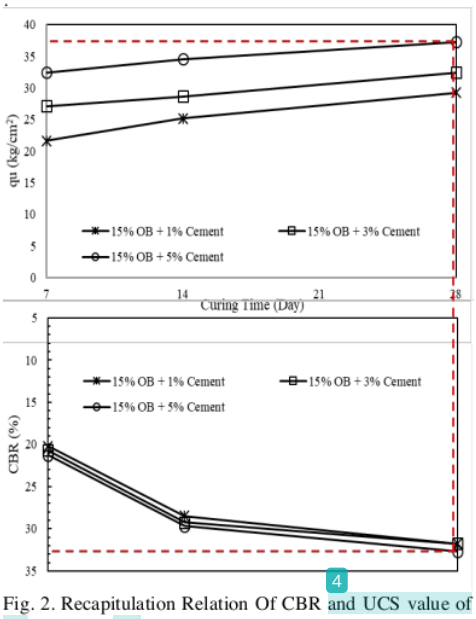

Fig. 2. Recapitulation Relation Of CBR and UCS value of the stabilized soil

From the result of the test it can be concluded that the more cement added to the soil, the higher CBR and UCS value become. And the more curing time given, the pozzolanic reaction become more stable and give the soil more stiffness, proofed by increasing CBR and UCS value. As result, soil stabilized by cement might be a solution for road foundation problems, especially in the potential area as utilization of local material.

5 CONCLUSIONS

Based on laboratory test and analysis of the data, we can conclude that cement addition to Soft Soil can increase CBR and UCS value significantly up to 4,19 times compared to CBR value of untreated soil, and 47,19 times compared to UCS value of untreated soil. Curing time can increase the CBR and UCS value by stabilizing the pozzolanic reaction between soil, overboulder and cement. Giving even higher CBR and UCS value.

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