Effect of Organic Content and Cement Quantity on The Shear Behavior of Artificially Cemented Soil

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Abstract : Most of the soil in the universe contain organic matter that results on the negative effects on the shear behavior of soil. The objective of this research is to study the effect of organic content and proportion of cement of artificially cemented soil. A compaction and direct shear test without curing period were undertaken on the soil with 6, 11, 16, and 21% organic content. Direct shear test results shows that the soil cohesion decrease and internal friction angle slightly increase as increasing of organic content. The direct shear test of artificially cemented soil with 21, 28, 42, and 56 curing time was then performed to investigate the effect of cement quantity on the shear behavior of cemented soil. The cement content was 25, 50, 75, and 100 kg/m3. The more cement quantity added to the soil, cohesion and friction angle of artificially cemented soil improves. There is also improvement of the shear stress due to the increase of cement proportion. Similarly, shear strength of stabilized soil improves inherent with curing period due to the short and long-term pozzolanic reactions.

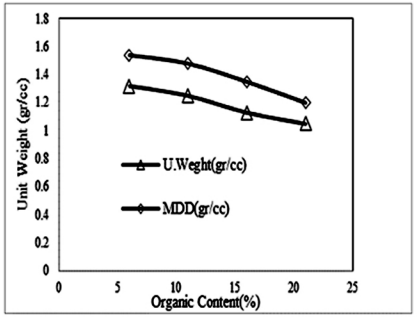
Keywords: organic content, cement quantity, cohesion, friction angle

Research Objective : the purpose of this research is to study the effects of organic content and binder quantity on the shear strength of cement stabilized soil.

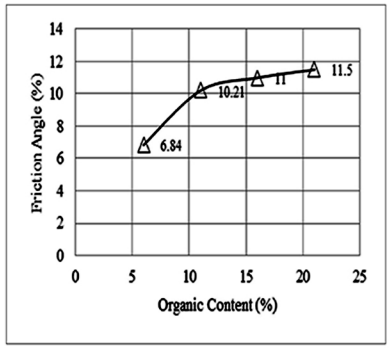
Research Methods : Experimental program presented in this study was undertaken with disturbed soil samples. The mineral composition and soil gradation were maintained to reduce the deviation between soil samples and natural soil. First, the original soil was sieved passed through #10 sieve (opening diameter 2.00 mm) to remove residues, than the soil was mixed with water to get enough liquidity index. The organic content that exist in the soil sample was spoiled by burning the soil at 300OC, then the soil without organic content was used to make artificial organic soil. The organic content mixed in the artificial soil is 6, 11, 16 (natural organic content), and 21%. Then , the soil with organic content (OC) were tested with standard compaction test, and direct shear test to investigate the effect of organic content , the maximum dry density (MDD), and optimum water content (OMC). Also the effect of OC to shear strength parameter was investigated. Soil with 6, 11, 16, 1nd 21% organic content were then mixed with ordinary Portland cement (OPC) with the proportion of : 25, 50, 75 and 100 kg/m3. Then, the cemented organic soil samples were cured with 21, 28, 42 and 56 days curing period. The long period of curing (56 days) is required to get perfect pozzolanic reactions, because the formation of calcium-silicate- hydrate (C- S-H) and aluminum silicate hydrate (C-A-H) happens at long period of curing. Table 3 shows the artificially cemented samples.

Results

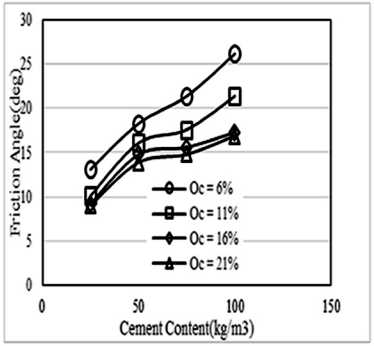
MDD and Unit weigt of treated soil decrease
If organic content increase



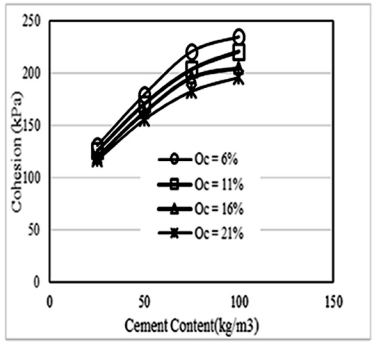
Friction Angle of treated soil increse
If organic content increase



Friction Angle of treated soil increase
If cement content increase



Cohesion of treated soil increase
If cement content increase



Conclusions

From a series of experimental works, results and discussion the following conclusions can be presented : the results of Standard Proctor compaction test indicate that the increase of organic content (OC) decrease the maximum dry density (MDD) , and increases of optimum water content (OMC) of untreated soil. Based on the result of direct shear test, the cohesion and internal friction angle of cemented soil increases proportional with cement content and curing period, followed by the improvement of shear strength. However, it is not recommended the optimum cement content to get the best proportion of artificially cemented soil. The more cement content and the longer curing time, there is the improvement the stiffness of treated soil , then the cemented soil behaves as high stress-small strain, whereas untreated soil behaves as small stress-large strain.

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