The Influence Of Lime On Unconfined Compressive Strength Of Cement-Treated Clayey Subgrade Soil

Introduction

Subgrade properties control the structural design of highway pavements system (Ahmed, Amer and Layth, 2017). When the available soil at the local area appear as clayey soil, it is not usable for subgrade. In this case, constructors need to bring suitable material from distance and the cost of its construction is increased accordingly. In Cambodia, the actions of taking the fulfil-requirement material for subgrade construction gradually destroy the natural resources.

Responding to this issue, the poor subgrade soil needed to be stabilized to decrease the negative impacts of economic, natural resources and human environment from road construction align with geotechnical risk management and sustainable development. Cement-treated soil is an applicably technical solution for poor subgrade soil stabilization technique. Base on the literature, the cement-treated soil generate more bearing capacity, but it reduce absorption and deformation (Lam, Behzad and Hadi, 2016). In the previous study, two reconstitution techniques, namely the wet-mixing saturated method and the dry-mixing unsaturated method are presented to value the unconfined compressive strength of cement-treated soil both in laboratory and field tests sampled from Fountain slide remediation project, Canada. As the result, reconstituting wet-mixing saturated condition doesn't work well while the dry-mixing unsaturated reconstitution method is relatively easy to use and the unconfined compressive strength appears variously according to water-cement ratio, cement content and soil type (Emilie, 2012).

Also, Combination of cement-treated soil with admixture gives more bearing strength for subgrade than other combinations (Rupesh, 2017). In this research project, I will study about using lime and cement together for stabilizing clayey soil in dry-mixing unsaturated method for subgrade.

Research Objectives

The research has two main objectives:

1. To study the influence of lime on unconfined compressive strength of cement-treated clayey soil using the dry-mixing unsaturated method.
2. To create the good agreement of lime and cement content to determine the best unconfined compressive strength of cement-treated soil.

Research Questions:

1. How will lime admixture affect the value of unconfined compressive strength of cement-treated clayey soil?
2. How to make the good agreement of lime, cement content and water-cement ratio for determining the strength of cement-treated clayey soil?

Methodology and Timeline

The proposed research takes Quantitative approach. The study will conduct literature review through the related journals for practical theories and conduct experimental test in laboratory to analyze. Fifteen samples of unsaturated clayey soil will be taken to make three kinds of specimens: untreated clayed soil, cement-treated clayey soil and cement-treated clayey mixed with lime by dry-mixing method with various proportions of indexes. Five sample of each kind of specimen will be tested in laboratory to value the unconfined compressive strength; the differences of the results will be defined how lime affect the cement-treated clayey soil, how it works compared to the untreated one. Moreover, the results of different strength values will define the best proportion for mixing cement-treated soil with lime that would answer to above research questions.

Conclusion

This research will provide a clear influence of lime on unconfined compressive strength of cement-treated clayed soil and the best proportion of mixing components for creating the best strength. I will bring this knowledge to apply in related soil stabilization tasks at my organization. Also, I will share it to other technical platforms in the ministry for updating national standard and guideline for geotechnical works solution on soil stabilization. This research will strengthen capacity of my organization in subgrade improvement techniques. Moreover, it help to develop the road infrastructure with high quality with reasonable cost and maintain environmental impacts.