



Cost Implications of Stabilization on Cement-Stabilized Black Cotton Soil and Cement-Stabilized Lateritic Soil

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Introduction

Soil is a fundamental component in any construction project, as the durability and stability of a structure rely on the strength properties of the soil. Black cotton soil and laterite soil differ significantly in composition, properties, and suitability for various construction purposes. Both soils are prone to settlement to successful use these soil for road pavement and foundation building, the soil engineering features such as strength, volume stability and durability need to be modified (Supriya & Nishad, 2019). Among the numerous soil types, black cotton soil and lateritic soil have distinct properties that influence their behaviour during stabilization process which lead to alterations of soil properties to improve their engineering performance, Garber & Hoel, (2000).

Materials and methods

The effects of cement stabilization on the two soil types i.e lateritic soil and black cotton soil were assessed in this study using a thorough experimental consolidation methodology. The soil samples were tested for index and engineering properties in both their natural and modified states using the methods described in British Standard 1377 (1990) and British Standard 1924 (1990), respectively. Each test, were conducted on soil samples stabilized with three different cement percentages substitution of 10%, 20%, and 30%. This approach allowed for a detailed examination of how increasing cement content influences the soils behaviour. For each stabilization level, 10%, 20%, and 30% of the soil sample's mass was systematically replaced with cement, ensuring consistent and comparable conditions across the tests. The tests were conducted four times for every stabilization level, including the control (0% cement), to guarantee the precision and dependability of the findings. Also, a comprehensive market survey for cement which was the major constituents in the composite material used for the study were carried out to establish the current prices of cement.

Result and discussion

The result of this study shows a decrease in preconsolidation pressure from 3600 kN/m² to 466.37 kN/m² at 30% cement substitution for black cotton soil while an increase in preconsolidation pressure from 110 kN/m² to 2000 kN/m² at 30% cement substitution for lateritic soil. This implies that more cement will be required by higher compressibility black cotton soil to avoid settlement on load, hence additional cost will be required in stabilizing black cotton soil than lateritic soil.

Conclusion

Road construction and other civil engineering applications can benefit from the practical conclusions of the study. For troublesome soils like Lateritic Soil and Black Cotton Soil, cement stabilization works better to improve their geotechnical and engineering characteristics. Stabilized soil enhanced strength and compaction properties which can result in more long-lasting and reasonably priced construction solutions. The use of cement as a binder to stabilize black cotton soil should be discouraged due to high cost of cement in the market. It will be of benefit to source for agricultural wastes such as palm kernel shells, rice husk, eggshell powder etc which can be used as an alternative to cement as a binder for stabilizing black cotton soil hence reduction in construction cost.

Keywords: Cement, Stabilization, Black Cotton Soil, Lateritic Soil, Consolidation