

Improvement of Coastal Sandy Soil by Blending the Local Uoori Clay for Subgrade/Embankment and Sub Base Construction: Experimental Study

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Abstract

The major part of the Northern Province is surrounded by sea and the mainland is connected by several lagoons. The terrain of the province is almost flat and of low elevation. The road development activities in the coastal line of the province has been intensified in the recent past to provide access to the community and other infrastructure development. Formation of coastal road network is emphasized to achieve socio economic benefits to the community. However scarcity of locally available road construction materials hinders the road development badly and causes heavy transport costs involving long haul distance. The borrowing of materials from outstations also leads to social and environmental issues.

Usually a traditional method is used for road formation/construction in the coastal areas, by placing the Palmyra leaves to reinforce the subgrade with adequate cover of locally available Uoori clay. However above construction method had shown signs of failure within a short period despite low traffic on the road due to Non- blending of materials by mechanical means and placing the clay with improper moisture content and uneven layer thickness.

It is prudent to explore the use of locally available materials with improvement of its quality with suitable stabilization technique. The coastal sandy soil and local Uoori clay are freely available in bulk in the coastal areas. Research on these materials were conducted to determine its properties under different compositions to meet the specification limit of the "Standard Specifications for Construction and Maintenance of Roads and Bridges (SSCM) (ICTAD, 2009)" in Sri Lanka.

Testing for Sieve Analysis, Atterberg Limits, Modified Proctor and California Bearing ratio (CBR) were performed for different composition 50:50, 60:40, 70:30, 80:20, 90:10 and 100:00 of Uoori clay and coastal sand. Initial dry sieve and wet sieve tests were conducted for composite material before compaction to determine the clay influenced by Uoori. The results shows the percentage of passing 0.075 μ m sieve is less than 1.20% for dry test and the percentage passing through 0.075 μ m varies from 14.7% to 32.6% for wet test depend on the

percentage of Uoori clay resulting higher passing percentage for samples with high amount of Uoori clay.

The Liquid Limit (LL) and Plasticity Index (PI) were computed for samples collected from initial composite material before proctor compaction and samples collected from optimum compaction level under laboratory conditions (MDD at OMC) to examine the influence of Uoori particles. The test results for two methods have shown the significant increment of limit results for each composite material due to the fraction of Uoori and escape of clay through 0.425 μ m sieve. The composite material 60:40 has satisfied the specification limits of sub base material for road construction even the limit variation for LL and PI from 32.20 to 36.90 and 6.59 to 11.11 respectively.

The Modified Proctor were performed for composite material to determine the maximum dry density (MDD) with corresponding optimum moisture level (OMC). The results showed that the composite material have satisfied the specification limits. CBR tests were conducted to examine the bearing strength of the composite material under four day soaked condition and test results have shown that the composite material 60:40 satisfied the specification requirement for sub base.

The above mentioned tests results for composite material 60:40 indicate acceptable specification limits except the initial test results of sieve analysis. Therefore, sieve analysis was conducted for specified composite material 60:40, where the sample was selected after the proctor compaction at MDD. In addition to that the behavior of the composite material 60:40 was evaluated by analyzing the particle fraction with increment of compaction effort to study the field condition.

Key Words: Uoori clay, Coastal sand, Composite material

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