A STUDY OF THE EFFECT OF FINES CONTENT ON THE PERFORMANCE OF SOIL AS SUB-BASE MATERIAL FOR ROAD CONSTRUCTION

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ABSTRACT

This study established optimum and determined the effect of fines content on the engineering properties of lateritic soil for use as sub-base material for roads. It also developed a regression model relating the fines content to the engineering properties. This was with a view to addressing road pavement failure, a common feature of the tropical environment.

Lateritic soil samples were collected from three selected borrow pits (one on Mokuro road and two on Ede road) in Ile-Ife and were termed MR, ER1 and ER2, respectively. The fines contents were separated from the coarse fraction by wet sieving through 75 μm sieve size. The fines and the coarse fractions were reconstituted in varying proportions of fines to coarse ratios, from 0:100 to 100:0 in 10% increments. The samples were subjected to compaction, California Bearing Ratio, and unconfined compression tests. The Optimum Moisture Content (OMC), Maximum Dry Density (MDD), soaked and unsoaked California Bearing Ratio (CBRs and CBRu) and the Unconfined Compressive Strength (UCS) were determined. Statistical models relating fines content to the engineering properties were developed and tested to ascertain the effects of fines on the performance of the soil samples.

The results showed that as the fines content increased from 10% to 100% the OMC values for samples MR, ER1 and ER2 varied from 10% to 30.5%, 12% to 31.2% and 10% to 40.5%, respectively. There was about 20%, 35% and 43% decrease in the MDD values as the fines content increased from 10% to 100% for samples MR, ER1 and ER2, respectively. The CBRu decreased to 0% from 85, 30 and 64% as the fines content increased from 10% to 50%; while the CBRs decreased to 0% from 65, 22 and 57% as the fines content increased from 10% to 30% for samples MR, ER1 and ER2, respectively. The UCS, however, increased with

increasing fines content to about 60% before it decreased rapidly to zero. The results further showed a linear relationship between fines content and MDD ($r = 0.937$, $p < 0.05$); and OMC ($r = 0.946$, $p < 0.05$). The CBR and fines content exhibited a polynomial relationship of third order ($r = 0.910$, $p < 0.05$), implying that a small increase in fines content will decrease the CBR significantly making the soil much less stable. Based on the engineering properties, fines content of 10% was obtained as the optimum percentage for the investigated soil samples.

The study concluded that increase in fines content reduced the strength of lateritic soil for use as sub-base material in road construction.