

Effectiveness of Rice Husk Ash in Stabilizing Kenyan Red Coffee Soil for Road Subgrades Construction

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Abstract

The high cost of traditional stabilizing agents such as lime and cement has led to the research on industrial and agricultural wastes as suitable alternatives. Rice growing areas of Kenya accumulate large quantities of rice husk which pose serious disposal problems. When burnt as a means of disposal, the rice husk ash formed is difficult to coagulate and thus contribute to air and water pollution, require a large space for disposal, and cause respiratory health problems when inhaled. Red coffee soil poses serious engineering problems such as swelling due to wetting, shrinkage due to drying, low bearing capacity, and differential settlement leading to cracks and needs improvement for strength and stability in service. Red coffee soil and rice husks samples were obtained from Gatundu and Mwea, respectively. The rice husk was burnt at temperatures between 500 and 700 °C to ensure maximal formation of siliceous component. Chemical analysis on the rice husk ash gave the sum of SiO_2 , Fe_2O_3 , and Al_2O_3 as 85.5 % indicating that it has pozzolanic activity. Rice husk ash was applied at 4, 6, 8, and 10 % by weight of dry soil. Plasticity index, liquid limit, and linear shrinkage decreased from 26.1, 67.1, and 13.0 % for lean sample to 18.5, 63.6, and 9.2 %, for 10 % rice husk ash stabilized samples, whereas plastic limit increased from 41.0 to 45.15 %. The soaked California bearing ratio value for rice husk ash stabilized samples increased from 5 to 22 % corresponding to soil subgrade class S4. However, lime-stabilized samples gave higher values.

Keywords

California bearing ratioLimeLiquid limitPlastic limitPozzolanaRed coffee soilRice husk ash

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