THE GEOTECHNICAL PROPERTIES OF BLACK COTTON SOIL TREATED WITH CRUSHED GLASS CULLET

Eberemu, Adrian. O.\textsuperscript{1}, Amadi, Agapitus. A.\textsuperscript{2} and Lawal Mohammed.\textsuperscript{1}

\textsuperscript{1}Dept. of Civil Engineering, Faculty of Engineering, Ahmadu Bello University Zaria, Kaduna State Nigeria.

\textsuperscript{2}Department of Civil Engineering, School of Engineering and Engineering Technology, Federal University of Technology Mina, Niger State Nigeria.

Abstract

This study is an investigation into the effect of crushed glass (glass cullet), a waste material, on some of the geotechnical properties of Black Cotton Soils (BCS) of North-Eastern Nigeria. The investigation includes evaluation of properties such as consistency limits, index properties, shear strength parameters, Unconfined Compressive Strength, California Bearing Ratio, permeability and potential volume change of the soil with up to 20% glass cullet content. The results obtained showed that the liquid limit and plastic limit decreased with an increase in glass cullet content, while the plasticity index increase with an increase in glass cullet content. The specific gravity increased with an increase in glass cullet content. It was also discovered that increase in glass cullet content decreased the Optimum Moisture Content (OMC) and increased the Maximum Dry Density (MDD) in Compaction. The Optimum Moisture Content (OMC) from the Compaction test was used to prepare the samples used in Direct Shear test (Shear Strength Parameter test), Unconfined Compressive Strength (UCS) test, Permeability test, California Bearing Ratio (CBR) and Potential Volume Change tests. From these tests, cohesion was found to be decreasing with increase in glass cullet content and the angle of internal friction increases as the glass cullet content increased. The Unconfined Compressive Strength test (UCS), permeability test and California Bearing Ratio test (CBR) increases as glass cullet content increased. Also the swelling pressure reduced with increased glass cullet content. These results reveal the suitability of the material in improving the geotechnical properties of the soil and a potential solution to the environmental nuisance created by glass cullet.

Keywords: Black cotton soil, Glass cullet, Geotechnical properties.

Email: aeberemu@yahoo.com; ahamefule4@yahoo.com

Received: 2012/05/13

Accepted: 2012/09/20