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Effect of Rock Dust on the Geotechnical Properties of Dark Magnesium Clay

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Extended Abstract

Expansive soil deposits on the volcanic island of Mauritius and other parts of the globe are unquestionably problematic for Civil Engineering structures as they swell with increase in moisture content and tend to shrink during the dry season [1]. They occur mainly in the arid and semi-arid area of the planet. The swelling and shrinkage properties are a global problem that poses some challenges for Civil Engineers. They are believed to have the potential for natural disasters that, if not handled properly, can cause significant damage to civil engineering infrastructures. Expansive soil causes more damage to structures, especially light buildings and sidewalks, than other natural disasters such as earthquakes and floods.

This paper investigates the effect of rock dust on the geotechnical properties of Dark Magnesium Clay with an aim to improve its properties and make it become acceptable for civil engineering purposes. Dark Magnesium Clay is an end product of the weathering process of volcanic basalt [2,3] containing montmorillonite as the predominant clay mineral, from where it acquires the swelling property.

Expansive soil was sampled from mountain slope at La Butte, Port Louis in Mauritius from a depth of 1 m. Rock dust was used as a stabilising agent and was collected from local construction materials industry, as a residue generated from the manufacture of basalt aggregates. For stabilization of the expansive soil, the additive in varying percentages (0%, 10%, 20%, 30%, 40%, 50%) was mixed with the soil in identical conditions [4,5].

A total of about 100 samples were prepared for laboratory investigation purposes. For each mix, Atterberg limits, compaction and consolidation properties [6] were determined and analysed. Results show that the Plasticity Index I_p, increases from 30.8% for plain expansive soil to 39.7% for 50% additive. The maximum dry density value γ_{dmax} increases by almost 10% from 1.51 g/cm^3 to 1.66 g/cm^3 with variation in optimum moisture content from 24% to 28% for 0% to 50% additive respectively. However, the optimum moisture content remained almost constant, or rather 28 % after 20% additive. Whereas, a net decrease in the pre-consolidation pressure values, ranging from 200 kPa to 120 kPa have been recorded for 0% to 50% rock dust.

At this stage, confirmatory laboratory experiments are ongoing, further to which conclusive interpretive results are expected.

Keywords: Expansive soil, rock dust, dark magnesium clay, soil stabilisation.

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