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Effect of Sodium Hydroxide on Geotechnical Properties of Soft Soil in Kathmandu Valley

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Abstract : Local soils are often chosen due to their widespread availability and low cost. However, these soils typically have poor durability, which can lead to significant limitations in their use for construction. To address this issue, various soil stabilization techniques have been developed and used over the years. This study investigates the viability of employing the mineral polymerization (MIP) technique to stabilize black soils, intending to enhance their suitability for construction applications. This technique involves the microstructural transformation of certain clay minerals into solid and stable compounds exhibiting characteristics similar to hydroxy sodalite, feldspathoid, or zeolite. This transformation occurs through the action of an alkaline reactant at atmospheric pressure and low temperature. The soil sample was characterized using grain size distribution, Atterberg limit test, organic content test, and pH-value tests. The unconfined compressive strength of the soil specimens, prepared with varying percentages of sodium hydroxide as an additive and sand as a filler by weight, was determined at the optimum moisture content. The unconfined compressive strength of the specimens was tested under three different conditions: dry, wet, and cycling. The maximum unconfined compressive strengths were 77.568 kg/cm², 38.85 kg/cm², and 56.3 kg/cm² for the dry, wet, and cycling specimens, respectively, while the unconfined compressive strength of the untreated soil was 7.38 kg/cm². The minimum unconfined compressive strength of the wet and cycling specimens was greater than that of the untreated soil. Based on these findings, it can be concluded that these soils can be effectively used as construction material after treatment with sodium hydroxide.

Keywords : soil stabilization technique, soft soil treatment, sodium hydroxide, unconfined compressive strength
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