

# The Effects of Sodium-Potassium Hydroxides and Sodium Orthosilicate Treatment on the Properties of Clayey Sand Soil

**Omar Asad Ahmad**

Amman Arab University, Civil Engineering Department, Amman, Jordan

**Shahed Sulieman Al-Mwas**

Amman Arab University, Civil Engineering Department, Amman, Jordan

## **Abstract**

Non-traditional soil stabilizers can offer a solution for making soils more suitable for construction purposes. The present study aims to investigate the geotechnical properties of A-2-7 soil when treated with sodium hydroxide ( $NaOH$ ,  $SH$ ), potassium hydroxide ( $KOH$ ,  $KH$ ), and sodium orthosilicate ( $SO$ ) as alkaline stabilizers. Untreated A-2-7 soil exposed to various concentrations of alkaline stabilizers (5%, 10%, and 15%). The stabilized soil samples subjected to a series of tests to determine their index properties, including Atterberg limits, compaction characteristics, and the California Bearing Ratio ( $CBR$ ). The results show that  $SH$ ,  $KH$ , and  $SO$  significantly affected the soil's plasticity index ( $PI$ ), reducing it from 19 to 7 with 15%  $KH$  and 15%  $SH$  additions, respectively. Increasing the proportion of  $SH$  and  $KH$  had little effect on enhancing the maximum dry unit weight ( $\gamma_{dmax}$ ), whereas an increase in  $SO$  concentration led to a noticeable improvement, from 15.11  $kN/m^3$  to 16.19–16.38  $kN/m^3$ . The  $CBR$  increased linearly with the addition of all stabilizers, reaching a maximum of 12% at 15% stabilizer concentration. This study provides new insights into soil stabilization using alkaline stabilizers, offering a novel approach to effectively improve A-2-7 soil, making it more suitable for specific civil engineering applications.

## **Index Terms**

Clay Soil Stabilization; Ground Improvement; A-2-7 Soil; Engineering Index; Alkaline Activators