



Geotechnical Engineering Applications in Foundation Design for Expansive Soils in Sudan and Its Implications for Uganda's Construction Industry

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Abstract

Geotechnical engineering plays a crucial role in foundation design for construction projects, especially in areas affected by expansive soils like Sudan and Uganda. A comprehensive review of existing literature on expansive soils and their impact on foundation design was conducted. Field investigations were carried out to collect data on soil properties and site conditions. Statistical models were used to predict settlement behaviour under different loading scenarios. Field observations revealed that the expansive soil in Sudan exhibits a significant variation (up to 15% of its original volume) during wet seasons, necessitating careful foundation design to prevent structural failures. The study concludes that incorporating expansive soil characteristics into geotechnical designs is essential for reliable construction outcomes. Recommendations include using reinforced foundations and monitoring settlement closely during construction phases. Construction professionals are advised to use proven techniques such as soil reinforcement with chemical additives or composite foundation systems, alongside regular site inspections to ensure project success. The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u + \epsilon$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Sudan, Uganda, Geosynthetic-Reinforced Soil (GRS), Site Investigation, Consolidation Settlement Analysis, Expansive Soils, Foundation Performance Assessment

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