

# **Variability in the geotechnical properties of an amphibolite derived laterite soil.**

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## **Abstract:**

Variabilities in the geotechnical properties, over a small area, of soils derived from coarse grained rocks have been widely recorded. Such reports concerning soils derived from fine grained rocks are however sparse.

This thesis examines the variability in the geotechnical properties of a laterite soil derived from a fine-grained gneissic amphibolite from the Ile-Ife-Ilesa area of South-western Nigeria. The laterite soil is clayey and highly plastic and belongs to the Itaganmodi soil association.

The variability of undisturbed soil samples taken from an area of one square meter has been examined through their shear strength, consolidation and permeability characteristics. A considerable sample to sample variation of the shear strength and consolidation characteristics was recorded. The coefficients of variation recorded for cohesion and angle of internal friction were greater than 50% and 155 respectively under total and effective stress conditions. The overconsolidation ratios for samples of the laterite soil were determined using the Cassagrande and the 'constrained modulus' methods. The coefficients of variation obtained for this parameter via the two methods were in excess of 40%.

Although the overall chemistry of the samples remains uniform, mineralogical variations exist in terms of the clay mineral (kaolinite) and goethite contents. Microstructural analyses of the soil show that the soil possesses variable microstructures. The microstructures have been related to variation in the goethite content of the soil.

The variability of the geotechnical properties have been attributed to the variable microstructures occurring within the soil as a result of the inconsistent cementation of the soil particles by the non-uniformly distributed goethite. The results emphasize the need for collection of a large volume of data when the geotechnical properties of laterite soils are required.

**Keywords:** Soil/ geotechnical properties/ rocks/ gneissic/ amphibolite/ shear strength/ consolidation/ permeability/ Cassagrande/ constrained modulus' methods/ minerals/ microstructures

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