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Consolidated Clay Soil Drying Process

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Description

Clay soil has a solid structure and is porous; therefore it can be examined in the context of porous media. The original saturated clay soil deforms during the drying process due to changes in water content and capillary pressure. The soil fractures as the capillary pressure rises further. In reality, the water content and capillary pressure are intimately linked to deformation and stress in clay soil. Understanding the variations in capillary pressure and water content inside the clay soil during the drying process is therefore of great importance. However, obtaining these field variables only through experiments is difficult. As a result, numerical modeling may be a viable option for gaining a better knowledge of the dry process in clay soil [1].

Desiccation is typically recognized in the profession of soil mechanical engineering as drainage (water loss) through evaporation, referring to either a reconsolidation mechanism or an air invasion mechanism. Surface and subsurface soils are both affected by desiccation. Clay soil, among the types of soils commonly encountered in engineering practice, is the most sensitive to changes in water content; clay soil becomes hard and fragile after drying due to its tiny particle size and high water content. Desiccation causes clay soils to crack. Desiccation fissures can impair soil attributes including strength, permeability, and compression ability, which might jeopardize the long-term viability of geotechnical constructions by, for example, negatively impacting embankment performance, mudflow, or foundation stability. Because of the importance of this subject, many researchers have been interested in the mechanism of desiccation cracking in clay soils in recent decades, in both experimental and numerical modelling [2].

The cracking results achieved by this method are obvious when extrinsic constraints on the shrinkage of the clay during the drying process, such as the base plate, are applied. In contrast to this strategy, this study investigates the internal reasons for the cracking mechanism in the clay throughout the drying process. Clay soil has a solid structure and is porous, therefore it can be examined in the context of porous media. The original saturated clay soil deforms during the drying process due to changes in water content and capillary pressure [3].

The original saturated clay deforms during the drying process due to the suction imposed by the desiccator environment's relative humidity as a result of the saline solution. The desaturation process is sluggish due to the consolidated specimen's poor permeability. As a result, the material develops a high-water pressure gradient, resulting in a considerable heterogeneous stress distribution in the specimen. One of the main reasons for the commencement of cracks inside the clay is the non-uniform distribution of moisture, which causes differential shrinkage and the creation of tensile strains.

When dealing with landslides in over-consolidated clays, professional help is required. The failure of slopes in clays and soft shales happens gradually. After around 30 years of temporary stability, the slope could disintegrate. When analysing the static stability of clay slopes, residual and drained shear strength parameters should be used. Peak undrained shear strength characteristics should be employed in dynamic analysis. A thin zone along the slip surface is where platy clay particles are oriented. As a result, the strength characteristics of the actual slip surface are much lower than those of any other supposed slip surface [4].

During the construction of a structure on a soil, the determination of soil mass settlement is critical. The compressibility of the soil bulk causes settlement. The compressibility of soil mass is determined by the consolidation characteristics of the soil, such as the compression index cc and the coefficient of consolidation cv. The compression index cc is calculated by plotting the void ratio e versus vertical effective stress'in the semi-logarithmic plane. The coefficient of consolidation (cv) is used to anticipate how long it will take for a given amount of compression to occur, i.e. the rate of settlement. Other soil consolidation characteristics, such as the recompression index cr and the preconsolidation pressure p, are also important in predicting the compressibility behaviour of the soil mass [5].

'Dry' with the right amount of moisture Because the air gaps are continuous, pore-air pressures dissipate quickly, there is no consolidation in the traditional sense, and the entire compression-time behaviour can be described using a simple rheological model. The settling issue in this state is linked to collapse when wet.

With occluded air gaps and a 'wet' of optimal, there is a risk of excessive pore-water pressures, and consolidation is a severe engineering concern. Terzaghi's theory is shown to be just as important as any of the more complex theories seeking to account for the influence of obstructed air. However, when the changeover in the region of optimum water content approaches, the usefulness of Terzaghi theory diminishes.

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Conflict of Interest

The author shows no conflict of interest towards this manuscript.

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