



# Unsaturated Soils: A fundamental interpretation of soil behaviour

*E. J. Murray, V. Sivakumar*

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An understanding of the mechanical properties of unsaturated soils is crucial for geotechnical engineers worldwide, as well as to those concerned with the interaction of structures with the ground. This book deals principally with fine-grained clays and silts, or soils containing coarser sand and gravel particles but with a significant percentage of fines.

The study of unsaturated soil is a practical subject, linking fundamental science to nature. Soils in general are inherently variable and their behaviour is not easy to analyse or predict, and unsaturated soils raise the complexity to a higher level. Even amongst practicing engineers, there is often lack of awareness of the intricacies of the subject. This book offers a perspective of unsaturated soils based on recent research and demonstrates how this dovetails with the general discipline of soil mechanics.

Following an introduction to the basic soil variables, the phases, the phase interactions and the relevance of soil structure, an up-to-date review of laboratory testing techniques is presented. This includes suction measurement and control techniques in triaxial cell testing. This is followed by an introduction to stress state variables, critical state and theoretical models in unsaturated soils.

A detailed description of the thermodynamic principles as applied to multi-phase materials under equilibrium conditions follows. These principles are then used to explore and develop a fundamental theoretical basis for analysing unsaturated soils. Soil structure is broken down into its component parts to develop equations describing the dual stress regime. The critical state strength and compression characteristics of unsaturated soils are examined and it is shown how the behaviour may be viewed as a three-dimensional model in dimensionless stress-volume space. The analysis is then extended to the work input into unsaturated soils and the development of conjugate stress, volumetric and strain-increment variables. These are used to examine the micromechanical behaviour of kaolin specimens subjected to triaxial shear strength tests and lead to observations not detectable by other means.

*Unsaturated Soils: A fundamental interpretation of soil behaviour* covers a rapidly advancing area of study, research and engineering practice and offers a deeper appreciation of the key characteristics of unsaturated soil. It provides students and researchers with a framework for understanding soil behaviour and demonstrates how to interpret experimental strength and compression data.

- provides engineers with a deeper appreciation of key characteristics of unsaturated soils
- covers a rapidly advancing area of study, research and engineering practice
- provides students and researchers a framework for understanding soil behaviour
- shows how to interpret experimental data on strength and compression
- the limited number of books on the subject are all out of date

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