
STRESS STATE VARIABLES FOR UNSATURATED SOILS[a]

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The discusser, Bloch, has provided insight into the difficulties associated with considering an unsaturated soil as having "interacting species." All the criticisms raised by the discusser relate to the assumption made by the writers that an unsaturated soil can be considered as a chemically inert mixture. Once this assumption is made, the equilibrium free energy analysis reverts to a multiphase Newtonian type stress analysis.

The writers have no intention of "giving a cold shoulder to the chemical potential in soil mechanics." However, it is clear that saturated soil mechanics has been successfull in practice without considering the chemical potential of the soil. The one stress variable [i.e., $(\sigma - u_w)$] for a saturated soil assumes that the soil is a chemically inert mixture. Mitchell (37) indicates how the stress state variable can be extended to consider chemical activity.

The writers believe that unsaturated soil mechanics can also be successfully developed by assuming the soil is a chemically inert mixture in a manner that parallels saturated soil mechanics. This is a necessary first step before attempting to embrace even more complex phenomena.

APPENDIX I.—REFERENCE

37. Mitchell, J. K., Fundamentals of Soil Behavior, John Wiley and Sons, Inc., New York, N.Y., 1976

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[a]May, 1977, by Delwyn G. Fredlund, and Norbert R. Morgenstern (Proc. Paper 12919).
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