World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:15, No:01, 2021

Prediction of Permeability of Frozen Unsaturated Soil Using Van Genuchten Model and Fredlund-Xing Model in Soil Vision

Authors : Bhavita S. Dave, Jaimin Vaidya, Chandresh H. Solanki, Atul K.

Abstract : To measure the permeability of a soil specimen, one of the basic assumptions of Darcy's law is that the soil sample should be saturated. Unlike saturated soils, the permeability of unsaturated soils cannot be found using conventional methods as it does not follow Darcy's law. Many empirical models, such as the Van Genuchten Model and Fredlund-Xing Model were suggested to predict permeability value for unsaturated soil. Such models use data from the soil-freezing characteristic curve to find fitting parameters for frozen unsaturated soils. In this study, soil specimens were subjected to 0, 1, 3, and 5 freezing-thawing (F-T) cycles for different degrees of saturation to have a wide range of suction, and its soil freezing characteristic curves were formulated for all F-T cycles. Changes in fitting parameters and relative permeability with subsequent F-T cycles are presented in this paper for both models.

Keywords : frozen unsaturated soil, Fredlund Xing model, soil-freezing characteristic curve, Van Genuchten model
Conference Title : ICUSSS 2021 : International Conference on Unsaturated Soils and Soil Science
Conference Location : Singapore, Singapore
Conference Dates : January 11-12, 2021