Determination of Unsaturated Soil Permeability Based on Geometric Factor Development of Constant Discharge Model

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Abstract : After Yogyakarta earthquake in 2006, the main problem that occurred in the first yard of Prambanan Temple is ponding area that occurred after rainfall. Soil characterization needs to be determined by conducting several processes, especially permeability coefficient (k) in both saturated and unsaturated conditions to solve this problem. More accurate and efficient field testing procedure is required to obtain permeability data that present the field condition. One of the field permeability test equipment is Constant Discharge procedure to determine the permeability coefficient. Necessary adjustments of the Constant Discharge procedure are needed to be determined especially the value of geometric factor (F) to improve the corresponding value of permeability coefficient. The value of k will be correlated with the value of volumetric water content (θ) of an unsaturated condition until saturated condition. The principle procedure of Constant Discharge model provides a constant flow in permeameter tube that flows into the ground until the water level in the tube becomes constant. Constant water level in the tube is highly dependent on the tube dimension. Every tube dimension has a shape factor called the geometric factor that affects the result of the test. Geometric factor value is defined as the characteristic of shape and radius of the tube. This research has modified the geometric factor parameters by using empty material tube method so that the geometric factor will change. Saturation level is monitored by using soil moisture sensor. The field test results were compared with the results of laboratory tests to validate the results of the test. Field and laboratory test results of empty tube material method have an average difference of 3.33 x 10⁻⁴ cm/sec. The test results showed that modified geometric factor provides more accurate data. The improved methods of constant discharge procedure provide more relevant results.

Keywords : constant discharge, geometric factor, permeability coefficient, unsaturated soils
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