Civil Infrastructure Researches, Vol. 7, Issue.1, Spring and Summer 2021, pp. 153-171

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Construction of a New Hollow Cylinder Apparatus to Study the Tensile Behavior of Clay with Different Plasticity Indices

Soil tensile strength is important in different geotechnical structures such as earth dams, roads, airports, landfills, and retaining walls. There are several experiments to study the tensile behavior of soils with different advantages and disadvantages. One of the methods used to investigate soil tensile behavior is tensile hollow cylinder apparatus, which has seldom been used. In this research, a hollow cylindrical device to measure the tensile properties of soil was built and operated. This device can apply tensile stress evenly to the entire soil sample so that stress concentration does not occur at any point in the sample. After designing, manufacturing, and assembling the apparatus, validation tests were performed to ensure the device was operating well. The results of the repeatability tests show the accurate performance of the device. Also, in this study, the effect of plasticity index (PI) on the tensile behavior of kaolinite clay was investigated. Clayey soils with plasticity indices of 10 and 24% were selected. The results show that for clays with a similar mineral, the tensile strength increases and the tensile failure strain decreases with increasing the plasticity index.

Keywords: Tensile hollow cylinder test, tensile strength, clay, plasticity index.

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Received 20 September 2021, Revised 24 October 2021, Accepted 29 October 2021.
DOI: 10.22091/cer.2021.7389.1303