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Micromechanical modeling of fiber reinforced pervious concrete composites

Yang, Mijia, mijia.yang@ndsu.edu, North Dakota State University

ABSTRACT

Pervious concrete is widely used in today's construction industry, e.g., parking lots, airport runways, etc. However, the durability and strength of the porous concrete remains a challenge, as the binding material proportion is low and the use of fine aggregates is nearly 0. Increasing the compressive load, the failure appears first in the weak concrete zone induced by the random distribution of voids. The process continues until the failure of the whole specimen occurs. In this study, the influence of random distribution of voids and void percentage on the strength and permeability of earlier concrete specimen is studied. A finite element model is generated by using MATLAB & ANSYS with a subroutine written in ANSYS Parametric Design Language. Load-deflection plots are generated and the obtained results including stiffness, strength and permeability are compared with the results from the experiments conducted following ASTM standards. A numerical fiber reinforced concrete specimen is also generated and the stiffness of the specimen was calculated and compared with the Kerner model. All the results numerically obtained are around or >90% accuracy of the experiment derived values, which validates the suggested micro-mechanical model of earlier concrete composite is a viable approach for predicting behavior of earlier concrete composites and could guide its future design for any specific functions.