TIDC Transportation Infrastructure Durability Center AT THE UNIVERSITY OF MAINE

Direct tensile and pullout behavior of Ultra high-performance concrete coupled with micromechanical modelling.

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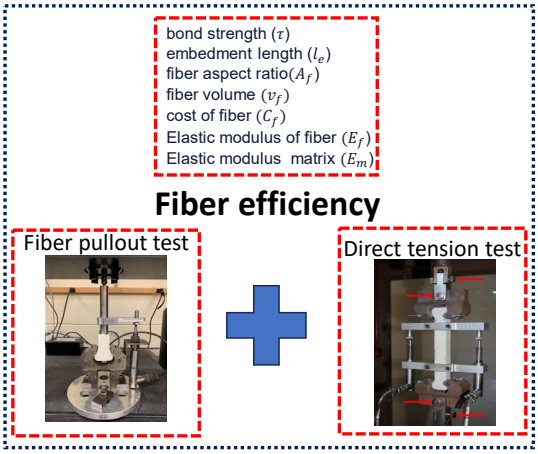
Abstract

Ultra high-performance concrete (UHPC) is an advanced form of cementitious composite with enhanced mechanical and durability properties. It is characterized by compressive strength of over 120 MPa and tensile strength of over 8 MPa with strain hardening behavior which is due to the addition of discontinuous steel fibers that impart ductility to the UHPC matrix. However, fibers are the most expensive component of UHPC and can contribute up to approximately 50% of the UHPC material cost. Despite abundance of work going on to improve the performance of UHPC, there has been limited work trying to improve the performance of UHPC by maximizing the fiber utilization to promote fiber efficiency which could help to lower the cost of UHPC and keep the amount of unutilized fibers to a minimum. In the current work, we investigate the direct tensile behavior and pullout behavior of UHPC using different length (13-19 mm) and volume (1-2%) of steel fibers. The results obtained from both the tests will be combined to calculate the fiber efficiency factor, which will be a function of bond strength, fiber embedment length, fiber aspect ratio, fiber volume, cost of fiber and Elastic modulus of fiber and matrix. This can pave a way to achieve fiber efficiency in UHPC. In addition to this, the obtained experimental results will be used to develop a reliable micromechanical model which can predict the experimental results with high accuracy.



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