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## **Influence of Fiber Volume on Compressive Strength and Tensile Behavior of Ultra-High Performance Concrete**

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### **Abstract**

Ultra-high performance concrete (UHPC), with its superior mechanical characteristics and durability, provides a potential way for sustainable highway infrastructure in the United States and worldwide. To attain these properties, the presence of fibers plays an integral part in ultra-high performance concrete (UHPC) mixes. In this paper, the influence of fiber volume on compressive strength and tensile behavior of UHPC is studied. To investigate this, specimens were cast using three different UHPC types with three fiber volume fractions of 1%, 2%, and 3%. Cubes with side length 2 in. and cylinders with dimensions 3 in. (diameter) x 6 in. (length) were tested for compression at four different ages. At 3% fiber volume, the strength ratio of cylinders to cubes is around 1. Whereas, at lower fiber volumes, the strengths of cylinders are higher than cube strengths and are consistent across the ages. Varying fiber volume fractions have a significant influence on the tensile strength and post-cracking tensile response of UHPC. A direct tensile test procedure developed by Federal Highway Administration (FHWA) was used to investigate tensile behavior. A higher volume of fibers resulted in higher tensile strength and a more extensive multi-cracking phase. The crack straining phase depends on the UHPC type and does not depend on fiber volume.