

SHEAR STRENGTH OF STEEL FIBER REINFORCED PRESTRESSED CONCRETE BEAMS

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Due to the increasing evidence from previous research results, the 2008 ACI Building Code allows engineers to use steel fiber reinforced concrete (SFRC) to replace the conventional shear reinforcement (i.e. steel stirrups) even if the design shear force is greater than half of the concrete shear strength. Though the new ACI provisions, marked a significant transfer from research to practice, beams constructed of steel fiber reinforced concrete are required to have a minimum amount of steel fibers of 0.75% in volume (100 pounds per cubic yards) and compressive strength not greater than 6 ksi. The ACI provisions are primarily formulated on experimental studies on non-prestressed concrete beams and majority of them had a cylinder compressive strength less than 6 ksi. However, in a prestressed concrete beam, the beneficial effect from prestressing forces could further relax the minimum required fiber volume fraction thus make the use of SFRC more economical. Further, concrete compressive strengths much higher than 6 ksi are commonly used in prestressed concrete beams to reduce the creep related issues as well as to provide larger loading capacity. Therefore, the current ACI requirements will hinder the use of SFRC in structures with prestressed concrete members made of high strength concrete.

This paper presents preliminary shear test results of large scale prestressed concrete beams constructed of steel fiber reinforced concrete. Suggested modifications to ACI requirements are discussed.