DOWEL ACTION CHARACTERIZATION IN REINFORCED STEEL FIBER CONCRETE BEAMS

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Abstract: Although many researchers have studied the shear behavior of reinforced steel fiber concrete beams (R/SFRC), there remain important gaps in the knowledge, including the contribution of each load transfer mechanism to the final strength. In this sense, this work aims to add to material's knowledge by investigating experimentally the dowel action behavior in R/SFRC beams. A series of 10 duplicate dowel specimens consisting in beams with 15x25x120 cm in size were tested and a central block isolated from the rest of the specimen was adopted to ensure load transfer exclusively by dowel action. The compressive strength of concrete, the concrete cover and the number of steel rebars were kept constant whereas two rebar diameters (ϕ = 12.5mm or 16mm), two aspect ratios for hooked-ended steel fibers (l/d = 45 or 80) and two fiber contents in volume (Vf = 0.5% or 1.0%) were varied. It was observed that increases in Vf and l/d resulted in greater peak dowel force (Pu) and post-peak descending branch with reduced slope. Comparing Pu of specimens with Vf = 0.5% to those from control specimens with the same properties but having plain concrete matrix, an increase of 20-35% could be observed. For the specimen with Vf = 1.0% and l/d = 80mm, an increase of 83% was recorded. A theoretical model based on the theory for beams on elastic foundation considering matrix non-linear tensile properties obtained experimentally was developed and successfully validated against experimental results.

Keywords: Reinforced concrete; Steel fibers; Dowel action; Shear mechanisms; Beam on elastic foundation