FLEXURAL BEHAVIOR OF UNDER-REINFORCED STEEL FIBER CONCRETE (R/SFRC) BEAMS

Daniel C. T. Cardoso (1) , Gabriel B. S. Pereira (1) , Julio J. S. Holtz Filho (1) , Flávio A.

Silva (1) , Eric V. Pereira (1)

(1) Department of Civil and Environmental Engineering, Pontifícia Universidade Católica do Rio de Janeiro, Brazil

Abstract: This paper reports the findings of an experimental program aiming to investigate the influence of steel fibers in the flexural behavior of under-reinforced reinforced concrete beams (S/SFRC). Hooked end steel fibers with aspect ratios of 48 or 60 were used to produce matrices with fiber content ranging from 0 to 2%, in volume. A full mechanical characterization was carried for each matrix studied, as well as for the reinforcing steel used. Reduced scale beams with reinforcing ratios of 0.28, 0.44 and 0.70% were instrumented with strain gages and displacement transducers. Digital image correlation (DIC) was also used to monitor strain field and crack formation and growth throughout the constant moment region during loading. Experimental load-deflection and moment-curvature relationships are reported, showing gains of capacity ranging from 21 to 109% with respect to conventional reinforced concrete (RC) beams. Increases in cracked stiffness were also observed and all beams presented ductility within desired limits. The results obtained using analytical models are compared to the experimental results and excellent agreement achieved shows that models can be successfully adopted to predict the actual behavior of R/SFRC beams in flexure. Finally, crack formation and growth are reported, showing that the use of steel fibers leads to a pattern characterized by multiple small cracks and a critical wider crack, but with opening much smaller than that obtained for RC.

.