

ABSTRACT

Behavior of RC beams under the effect of static cyclic loads through the addition of steel fibers was investigated experimentally and analytically. The main parameters studied were; the ratio of the longitudinal steel reinforcement, the volume fraction and the aspect ratio of steel fibers, and the loading history.

In the experimental part of the research, 12 proto - type beams and their corresponding control specimens were used to investigate effects of the above mentioned parameters on beams' ductility, curvature, deflection and cracking behavior. Further, cyclic compressive stress - strain curves of tested specimens were obtained experimentally. The analytical part of the study was devoted to develop a computer program suitable for the analysis of SFRC beams under monotonic and cyclic loads. The effects of the above mentioned parameters on the analytical moment - curvature relationships and the distribution of concrete strains along beams depth have been studied. A comparison of experimental and analytical results are presented.

Test results indicate that, addition of fibers was insignificantly affected the compression strength and the modulus of elasticity of tested specimens. An increase in the strain at the peak stress and a reduction in the slope of the descending part of the compressive stress - strain curve were obtained.

As the ratio of the longitudinal steel reinforcement was increased, an improvement in the cracking and yielding stages of behavior and in the ductility of tested beams were obtained. The increase in the fiber content improved the ductility of the SFRC member and enhanced the ability of the material to arrest the crack propagation which resulted in larger number of finer cracks. Whereas, the effect of the aspect ratio of steel fibers on the properties of tested beams was insignificant due to the dominant effect of

the steel reinforcement. For beams tested under full reversed cyclic loads, more cracks and deterioration were observed compared to beams tested under repeated loading only.

The analytical results obtained using the proposed models were in a good agreement with the experimental results.

