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# Behavior of Macro Synthetic Fiber Concrete Beams Strengthened with Different CFRP Composite Configurations

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## Abstract

Thirty-two normal-strength macro discontinuous structural synthetic fiber (DSSF) concrete beams were constructed and tested. In order to determine the optimum dosage of DSSF, eight of the beams were prepared with various dosages of DSSF, while the rest beams were prepared with an optimum DSSF dosage of 0.55% and with various carbon fiber reinforced polymer (CFRP) sheet lengths and widths. The tested parameters include mode of failure, load versus mid-span deflection response, ultimate deflection, ultimate load capacity, energy absorption, stiffness, performance factor, energy absorption ductility index, displacement ductility index, and concrete and CFRP sheet strains. The addition of DSSF and CFRP sheet enhanced most of the investigated parameters by providing internal and external crack arresting mechanisms, respectively, and enhancing the post-cracking ductility after reaching the extreme load capacity.

**Keywords:** Macro Synthetic Fibers; Behavior; beams; Strengthened; CFRP Configuration

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