

Strengthening Reinforced Concrete Beams Externally using Different FRP Systems

Hisham Abdel-Fattah¹, Sameer Hamoush²

Summary

This paper develops Fiber Reinforced Plastic (FRP) Composites retrofit systems to enhance the structural performance of deficient reinforced concrete beams. The paper highlights the design of the different FRP systems and then, systems with promising results are used to upgrade deficient beams. Structural evaluation for retrofitted beams is performed to evaluate the ductility and strength performance. This study mainly focuses on the uses of Glass Fiber Reinforced Plastics (GFRP), Carbon Fiber Reinforced Plastics (CFRP) and hybrid reinforced plastics that use a mixture of carbon and glass fibers. As part of the design of the FRP systems, an experimental program was conducted on small test specimens to determine the stress strain response of various FRP system fiber configurations. Two fiber orientations, 0° , and $\pm 45^\circ$ for two fiber material types, glass and carbon in a vinyl ester resin were evaluated. The performance of these small test coupons was used to design and fabricate different sets of FRP systems for various combinations of fiber types and orientation angles. Each set provided the stress-strain relationship for each FRP system under study. This stress strain model was incorporated into a numerical model of a retrofitted reinforced concrete section to establish moment curvature behavior.

¹Department of Civil & Environmental Engineering, University of Sharjah, P. O. Box 27272, Sharjah, UAE

²Civil & Architectural Eng. Department, North Carolina A & T State University, Greensboro, NC 27411

