41st IAHS WORLD CONGRESS
Sustainability and Innovation for the Future
13-16th September 2016
Albufeira, Algarve, Portugal

EXPERIMENTAL ANALYSIS OF REINFORCED CONCRETE BEAMS STRENGTHENED WITH INNOVATIVE TECHNIQUES

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Keywords: Beams, reinforced concrete, strengthening, experimental analysis, CFRP.

Abstract *The strengthening of reinforced concrete structures with FRP materials has received a considerable increment in recent years due to their durability characteristics, high strength-weight and stiffness-weight ratios of FRP compared to other materials.*

An experimental program was conducted in order to analyze the behavior of different structural solutions to strengthen reinforced concrete beams with carbon FRP composites: EBR (Externally-Bonded Reinforcement), NSM (Near Surface Mounted) reinforcement and an innovative technique externally-bonded using continuous reinforcement embedded at ends (CREatE). The reinforced concrete beams had a 3m span by 0.3m height and were tested until rupture in a 4-point bending test system.

The CREatE technique has proved to be the most effective of the three alternatives tested, with the full utilization of the CFRP and the highest strength, combined with the highest ductility.

CONCLUSIONS

When analyzing the tests carried out, it is evident that the CREatE strengthening technique has brought a series of advantages: it has provided expected rupture modes by the reinforcement (Figure: 7c); has improved the bending and shear behavior; and has allowed a significant increase in the yield load and on the rupture load, with a significant improve on the ductility in displacement of the beams strengthened with this technique. CREatE is furthermore a versatile technique that allows the strengthening reinforcement to be applied either externally (EBR) or embedded on the cover (NSM), and thus exploits the advantages associated with each of these strengthening methods.

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