Shear Strengthening of Reinforced Concrete Deep Beams Using Carbon Fiber Reinforced Polymers

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Abstract : This experimental investigation deals with shear strengthening of reinforced concrete (RC) deep beams using the externally bonded carbon fiber-reinforced polymer (CFRP) composites. The current study, therefore, evaluates the effectiveness of four various configurations for shear strengthening of deep beams with two different types of CFRP materials including sheets and laminates. For this purpose, a total of 10 specimens of deep beams were cast and tested. The shear performance of the strengthened beams is assessed with respect to the cracks' formation, modes of failure, ultimate strength and the overall stiffness. The obtained results demonstrate the effectiveness of using the CFRP technique on enhancing the shear capacity of deep beams; however, the efficiency varies depending on the material used and the strengthening scheme adopted. Among the four investigated schemes, the highest increase in the ultimate strength is recorded by using the continuous wrap of two layers of CFRP sheets, exceeding a value of 86%, whereas an enhancement of about 36% is achieved by the inclined CFRP laminates.