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Repair and Strengthening of Plain and FRC Shear Deficient Beams Using Externally Bonded CFRP Sheets

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Abstract : This paper presents experimental and analytical study on the behavior of repaired and strengthened shear critical RC beams using externally bonded CFRP bi-directional fabrics. The use of CFRP sheets to repair or strengthen RC beams has been repetitively studied and proven feasible. However, the use of combined repair techniques and applying that method to both plain and FRC beams can maximize the shear capacity of RC shear deficient beams. A total of twelve slender beams were tested under four-point bending. The test parameters included CFRP layout, number of layers and fiber direction, injecting cracks before applying repairing sheets, enhancing the flexural capacity to differentiate between shear repair and strengthening techniques, and concrete matrix types. The findings revealed that applying CFRP sheets increased the overall shear capacity, the amount and orientation of wrapping is of prime importance in both repairing and strengthening, CFRP wrapping could change the failure mode from shear to flexural shear, the use of crack injection combined to CFRP wrapping further improved the shear capacity while, applying the previous method to FRC beams enhanced both shear capacity and failure ductility. Acceptable agreement was found between predicted shear capacities using the Canadian code and the experimental results of the current study.

Keywords : CFRP, FRC, repair, shear strengthening
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