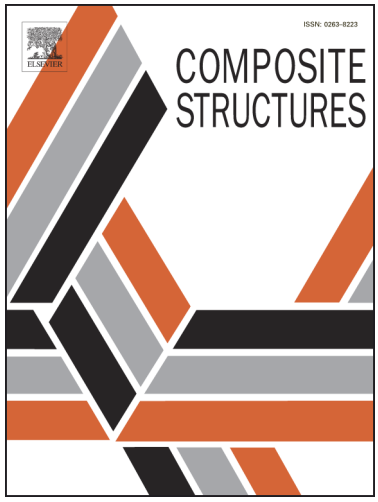

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FLEXURAL BEHAVIOR OF PRELOADEDREINFORCEDCONCRETE BEAMS STRENGTHENED BY PRESTRESSEDCFRPLAMINATES

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ABSTRACT

This study focuses on evaluating flexural behavior of preloaded reinforced concrete beams (RC) strengthened with pre-tensioned (prestressed) carbon fiber reinforced polymer (CFRP) laminates. A technique for tensioning and application of pre-tensioned CFRP laminates strengthening system were developed. In order to verify the effectiveness, a total of twelve RC beam specimens were strengthened and tested under monotonic three-point loading up to failure. For comparison purposes, one unstrengthened control (as-built) RC beam and another specimen strengthened with conventional non-tensioned CFRP laminates were tested. The other ten RC beam specimens were strengthened with pre-tensioned CFRP laminates and the performance was compared to the control specimens. Several influential experimental parameters were considered including: (i) pre-tensioned strain level, (ii) CFRP reinforcement ratio, and (iii) sustained loading level. Experimental results indicated that the first two parameters of pre-tensioning strain and CFRP reinforcement ratio had significant influence on both flexural strength and stiffness of the strengthened beams. However, experimental results indicated that the level sustained load had less influence, especially when failure mode is in the form of CFRP laminates rupture. Also, the behavior of retrofitted beams was simulated using nonlinear finite element analyses. Good correlation between experimental and numerical

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