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## Flexural Behavior of RC Beams Strengthened by NSM-CFRP Laminates or Bars

**Abstract-** *The strengthening and enhancing the structures represents an important aspect in the construction industry due to the growing need to increase the tolerability of origin to a specific level and within the required rehabilitation and maintenance work. This paper assessed the performance and effectiveness of the Near Surface Mounted (NSM) strengthening technique for the reinforced concrete beams. Three (140x260x2700 mm) reinforced concrete beams were strengthened in flexure with NSM strengthening systems using Carbon Fiber Reinforced Polymer (CFRP) strips, bars, and cement-based adhesive as a binding materials. The flexural behaviour of the beams was evaluated by testing the specimens under three-point loading to failure. The structural performance, deflection, ductility, stiffness, and modes of failure of the tested beams are presented and discussed in this paper. The test results indicate that using NSM-CFRP strips and bars is practical and significantly improves the stiffness and increases the flexural capacity of reinforced concrete beams. The strength increments were 48, 42, and 15 percent recorded with CFRP bars, rough strips, and smooth strips respectively. The deflection of the strengthened beams was reduced by about 66, 48, and 58 percent for CFRP smooth strips, rough strips, and CFRP bars respectively, compared with the control beam due to the increased stiffness of the strengthened beams.*

**Keywords-** *CFRP; NSM; NSM CFRP flexural strengthening; reinforced concrete beams;*

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