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Entitled

Shear Behaviour of RC Beams Reinforced with Different Configurations of Internal Steel Plates

By

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ABSTRACT

This thesis aimed to investigate the applicability of using special configurations of web reinforcement in RC beams. It studied experimentally and analytically the shear performance of RC beams in order to limit the propagation of the shear crack width, as well as to increase their shear strength. Accordingly, a pre-prepared steel trusses have been configured and assembled using steel strips of 2 mm thickness. They were used to reinforce the shear span zone of the reinforced concrete beams. For comparison purpose, corresponding steel trusses were assembled from equivalent rounded steel bars to reinforce RC beams. Then, the shear behaviour of reinforced concrete beams with either trussed strips or trussed bars was compared. Accordingly, an experimental program consisted of fifteen reinforced concrete beams, including one control beam, has been prepared, where the shear span-to-depth ratio was the same for all tested beams (a/d=2.3). The studied shear span was kept free of web reinforcement to clearly identify the effect of the proposed trusses. Whereas the other shear span was designed to sustain the ultimate loads. The studied parameters included: (a) the configuration of the assembled members (vertical, inclined, and truss), (b) the cross-sectional area of the truss members (28, 50, and 80 mm^2), and (c) the spacing between the vertical members (160, 200, and 265 mm). Test results showed that the beams reinforced with trussed steel strips have better shear performance than that of the beams reinforced with equivalent trussed bars. This is because the internal trussed strips have higher surface area than that of the equivalent rounded bars which enabled the reinforced beam to maintain the confinement of the concrete core thus decreased the major shear crack width and increased the ultimate strength of

reinforced concrete beams. Consequently, the ultimate capacity for reinforced concrete beams reinforced with internal trussed strips was higher than the corresponding capacity of beam reinforced with equivalent trussed bars by an average value of about 16%. Besides, the internal steel strips hindered the appearance of shear cracks and decreased the major shear crack width compared to the case of using equivalent rounded bars by an average value of about 54%. Moreover, the experimental findings showed comparable results against the available analytical models from the viewpoints of ultimate shear capacity and maximum shear crack width.