Flexural Behavior of Composite Reinforced Concrete T-Beams Cast in Steel Channels with Horizontal Transverse Bars as Shear Connectors .

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ABSTRACT

The experimental investigation described herein concerns the flexural behavior of composite reinforced concrete T-beam cast in steel channel with horizontal transverse bars extending between the flange of the steel channel. That behavior is represented by the load~mid span deflection ,and the load~relative longitudinal end-slip relationships.

Five large-scale composite reinforced concrete beam models of the configuration, constituent geometry ,and interconnection defined above have been manufactured, loaded up-to-failure, observed and measured in the laboratory to predict the fracture patterns in addition to the ultimate bending moment capacity, flexural stiffness, and flexural integrity from the two specified relationships.

Differences between each of the five beams and the other four ones concern variance of the transverse-bar shear connectors in one or more of the following aspects : amounts, span wise distribution, diameters, and connector diameter :spacing ratios .

The experimentally_ obtained load~mid span deflection relationship of a typical composite reinforced concrete T-beam cast in steel channel has been compared with corresponding relationship based on the British standard method for reinforced concrete beams then extended to analyzing beams of the present

studied composite system (with full interaction assumption). From this compression , the partial –interaction evaluation has been evaluated and found to be of a high degree(41% in average), furthermore, a modification to Branson's equation of the equivalent second moment of area of a reinforced concrete beam cracked cross-section (adopted by the ACI- code) has been suggested here to make that equation suitable for the deflection computation of the present composite reinforced concrete beams. As compared with the BS-method prediction, the present modification on the ACI method (also assuming full interaction) has given high agreement with the former theoretical method and a slightly softer idealization were the maximum discrepancy is 9% .

The privilege of the present horizontal-bar shear connector over the traditional headed-stud style in reinforced concrete T-beams cast in steel channel has been verified and evaluated by a comparative investigation with the findings of a recent previous experimental study on such composite reinforced concrete T-beams with the competitive headed-stud shear connectors , from which beams with new horizontal-bar shear connector have revealed substantially higher ultimate bending moment capacity ,flexural stiffness and flexural integrity (represented by the measured relative longitudinal end-slip). Enhancement realized in the mechanical parameters specified above are 43% , 33% and 33% respectively.

An experimental parametric study on the effect of the variations of the horizontal transverse-bar shear connector in the four formerly- stated aspect has been carried out to evaluate effects of the variances in those aspects then to model the beam of optimum specific amount, distribution, spacing and diameter of horizontal transverse-bar shear connectors.