

عنوان مقاله:

Enhancing the Flexural Capacity of Reinforced Concrete Beam by Using Modified Shear Reinforcement

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خلاصه مقاله:

Many researchers have studied how modifying conventional shear reinforcement into spiral and truss systems improves the behavior of RC beams. However, there is a scarcity of studies investigating the influence of spiral reinforcement, and limited research is available on the flexural capacity of beams utilizing truss reinforcement systems. Additionally, recent designs focused only on the rectangular spiral and rectangular truss systems, underscoring the necessity of incorporating a new design of modifications in the stirrup configurations. These gaps must be addressed to identify the most effective design for achieving the desired flexural capacities. As a result, the present study conducts a simulation and experimentation on RC beams utilizing modified stirrups through the Abaqus software to describe the load-deflection relationship, determine the flexural capacity and ductility, and analyze the failure mode and crack patterns. The present study simulated seventeen finite element models, including one control beam as BN and four various designs that used rectangular spiral (BR-S), rectangular truss system (BT-R), and a new modification, namely vertical X-shaped stirrups (BV-X), and X-shaped truss system (BT-X) with four spacings of ۱۵۰mm, ۱۲۵mm, ۱۰۰mm, and ۷۵mm. The findings reveal that the most effective enhancement in RC beam behavior was observed within the BT-R group, particularly with BT-R ۱۰۰, which demonstrated a remarkable ۶.۵۵% increase in flexural capacity compared to BN. Moreover, stirrup spacing and inclination considerably impact the beam's performance, depending on the various modifications of stirrups in RC beams. Furthermore, uniform failure modes have been observed across all models and specimens, including BN, demonstrating that modified stirrups improve RC beam performance. The present study compared and verified the finite element simulation results through an actual experiment from BN and BT-R ۱۵۰ models and specimens. Doi: ۱۰.۲۸۹۹۱/CEJ-۲۰۲۴-۰۱۰-۰۶-۰۲ Full Text: PDF

کلمات کلیدی:

Modified Stirrups; Spiral; Truss Reinforcement; X-shaped stirrups; Finite Element Method

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