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NON-LINEAR ANALYSIS TO IMPROVE PUNCHING SHEAR STRENGTH IN FLAT SLAB USING Z-SHAPE SHEAR REINFORCEMENT

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ABSTRACT

Currently, flat slabs become one of the widely used structures due to its architectural benefits such as uncomplicated formwork, flexibility and minimum construction time. However, these structures are relatively weak to resist the punching shear due to a considerable lowering in stiffness induced from the development of cracks that resulting from axial and seismic loads. Moreover, the punching failure is considered a brittle failure caused by the transferring of unbalanced moments and shear forces between the structural members. Unfortunately, this may cause a catastrophic collapse, especially in the region of the slab-column. Therefore, many experimental and theoretical studies were done to improve the punching strength of the flat slab. In the current work; a finite element three-dimensional non-linear analysis has simulated by ABAQUS tool to investigate the structural behaviour of flat slab. Two specimens have considered, the first is a flat slab reinforced by ordinary steel reinforcement. While in the second one, a Z-shape shear rebar improvement has been added to the slab-column connection. The proposed model has reflected a reasonable enhancement to the flat slab. The analysis considers different parameters such as punching shear forces, deformations, and stresses of Von-Mises. The outcomes indicate that punching shear strength is increased by approximately 11.1%, and the deflections are decreased by 77.3% when the Z-shape reinforcement is used. In the meantime, stress concentrations were reduced and move from the slab-column connection.

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