# Strength and Ductility of Lightweight Reinforced Concrete Slabs under Punching Shear

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**Abstract**

Preventing a sudden punching failure and achieving an economic design, require reliable mechanical models that make physical sense. In addition, Lightweight (LW) concrete is gaining a lot of attention due to its economic advantage. Moreover, all design codes offer punching shear provisions for LW concrete as a viable alternative for the conventional Normal weight (NW) concrete. However, these punching shear provisions were developed for NW concrete slabs. The purpose of this study is to develop a mechanical model for the punching shear behavior of LW concrete slabs, that make physical sense. Inspired with the well-established critical shear crack theory, a punching shear mechanical model for LW concrete slabs was developed, validated, and proposed. In addition, using the proposed model, a parametric study was conducted in order to investigate the effect of concrete density, slab depth, flexure reinforcement ratio on the strength and ductility of LW concrete slabs under punching loads. The proposed model accounted for the effect of concrete type using both the aggregate size and the concrete density. Thus, resulted in a more consistent and more accurate strength and rotation predictions compared to existing models and design codes with respect to the experimental results of LW concrete slabs. The results of the parametric study showed that increasing the concrete density, decreasing the slab depth leads to an increase in the failure strength, the failure rotation, and the ductility. In addition, increasing the flexure reinforcement ratio increase the strength but decreases the failure rotation and ductility.

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