

# EVALUATION OF TENSILE AND COMPRESSIVE MEMBRANE ACTION IN ISOLATED SLAB COLUMN SPECIMEN

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## ABSTRACT

Older flat-plate buildings are susceptible to progressive collapse in which the failure of one slab-column connection can propagate to other connections and cause a full collapse of the building. The most common mechanism of failure in flat-plates is known as punching shear, when inclined shear cracks propagate through the depth of the slab and cause a conical failure around the column. Alternative resistance mechanisms such as compressive and tensile membrane action may enhance the strength and ductility of a slab and arrest the progression of the collapse. It is hoped that providing sufficient in-plane lateral restraint on an isolated slab-column specimen with continuous reinforcement will better develop these in-plane forces.

An isolated slab-column specimen with 1% reinforcement ratio was tested in negative bending with in-plane lateral restraint and continuous reinforcement through the column. The slab achieved a punching shear strength of 70 kips before the first failure with 5 kips of lateral compressive force acting on the sides of the slab. It was found that the in-plane compressive forces only enhanced the capacity by 1%, but it is believed that the horizontal stiffness of the test setup was insufficient in developing the full potential of compressive membrane action. The tension reinforcement in the slab around the column experienced yielding well before the punching shear failure took place. Following the punching failure, the slab achieved a residual capacity of 69 kips due to the continuous reinforcement through the column. This indicates that the slab showed tremendous ductility as a result of the ability of the slab to develop tensile membrane action.