

Push-off tests of loop bar shear connectors of precast concrete walls

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ABSTRACT

Recently, precast concrete wall structural systems have gained significant attention in the construction industry. The structural system reveals a strong preference among engineers when building medium-rise residential buildings. One of the prevalent vertical connection types of precast concrete walls is known as a loop bar joint. This type of joint provides simplicity in the construction and installation processes. While most research typically emphasizes the study of developing joint configurations of the precast wall systems to enhance their seismic resistance, the understanding of the behavior of existing buildings using the precast wall systems and those to be constructed remains relatively underexplored. In this study, a push-off test was conducted to investigate the direct shear behavior of various configurations of loop bar connections. A total of 12 panels assembled into 6 vertical joint specimens with different joint configurations were tested. The specimens were divided into two groups, loop bar joints with and without shear keys. The number of loops varied between 1 and 2 bars and were made of either 6-mm RB or 5-mm wire rope. The shear force, panel deformation, shear deformation of the joint, and failure mode of the joint were observed. From the results, the joints with 5-mm wire rope yielded the lowest shear capacity among all specimens. The shear strength of the vertical plane joints increased when increasing the number of 6-mm RB loop bars from 1 to 2 loops. Adding shear keys significantly increases the shear strength of the shear connections.

Keywords: earthquake, precast concrete wall, joint, push-off test