# Performance of Masonry walls Under In-Plane Seismic Loading

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**Abstract:**

This paper presents the results of in-plane dynamic tests of masonry walls. Five half-scale walls were built, using half-scale hollow clay brick units. Two mo- ment/shear ratios (1.4 (slender) and 0.7 (squat)) and two mortar types (M2.5 and M9) have been investigated. Four walls were tested as Un-Reinforced Masonry (URM) walls. The fifth wall was specially designed to study the shear behavior of a slender masonry wall. This was achieved by applying two vertical plates of carbon fiber reinforced poly-mers (CFRP) on a single side of the test specimen. These CFRP plates increased the specimen's flexural strength with minimal increment in its shear strength. The test specimens were subjected to a series of synthetic earthquake motions with increasing intensities on a uni-axial earthquake simula- tor. The test results show that the walls behavior is highly dependent upon the moment/shear ratio and level of the normal force, with material properties playing a smaller role. For slender URM specimens, the behavior was domi- nated by rocking. For other specimens, the behavior was dominated by mixed modes of failure (shear and flexural). The average cracking drifts were 0.06% for slender speci- mens and 0.08% for squat specimens. Also, the maximum measured drifts were 0.76% for slender URM specimens and 0.33% for other specimens. The cracking load ranged from 65 to 77% of the ultimate load for slender and squat walls, respectively. In addition, the lateral resistances of the specimens were compared with the prediction using exist- ing simple models. In the case of slender URM specimens, the measured lateral resistances were approximately 97% of the calculated flexural strengths. In case of squat speci- mens, the measured lateral resistances ranged from 104% to 166% of the predicted shear strengths and 85% of the predicted flexural strengths. For the slender specimen with CFRP, the measured lateral resistance was approximately 78% of the predicted shear strength.



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