In-Plane Behavior and Strength of Fully-Grouted Reinforced Masonry Shear Walls

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Abstract:

The objectives of this paper are to experimentally study the in-plane behavior of fully grouted (FG) reinforced concrete masonry shear walls, explore the influence of different parameters, e.g. size of specimen and aspect ratio, on the lateral resistance of such walls, assess the appropriateness of the existing analytical shear strength prediction methods, and determine the influence of mortar formulation in the behavior of such walls. To accomplish this, four fully-grouted Special Reinforced Masonry Shear Walls (SRMSW) were constructed based on the provisions of the Masonry Standards Joint Committee (MSJC) 2008 code and subjected to in-plane reversed cyclic displacements. Full-size/full-scale walls were chosen to better represent walls in real buildings, and were the largest walls tested to date. The experimental test variables included mortar formulation and unit type (concrete and clay). To aid in satisfying the objectives, current test walls are compared with 43 wall specimens which exhibited shear failure modes, and 15 wall specimens that exhibited flexural failure modes in the past research studies. The results of this study indicate that although the shear strength expression adopted by MSJC (2008) is conservative for most fully grouted reinforced masonry shear walls, this conservatism decreases as the size of the wall increases. For the two fully grouted reinforced clay block masonry shear walls tested in this research program, with reinforcement located at 1220 mm (48 in.) on center, it is found that the MSJC (2008) shear strength expression is unconservative, which shows a potential knowledge gap related to the behavior of such walls. Moreover, it was concluded that, despite minor influence on the type of failure and energy dissipation of the shear walls, mortar formulation does not impact the shear resistance of fully grouted reinforced masonry shear walls.

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