

Sensitivity Analysis of Parameters on the In Plane Behavior of Unreinforced Masonry Wall Strengthened with Steel Wire Reinforced Cementitious Matrix (SWRCM)

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Abstract:

Retrofitting using steel wire mesh embedded in the cementitious matrix (SWRCM) can be an effective and economical solution for improving the in-plane capacity of unreinforced masonry (URM) walls. The in-plane capacity of masonry walls strengthened with SWRCM can be defined as a function of various parameters such as geometric and material properties of the masonry wall, area of reinforcement, strength of the cementitious matrix, and overlay thickness. To understand the effect of these parameters, a sensitivity analysis using finite element (FE) models was carried out considering a wide range of properties. Three different aspect ratios along with three types of compressive strength of masonry (weak, moderate, and strong masonry) were used to develop the FE model of URM walls. The numerical model URM walls were strengthened using five different steel wire mesh either on one side or both sides. To evaluate the role of the cementitious matrix, two different strengths along with two distinct thicknesses (7mm and 15mm) were considered in this study. In total 369 FE models were analyzed to understand the effect of these parameters on the in-plane lateral load behavior of URM walls. The numerical results showed that the strength of the cementitious matrix could play a crucial role in the in-plane capacity of the SWRCM-strengthened masonry wall. Also, the study provides an understanding of the influence of various parameters on the in-plane lateral load carrying capacity of masonry strengthened with SWRCM. Further, using the parametric results, an analytical investigation was performed and the suitability of existing equations for the prediction of in plane strength was evaluated.

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