

In-Plane Strengthening of URM Infill Wall Assemblages Using GFRP Laminates

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Abstract:

An experimental investigation was conducted at Drexel University to study the in-plane behavior of face shell mortar bedding (FSMB) unreinforced masonry (URM) assemblages strengthened with different glass fiber-reinforced polymer (GFRP) composite laminates. A total of fifty-seven URM assemblages were tested under different conditions of stresses present in infill walls. Twenty-four specimens were loaded in compression normal to the bed joints, nine were compressed parallel to the bed joints, and twenty-four specimens were loaded under direct shear. Parameters such as the type of fibers, the number of plies, and the fibers orientation were investigated. The general behavior of each specimen type is discussed with emphasis on failure loads and modes of failure. Results showed that the application of GFRP laminates on URM has a great influence on strength, post peak behavior, as well as failure modes. An increase of 90% for compressive strength was achieved using the GFRP laminates and the shear strength increased by fourteen folds. Results showed that the use of GFRP laminates for in-plane strengthening of masonry walls would produce an engineered masonry-GFRP composite wall in which the masonry face shells provide the compressive strength and the GFRP laminate supplies the required tensile and shear strengths as well as assisting the face shells in carrying compression loads.

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