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In-plane Behavior of Un-reinforced Brick Masonry Walls Retrofitted with Partially Confined Reinforced-concrete Bands: Shake Table Experiments

Lakshmi Latha[1], Samit Ray Chaudhuri[2]

[1]Ph.D. Scholar, Dept. of Civil Eng., Indian Institute of Technology Kanpur
[2]Professor, Dept. of Civil Eng., Indian Institute of Technology Kanpur

Abstract

Un-reinforced brick masonry structures are popular in many countries. In India, un-reinforced brick masonry constitutes the majority of the total building stock, which is quite common in urban and rural areas due to cost constraints. In seismically active places, failure of such structures, frequently not designed and built according to best engineering practice, can be catastrophic. Hence, strengthening of these structures has become extremely important. In this study, the efficiency of partial-confinement using reinforced-concrete bands on the in-plane behavior of un-reinforced brick masonry walls was investigated using shake table tests. For this purpose, several half-scale clay brick masonry walls were constructed. Many of these wall specimens were retrofitted with horizontal and vertical reinforced-concrete bands by cutting grooves on the wall surface to simulate partial confinement. These wall specimens, with and without reinforced-concrete bands, were then tested on a unidirectional shaking table at IIT Kanpur. A series of ground motions, scaled to simulate different intensity levels, were then applied in the in-plane direction of the wall specimens. It was observed from these tests that while the un-reinforced wall specimens showed a tendency to significant damage, the partially confined wall specimens maintained structural integrity. Further, the proper connection of reinforced-concrete bands with the wall, roof slab, and base slab was found to delay the failure, thus improving the structural performance.

Keywords: Un-reinforced masonry, Reinforced-concrete bands, Partial-confinement, Shake-table test