ABSTRACT

Earthquakes are natural hazards under which disasters are mainly caused by damage to structures or collapse of buildings and other man-made structures. Shaking and ground rupture are the main effects created by earthquakes, principally resulting in more or less severe damage to buildings and other rigid structures. As the earth vibrates, all buildings on the ground surface will respond to that vibration in varying degrees. The horizontal ground motion action is similar to the effect of a horizontal force action on the building.

The seismic vulnerability of masonry buildings is strongly affected by the performance of the shear walls. The shearing strength of masonry mainly depends upon the bond or adhesion at the contact surface between the masonry unit and the mortar. Use of strong mortars, high strength masonry, added reinforcement, improved detailing and the introduction of good anchorage between masonry walls and floors and roofs have enhanced the resistance of masonry to seismic stress. Since shear strength is important for seismic resistance of masonry walls, an attempt has been made to investigate the brick masonry wall with clay brick / fly ash brick having the ratio of 1:6 cement mortar with partial replacement of fine aggregate with fly ash as 0%, 10% and 20% for their compressive strength and shear strength. Horizontal reinforcing of wall is required for imparting strength against plate-action and for tying the perpendicular walls together. When the masonry wall is subjected to lateral loading, the horizontal reinforcement prevents separation of the wall’s cracked parts at shear failure, therefore improving the shear resistance and energy absorption capacity of the wall. Also, when the wall is adequately reinforced horizontally, many smaller cracks will be evenly distributed over the entire surface of the wall. Experiments have been conducted to understand the shear behavior of the unreinforced and the reinforced masonry wall.

In-plane shear response of masonry walls was investigated under the combination of constant vertical compression load and increasing horizontal or lateral in-plane load and diagonal compression (shear) load as per ASTM standard. The results indicated that the clay brick masonry in the ratio of 1:6 cement mortar with 20% replacement of fine aggregate with fly ash and fly ash brick masonry in the ratio of 1:6 cement mortar with 10% replacement of fine aggregate with fly ash performed well with their compressive strength and shear strength. Using the results obtained from the experiments, a simplified model for the elastic modulus and in-plane shear capacity was developed. Brick masonry wall in seismic zones was suggested, as a contribution towards the development of housing unit in India.
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