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THE PERFORMANCE OF URM WALLS DURING THE 2017 SARPOL-E ZAHAB EARTHQUAKE IN IRAN

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Unreinforced Masonry (URM) buildings are still one of the most popular structural systems in some regions of the world, mainly due to low cost, availability of construction materials and ease of construction.

In Iran, different types of URM buildings can be found in rural and urban areas. Unlike the early traditional URM buildings which did not have appropriate elements to integrate the structural components (walls, roofs and foundation), according to the Iranian Building Regulations, using beam and column tie elements in URM buildings based on a series of prescriptive provisions have been mandatory in recent decades. The tie elements in confined masonry buildings not only provide the integrity of the structural elements, but also by confining the URM walls enhance their in-plane nonlinear deformation capacity.

Masonry walls in URM buildings are one of the main load resisting elements. They resist the gravity loads as well as the lateral loads due to earthquakes as shear walls. In other words, they provide the lateral load resisting system for the URM buildings. In addition, the URM walls are susceptible to out-of-plane failure due to the inertia force component normal to their plane. Consequently, the global seismic performance of the URM buildings depends on the performance of the masonry walls.

Observation and investigation on the performance of structures after major earthquakes, not only give realistic insight about their seismic behavior, but also help to evaluate the code provisions which influence the future editions of the building design codes. There are several reports and articles which concentrate on the seismic performance of different types of constructions in major seismic events.

Figure 1. Observed damages in URM walls in Sarpol-e Zahab earthquake.

According to the significant number of the URM buildings (traditional and confined) in Iran and importance of the behavior of URM walls, in this article, different types of damages in load bearing and non-structural masonry walls in URM buildings observed after 2017 Sarpol-e Zahab Earthquake have been reported, see Figure 1. Different types of in-plane mode of failure, out-of-plane cracking and combined in-plane and out-of-plane failure were observed in URM shear walls.

Furthermore, the global seismic behavior of the URM buildings which is the result of the seismic performance of masonry shear walls are evaluated and discussed. Moreover, the role of RC beam and column tie elements on the in-plane behavior of the confined masonry walls has been demonstrated.

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