



Assessment of Seismic Capacity for Reinforced Concrete Frames with Perforated Unreinforced Brick Masonry Infill Wall

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Abstract

Infill walls increase the strength and stiffness of the reinforced concrete frames, but they usually are not considering in design. However, when the infills are considered in the design, the opening for doors/windows necessitates investigation as well. This research work aims to investigate the effect of perforations (openings) in the infill walls on the performance of infilled RC frames, in other words, this research investigates the number of infill walls in infilled RC frames. Based on the current construction practices in Pakistan, two full scales perforated infilled RC frames were constructed in the laboratory. One infilled RC frame has an eccentric door and window (specimen-1) while the other has only window at its centre (specimen-2). Both the specimens were tested against reverse cyclic loading (quasi-static test). From the experimental testing, it was found that infilled RC frame having less amount of opening in infill wall has more resistance to lateral loads, have more stiffness and dissipated higher energy as compared to infilled RC frame having a significant size of the opening in infill wall. Similarly, displacement ductility (μ_D) and Response modification factor (R) also depend on the quantity of opening in infill wall in infilled RC frame.

Keywords: RC Frame; Masonry Infill; Perforations; Quasi-static Test; Seismic Behaviour; Cyclic Loading; Performance Levels.

1. Introduction

Infilled walls are provided in Reinforced Concrete (RC) frames around the globe for insulation against temperature, moisture, noise and fire [1]. These are considered as nonstructural components and are often, therefore, usually neglected in structural analysis and design [2]. If separation joints are not provided between the infilled walls and frames, under seismic excitations, these walls might contribute to the load resisting mechanism and failure pattern of RC frames [3]. During an earthquake, both the positive and negative role of infilled walls on RC frames have been observed. In some cases, the infilled wall increased the strength and stiffness of RC frames [4] while in other cases, these might led to shear failure of RC frame columns [5].

It is worthy of mentioning that the absence of infilled wall in the bottom of the middle storeys may result in forming soft storey mechanism [6]. Similarly, the partial infilled wall can create short column effect [7], and

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