In-Plane Behavior of Strengthened Unreinforced Masonry Infill Walls: Experimental and Numerical Study

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Abstract

Masonry walls are often regarded as non-load-bearing components in most steel or concrete-framed buildings which effectively increases the total system's strength and stiffness when subjected to horizontal forces. This paper will discuss the experiment using reversed quasi-static cyclic sinusoidal displacement-controlled loading on the masonry infill wall and explains the outstanding ductility capability of masonry infills in Reinforced Concrete (RC) frames, as seen during cyclic experimental testing on wall specimens. The study's primary aim was to describe how the rectangular brick infill panels on RC frames behave during earthquakes. The results regarding in-plane force-displacement responses, damage evolution and energy dissipation capacity will be presented. Ultimately, the experimental tests were simulated in the software ABAQUS through a simplified modelling approach and validated against the experimental results.

Keywords: Masonry Infill Walls; Quasi-Static; Textile Reinforced Concrete (TRC); Numerical Simulation; Force-Displacement Responses.

1 Introduction

The most popular structural technologies globally are reinforced concrete (RC) frames and masonry infill walls (MIW). Across the world, particularly in developing nations like India, these structural types are employed for low- to medium-rise buildings. Infill panels are employed as partitions in these structures, while the enclosing frame serves as a structural skeleton to handle lateral and vertical loads. It is standard practice not to include the infill walls in the numerical models used for practical structural analysis and design purposes when building such structural systems against seismic activities because these parts are not load-bearing [1]. By doing this, their contribution to the frame's stiffness and strength and its interaction with the load-bearing components (i.e., the beams, columns, and walls) are entirely disregarded.

As a result, based on structural assessments, the actual performance of infilled RC frames would differ from the predicted performance [2]. The interaction of the frame and infill between the interfaces between the surrounding structure and the infill walls, which increases the stiffness of the entire frame, is typically the only way that infill walls are considered. Masonry infill walls can significantly impact the structural performance of

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