buildings

MDPI

Article

Experimental Study of Infill Walls with Joint Reinforcement Subjected to In-Plane Lateral Load

Jesús Martin Leal-Graciano [1,*], Juan J. Pérez-Gavilán [2], Alfredo Reyes-Salazar [1], Federico Valenzuela-Beltrán [1], Edén Bojórquez [1] and Juan Bojórquez [1]

[1] Facultad de Ingeniería, Universidad Autónoma de Sinaloa, Calz. Las Americas Nte. S/N, CU, Culiacán de Rosales 80013, Mexico; reyes@uas.edu.mx (A.R.-S.); fvalenzuelab@uas.edu.mx (F.V.-B.); eden@uas.edu.mx (E.B.); juanbm@uas.edu.mx (J.B.)

[2] Instituto de Ingeniería, Universidad Nacional Autónoma de México, Av. Universidad 3000, CU, Ciudad de México 04510, Mexico; jperezgavilane@iingen.unam.mx

* Correspondence: jesusleal@uas.edu.mx

Abstract: The results of an experimental study of four infilled frames with brick masonry walls subject to reversal cyclic lateral load are presented. The variables studied were the height to length aspect ratio of the wall and the use of joint reinforcement. The investigation was motivated by the fact that the Mexican code establishes the same specifications about the use of joint reinforcement for infill walls as for confined walls, because there is not enough experimental evidence on joint reinforced infill walls. To investigate the possible interaction of the study variables in the seismic performance of the walls, two pairs of specimens, scaled 1:2, with different aspect ratios (H/L = 0.75, 0.41) were tested. The specimens in each pair were identical except that one of them included steel bars into the bed-joints as reinforcement leading to amount $p_h f_{yh} = 0.6$ MPa. The infill walls with H/L = 0.41 were included from a previous study. The behavior of the specimens was defined in terms of lateral strength, ductility, displacement capacity, deformation of the joint reinforcement and crack pattern. The results indicate that joint reinforcement increases the strength of the system; however, the increase was more pronounced in longer walls. Ductility was reduced with horizontal reinforcement and this behavior was more important for longer walls. As occurred in confined walls, the joint reinforcement generates a more distributed cracking and reduces the width of the cracks. The experiments are described and this and other results are discussed in detail.

Keywords: infill wall; joint reinforcement; infilled frame; seismic behavior; RC frame structure

check for updates

Citation: Leal-Graciano, J.M.; Pérez-Gavilán, J.J.; Reyes-Salazar, A.; Valenzuela-Beltrán, F.; Bojórquez, E.; Bojórquez, J. Experimental Study of Infill Walls with Joint Reinforcement Subjected to In-Plane Lateral Load. *Buildings* **2022**, *12*, 259. https://doi.org/10.3390/buildings12030259

Academic Editor: Alessandra Aprile

Received: 18 January 2022
Accepted: 16 February 2022
Published: 23 February 2022

1. Introduction

Load-bearing walls are those that support both vertical and lateral loads. Usually, when these type of walls are used, they constitute the main resisting elements in the system. Historically, unreinforced masonry was used for load-bearing walls around the world; however, it is rarely used now a days in seismic zones where it has been replaced by reinforced and/or confined masonry walls. Reinforced masonry is seldom used in developing countries, such as Mexico, mainly due to its high cost when compared to confined masonry [1]. For this reason, we will restrict our presentation to confined masonry walls.

On the other hand, infill walls are surrounded by beams and columns of a structural frame, to which they provide rigidity against lateral loads [2]. Unreinforced masonry is still the dominant masonry system for infill walls. Only recently, confined masonry was proposed as an alternative system for infill walls (Figure 1). It has been observed in experimental tests, that unreinforced masonry infill walls can fail out of plane once they have developed some type of cracking during an earthquake. Confining elements reduce the vulnerability of the wall to out-of-plane failure and improve the performance of in-plane walls [3]. The system was adopted in the Mexican code, while unreinforced