Seismic evaluation of masonry-infilled RC frames strengthen with shotcrete

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Masonry-infilled RC frames have been used in buildings for architectural and structural purposes. For Seismic behavior improvement, assessment of masonry-infilled frames is necessary. Masonry-infilled RC frames is such a usual structural method that if these frames been designed adequate would improve seismic performance of structure. In this article seismic behavior of masonry-infilled RC frames subjected to push-over analysis has been assessed by using ABAQUS. After verification , RC frame with masonry infill has been modeled and has been strengthened with shotcrete. The result of two cases has been compared and show that the strengthened ones are better in strength and stiffness and ductility.
Keywords: RC frame, masonry infill, shotcrete

1. Introduction

An important issue to note in strengthening is to identify and evaluate structures to be strengthened. Strengthening and reinforcing constructions may reduce the probability of losses and damages in future, and vulnerability of structures to damages. However, there is a limit to such reduction. It is obvious that the scope and extent of reinforcement should be limited based on the seismicity of the region where the structure of interest is located.
Different methods have been studied for improving or reconditioning infill panels. One of these methods is shotcreting in which a mesh of reinforcing bars is placed on one or two sides of walls. The spacing and size of bars in this method varies depending on the required level of reinforcement. The meshes should be fastened to walls to prevent detachments during concreting process.
This method was proved to be useful in reinforcing concrete and brick structures. Experience shows that the sprayed concrete fills the spaces between the bricks and provides acceptable adhesion. To further enhance the adhesion between concrete and bricks, some bricks may be taken out and replaced with concrete during the shooting process. This may improve the bond between concrete and walls to a great extent.
Vertical bars in concrete overlay prevent bending fractures in the strengthened walls and make these walls behave like reinforced concrete walls. In the walls with length-to-height ratio close to or larger than one (*i.e.* relatively long walls), the dominate form of fracture is shear fracture. Oblique cracks in these walls result in fractures. Here, the horizontal component attempts to distant the upper part of cracks from the lower parts. Horizontal bars must then be used to compensate the forces resulting from such stress. The bars therefore will be subjected to strains. Strengthening infill panels for construction materials using concrete frames and the effects of shotcreting on resistance, stiffness, and ductility of frames have been the subject of many studies in the area of structure and earthquake engineering in the past five decades.

2. Literature Review

Decanini *et al.* (1994) analyzed the effect of infill panels on structures framed with reinforced concrete overlays. They showed that proper design could result in bending moments on bars and columns embedded in frames. In fact, infill panels create more uniform moments.