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AN INVESTIGATION ON THE SEISMIC PERFORMANCE OF INFILLED FRAMES STRENGTHENED WITH SHOTCRETE

Farhad DOUSTI POUR
M.Sc. Student, Department of Civil Engineering, Najafabad Branch, Islamic Azad University, Najafabad, Iran
farhaddoustipour@yahoo.co
Sayed Mohammad MOTOVALI EMAMI
Assistant Professor, Department of Civil Engineering, Najafabad Branch, Islamic Azad University, Najafabad, Iran
sm.emami@pci.iaun.ac.ir

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One of the most conventional methods to strengthen the infills is applying the shotcrete on the wall. This method not only increases the stiffness of the infilled frame, but also improves its ultimate strength. Experimental studies and the last earthquake experiences have shown that the behavioral improvement of the strengthened infill wall depends on the shotcrete connection to the infill wall. The connection of shotcrete layer to the infill is done by the concrete cohesive as well as connector. The former will rapidly damage in the first cycle of earthquake, but the latter has an important role during the loading. Previous studies have shown that the configuration of the connector on the infill, the distance between them and the connection details of connector to the mesh are significantly affect the behavior of shotcreted infill wall. Mander et al. (1993), Moghadam (2004), Mohammadi (2007), Amanat et al. (2007) and Motovali Emami (2017) and some other researchers have experimentally studied the shotcreted infilled frame and have noted the importance of connectors of shotcrete to infill wall. Although some of them emphasized the important role of adhesive strength of mortar layers, but this strength should be taken into account in practical range in the research studies. This study deals with the effect of shotcrete connection details on the stiffness and strength of strengthened infilled steel frame. For this purpose, numerical parametric studies have conducted using ABAQUS environment. Firstly, numerical models have verified using the results of three experimental specimens. These specimens included one bare frame, one masonry infilled steel frame and one shotcreted infilled frame. After that the parametric models were laterally analyzed and their stiffness and strength were compared.

The results have shown that the connectors play an important role in the behavior of strengthened infill panels. For example, the presence of connectors, especially in the corners, increases the strength and stiffness of the infill frame. Figure 1 shows the strengthened infilled frame in which the shotcrete layers apply to the infill panel without any connector. It is obvious that the shotcrete layer is delaminated form the infill wall. It should be noted that the tensile strength between shotcrete layer and masonry panel was taken to be 0.15 MPa which is in conventional range in practice.

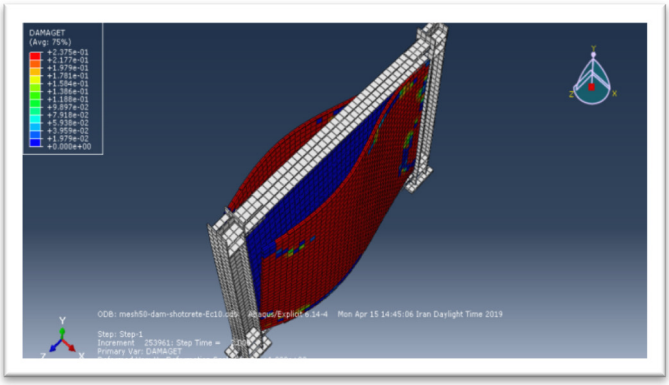

Figure 1. Delamination on shotcrete layers applying to the panel without connector.

Also, it has shown that the distance between the connectors and their connection types to the infill and shotcrete is important. Moreover another important point in this study is the proper bonding of shotcrete to the brick wall; if the connection between them is done well, the infilled frame will show a good initial stiffness compared with the weak bonding one.

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