Evaluation of seismic behavior of infilled frames

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Abstract

In many buildings, masonry panels were built for architectural function which they have, but because of complicated role and lack of cogent analytical model, some assumptions may cause severe decrease in estimation of lateral stiffness, strength and ductility.

Based on last five decades behavior of infilled frame which has carried out there are many factors that affect behavior and form of damaged infilled frame, but despite lengthy background, there are not any agreement in presenting a unique method for designing of infilled frame and none of these model couldn't present any practical method for designing of these structures, therefore it is a fallacy to ignore them in analyzing and designing these kind of structures.

Based on Surveys and statistics, many of these kinds of buildings have acted poorly. The most important problems for these structures are decrease in strength, stiffness and energy capacity in cyclic loading caused by damage development in intersection of masonry panel and its frame.

In this research two kinds of equivalent strut, three equivalent struts and single equivalent strut have been studied. The three equivalent strut method, the newest technique presented and the single equivalent strut method proposed by the Iranian Seismic Rehabilitation Code are techniques for modeling infilled frame. In this research four characters of infilled frame such as height, number of span, thickness and modeling technique for infilled frame have been studied. To load, analyze and design of these frames, Iranian loading code, Iranian seismic code and Iranian national designing steel structure code have been applied. To demonstrate comparison between Infilled frame and ordinary frame, two procedures based on nonlinear incremental static analyzing method and nonlinear incremental dynamic analyzing method have been applied.

Results show that increase in strength and stiffness, performance improvement and declining in number of plastic hinge are unavoidable, but generally, damage of the panel providing an exceptional force for the frame to yield. The results have shown that applying single equivalent strut method is more conservative than the other method.

For the infilled frame, increasing in height, reduce the intensity of increase in stiffness and decrease in drift and in spite of increasing in infilled panel thickness, fallacious design provided by the ignoring of infilled panels, is unavoidable.