EFECT OF RIGIDITY OF BEAM TO COLUMN CONNECTION IN STRENGTH AND STIFFNESS OF THE INFILL FRAME

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Infill walls are commonly used in buildings for structural and architectural purposes. Based on extensive study since 1950 up to now, it has been proved that infills have a significant effect on the behaviour of structures and also energy dissipation during earthquakes. Therefore, they should not be ignored in analysis and design of structures (Moghadam and Dowling, 1987). Several methods have been proposed to model infilled wall in previous studies. One of the most prevalent models that used by many researchers and engineers and also recommended by FEMA356 and ASCE41-06 is a single compression strut model, proposed by Mainstone (1971). The stiffness and strength of infilled panels can be estimated by Mainstone formula, acceptably. On the other hand, the formula is obtained based on experiments and analyses on which beams were connected to columns with rigid connections. Therefore, using this method to determine the behaviour of infilled frames with pinned connections is doubtful.

Despite the large amount of researches on infilled frames, there is a lack of scientific evidence in literature in subject of the effects of beam to column connection rigidity of surrounding frame. For instance, Dawe and Seah (1989) found out that the specimens in which panel is enclosed in a completely hinged steel frame behave differently in comparison with that of with moment resistant frames. They concluded that pinned connection of surrounding frame causes decrease in initial stiffness, maximum strength and the ductility of infill frames. Flangan and Bennet (1999) preformed a series of experiments on steel frames with structural clay tile infills. The steel beams connected to column using double clip angles. The results show that the values of stiffness and strength of the specimens are reduced about 50% compared with calculated values from Mainstone formula.

In this paper, an experimental program is carried out to find out the effect of beam to column connection rigidity on behaviour of infill steel frames. For this purpose, two half scale steel single-story, single-frame with masonry brick infills are subjected to cyclic in plane load. One of the specimens is fabricated with rigid beam to column connection and another with pinned connection. Table 1 gives a summary of the infilled frames that were tested, with a schematic test setup, shown in Figure 1. As it shown in figure 1 the in-plane lateral load is applied to the frames by actuator. To investigate the effect of connection rigidity on the behaviour of infilled frame, a set of FEMA461 loading protocol is applied. The results show that the stiffness and strength of infilled frame with pinned connections decrease in comparison to infilled frame with rigid connections. Figure 2 shows the envelope curve of M-RC-1B and M-PC-1B specimens. According to this picture the ultimate strength of M-RC-1B and M-PC-1B are 325kN and 290kN, respectively.

Table 1. Summary of specimens

Specimen	Height (cm)	Length (cm)	Column	Beam	Beam to Column Connection
M-RC-1B	150	225	IPBI 180	IPBI 120	rigid
M-PC-1B	150	225	IPBI 180	IPBI 120	Pinned

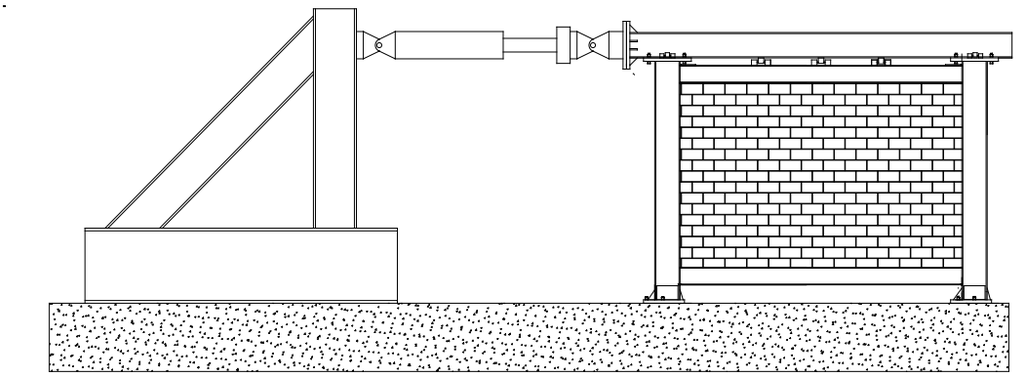

Figure 1. Test setup

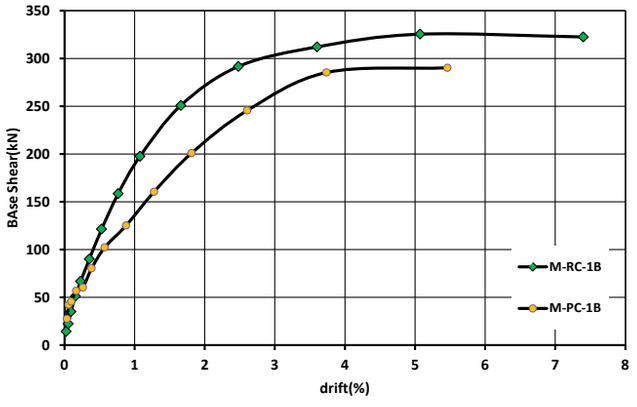

Figure 2. Pushover curves of specimens

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