

EFFECT OF RIGIDITY OF BEAM TO COLUMN CONNECTION ON STRENGTH AND STIFFNESS OF INFILLED FRAMES

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ABSTRACT

This paper deals with an experimental program to investigate the effect of beam to column connection rigidity on the stiffness and strength of steel infilled frames. Two half scaled 1-story, 1-bay specimens were tested under in-plane lateral cyclic loading applied at the top of the frame. One of the specimens is fabricated with rigid beam to column connections and the other with pinned connections. The experimental results indicate that the less the connection of beam to column has rigidity, the less stiffness and strength of infilled frame are obtained. Also the stiffness and ultimate strength obtained from experimental tests were compared with the values calculated by Mainstone formula. The results show that Mainstone method significantly overestimates the stiffness for the specimen with pinned beam to column connection in comparison with the specimen having rigid connection.

INTRODUCTION

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 (2000) and ASCE41-06 (2007) 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) performed 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