SEISMIC VULNERABILITY ASSESSMENT OF LOW-RISE INFILLED RC FRAME STRUCTURES BY NUMERICAL ANALYSIS

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1. INTRODUCTION

RC frames with infill walls account for a large portion of building stocks, particularly for low to medium-rise buildings in Asia and other parts of the world. Based on past studies and the observed responses of these buildings during earthquakes, infill walls play an important role in the structural response of buildings under seismic excitations. Disregarding their influences on the seismic design and evaluation of structures could be potentially dangerous. However, the interaction between the frame and the infill wall is very complex [1]. Therefore, a reliable numerical model is necessary. A novel multi-strut macro finite element model was used in this study to perform vulnerability assessment of an example low-rise RC frame.

2. MULTI-STRUT INFILLED FRAME MODEL

A data-driven multi-strut model for the seismic simulation of infilled RC frames was recently developed [2]. The model is capable of simulating both global and local responses. Two diagonal struts per direction are used to represent the infill panel as shown in Fig. 1. The struts are modeled by fiber-section truss elements. Empirical formulas for predicting these stress–strain parameters were also developed. The formulas were developed based on a comprehensive experimental database of 46 infilled frame specimens with various characteristics collected from previous studies. The calibration results show that this model is capable of simulating the response for test specimens with different characteristics and failure modes to a very good degree of accuracy as shown in Fig.2.

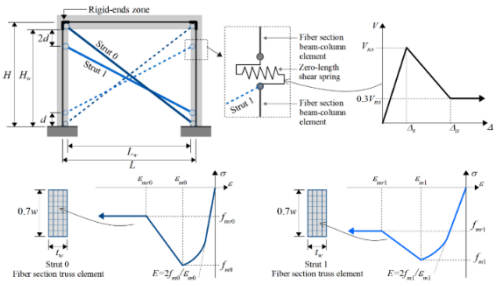

Figure 1. Multi-Strut Model for the assessment of Infilled RC Frame [2].

2. RC FRAME SIMULATION

A structural model was created to represent a low-rise building structure in Thailand. The building was two stories in height and represented a typical school building in Thailand. Static pushover and nonlinear dynamic analyses were carried out to assess the performance and the vulnerability of the structure under earthquake loading. An example of the results is shown in Fig. 3. The assessment showed that the frame was vulnerable to soft-story type failure.

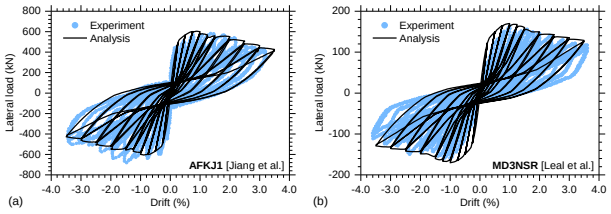

Figure 2. Example of Simulation Results [2].

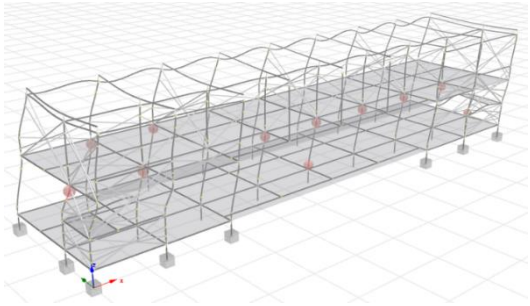

Figure 2. Infilled RC frame response showing the location of the column failure.

3. CONCLUSIONS

A data-driven multi-strut model for the seismic simulation of infilled RC frames was recently developed. The model is capable of simulating the complexed Infill-RC frame Interaction. This model can be applied to vulnerability assessment of Infilled RC frame structures.

REFERENCES

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