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SEISMIC FRAGILITY ANALYSIS OF MULTI-STORY RC SHEAR WALL-FRAME SYSTEM FOR ASSESSMENT OF GLOBAL BEHAVIOR

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With the development of cities and rapid growth of population, buildings tend to become taller. Most of these buildings, which are located in seismic prone areas, rely on the reinforced concrete shear wall as a primary lateral load resistance system, thereby developing an accurate analytical model to analyze such a system under the earthquake excitation is required. Hence, a numerical model of seven-story RC shear wall–frame system is developed with the fiber-force element by using OPENSEES simulation platform and validated against an experimental model (Kenji Koike). The fiber element is easy to implement and is affordable in computational cost in comparison with other methods (Spacone, 1996). After assurance of the accuracy of the numerical model, three damage states, namely occurrence of the first inelastic deformation (Slight or DS(I)), the onset of yielding of rebar and/or crushing of concrete (Moderate or DS(II)), and instability and collapse (Severe or DS(III)) of the system were defined (Hyo-Gyoung Kwak, 1990) by conducting pushover analysis and after that, the IDA analysis has been done to create the fragility curve under 27 near-field (14 records with pulse and 13 without pulse) and 14 far-field records to assess the global behavior and performance of such a system under seismic excitation (Figures 1 and 2).

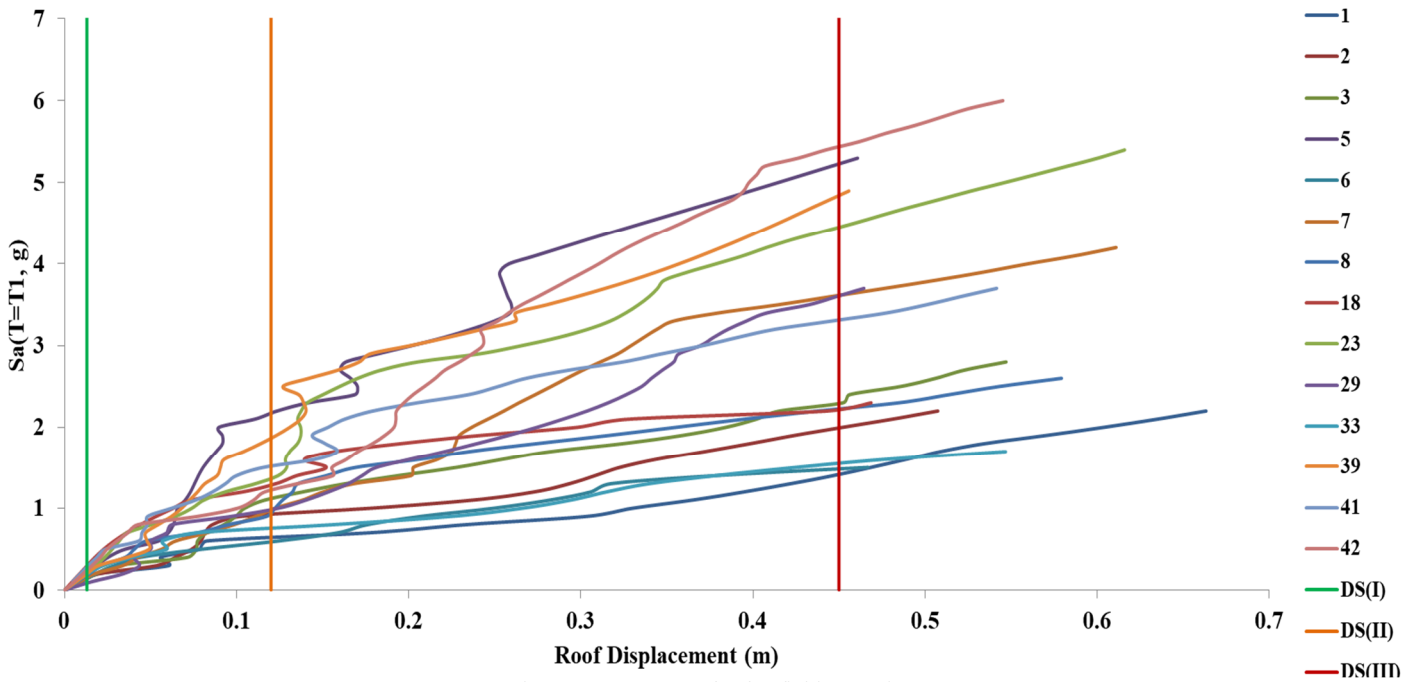

Figure 1. IDA curve for far-field records.

The results show that the behavior of the system under near-field and the far-field record is identical in slight and moderate damage state and a little discrepancy is observed that is ignorable. However, for severe damage state, the probability of collapse of the studied structural system in low-range to mid-range of response spectra acceleration ($0 < Sa < 3.1$) for the near-field records is more than the far-field records in contrast to the mid-range to high-range of response spectra acceleration ($3.1 < Sa < 9$), which is the opposite of the previous state as shown in Figure 3.

Different results were observed in the scenarios with and without pulse comparing to the above scenarios, which would be discussed further at the main paper in detail.

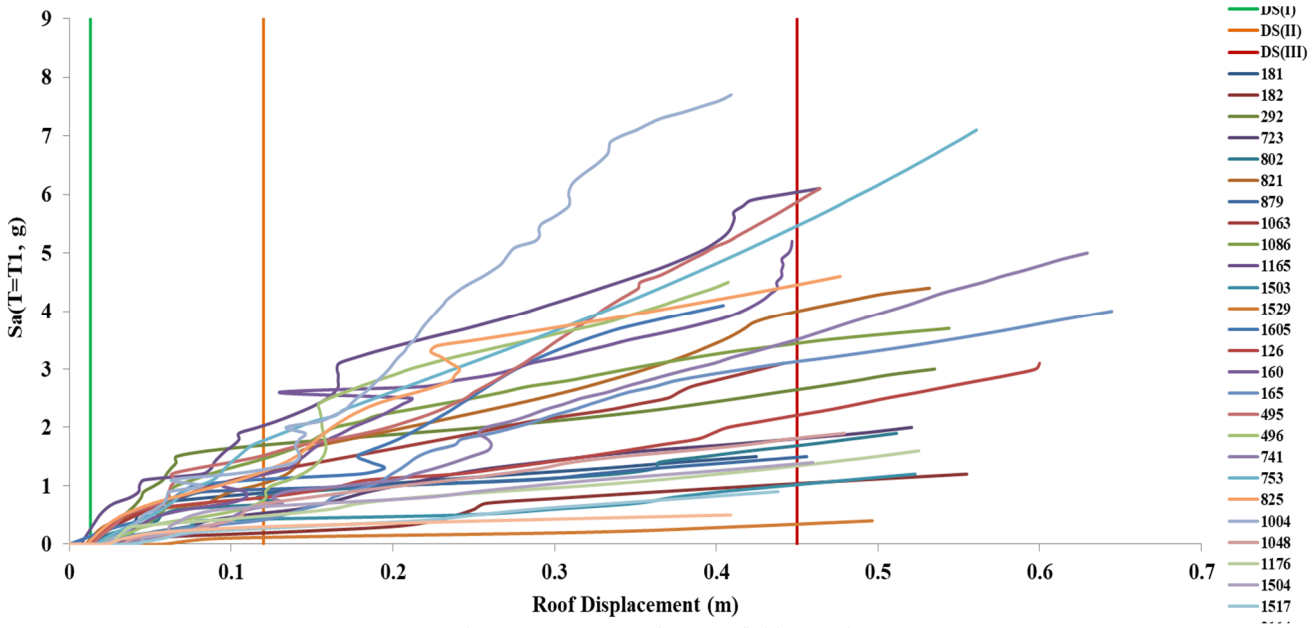

Figure 2. IDA curve for near-field records.

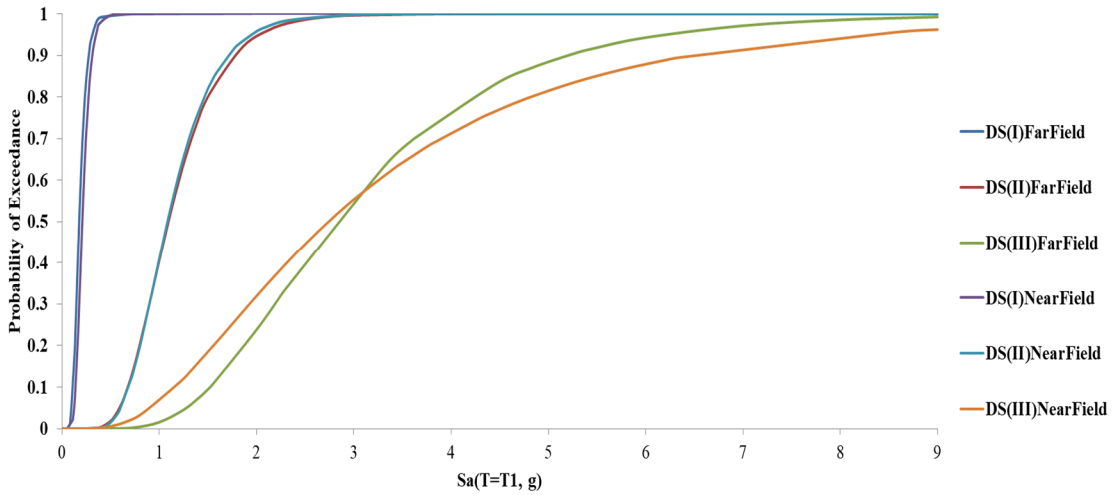

Figure 3. Comparison of data of fragility curve for near-field and far-field record.

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