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CORRELATION BETWEEN SEIMIC PARAMETERS OF FAR FAULT GROUND MOTION AND RESPONSE OF MOMENT STEEL FRAMES

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In seismic countries, regarding to the damages and losses caused by ground motion, the earthquake resistant design of structures is a very important matter. Previous earthquakes have shown that the regulation in seismic codes does not guarantee the buildings to resist against seismic forces and may cause severe damage in the structures. This subject goes back to the design philosophy in seismic code and also weakness in the hypothesis of seismic design of structures. Note that the earthquake records include many inherent parameters affected the response of the structures. Meanwhile the seismic codes use only a few of them in the designing process such as spectral acceleration at the first mode period, i.e. Sa(T1). In recent decades, many studies focus on the correlation between seismic parameters and the response of structures and found out that the used Parameters in the codes do not have the best correlation with the response of structures. This finding depends on the databank of the records including the site-to-fault distance, intensity of the earthquake, frequency content etc. as well as the type of earthquake resistant structure. This study deal with the correlation between far filed earthquake parameters and response of moment resisting steel frames. For this purpose, a series of nonlinear time history analyses were carried out on 3, 6, 9, 12, 15 and 20 moment resisting steel frame using OpenSEES. 100 far field records were selected from FEMA P695 as well as Pacific Earthquake Engineering Research (PEER) databases. Two damage indices including maximum inter-story drift (MISD) and the amount of absorbed energy were calculated in studied frames. To assess the relationship between seismic parameters and structural damage Pearson correlation coefficient was used. The results show that velocity spectral intensity (VSI) Housner intensity and Sa(T1) have the best correlation with response of structure in MISD and structure absorb energy. Correlation between MISD and structure absorb energy have increased by addition of number of stories. Figure 1 shows comparison of correlation between 6 and 20 story, considering MISD damage index.

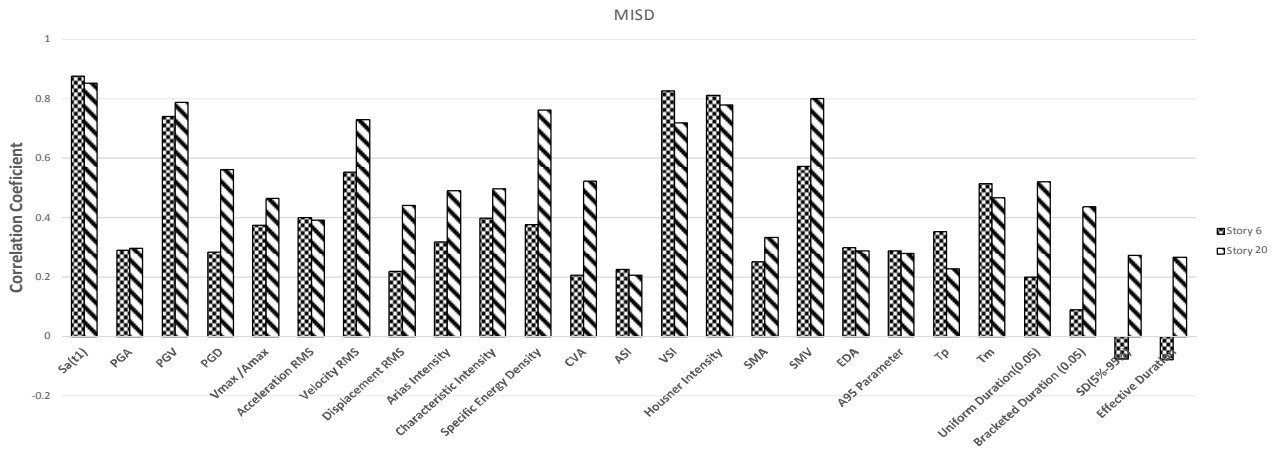

Figure 1. Comparison of correlation between 6 and 20 story, considering MISD damage index

Figure 1 shows that, Sa(T1), VSI and Housner intensity have the best correlation with MISD. Also, the correlation coefficient of displacement dependent parameters is enhanced by increasing the number of stories. Moreover the results indicate a weak correlation between PGA and response of structures for both MISD and absorbed energy. According to the result it can be concluded that the parameters depended on velocity like Housner intensity and velocity spectral intensity have the best correlation with MISD and absorbed energy. Also, the parameters depended on earthquake duration like Significant Duration and Effective Duration have weak correlation with the response of structures.

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