The effect of soil-flexibility on seismic behavior of steel plate shear wall

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Real behavior of engineering structures in contact with ground is affected by dynamic properties of the supporting medium which the structure is built on. In this regard, in the earthquake engineering field, soil structure interaction (SSI) is used to evaluate interactive process between subsoil and structure in order to reproduce structures behavior. As this phenomenon is becoming increasingly more important in construction designs, it was selected in this research to be of interest. On the other hand, the building frame designs follow the assumption that the frames are to be fixed at their bases for dynamic loading, but in reality, the soil moves and this has its direct effects on the overall stiffness of what is built on it. This is a sense increases the natural period of the system in general. An accurate model of seismic demand for SPSW requires adequate consideration of the effect of all components for analysis such as structural, foundation, subsoil elements and the interaction between them. Such interaction may alter the dynamic characteristics of structures and consequently may be beneficial or detrimental to the performance of structures. Thus, the effect of SSI on the structural response of SPSWs may be of major concern. In this respect, current study is intended to contribute towards achieving this goal. This study is aimed to investigate soil flexibility effects on seismic behavior of steel plate shear wall (SPSW) buildings using time direct method. In order to obtain this objective three typical SPSW models consist of 3, 6 and 9 story structures resting on three types of soil are modeled which are excited by five different earthquake ground motions. Various important parameters from the structural designers' point of view, are selected from the nonlinear seismic responses to make known SSI effects on dynamic behavior of SPSWs. Comparison of results obtained from 3-dimasional time history analyses in the cases with and without SSI consideration shows that SSI can greatly affect the seismic performance of the SPSW structures in terms of the seismic story shear forces, displacements, interstory drifts, distribution of story shear between vertical elements and ductility demands.