EVALUATION OF SEISMIC BEHAVIOR OF STEEL STRUCTURES EQUIPPED WITH TADAS DAMPER WITH CONSIDERING THE SOIL - STRUCTURE INTERACTION

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The main elements of the steel moment resisting frames such as beams and columns usually yield to dissipate energy induced by earthquakes energy. However, retrofitting and changing of the damaged primary elements are too difficult. Therefore, dampers are used to absorb energy and avoid damage occurrence in beams and columns. In this paper, the stiffness calibration technique is utilized to design steel frames equipped with different types of dampers. This technique mainly relies on two purposes: 1) the drift distribution should be uniform along the height of the structure, 2) the maximum story drift should not exceed the specified values.

In this study, an eight story steel moment resisting frame is designed for 75% of base shear without controlling the drift using SAP2000 according to the Iranian code of practice for seismic resistant design (2800, 4th Edition). Then, the damper stiffness value in each story is obtained in such a way that the total damper stiffness and frame stiffness in each story are equal to the required stiffness obtained from the stiffness calibration technique. To compare the seismic performance of the steel moment resisting frame with or without TADAS dampers, the desired frames response are studied under time history seismic excitation. The results showed that the steel moment resisting frame with TADAS dampers had better performance compared to the bare steel moment resisting frame.

In the second part of this study, the effects of the soil specifications on the response of the structure considering the soil-structure interaction, are investigated using finite element model software package ABAQUS. According to the Iranian seismic code, four types of soil are selected. Three earthquake records, Kobe, Hectore Mine and Loma Prieta are also applied to the soil-structure system. Results showed that the variation of soil types with different dynamic characteristics caused changed in structure responses in all models and displacement response of the roof in structures equipped with TADAS damper experienced less displacement compared to steel moment resisting frame in all soil types.

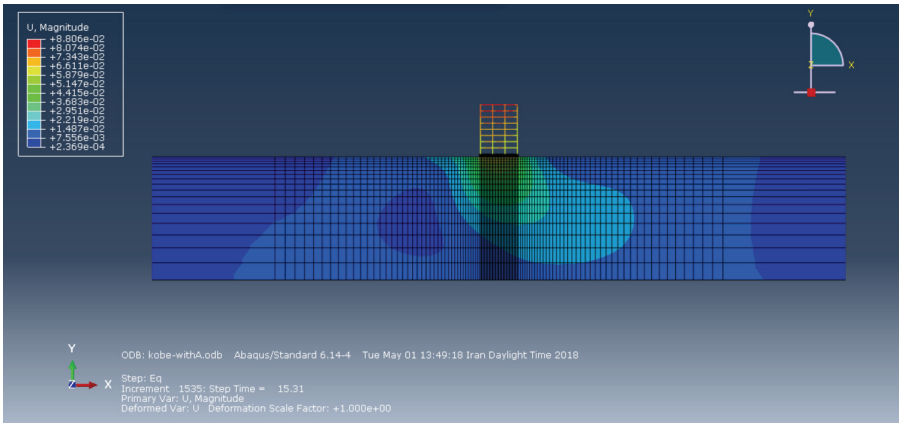

Figure 1. Finite element modeling of soil-structure interaction using software package ABAQUS.

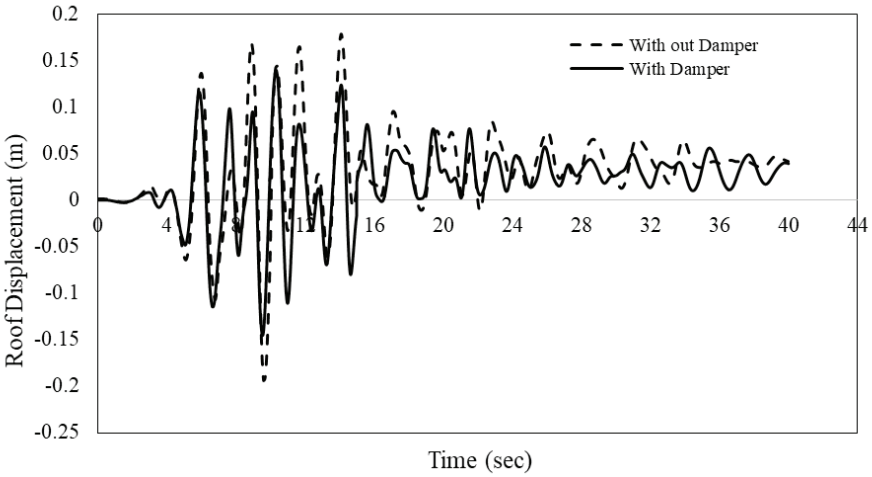

Figure 1. Roof displacement of structure equipped with TADAS damper and structure without damper subjected to Loma Prieta Earthquake.

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