

INVESTIGATION OF DUAL SCALING OF ACCELEROGRAMS FOR TIME HISTORY ANALYSIS IN STEEL FRAME STRUCTURES

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Nowadays, especially in developing countries like Iran, the buildings change from low-rise to mid-rise structures or even skyscrapers. By considering this changes and need to determine the seismic parameters of these structures accurately, the engineers use dynamic analysis which needs to select and scale the natural seismograms. There are different methods of scaling aforementioned records. One of them is amplitude scaling method been applied in Iranian code of practice for seismic resistant of buildings (Standard No. 2800). The second method is the combined method including the combination of endurance time scaling and amplitude scaling methods. The third one addressed in this paper, named dual scaling method is a combination of amplitude scaling and endurance time scaling simultaneously corroborated with an imposed value of Housner intensity. A total of seven real accelerograms recorded at the same site conditions for 5, 8, and 12 story conventional steel moment frame buildings are compiled and each individual record is scaled by using above three methods to develop the acceleration response spectra. The comparison between the response spectra provided in Figure 1 shows that using dual scaling method may lead to more realistic response spectrum. Further, by applying dual scaling method, the taller the structure is, the more similarity between the structure response spectrum and the standard design spectra will be.

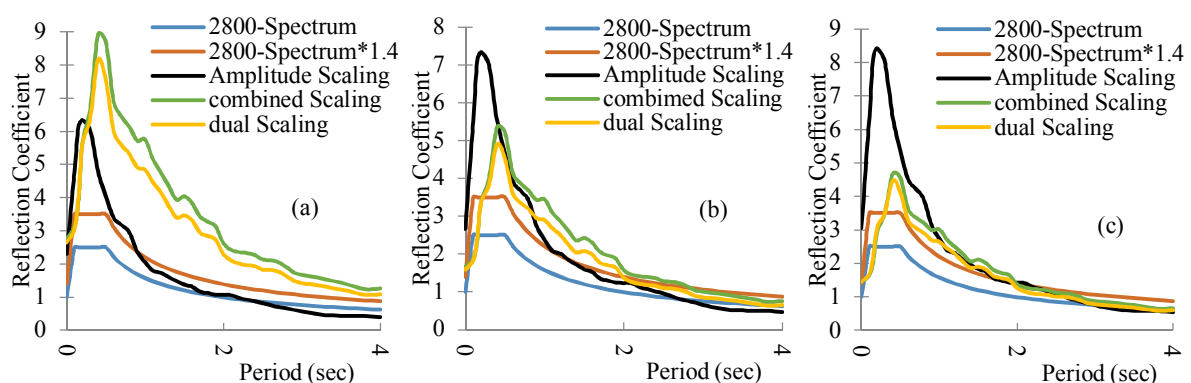


Figure 1. Response spectra determined by different scaling methods, (a) 5-story building, (b) 8-story building, (c) 12-story building.

The time history analysis results of three mentioned structures show that applying dual scaling method to scale the records may lead to more convergent answers. For example, the maximum displacements of 12-story structure obtained by using seven records processed in different scaling methods provided in Figure 2 show that applying dual scaling method can result more convergence in comparison with applying standard No. 2800 scaling method or even using

combined scaling method. Further, applying dual scaling method decreases the maximum story displacements and story shears especially in taller structures.

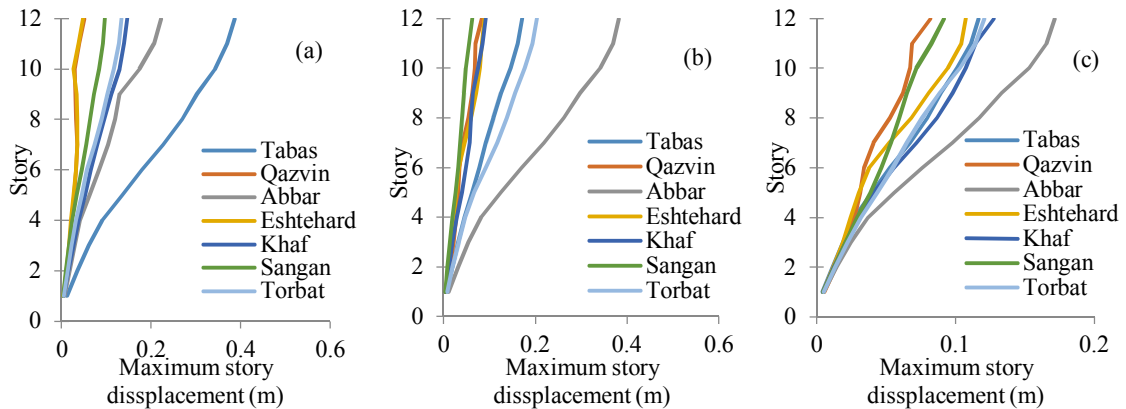


Figure 2. Maximum story displacement of 12-story building by applying different scaling methods, (a) Standard No. 2800 method, (b) Combined method, (c) Dual method.

Therefore, by using dual scaling method a better adaptation in response and design spectra is obtained which may lead to a more economical and efficient design.

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