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Correlations between Earthquake Parameters and Variation of Fundamental Period in RC Frames

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Abstract

In recent decades many researchers have studied on the damage assessment of structures after a seismic event. To assess the damage of structures after an earthquake, it is so important to study the correlations between earthquake parameters and damages of the structures. Variation of fundamental period is one of the methods to identify the damage of the structures. In this paper correlation between earthquake parameters and variation of fundamental period is studied.To characterize a seismic event, a lot of parameters have been defined. In this paper several earthquake parameters are chosen to study. Two RC frames are analyzed under far-fault earthquake records by nonlinear dynamic analyses. The correlations between earthquake parameters and variation of fundamental periods are calculated. The results show that some of the earthquake parameters have high correlations with Variation of fundamental period. The most correlations are for those earthquake parameters which some researchers have shown high correlations between damage indexes of structures and them. So some earthquake parameters which have high correlations with variation of fundamental period can be proper indices to estimate the damage potential of an earthquake.

Keywords: Earthquake parameters, Variation of Periods, Correlation, RC frames, Damage.

۱. Introduction

There are a lot of methods to assess the damage of the structures. Variation of dynamic characteristics is of the main methods to identify the intensity of damage. To characterize a seismic event a lot of parameters have been proposed. No single ground motion parameter provides an ideal index of damage. The correlation of some earthquake parameters with actual damage has shown a complicated multi-parameter subject of research [۱]. Elenas and Meskouris studied correlations between different earthquake parameters and damage intensity in a ۸-storey RC frame [۲]. They extracted earthquake parameters from ۲۰ records of earthquakes. They concluded that earthquake energy parameters provide good correlation with damage intensity. A ٦-storey RC frame was modeled by Nonos et al and correlation between different earthquake parameters and damage intensity was investigated [۳]. The parameters were extracted from ٤٥٠ different synthetic records. The results showed high correlations between earthquake energy parameters and damage intensity. Elenas et al showed that spectral acceleration and energy parameters have the highest correlation with damage [٤] and [٥]. Danciu concluded that peak ground velocity, Arias Intensity, and also spectral intensity have the highest correlation with damage [٦]. In this paper intensity of damage is identified by the variation of fundamental periods. Some earthquake parameters which are extracted from far fault records of earthquakes are considered to study. The records are applied to two RC frames. Inter-relations between variations of fundamental periods and the selected earthquake parameters are studied.

۲. Earthquake parameters

A lot of earthquake parameters are proposed by researchers. In this paper five earthquake parameters are studied. Theses main parameters are widely used by researchers.

۲,۱ Root mean square of accelerations (a_{RMS})