

Engineering Characteristics of the 2006 Yogyakarta Earthquake Ground Motions and Its Implication to the Inelastic Response of RC Structure

Author(s)

Widodo Pawirodikromo

*Department of Civil Engineering, Faculty of Civil Engineering and Planning
Islamic University of Indonesia*

Abstract

There was no official ground motion records of the 2006 Yogyakarta earthquake. Elnashai et al. (2006) stated that the only over scale seismogram records were available at YOGI station Yogyakarta. After long effort of processing data, finally the best available estimated ground motion records were obtained and published (Elnashai et al., 2006). However, the digitized those ground motion records were not obtained at Yogyakarta even though formal communication to Elnashai and his colleagues have been made. It makes difficulty to Indonesian practitioner and academician to explore the ground motion characteristics as well as its damage potential contain in the records.

An effort to obtain the 2006 Yogyakarta earthquake has been carrying out. By using manual process, the approximate digitized data of the 2006 Yogyakarta earthquake was finally can be made. It is necessary to check the reliability of approximate digitized data by comparing its response spectrum to the spectrum that has been published by Elnashai et al. (2006). Unfortunately, two response spectrums are not match up each other. By using Spectral Matching the approximate ground motion digitized data are modified to match up to the original response spectrum published by Elnashai et al. (2006). Engineering characteristics of earthquake ground motions either based on peak values, duration, response spectrum, frequency contents, intensity groups and damage potential are common parameters that are used to describe the destructiveness of earthquake ground motions. Multi-storey reinforced concrete (RC) structure is used as a building model and Ruaumoko Computer Package Programs is used in this investigation.

Result of the matching spectrum indicated that two corresponding spectrums are now identical. It means that the 2006 Yogyakarta earthquake ground motion record in term of digitized data is now obtained and valid. The earthquake ground motion digitized data than to be used as an input motion. Very interesting results were found. It was not guessed before that certainly the 2006 Yogyakarta earthquake ground motions possesses a huge destructiveness effects to the RC structure. To be contrast, the engineering characteristics of the 2006 Yogyakarta ground motion record then to be compared with the similar characteristics of the 1940 El Centro NSC earthquake, since the two maximum ground accelerations are close each other. The 2006 Yogyakarta earthquake causes higher in almost all of the ground motion characteristics (such as effective earthquake duration, response spectrum, Arias intensity, Housner intensity, destructiveness potential as well as mean earthquake imparted energy) as compared to the 1940 El Centro NSC earthquake. The 2006 Yogyakarta earthquake tend to have lower frequency content and smaller maximum ground acceleration than those for the 1940 El Centro earthquake. More over, starting from floor horizontal displacement, beam's curvature, beam's rotation of plastic hinge, beam damage index, input energy, total hysteretic energy as well as total base shear subjected to the 2006 Yogyakarta earthquake are much higher/bigger than those caused

by the 1940 El Centro NSC earthquake. It can be concluded that the 2006 Yogyakarta record contains destructiveness impacts much greater than those 1940 El Centro NSC earthquake.

Keywords : -.