

ABSTRACT

Safety and security factors for the building inhabitants are the main aspects in designing the earthquake-resistant buildings. Safety risks may occur due to the structural failure and earthquake shaking magnitude. The shaking intensity magnitude has not been specifically considered when designing the earthquake-resistant buildings. This research aims to analyze shaking intensity using Seismic Intensity Level (SIL). The SIL levels were classified based on the quantitative values of mSIL measurement calculated based on the earthquake time history. The shaking intensity was computed using shaking intensity occurring on the ground surface based on the spectrum response (rs_mSIL) and building floor based on the natural shaking period of the structure (lt_mSIL).

This research quantitatively developed a model of correlation between spectrum response and mSIL (rs_mSIL). The research used three different spectrum responses to create an artificial earthquake in which each model contains 50 variations. The actual earthquakes used to develop the model were Sumatera and Chile (megathrust), Kern Country and Michoacan (benioff) as well as Livermore01 and BigBear01 (shallow crustal). Spectrum on two directions of U-S and B-T was independently matched with yield spectrum resultant to satisfy the target spectrum. On the other hand, formulation of lt_mSIL was made through the mSIL (λ) approach based on the building period ranging from 0.1 – 2 seconds.

The results showed that the spectrum responses influencing the mSIL value had maximum acceleration (coefficient K) and period (Ts). On all period variables (TS), the relationship between coefficient K and mSIL had positive trend with algorithm function. The formulation of lt_mSIL used standard equation of mSIL approach issued by the Japan Meteorological Agency (JMA) using the values of λ ranging from 0.1 – 2 seconds. The validation of both methods was very good when compared to the calculation of mSIL using JMA standard with the deviation of 1.029% (rs_mSIL) and 2.469% (lt_mSIL).

The application of rs_mSIL in the linear analysis of time history was used to calculate the intensity of shaking occurring at the ground surface based on the spectrum response. Meanwhile, the lt_mSIL was able to be used to calculate the intensity of swaying occurring on the building floors. The application of rs_mSIL and lt_mSIL is expected to provide an overview of the sway intensity magnitude during an earthquake.

Keywords: SIL, time history, spectrum response, mSIL, rs_mSIL, lt_mSIL