

Analysis of Building Response from Vertical Ground Motions

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Abstract : Building structures are subjected to both horizontal and vertical ground motions during earthquakes, but only the horizontal ground motion has been extensively studied and considered in design. Most of the prevailing seismic codes assume the vertical component to be 1/2 to 2/3 of the horizontal one. In order to understand the building responses from vertical ground motions, many earthquakes records are studied in this paper. System identification methods (ARX Model) are used to analyze the strong motions and to find out the characteristics of the vertical amplification factors and the natural frequencies of buildings. Analysis results show that the vertical amplification factors for high-rise buildings and low-rise building are 1.78 and 2.52 respectively, and the average vertical amplification factor of all buildings is about 2. The relationship between the vertical natural frequency and building height was regressed to a suggested formula in this study. The result points out an important message; the taller the building is, the greater chance of resonance of vertical vibration on the building will be.

Keywords : vertical ground motion, vertical amplification factor, natural frequency, component

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