

Analyzing Time Lag in Seismic Waves and Its Effects on Isolated Structures

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Abstract : Time lag between peak values of horizontal and vertical seismic waves is a well-known phenomenon. Horizontal and vertical seismic waves, secondary and primary waves in nature respectively, travel through different layers of soil and the travel time is dependent upon the medium of wave transmission. In seismic analysis, many standardized codes do not require the actual vertical acceleration to be part of the analysis procedure. Instead, a factor load addition for a particular site is used to capture strength demands in case of vertical excitation. This study reviews the effects of vertical accelerations to analyze the behavior of a linearly rubber isolated structure in different time lag situations and frequency content by application of historical and simulated ground motions using SAP2000. The response of the structure is reviewed under multiple sets of ground motions and trends based on time lag and frequency variations are drawn. The accuracy of these results is discussed and evaluated to provide reasoning for use of real vertical excitations in seismic analysis procedures, especially for isolated structures.

Keywords : seismic analysis, vertical accelerations, time lag, isolated structures

Conference Title : ICESE 2018 : International Conference on Earthquake and Structural Engineering

Conference Location : Sydney, Australia

Conference Dates : January 29-30, 2018