WIND-INDUCED VIBRATIONS OF TORSIONALLY COUPLED SYSTEMS WITH SOIL-FOUNDATION-STRUCTURE INTERACTION

Ming-Yi LIU* and Sheng-Yin HUANG
Department of Civil Engineering, Chung Yuan Christian University – Taiwan
myliu@cycu.edu.tw

Abstract

The objective of this paper is to investigate the wind-induced vibrations of high-rise buildings with soil-foundation-structure interaction (SFSI). The computational procedure for an analytical model including the soil-foundation-structure model, wind load model and frequency domain analysis is presented for this purpose. Numerical examples, i.e., two types of structures: the torsionally uncoupled and coupled systems, on four types of grounds: the fixed base, hard, medium and soft soils, for a variety of attack angles, are also provided to illustrate the analytical model. For each structure under a variety of attack angles, the peak acceleration for the case of the hard soil nearly coincides with that of the fixed base, and the lower soil stiffness leads to a decrease in the peak acceleration. These results suggest that the SFSI can be reasonably neglected for simplified analysis under the condition of high soil stiffness. On the other hand, the response will be overestimated under the condition of low soil stiffness if the SFSI is assumed to be negligible. Consequently, compared to the fixed-based models, the soil-foundation-structure model can be used to more appropriately simulate the wind-induced vibrations of high-rise buildings with SFSI.