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Vibration analysis of pedestrian link bridges between building-towers under heel-drop excitations

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Pedestrian bridges between buildings are now becoming more and more popular. They serve as additional areas for retail businesses. They function as strategic recreational spaces. Most importantly, they work as convenient building-to-building walkways. However, the current research and experiment in structural engineering reveals that pedestrian bridges have natural frequencies that coincide with the dominant frequencies induced by human activities. This means the bridges are susceptible to excessive and complex vibrations under dynamic loads. Hence, an in-depth analysis of the vibration caused by heel-drop excitations is imperative. In this regard, the researcher conducted this study, taking into account the effects of dynamic actions and vibration behaviors of the pedestrian bridges between buildings due to heel-drop excitation loadings. The aim was to ensure that pedestrian bridges that are yet to be constructed will be safe and fit for service. Through the course of the study, an analytical three-dimensional model was developed to carry out linear dynamic modal time history analyses. The Finite Element Method (FEM) was also performed to obtain the natural frequencies and appropriate mode shapes. Then, the dynamic response of the bridge in terms of peak accelerations was determined methodically. Finally, the assessment of the serviceability for the design of pedestrian bridge with regards to comfort criteria was presented using appropriate codes and design guidelines that were developed in different countries.

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