Vibration design and dynamic testing for long-cantilever composite floors equipped with vibration rods in office tower

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**Abstract**

Given the growing requirements for architectural space, large-span and long-cantilever floor structures have become prevalent in urban complexes. Large-span and long-cantilever floor structures have low fundamental vibration frequency due to weak vertical stiffness, and generate greater vertical vibration induced by human activity. Human comfort of the floor vibration becomes a determining factor of structural design. To effectively improve the comfort of floor vibration, it is necessary to adopt efficient vibration reduction measures that do not affect architectural functions and have relatively limited costs. This paper mainly discusses the principle of vibration design for long-cantilever floors with vibration rods, as well as the design points in engineering applications. Taking the example of the Lingchao Building located in Shenzhen, China, the paper presents a theoretical analysis and sensitivity study of vibration rods during the design phase of long-cantilever floor structures. Additionally, it describes dynamic testing of floor vibration comfort during the construction phase, providing empirical evidence to validate the effectiveness of the vibration rods in vibration mitigation.

**Keywords:** vibration rods; dynamic testing; long-cantilever floors; human comfort of the floor vibration; vibration analysis induced by human activity.

**1 Introduction**

Given the growing requirements for architectural space, large-span and long-cantilever floor structures have become prevalent in urban complexes. Large-span and long-cantilever floor structures have low fundamental vibration frequency due to weak vertical stiffness, and generate greater vertical vibration induced by human activity. Beyond a certain threshold, these vibrations can induce discomfort and psychological distress among occupants. (1) Therefore, in the