

**EXPERIMENTAL AND ANALYTICAL STUDY  
OF VIBRATIONS IN LONG SPAN DECK FLOOR  
SYSTEMS**

by

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## **(ABSTRACT)**

Experimental and analytical research was conducted to address the vibration properties of Long Span Deck Floor Systems (LSDFS). The research comprised three stages. In the first part, experimental in-situ tests were conducted on thirteen bays of buildings under construction. The natural frequencies and acceleration responses were captured to observe the vibration behavior of the tested floors.

In the second part, a laboratory footbridge was constructed to determine the fixity level attained at the supports when a LSDFS is supported by CMU walls. For this purpose, the footbridge was tested with three support conditions, and a number of experiments were carried out to determine the dynamic properties of the structure. Static tests using both point and distributed loadings were conducted to measure the deflections at the footbridge midspan. The static test results were compared to the theoretical deflections for a pinned-end beam and a fixed-end beam. Dynamic tests using experimental modal analysis techniques were conducted to determine the natural frequencies and mode shapes of the structure. The measured fundamental natural frequency of the footbridge was compared to the frequencies calculated for a simply supported beam and a beam with fixed ends, to determine the degree of fixity attained in the connection between the LSDFS and the supporting walls.

In the last part of the research, three analytical procedures to predict modal characteristics of long span deck floor systems are studied. Floor frequencies are

calculated using finite element analyses. Two design guides for floor vibration analysis were used to calculate natural frequencies and response accelerations. The predicted results obtained from the analytical methods are compared to the experimental results to determine their accuracy. Recommendations for the use of the analytical methods are provided.

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