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A Comparison of Experimental Characterization Results for Multiple Bridge Spans of the Same Design

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The efficacy of Structural Health Monitoring applications for bridges is often limited by both uncertainty related to the experimental methods used to characterize the structure and uncertainty due to the constructed nature of these systems. A global level characterization of a bridge structure serves as both a baseline for evaluating future performance and condition, and as the primary source of quantitative data used in structural identification of a structure. Bridges are usually characterized at the global level by full-scale static or dynamic testing. The uncertainty associated with full-scale static or dynamic testing methods has been discussed in numerous papers, and in most cases can be quantified or bounded through laboratory evaluation studies. The constructed nature of bridges can lead to uncertainty in their material and mechanical characteristics. Furthermore, the ultimate effect on long-term performance and condition of the various defect, deterioration and damage mechanisms that a bridge may be exposed to over its relatively long service life is difficult to quantify, particularly if the uncertainty associated with the constructed nature of a bridge has not been characterized and evaluated.

The authors conducted a full-scale dynamic characterization by ambient vibration testing of two bridges that each had multiple spans of the same design. The first structure evaluated was constructed in 1987 and has ten identical, simply-supported concrete deck on steel beam spans. The second structure was constructed in 1930 and consists of three identical simply-supported Parker Pony Trusses. The bridges were selected so that the consistency of the full-scale characterization results could be compared and evaluated for both a modern and historic bridge structure. The ages of the test structures is important characteristic as construction methods and material technologies have evolved significantly over the 50+ years between the initial construction of each structure. Another important consideration in selecting these bridges was to evaluate the consistency of the characterization results for two fundamentally different structural systems. This paper describes the field testing of multiple spans of the two test structures and discusses the consistency of the characterization results.

Ключевые слова:

Содержание.

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