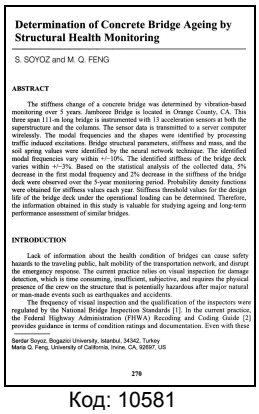

Determination of Concrete Bridge Ageing by Structural Health Monitoring

S. SOYOZ and M. Q. FENG

ABSTRACT

The stiffness change of a concrete bridge was determined by vibration-based monitoring over 5 years. Jamboree Bridge is located in Orange County, CA. This three span 111-m long bridge is instrumented with 13 acceleration sensors at both the superstructure and the columns. The sensor data is transmitted to a server computer wirelessly. The modal frequencies and the shapes were identified by processing traffic induced excitations. Bridge structural parameters, stiffness and mass, and the soil spring values were identified by the neural network technique. The identified modal frequencies vary within +/-10%. The identified stiffness of the bridge deck varies within +/-3%. Based on the statistical analysis of the collected data, 5% decrease in the first modal frequency and 2% decrease in the stiffness of the bridge deck were observed over the 5-year monitoring period. Probability density functions were obtained for stiffness values each year. Stiffness threshold values for the design life of the bridge deck under the operational loading can be determined. Therefore, the information obtained in this study is valuable for studying ageing and long-term performance assessment of similar bridges.

INTRODUCTION

Lack of information about the health condition of bridges can cause safety hazards to the traveling public, halt mobility of the transportation network, and disrupt the emergency response. The current practice relies on visual inspection for damage detection, which is time consuming, insufficient, subjective, and requires the physical presence of the crew on the structure that is potentially hazardous after major natural or man-made events such as earthquakes and accidents.

The frequency of visual inspection and the qualification of the inspectors were regulated by the National Bridge Inspection Standards [1]. In the current practice, the Federal Highway Administration (FHWA) Recoding and Coding Guide [2] provides guidance in terms of condition ratings and documentation. Even with these

Serdar Soyoz, Bogazici University, Istanbul, 34342, Turkey
Maria Q. Feng, University of California, Irvine, CA, 92697, US

Код: 10581

S. Soyoz, M.Q. Feng

Determination of Concrete Bridge Ageing by Structural Health Monitoring

Издательство DEStech Publications, Lancaster, 2010 год

6 стр; формат: 23,5 x 16 см; библиографический список: 11 единиц
ISBN: 978-1-60595-024-2

The stiffness change of a concrete bridge was determined by vibration-based monitoring over 5 years. Jamboree Bridge is located in Orange County, CA. This three span 111-m long bridge is instrumented with 13 acceleration sensors at both the superstructure and the columns. The sensor data is transmitted to a server computer wirelessly. The modal frequencies and the shapes were identified by processing traffic induced excitations. Bridge structural parameters, stiffness and mass, and the soil spring values were identified by the neural network technique. The identified modal frequencies vary within +/-10%. The identified stiffness of the bridge deck varies within +/-3%. Based on the statistical analysis of the collected data, 5% decrease in the first modal frequency and 2% decrease in the stiffness of the bridge deck were observed over the 5-year monitoring period. Probability density functions were obtained for stiffness values each year. Stiffness threshold values for the design life of the bridge deck under the operational loading can be determined. Therefore, the information obtained in this study is valuable for studying ageing and long-term performance assessment of similar bridges.

Ключевые слова:

Содержание.