Integration of SHM at an early stage in the design and construction of long-span bridges

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Abstract

Automated monitoring systems are being increasingly used on long-span bridges to address a wide range of challenges, such as those encountered during the construction stage or those associated with maintenance and life-cycle optimization. Bridge designers are now more prepared than in the past to consider the use of SHM systems in their work from an early stage, and to support contractors in implementing such systems during the construction stage. Close coordination between bridge designers, contractors and SHM specialists enables the appropriate equipment to be integrated wisely in the construction process, and ensures that full advantage may be taken of the benefits that can be gained from the use of an SHM system, right from the start of the bridge's life cycle. This can be particularly important, for example, where components of the SHM system require to be embedded in a structure's concrete during the construction stage, or where the system will play a significant data measurement and assessment role in the construction process as a whole. This is illustrated with reference to current bridge construction projects in India and Canada.

Keywords: expansion joint, flexible plug joint, new material, European Approval, life-cycle cost

1 Introduction

SHM systems are becoming more and more widely used on significant structures such as cable-stayed bridges, to address a wide range of challenges – including the ones related to construction phase as well as the issues associated with the maintenance and life-cycle optimization. Nowadays, bridge designers are more ready to consider the use of SHM systems in their specifications from an early stage, and to support contractors in implementing such systems during the construction stage. Close and timely coordination between bridge designers, contractors and SHM specialists enables the appropriate equipment to be integrated wisely in the construction process.

This paper describes the experiences of integrating SHM systems into a number of long-span bridges for the purpose of construction stage and permanent monitoring. Important parameters measured include cable vibrations, forces, movements at bearings and expansion joints, inclinations and positioning of pylons, corrosion, strain in concrete and steel elements, weather, etc. The positioning of sensors, determined by the SHM specialist in agreement with the bridge designer, typically includes critical locations such as tops of pylons, longest cables, main girders and other key

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