Research Project

04-2ST

Capsule

Technology Transfer Program

LTRC

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Structural Monitoring of Rigolets Pass Bridge

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LTRC

Louisiana Transportation Research Center

Sponsored jointly by the Louisiana Department of Transportation and Development and Louisiana State University

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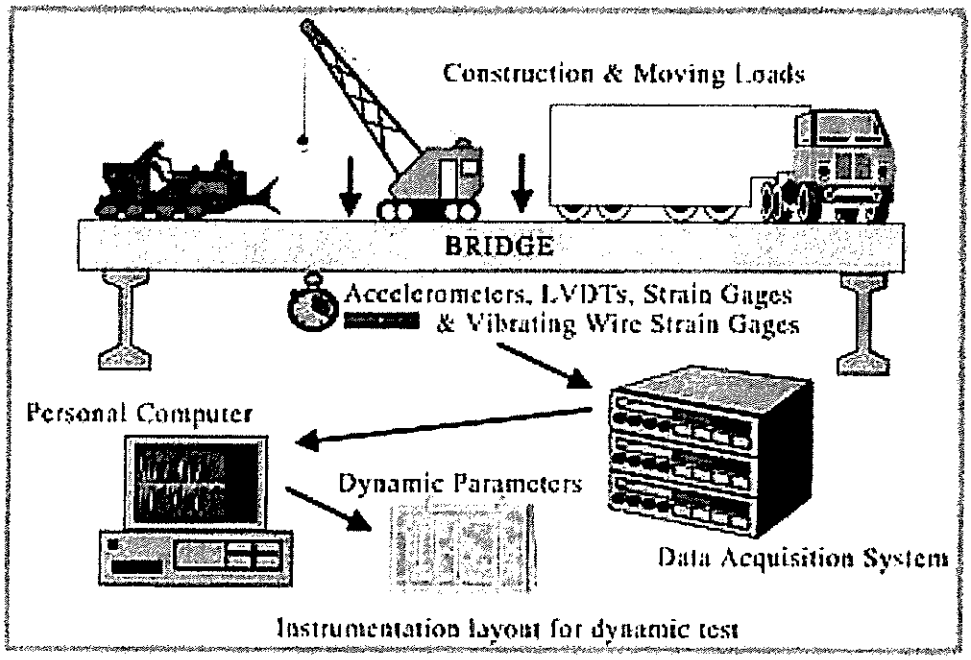
Problem

The American Concrete Institute defines high-performance concrete (HPC) as concrete meeting special performance and uniformity requirements that cannot always be achieved using only conventional constituents and normal mixing, placing, and curing practices. Many state highway departments currently use HPC on bridge decks, and some states commonly use high-strength HPC for prestressed concrete girders on medium and long-span bridges.

The well-documented benefits of HPC bridges include improved long-term durability and enhanced mechanical properties, allowing for the use of longer span lengths and wider girder spacings. This results in reduced construction time and more efficient use of material.

Louisiana has historically been a leader in the field of prestressed concrete. The state has been actively involved in the improvement of prestressed concrete technology and the investigation of the behavior of prestressed concrete, most recently with the development and implementation of HPC on the Charenton Canal Bridge. This bridge incorporated high-strength HPC in the prestressed concrete girders and piles and con-



Instrumentation for structural monitoring of Rigolets Pass Bridge

ventional-strength HPC in the bridge deck, pile caps, abutments, approach slabs, and barriers. The Charenton Canal Bridge incorporated relatively short spans of 73 feet.

DOTD now plans to use HPC for the prestressed concrete girders and deck slab of the Rigolets Pass Bridge, which will have 78-inch deep prestressed high-strength HPC girders with a design strength of 10,000 psi and a typical span length of 131 feet. The construction of the Rigolets Pass Bridge presents a significant opportunity to monitor the structural behavior of this long-span structure.

Objective

The objective of this research is to obtain measured strain and deflection data from one instrumented span of the Rigolets Pass Bridge. In addition, researchers will conduct a comprehensive study of material properties of the concrete incorporated in the superstructure of the instrumented bridge span.

Description

One span of the Rigolets Pass Bridge will be instrumented to measure concrete strains and deflections. This span will be chosen in consultation with DOTD, LTRC, and the bridge contractor. Material property tests will be performed on representative samples of concrete and prestressing strands incorporated in each instrumented girder, and on concrete samples from the deck slab. The instrumentation will include vibrating wire strain gauges, deflection reference points, and load cells.

A feature of this project that distinguishes it from previous similar investigations is the proposed utilization of automated data acquisition with remote access. Remote monitoring of the vibrating wire strain gauges will allow more frequent readings and eliminate the need for trips to the job site for data collection.

Manual measurements taken during fabrication of girders and construction of the deck slab will be analyzed along with the data collected using the automated data acquisition system. In addition to evaluating deflections and prestress losses, the concrete strains measured in the girders and deck slab will be analyzed to examine the effects of temperature and moisture gradients on the bridge superstructure near mid-span.

Implementation Potential

This research will ensure that Louisiana remains a leader in the applications of high-strength/high-performance concrete bridge structures. The Rigolets Pass Bridge is a major long-span high-strength concrete bridge that is the first of its kind in Louisiana, and, as such, will provide a unique opportunity to understand the structural behavior of a prototype for future bridge construction in the state. Findings and conclusions drawn from this research will be useful in the development of specifications and designs for future HPC bridge structures.