



RESEARCH PROJECT CAPSULE [14-2ST]

November 2015

TECHNOLOGY TRANSFER PROGRAM

Development of a Sustainable UHPC Bridge Deck for Movable Bridges

JUST THE FACTS:

Start Date:
September 1, 2015

Duration:
27 months

End Date:
December 30, 2017

Funding:
SPR: TT-Fed/TT-Reg

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Sponsored jointly by the Louisiana
Department of Transportation and
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University

POINTS OF INTEREST:

*Problem Addressed / Objectives of
Research / Methodology Used
Implementation Potential*

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PROBLEM

Louisiana has approximately 160 movable bridges, mostly in the southern part of the state, which places Louisiana among states with the highest inventory of movable bridges in the nation. These transportation arteries are important for the economic well-being of the state, as well as for the safety of the inhabitants in hurricane-vulnerable regions during evacuation. Most of the movable bridges in Louisiana are either swing-span or lift-bridge type structures, while very few movable steel bridges are of the bascule type.

The typical deck systems in these movable bridges consist of steel gratings. These decks are light and easily replaceable. However, records show that steel grating has had maintenance issues. The proximity of these exposed steel systems to humid environments leads to rapid deterioration. As a result, decks become loose, causing extreme noise. Furthermore, bridges close to residential areas often receive complaints from residents about noise levels resulting from vehicles crossing over steel gratings. These problems are aggravated by trapping foreign debris throughout the deck gratings.

The Department has an interest in using concrete decks on recent vertical-lift bridges. The dead weight of conventional concrete will have a negative impact on the mechanical system, through vertical lifting or horizontal swaying of the deck. A light ultra-high or high performance concrete (UHPC/HPC) deck would provide an alternative to steel grate decking for movable bridges. The proposed research will investigate the utilization of UHPC/HPC in a composite construction that utilizes the high strength and durability of UHPC/HPC while offering a smooth ride for vehicles crossing the bridge.

OBJECTIVE

The objective of this study is to develop a concrete bridge deck system for movable bridges, vertical lift, and swing spans types that are to be constructed or rehabilitated. The new system is expected to be more durable, offer better noise performance than current systems, and not impose an increase in dead weight requirements.

METHODOLOGY

The work on this project will comprise the following tasks:

- TASK 1: Conduct a literature review.
- TASK 2: Compile DOTD Bridge Plan details of current moveable bridge deck systems.
- TASK 3: Create a proposed Precast Deck System-Interim Report.
- TASK 4: Perform laboratory testing of concrete mixes.
- TASK 5: Create a second Interim Report.

TASK 6: Cast trial panels.

TASK 7: Test panels

TASK 8: Analyze data.

TASK 9: Conduct a benefit/cost analysis.

TASK 10: Develop design details and guidelines.

TASK 11: Create a final report.

IMPLEMENTATION POTENTIAL

The results of the proposed research can be directly implemented in the design and construction of an UHPC deck panel for movable bridges. The engineering community can use the results of this research to design the proposed precast deck panels to meet AASHTO's requirements at the service and ultimate load stages. The quantification of live load distribution factors will be crucial in this regard as will be the performance of the deck panels at various load levels.