Title: Field Performance Evaluation of Multiple Fiber Reinforced Polymer Bridge Deck Systems Over Existing Girders - Phase I

State Job Number: 14708
PID Number:
Research Agency: University of Cincinnati
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Sponsor(s): Tony Vogel
Study Start Date: 7/6/1998
Study Completion Date: 6/30/2001
Study Duration: 36 Months
Study Cost: $402,111.00
Study Funding Type: 80 Federal / 20 State from ODOT SPR (2)

STATEMENT OF NEED:
In recent years, fiber-reinforced polymer (FRP) deck systems have emerged as a viable alternative to conventional systems, namely reinforced-concrete slabs. The use of such systems to replace existing, deteriorated bridge deck systems offers both economical benefits and improved performance. The research work presented in this report is focused on experimental evaluation of FRP deck systems which have been used on two side-by-side bridges on Route 49 in Dayton, Ohio. Phase I of this project focused on the performance criteria and existing laboratory testing. The pair is called First Salem Bridge with Bridge No. MOT-49-10 and spans the Great Miami River.

RESEARCH OBJECTIVES:
- Assess the performance criteria developed by Ohio DOT for FRP deck systems.
- Evaluate the mechanical properties of the FRP deck materials.
- Evaluate the bending and shear stiffness of the FRP deck panels.
- Evaluate the fatigue response of the FRP deck panels on steel girders at high and low temperature.
- Evaluate the environmental durability of the FRP deck materials.

RESEARCH TASKS:
- Environmental exposure characterization of FRP materials.
- Static and failure tests of FRP deck panels.
- Fatigue evaluation of FRP bridge decks at extreme temperature conditions.
**RESEARCH DELIVERABLES:**

- The final report documenting research findings and recommendations.

**RESEARCH RECOMMENDATIONS:**

- The coupon level materials testing of each deck material type have shown that the materials are consistent in their properties and the coefficients of variation are relatively small.
- The environmental exposure and durability study served to discriminate the FRP materials that satisfied the durability requirements. The HITEC evaluation criteria were used to establish the minimum levels of retained properties. The average was 85% retention.
- The static test and failure test of panels served to characterize stiffness coefficients and establish a safety factor
- The extremely high and low temperature fatigue cycling served to assess the performance of the FRP panels, the panel to panel joint, and the specific connections to the steel girders proposed by the fabricators for the study.

**PROJECT PANEL COMMENTS:**

_Omar Abu-Hajar:_ The Laboratory tests seem to give promising results for the performance of the FRP deck system. The true test to determine the actual performance is to field monitor the behavior of the FRP deck system.

**IMPLEMENTATION STEPS & TIME FRAME:**

Continue laboratory testing of fatigue and environmental durability response as well as field testing and monitoring of the bridge using the FRP deck system. Phase II of this research, SJN: 14715, is proposed to end in October of 2005.

**EXPECTED BENEFITS:**

The expected benefit in going to Phase II is the increased confidence in the FRP deck panels to perform well in the field. If proven successful, it will compete with the conventional reinforced concrete slab decks. Thus, reducing maintenance costs and minimizing impact on traffic.

**EXPECTED RISKS, OBSTACLES, & STRATEGIES TO OVERCOME THEM:**

Finding the funds to finance Phase II of the research will present a challenge. This will require searching for alternate funding sources.

**OTHER ODOT OFFICES AFFECTED BY THE CHANGE:**

None
PROGRESS REPORTING & TIME FRAME:
N/A

TECHNOLOGY TRANSFER METHODS TO BE USED:
The final Report has been posted on the ODOT Office of Research & Development website and the hard copy of this report was distributed to other national libraries.

IMPLEMENTATION COST & SOURCE OF FUNDING:
The anticipated cost for Phase II is $1,267,636 coming from research funds of the Department.

Approved By: (attached additional sheets if necessary)

Office Administrator:
Signature: Tim Keller Office: OSE Date: 9/30/2005

Division Deputy Director:
Signature: Tony Vogel Division: DHO Date: 10/3/2005