Statement No. 16

Arkansas State Highway and Transportation Department
Transportation Research Committee

RESEARCH PROBLEM STATEMENT

DATE: 09/08/2016 | **PROJECT AREA:** Maintenance

TITLE: Implementation of pre-stressed CFRP fatigue retrofits for cracked steel bridge connections

PROBLEM STATEMENT:

As our transportation infrastructure continues to age, preservation actions that are capable of extending infrastructure life are needed, to allow distributed reconstruction efforts over time. For Arkansas' bridge infrastructure, partial depth diaphragm-to-girder connections are a "hot-spot" for distortion-induced fatigue in skewed and curved steel bridges, complicating system preservation efforts. Many existing skewed bridges within Arkansas have fatigue cracks resulting from this common connection detail. The proposed study will investigate the effectiveness of a novel, low-cost, fatigue retrofit (already under development in a current research study) consisting of pre-stressed carbon fiber reinforced polymer (CFRP) plates applied with designed pre-stress levels to increase bridge fatigue life. In the applied retrofit, the carbon fiber plates are un-bonded from the steel surface and no holes or modifications to the steel girder are necessary, making its application fairly universal. The study will involve application of the retrofits on existing skewed bridges having various degrees of skew, and long-term monitoring of component response with and without the retrofits will be used to identify clear fatigue damage rehabilitation strategies for skewed steel bridges. Bridge instrumentation measurements near the critical regions will provide information for further component fatigue life evaluations and add to existing AHTD bridge databases.

OBJECTIVES:

The objectives of the proposed project are to: 1) apply novel fatigue retrofit strategies to commonly affected (both cracked and uncracked) steel bridge sections and monitor performance under real-time traffic loading; 2) investigate fatigue susceptibility for the partial depth web connections of bridges having various degrees of skew; 3) Identify "problem conditions" (degree of bridge skew, size of web-gap in partial depth connection, etc.) to aid rehabilitation strategies and improve bridge system preservation decisions.

FORM OF RESEARCH IMPLEMENTATION:

The result of the proposed project would be an implementable, cost-effective, fatigue retrofit / fatigue rehabilitation strategy for use on steel bridges, validated through long-term monitoring and instrumented measurements. Results will be compiled into a seminar series on fatigue life evaluation of bridge components. Findings will be documented in a detailed field manual for application of retrofit strategies, and published in peer reviewed journal publications for broad dissemination.

REVIEWER: Davin Webb

Estimated Project Duration: 24

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Standing Subcommittee Ranking	Advisory Council Ranking	Statement Combined with Statement Number(s)
4/6	14	