

**TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT**

Date: July 16, 2012

Lead Agency (FHWA or State DOT): Indiana DOT

INSTRUCTIONS:

Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.

Transportation Pooled Fund Program Project # <i>(i.e., SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX))</i> <u>TPF 5(238)</u>		Transportation Pooled Fund Program - Report Period: <input type="checkbox"/> Quarter 1 (January 1 – March 31) <input checked="" type="checkbox"/> Quarter 2 (April 1 – June 30) <input type="checkbox"/> Quarter 3 (July 1 – September 30) <input type="checkbox"/> Quarter 4 (October 1 – December 31)	
Project Title: Design and Fabrication Standards to Eliminate Fracture Critical Concerns in Steel Members Traditionally Classified as Fracture Critical			
Name of Project Manager(s): Tommy E. Nantung		Phone Number: 765-463-1521 ext. 248	
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Lead Agency Project ID: TPF-5(238)		Other Project ID (i.e., contract #):	
		Project Start Date: 8/1/2011	
Original Project End Date: 7/31/2014		Current Project End Date: 7/31/2014	
		Number of Extensions: None	

Project schedule status:

On schedule On revised schedule Ahead of schedule Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
\$790,000	\$116,491	22%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
\$86,549 (10.9%)	11%	35%

Project Description:

The objective of this research project is to take advantage of the major advances that have occurred in the past 30 years in the following areas related to fracture control in steel bridges:

1. The very high toughness of high performance steel (HPS), which was not available 30 years ago, can be used to take brittle fracture off the table so to speak. Crack arrest and very large defect tolerance can be ensured in these steels. Similar strategies have been employed by other industries for several years.
2. Modern fatigue design and detailing can ensure fatigue cracking does not occur.
3. Modern fabrication, shop inspection and the AWS FCP, greatly reduces the likelihood that defects are not introduced during. Advancements in NDT techniques along with technologies not regularly used, such as phased array UT have the potential further reduce the chance of a defect being missed.

Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):

- The literature review continues.
- The test setup has been designed, specimen dimensions including load frame and actuator placement were investigated.
- Fixtures for loading have been designed and are currently in fabrication.
- Out-of-plane bracing for both the load frame and test specimens has been designed. Drawings have been sent to several fabricators to obtain quotes.
- Programming for the synchronization of two hydraulic actuators has been completed.
- Calculations and testing have been performed to size all required hydraulic equipment (valves, manifolds, and hose) to handle the elevated demand required for the fracture tests. Multiple quotes have been solicited for the required hydraulics and are being evaluated.
- Small-scale material testing (CVN, CTOD) continues.
- The research team is working with various steel fabricators and DOT's to obtain "drops" of HPS from bridge projects around the US. The small pieces of HPS will be used for samples to be used in the small scale testing
- Preliminary FE work has begun. Basic fracture mechanics models (i.e., a plate with a center crack or plate with a hole crack) are being created and validated with known solutions.

Anticipated work next quarter:

- Continue to refine the testing plan.
- Finalize design of large scale specimens
- Take delivery of the large-scale testing fixtures.
- Place order for all required bracing.
- Place order for all required hydraulic equipment.
- Continue with small-scale material testing.
- Continue to work with DOT's to obtain more "drops".
- Once reliable results are obtained from the preliminary FE studies, more complex models attempting to estimate fracture toughness demands on girders and plates with cracks will be created.

Significant Results:

During the past quarter, the major steps forward included:

1. Programming of the actuator control program to synchronize two actuators.
2. Sizing all required hydraulic equipment.
3. Design of the fixture and specimen bracing.
4. Initial FE work has commenced.

Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).

None this quarter

Potential Implementation:

None at this time. Too early in the research.