

**TRANSPORTATION POOLED FUND PROGRAM  
QUARTERLY PROGRESS REPORT**

Date: March 31, 2014

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.*

<b>Transportation Pooled Fund Program Project #</b> <i>(i.e., SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX))</i>  <u><b>TPF 5-238</b></u>	<b>Transportation Pooled Fund Program - Report Period:</b> <input checked="" type="checkbox"/> Quarter 1 (January 1 – March 31) <input 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)	
<b>Project Title:</b> <b>Design and Fabrication Standards to Eliminate Fracture Critical Concerns in Steel Members Traditionally Classified as Fracture Critical</b>		
<b>Name of Project Manager(s):</b> Tommy E. Nantung	<b>Phone Number:</b> (765) 463-1521 ext. 248	<b>E-Mail</b> <a href="mailto:tnantung@indot.in.gov">tnantung@indot.in.gov</a>
<b>Lead Agency Project ID:</b>	<b>Other Project ID (i.e., contract #):</b>	<b>Project Start Date:</b> 8/1/2011
<b>Original Project End Date:</b> 7/31/2014	<b>Current Project End Date:</b> 7/31/2014	<b>Number of Extensions:</b> 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
<b>\$790,000</b>	<b>\$455,037</b>	<b>55%</b>

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
<b>\$56,937</b>	<b>7.2%</b>	<b>84.6%</b>

**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 fabrication. Advancements in NDT techniques along with technologies not regularly used, such as phased array UT have the potential to 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 continued.
- Received repaired actuator valve and reassembled in test fixture.
- Quotes were received for large-scale specimens. Based on the quotes full-length girders will be ordered as opposed to the drop-in splice option.
- Preliminary toughness parameters were established for the large scale specimens. Steel producers donating material were asked for Grade 50 material with an average CVN value of 125 ft-lbs at -10 °F with a maximum CVN value of 150 ft-lbs and a minimum CVN value of 100 ft-lbs.
- Small-scale material testing (CVN, tension, static and dynamic pre-cracked CVN, and crack arrest) continued.
- Legacy CVN data continued to be evaluated using Master Curve.
- A second Round Robin with NASA was performed to ensure the finite element modeling techniques continue to be comparable with industry.

**Anticipated work next quarter:**

- Continue reviewing relevant literature.
- Order first round of large-scale specimens.
- Plan instrumentation layout for large-scale specimens.
- Completion of small-scale testing.
- Completion of legacy CVN data Master Curve analysis.
- Continue to work with DOT's to obtain more "drops".
- Continue J-Integral studies for various specimen geometries; specifically, a through-thickness center crack and through-thickness edge crack for an I-shape subjected to axial load.
- Begin FE modeling of large-scale specimens.

**Significant Results:**

During the past quarter, the major steps forward included:

1. Quote received for large-scale specimens.
2. Preliminary toughness criteria determined for large-scale specimens.
3. Small scale testing thoroughly underway.

**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).**

**Potential Implementation:**