TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT

Date: _December 31, 2015_

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.e, SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX)* ***TPF 5-238***	**Transportation Pooled Fund Program - Report Period:** ☐Quarter 1 (January 1 – March 31) ☐Quarter 2 (April 1 – June 30) ☐Quarter 3 (July 1 – September 30) XQuarter 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**	**E-Mail** tnantung@indot.in.gov
Lead Agency Project ID:	**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 X 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	**$763,034**	**85%**

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
$33,034	**4.2%**	**100%**

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.):

- Continued literature review.
- Received Grade 70 bending test specimens from fabrication: Specimens 70_1-5_1B and 2B.
- Received axial test Specimen 50_2-5_1A from fabrication.
- Removed north load cell from west bending test setup for repair.
- Tested four bending test specimens: 50_2-0_1B and 2B as well as 70_1-5_1B and 2B (Figures 1 - 4).
- Tested two axial test specimens: 50_1-5_1A and 2A (Figures 1 and 2).
- Ordered axial test Specimens 70_1-5_1A and 2A.
- Completed precracking of all fracture toughness specimens and sent out for side grooving.
- Completed precracking of plates E and H reference temperature determination specimens and sent out for side grooving.
- Continued FE modeling of large-scale specimens.
- Submitted draft final project report on small-scale testing

Anticipated work next quarter:

- Continue reviewing relevant literature.
- Receive and reinstall north load cell to west bending test setup.
- Complete testing of bending Specimens 50_2-5_1B and 2B.
- Complete testing of axial Specimen 50_2-5_1A.
- Receive and test axial test Specimens 70_1-5_1A and 2A.
- Complete precracking of plates I and J reference temperature determination specimens and send out for side grooving.
- Begin fracture toughness testing.
- Begin reference temperature determination testing of plates E and H.
- Continue FE modeling of large-scale specimens.

Significant Results:
During the past quarter, the major steps forward included:

1. Completed testing of 4 bending test specimens
2. Completed testing of 2 axial test specimens
3. Completed fatigue precracking of all fracture toughness test specimens and half reference temperature determination specimens

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:
None to date

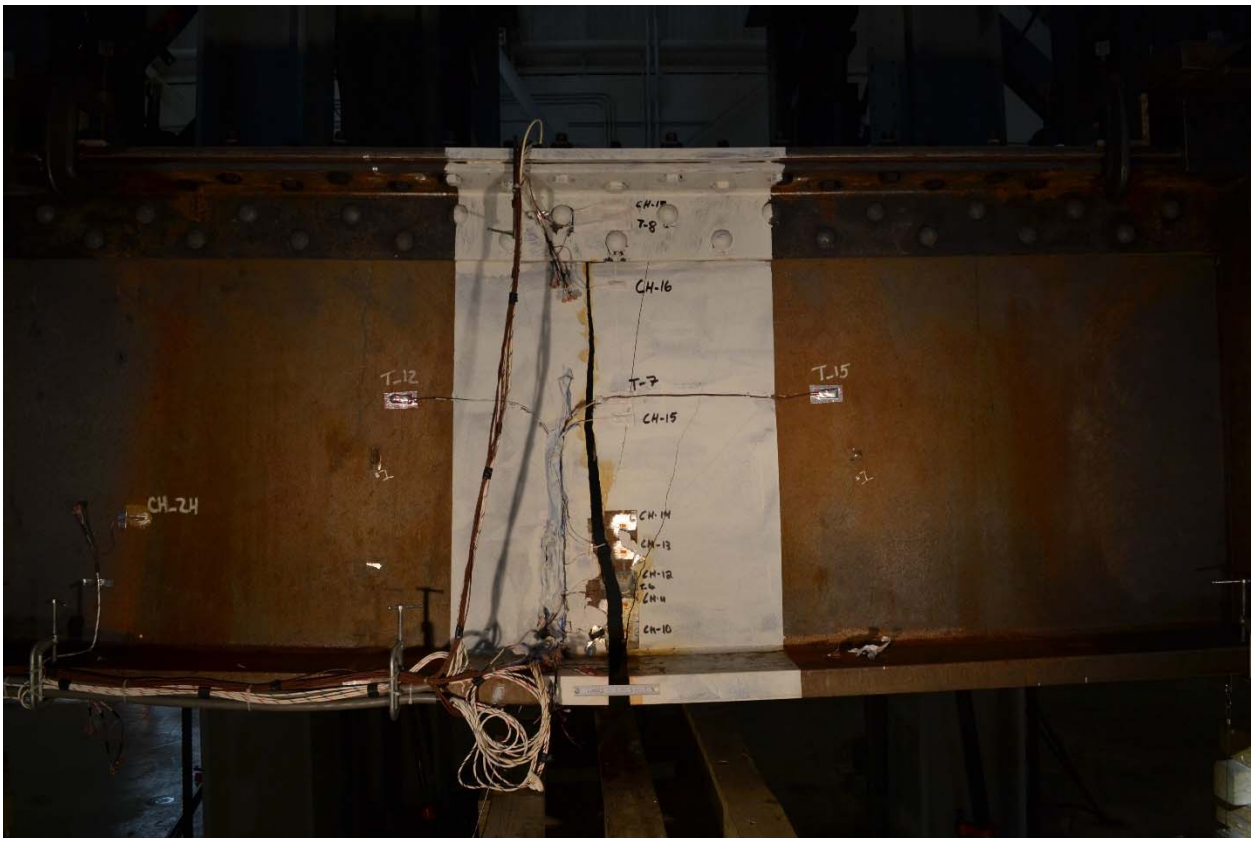

Figure 1: Specimens 50_2-0_1B

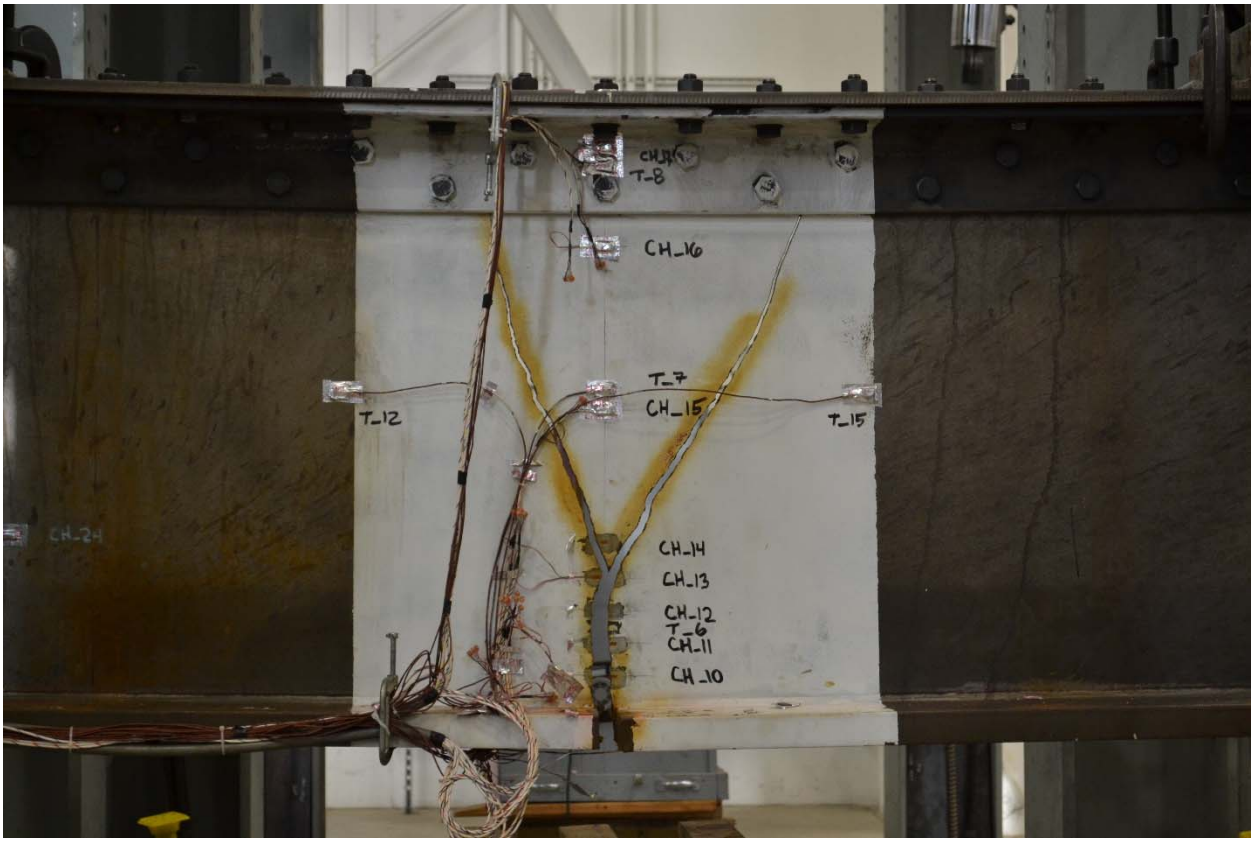

Figure 2: Specimen 50_2-0_2B

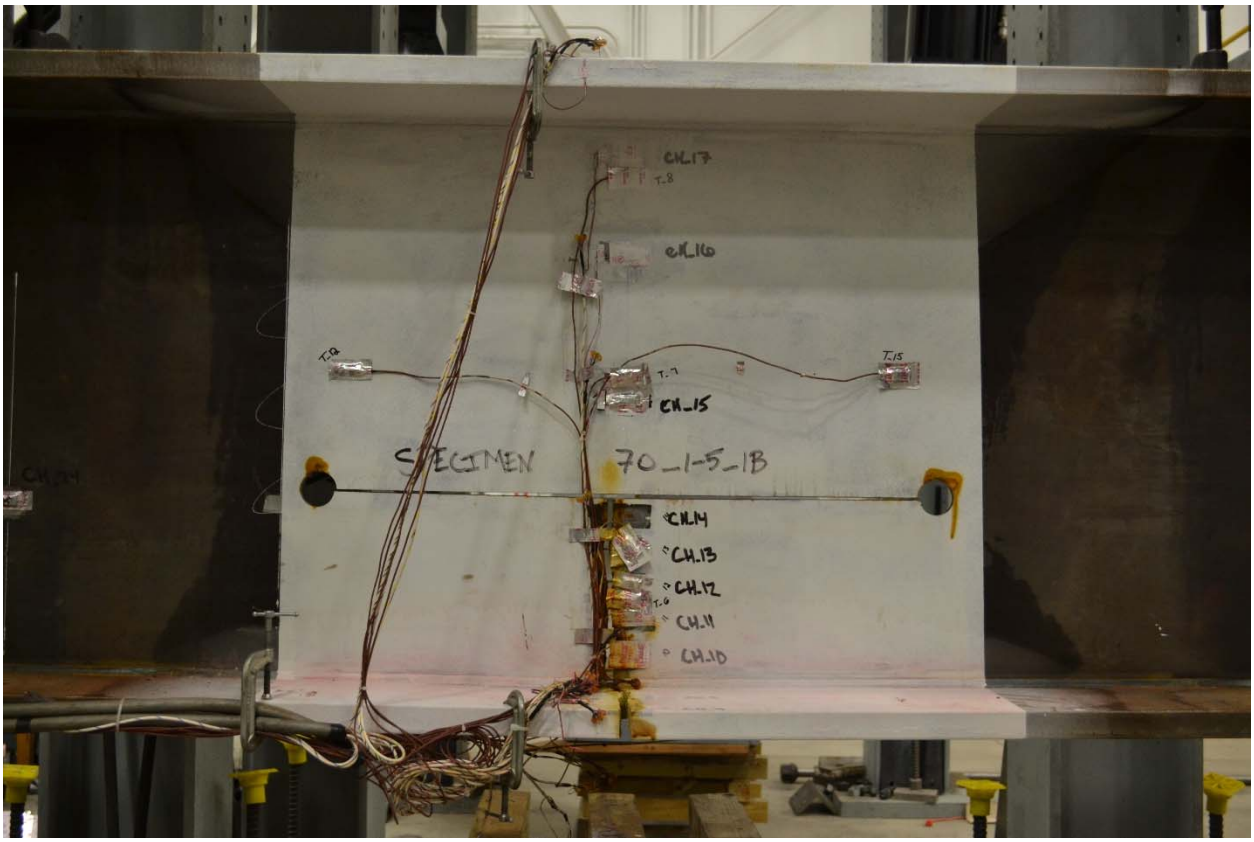

Figure 3: Specimen 70_1-5_1B

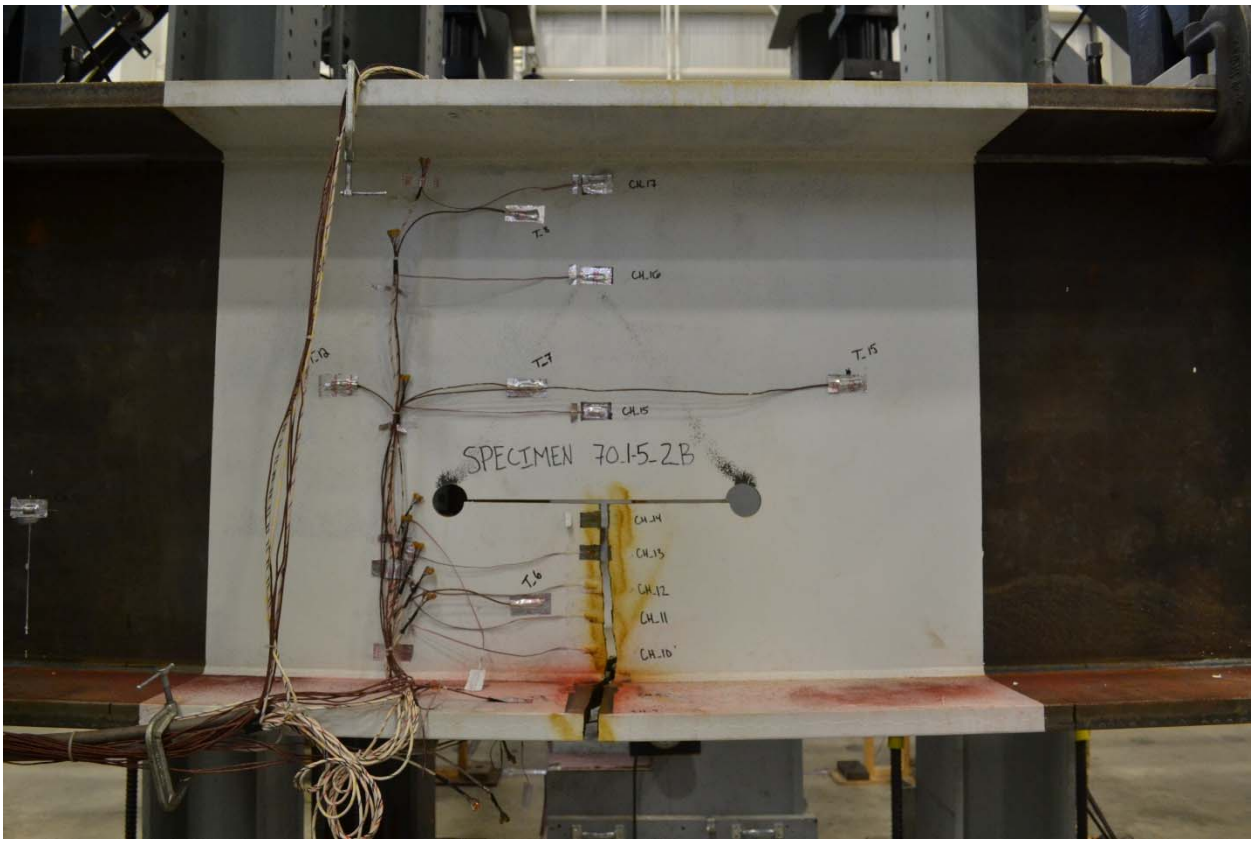

Figure 4: Specimen 70_1-5_2B

Figure 5: Specimen 50_1-5_1A

Figure 6: Specimen 50_1-5_2A