

## TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): Virginia Department of Transportation

### 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>  <b>TPF(5)-226</b>	<b>Transportation Pooled Fund Program - Report Period:</b> <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 4 – December 31)	
<b>Project Title:</b> Instrumentation to Aid in Steel Bridge Fabrication		
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<b>Lead Agency Project ID:</b>	<b>Other Project ID (i.e., contract #):</b> 100-CMW	<b>Project Start Date:</b> 7/20/10
<b>Original Project End Date:</b> 7/19/11	<b>Current Project End Date:</b> 7/19/11	<b>Number of Extensions:</b> 0

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	Total Percentage of Work Completed
\$150,000	\$119,512	95%

Quarterly Project Statistics:

Total Project Expenses This Quarter	Total Amount of Funds Expended This Quarter	Percentage of Work Completed This Quarter
\$24,471 (project items, consultants, travel)	\$31,911	20%

**Project Description:**

Transportation Pooled Fund Project TPF(5)-226 “Instrumentation to Aid in Steel Bridge Fabrication” will deliver a laser based bridge measurement system that will greatly improve the quality and reduce the cost of complex bridge fabrication. This system will reduce or eliminate the need for shop fit-up and assembly by providing a virtual assembly capability using specialized solid modelling and analysis software specifically targeted at large-scale complex structures. This laser system will be specifically designed for steel bridge fabrication and will accurately and precisely measure all aspects of a bridge component, including splice hole locations, camber, sweep, and end-kick in a nearly full-automated manner. The completed system can also be used as a quality control tool to document as-built conditions of girders and as a virtual fit-up tool to eliminate shop assembly.

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

The following efforts summarize the status of all project tasks and show additional work completed.

***Task 1 – Complex Structure Fabrication Procedure Analysis (100% complete)***

The bridge girder fabrication process was examined in detail. Measurement requirements and integration plans were assessed. The existing fabrication process was examined in terms of optimal laser system measurement integration.

***Task 2 - Assess commercial software and analysis tools (100% complete)***

Existing commercial software tools were examined for integration into the project system. This included requirements for integrating with existing fabrication CAD systems in the existing fabrication process.

***Task 3 – Fabricator large-scale component tests (100% complete)***

Laser system testing has been completed at the Hirschfeld Industries plant in Abingdon, VA plant. Straight, curved, and large-scale tub girders were measured in an actual shop environment. The virtual fit-up process was demonstrated on a pair of straight-girders. System modifications were made to prepare the equipment for fabrication job testing.

***Task 4 – Documentation (50% complete)***

The project final report and Phase II work plan are under development.

***Additional Tasks Completed***

The initial goals of Phase I were to better assess the fabrication process and identify the items needed to implement a full-time system in a fabrication environment. Phase II was scheduled to design and integrate a custom laser system and to make measurements on a real bridge job. Due to favorable circumstances presented during the course of the project the project has proceeded far ahead of schedule and is now coordinating an actual bridge job project with TDOT where the project laser system will be used to design splice plates, eliminating the lay-down process. Given the opportunity for testing, work has been accelerated in three key areas.

- Phase I Task 2 not only defined and specified the optimal commercial tools, but work has progressed beyond this task to begin development with these tools. The process of converting 2D shop drawings to 3D models needed for measurement and analysis is well under-development. Many of these steps have been nearly/fully automated. This is a key step in the over-all process and is needed for successful implementation on a real bridge job.
- To prepare for the TDOT job involving a large-scale production job in the shop environment, work has begun on measurement automation steps, not originally planned for Phase I. Software tools have been created to automatically setup, capture, and organize data. Measurement automation is needed to successfully implement the system on a real bridge job and work effectively within a production environment.

- Phase I Task 3 planned minimal basic system modifications, which were completed and implemented into the Phase I fabrication shop testing. The size and complexity of the girders for the TDOT job require significant hardware changes to the system. In order to be able to successfully conduct the planned measurements, substantial system design and integration modifications, originally planned for later in Phase II, have been begun and many will be completed for the TDOT job.

Work this period has been focused on coordinating the TDOT bridge job. Significant system modifications have been designed and worked has been completed to integrate these changes into the overall system. Work has been progressing on development of 3D CAD models for the bridge job. More importantly, procedures are being developed to make generation of these 3D models fast and efficient for use during actual testing.

**Anticipated work next quarter:**

Work will continue the following tasks.

- Coordinate TDOT testing
- Continue system hardware and software modifications to prepare for testing
- Out-reach efforts to discuss the project with State Departments of Transportation, bridge fabricators, and other interested parties

**Significant Results:**

Tennessee DOT (TN DOT) has agreed to allow laser measurements and virtual assembly procedures from this project in place of a conventional lay-down process for a schedule bridge job with Hirschfeld Industries. Several girders will be fabricated without lay-down and subsequently measured with the laser system. Virtual fit-up and splice plate design will then be completed. The details of this testing are now being planned. Fabrication is scheduled for this summer.

The status of this project was presented to the AASHTO T-14 Committee (Structural Steel Design) on May 16, 2011.

**Circumstance affecting project or budget (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