

Semi-Annual Progress Report

Project Number and Title: 3.4 Testing, Monitoring and Analysis of FRP Girder Bridge with Concrete Deck

Research Area: Thrust Area 3

PI: W. Davids, UMaine

Co-PI(s): H. Dagher, UMaine

Reporting Period: 4/1/2019 – 9/30/2019

Date: 9/30/2019

Overview: (Please answer each question individually)

Provide overview and summary of activities performed during previous six months....

Over the past months, progress has been made toward Task 1: Manufacturing and Construction Monitoring. This has included observing test layups and infusions, layup and infusion of mock-up girder sections on multiple iterations of mold, and examination and documentation of resulting parts. Additionally, construction and manufacturing meetings have been attended during which information on manufacture and construction have been discussed by AIT and the MaineDOT. An image of a completed, cured, 6-foot section of girder is presented in Figure 1.



Figure 1: Completed Mock-Up Section of Girder

Provide context as to how these activities are helping achieve the overarching goal of the project...

The previously stated activities are in direct support of the overarching project goal of assessing the constructability and design methodology for FRP bridge girder bridges. By observing and documenting the process of iteratively manufacturing parts – from test panels to full girders – the problems encountered and their subsequent solutions can be used to streamline and improve upon the final manufacturing process. In addition, the observations made will help in assessing the viability of this type of structure relative to more conventional structures.

Describe any accomplishments achieved under the project goals...

Observations of the manufacturing process have been made and documented, including challenges that have arisen and the solutions developed to overcome them.

Describe any opportunities for training/professional development that have been provided...

The project PI regularly provides input to the AIT engineers on design details and provides feedback on design assumptions and procedures employed by AIT.

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Describe any activities involving the dissemination of research results (be sure to include outputs, outcomes, and the ways in which the outcomes/outputs have had an impact during the reporting period)...

During the reporting period, an overview of the composite girder technology, as well as observations of manufacturing made to the time of presentation were presented at the Transportation Infrastructure Durability Center Annual Conference where they were available for the engineering community. Further, the PI will be presenting details and results of FRP CT girder research at the Maine Transportation Conference in December, as well as at the International Accelerated Bridge Construction Conference in Miami, FL in December.

Participants and Collaborators:

List all individuals who have worked on the project.

Dr. William Davids, UMaine (Project PI)
Dr. Habib Dagher, UMaine (Co-PI)
Anthony Diba, UMaine (Former)/AIT
Dante Guzzi, UMaine (Former)
Andrew Schanck, UMaine
Wendell Hariman, AIT
Tim Kenerson, AIT
Ken Sweeney, AIT
Carmala Buzzell, AIT

List all students who have participated in the project. (Include name, email address, class standing, major, and role in the research)

Two former and one current graduate student have participated in this project. Anthony Diba (anthony.diba@maine.edu), a former M.S. student in Mechanical Engineering, developed the original prototype girder system and has been assisting in the design of the demonstration bridge as an employee of AIT. Dante Guzzi (dante.guzzi@maine.edu), a former M.S. student in Civil Engineering funded by the US Army developed a novel shear connection system to ensure composite action between the girder and deck. Andrew Schanck (andrew.schanck@maine.edu), a Ph.D. student in Civil Engineering has developed and performed FE analyses in support of the design of the demonstration bridge and observed and documented the girder manufacturing process as it has developed.

What organizations have been involved as partners on this project? What was their role?

The designers of the bridge (AIT) as well as the future bridge owner, MaineDOT have partnered with UMaine on the development and completion of this project. There are regular meetings between AIT and UMaine to disseminate relevant research results. In addition, additional development of the girder system is proceeding with separate federal funding from the US Army Corps of Engineers which will enhance the constructability and economy of future projects after the Hampden Grist Mill Bridge.

Have other collaborators or contacts been involved? If so, who and how?

No additional collaborators have been contacted

Changes:

Discuss any actual or anticipated problems or delays and actions or plans to resolve them...

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Over the past few months significant delays have occurred due to construction scheduling and setbacks in manufacturing. Most notably, the construction of the demonstration bridge has been delayed until 2020, which affects the entirety of the

original project schedule. Additionally, although the manufacturing schedule had been adjusted to reflect the new construction schedule, delays have occurred in manufacturing which have elongated the observation process. To resolve these delays, the problem schedule has been adjusted and will continue to be adjusted, and a greater amount of preliminary work will be done before construction occurs, rather than after.

Discuss any changes in approach and the reasons for the change...

To account for the construction schedule delay, a significant amount of preliminary work will be performed before construction of the demonstration bridge where it had previously been scheduled to be performed after. This will ensure that when the bridge is constructed, all preliminary work will have been done with new information able to be added immediately.

Planned Activities:

Description of future activities over the coming months.

In the coming months, progress in manufacturing will continue to be observed and documented. Additionally, aspects of Tasks 2 and 3 which can be performed prior to the completion of the bridge will be identified and performed to streamline work performed after the bridge is constructed.