

Quarterly Progress Report:

Project Number and Title: 3.1X FRP-Concrete Hybrid Composite Girder Systems: Web Shear Strength and Design Guide Development

Research Area: Thrust Area 3

PI: W. Davids, UMaine

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

Reporting Period: 10/1/2020 – 12/31/2020

Submission Date: 12/31/2020

Overview: (Please answer each question individually)

*Provide **BRIEF** overview and summary of activities performed during the reporting period.*

During the reporting period, sandwich panels were laid up and infused by AIT, which we subsequently used to manufacture and post-process the 24 test specimens that will be tested under ASTM D8067-17. This involved CNC waterjet cutting the specimens from the parent stock, CNC machine drilling the mounting holes, and applying a stochastic paint pattern to one of the faces for DIC strain measurement. Additionally, base-line finite element models have been created, by which each of the test specimens will be numerically analyzed under static and Eigenvalue buckling conditions. Finally, literature review has continued which aims to provide more detail and context to the skeletal design guide.

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

Manufacturing and post-processing of the ASTM D8067-17 test specimens allows for testing to commence immediately upon receiving the updated test fixture. This, as well as creating baseline finite element models, leads toward increasing our understanding of the shear behavior of CT girders and completion of Task 1. Continued literature review, especially as pertains to sandwich panels under in-plane shear forces, helps to improve the overall context and understanding of the CT girder’s behavior such that the design guide incorporated includes as much research experience as is available.

Describe any accomplishments achieved under the project goals...

The test specimens required for Task 1 have been manufactured and post-processed, and the testing set-up has been completed. Finite element models of these specimens have been created and their functionality verified.

Complete the following tables to document the work toward each task and budget (add rows/remove rows as needed, make sure you complete the Overall Project progress row and include all tasks even if they have ended or have not been started)...

Table 1: Task Progress			
Task Number	Start Date	End Date	% Complete
Task 1:	6/1/2020	5/31/2021	30
Task 2:	6/1/2020	5/31/2022	10
Overall Project:	6/1/2019	5/31/2022	25

Table 2: Budget Progress		
Project Budget	Spend – Project to Date	% Project to Date*
\$98,775	????	????

**Include the date the budget is current to.*

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

No opportunities for training or professional development have yet arisen as a result of this project.

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. Please use the tables below for any Publications and Presentations in addition to the description of any other technology transfer efforts that took place during the reporting period.)... Use the tables below to complete information about conferences, workshops, publications, etc. **List all other outputs, outcomes, and impacts after the tables** (i.e. patent applications, technologies, techniques, licenses issued, and/or website addresses used to disseminate research findings).

Table 3: Presentations at Conferences, Workshops, Seminars, and Other Events				
Title	Event	Type	Location	Date(s)
N/A				

Table 4: Publications and Submitted Papers and Reports				
Type	Title	Citation	Date	Status
N/A				

No results have yet been created or disseminated.

Participants and Collaborators:

Use the table below to list all individuals who have worked on the project.

Table 5: Active Principal Investigators, faculty, administrators, and Management Team Members			
Individual Name	Email Address	Department	Role in Research
William Davids	william.davids@maine.edu	Civil and Environmental Engineering	Principal investigator

Use the table below to list all students who have participated in the project during the reporting. (This includes all paid, unpaid, intern, independent study, or any other student that participated in this project.)

Table 6: Student Participants during the reporting period				
Student Name	Email Address	Class	Major	Role in research
Andrew Schanck		Ph.D	Civil Engineering	Conduct and coordinate testing, modeling, report results, design guide drafting

Use the table below to list any students who worked on this project and graduated during this reporting period.

Table 7: Student Graduates			
Student Name	Role in Research	Degree	Graduation Date
N/A			

Use the table below to list organizations have been involved as partners on this project and their contribution to the project.

Table 8: Research Project Collaborators during the reporting period						
Organization	Location	Contribution to the Project				
		Financial Support	In-Kind Support	Facilities	Collaborative Research	Personnel Exchanges
Advanced Infrastructure Technologies	Brewer, Maine	x		x		

List all other outputs, outcomes, and impacts here (i.e. patent applications, technologies, techniques, licenses issued, and/or website addresses used to disseminate research findings). Please be sure to provide detailed information about each item as with the tables above.

No technology transfers have occurred within the reporting period.

Have other collaborators or contacts been involved? If so, who and how? (This would include collaborations with others within the lead or partner universities; especially interdepartmental or interdisciplinary collaborations.)

Who is the Technical Champion for this project?

Name: Anthony Diba

Title: Engineer

Organization: AIT Bridges

Location (City & State): Brewer, Maine

Email Address: anthony@aitbridges.com

Changes:

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

A number of unforeseen problems have arisen which have led to delays in testing of the 24 test specimens. Most recently, upon attempting to test the first panel, the test fixture broke due to local overloading of one of the hardened corner pins. This has necessitated communication with the fixture manufacturer who has agreed to provide a redesigned fixture. We are currently awaiting delivery, at which point testing will resume.

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

No changes in approach are planned for the foreseeable future, with the exception being an updated, delayed schedule.

Planned Activities:

Description of future activities over the coming months.

In the coming months, the ASTM D8067-17 specimens will be tested, and the results from testing analyzed. Data collected will be used to calibrate the FEA models, allowing for more accurate prediction of their behavior. This will be accompanied by additional literature research pertaining to CT girder design and analysis, with particular attention paid to shear strength and stability design.