

Quarterly 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: 1/1/2021 – 3/31/2021

Submission Date: 3/31/2021

Overview: (Please answer each question individually)

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

Just before the start of the current reporting period (too late to be reported upon in the previous progress report), live-load testing was performed on the Hampden Grist Mill Bridge (HGMB). Load was applied with overloaded dump trucks (producing moments equaling close to full HL-93 moment with impact) and resulting strains were recorded with purpose-made, full-bridge strain transducers. The resulting data were analyzed allowing conclusions of the bridge’s behavior to be drawn and its capacity rating factor to be updated based on measured response. These activities effectively close out Task 2 of the project. IN addition, the data recorded during testing have been used to validate and tune the 3D finite element (FE) models that had been previously made for the HGMB. The results of the final, calibrated model analyses will clarify additional behavior which could not be detected by live-load testing alone.

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

Live-load testing of the Hampden Grist-Mill Bridge is vital to improving our understanding of this novel structure’s behavior, specifically its flexural behavior and live-load distributive properties. Creation of a detailed, calibrated finite element model will enable a more fundamental understanding of the bridge’s behavior, allowing in-depth assessment of individual components’ individual contributions to overall behavior.

Describe any accomplishments achieved under the project goals...

Live-load testing and analysis of the resulting data fulfills the goals for Task 2, significantly increasing the overall project progress and allowing additional progress to be made in Task 3. Continuing development of the HGMB FE models allows new conclusions to be made regarding the bridge’s behavior.

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:	3/2019	12/2020	100
Task 2:	1/1/2020	1/2021	100
Task 3:	1/1/2020	5/2021	65
Overall Project:	3/2019	5/2021	88

Table 2: Budget Progress		
Project Budget	Spend – Project to Date	% Project to Date*
\$161,747	????	????

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

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.

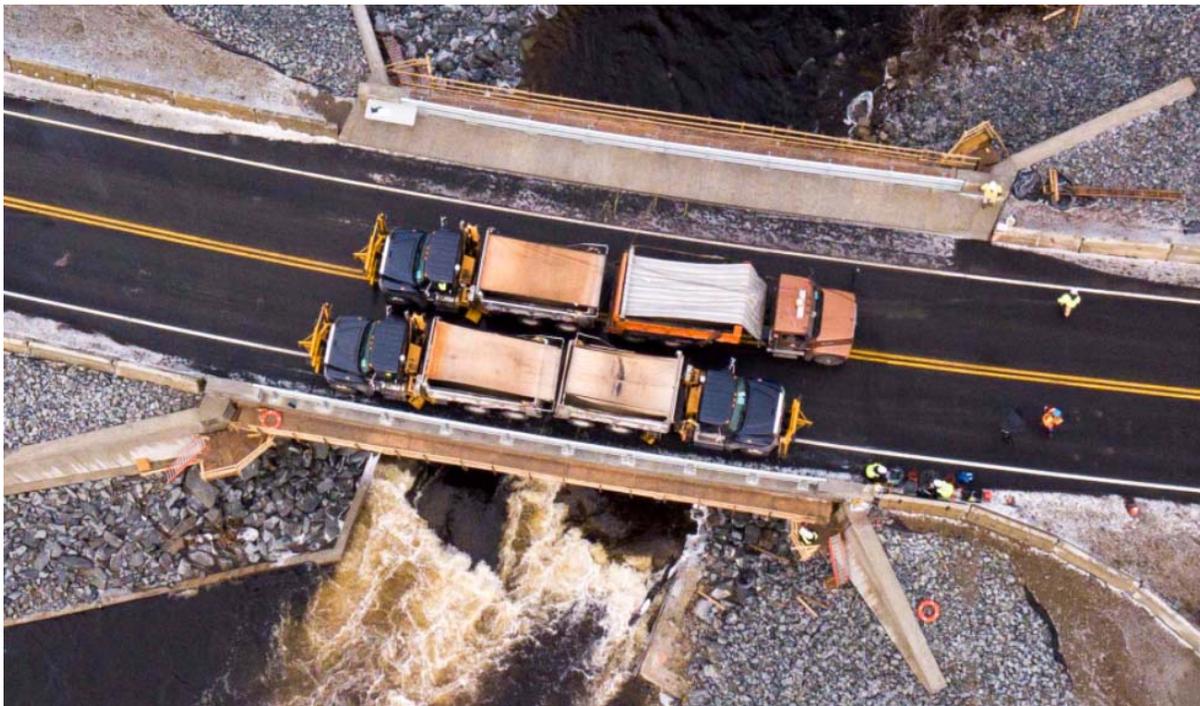
Describe any activities involving the dissemination of research results (be sure to include outputs, outcomes, and the ways in which the outcomes/outputs have had an impact during the reporting period. Please use the tables below for any Publications and Presentations in addition to the description of 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)

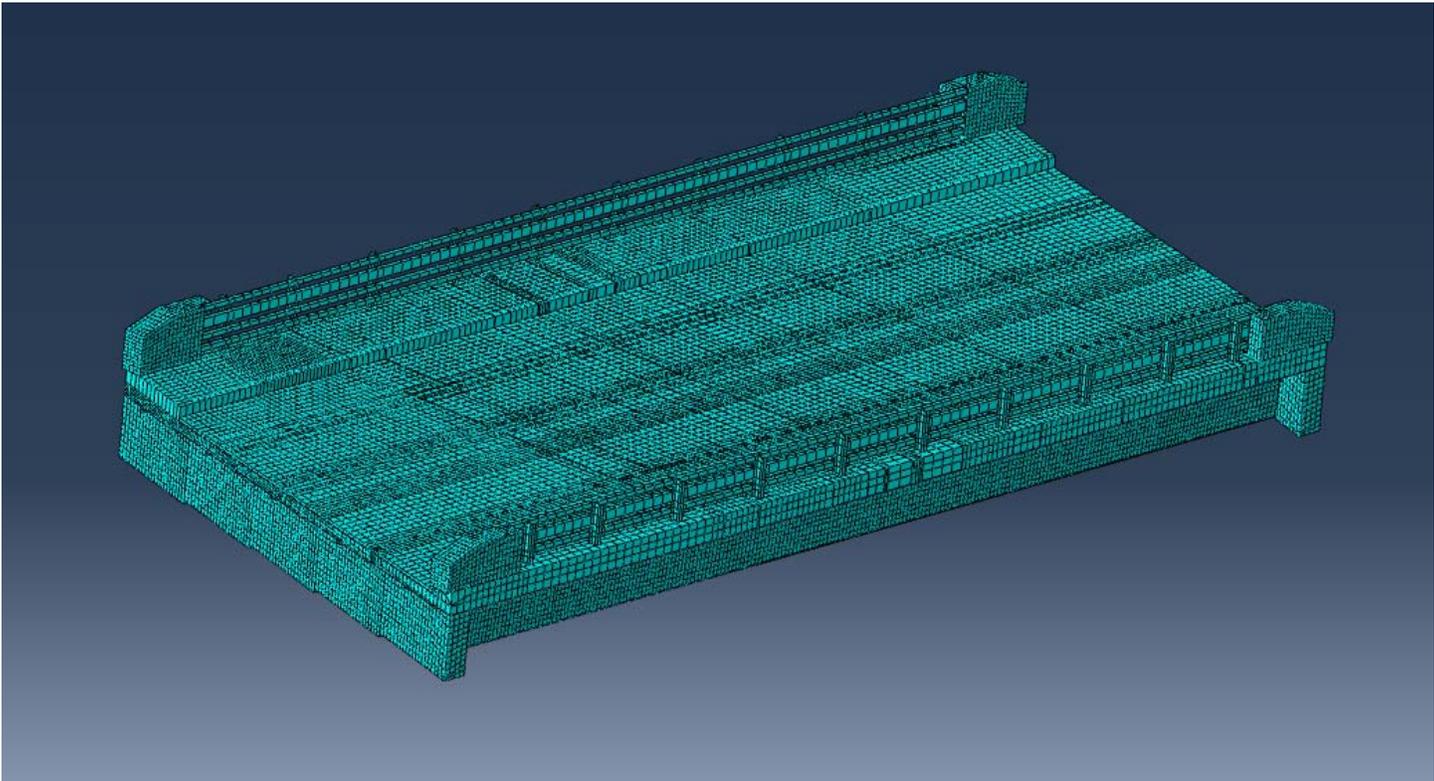
Table 4: Publications and Submitted Papers and Reports				
Type	Title	Citation	Date	Status
N/A				

No formal presentations or publications have been submitted or given. However, the analysis of data collected during live-load testing have been shared with the industrial partner, Advanced Infrastructure Technologies, for discussion and deliberation.

Encouraged to add figures that may be useful (especially for the website)...



Aerial Photo of Live-Load Testing (Courtesy of Advanced Infrastructure Technologies)



Meshed FE Model of the HGMB

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
Habib Dagher	hd@maine.edu	Civil and Environmental Engineering	Co-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	Manufacture/construction observation, modeling

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		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.)

Collaboration has been on-going with researchers at UMass Lowell to coordinate installation of sensors for long-term monitoring of the Hampden bridge.

Table 9: Other Collaborators			
Collaborator Name and Title	Contact Information	Organization and Department	Contribution to Research
Tzuyang Yu, Associate Professor	TzuYang_Yu@uml.edu	UMass Lowell, Civil and Environmental Engineering	Sensor installation coordination

Who is the Technical Champion for this project?

Name: Joshua Hasbrouck
 Title: Civil Engineer
 Organization: Maine Department of Transportation
 Location (City & State): Augusta, Maine
 Email Address: Joshua.p.hasbrouck@maine.gov

Changes:

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

No problems or delays have been encountered or anticipated during the current reporting period.

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

No significant changes in approach have been required during the current reporting period.

Planned Activities:

Description of future activities over the coming months.

During the next months, the HGMB FE models will continue to be refined and analyzed for the purpose of drawing conclusions on the bridge's behavior. These, along with the findings of Tasks 1 and 2 will be reported upon, effectively closing out the project.