

Quarterly Progress Report:

Project Number and Title: 2.10 Durability Evaluation of Carbon Fiber Composite Strands in Highway Bridges
Research Area 2: New materials for longevity and constructability

PI: *Roberto Lopez-Anido, University of Maine*

Co-PI(s): *Keith Berube and Andrew Goupee, University of Maine*

Reporting Period: *04/01/2020 to 06/30/2020*

Date: *06/30/20*

Overview:

The work during the current period has included the following:

- We developed of a safety protocol for performing bridge site visits while ensuring the safety of personnel, which was compliant with University recommendations for COVID-19. This plan was approved by the University.
- We continue to develop the online interface for the DAQ system including interfaces for the fiber optic conditioning unit and additional sensors.
- We updated the literature review on existing use of carbon fiber cables/strands in civil infrastructure.
- We assembled a wireless data acquisition team with Curtis Libby from the UMaine Composites Center and MaineDOT IT to work on the online interface for the data acquisition system.
- We identified potential units for wireless data acquisition system options. The final system selection will be based on the networking capabilities at the bridge site.
- We have resolved data acquisition issues.
- We processed the existing bridge monitoring data from prior years with numerical models for durability assessment.

The literature review on carbon fiber cables is part of the Durability Assessment in Task 4, the processing of existing data with numerical models is part of Task 3, environmental sensing instrumentation is part of Task 2, while the remaining work is contributing to the upgrade of the data acquisition system in Task 1.

We obtained three sets of continuous data at a stay anchorage locations at the Penobscot-Narrows Bridge site. Four trips were made to the bridge. One of the trips to the bridge was with the MaineDOT and UMaine wireless data acquisition team to investigate the current networking capabilities on site.

We had an information project update meeting with the Technical Champion, Dale Peabody from MaineDOT, on June 19th. We participated in the stay icing monitoring meeting with MaineDOT bridge designers on June 30th.

The current status of each task and the current state of the budget are presented in Tables 1 and 2, respectively.

Table 1: Task Progress			
Task Number	Start Date	End Date	Percent Complete
Task 1: Upgrade Data Acquisition System	6/1/2019	8/31/2020	40%
Task 2: External Environmental Sensing	1/1/2020	8/31/2020	5%
Task 3: Implement Analytical Model	11/1/2019	5/30/2021	20%
Task 4: Durability Assessment	11/1/2019	12/31/2021	20%

Table 2: Budget Progress		
Entire Project Budget	Spend Amount	Spend Percentage to Date

An abstract titled “Durability Evaluation of Carbon Fiber Composite Strands in Highway Bridges,” co-authored by Braedon Kohler, Keith Berube, Andrew Goupee, and Roberto A. Lopez-Anido, was submitted to the 2020 TIDC Annual Conference.

Table 3: Presentations at Conferences, Workshops, Seminars, and Other Events				
Title	Event	Type	Location	Date(s)
Durability Evaluation of Carbon Fiber Composite Strands in Highway Bridges	2020 TIDC Annual Conference	Abstract	Virtual	August 12-13

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

Participants and Collaborators:

The principal investigators and graduate students that have participated in the project during the current reporting period are listed in Tables 5 and 6, respectively.

Table 5: Active Principal Investigators, faculty, administrators, and Management Team Members			
Individual Name	Email Address	Department	Role in Research
Roberto Lopez-Anido	RLA@maine.edu	UMaine Civil and Environmental Engineering	Project PI, Graduate student co-advisor, and Structural lead.
Keith Berube	keith.berube@maine.edu	UMaine Mechanical Engineering Technology	Project Co-PI and Data acquisition instrumentation lead.
Andrew Goupee	Andrew.goupee@maine.edu	UMaine Mechanical Engineering	Project Co-PI, Graduate student co-advisor, and Modeling lead.

Table 6: Student Participants during the reporting period				
Student Name	Email Address	Class	Major	Role in research
Braedon Kohler		Masters	Mechanical Engineering	Modeling, programming and data acquisition

There were no students working on the project who graduated during the current reporting period.

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

During the current reporting period the Maine DOT provided support, as indicated in Table 8. Their contribution has been to provide access to the PNB work site, provide IT networking support and contribute to the environmental sensing background research.

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
Maine DOT	Augusta, ME		x			

Changes:

The schedule has been affected by disruptions of day-to-day campus and field work due to the University shutdown in response to COVID-19 health safety precautions.

Planned Activities:

The following activities are planned for the next three month period:

- Continue to obtain continuous data from different stay anchorage locations at the PNB site.
- Finalize background research and purchase wireless data acquisition (DAQ) system.
- Select environmental sensors for external environment monitoring at the PNB site.
- Finalize the online interface for the DAQ system.
- Continue using existing analytical model to process continuous data sets as they are acquired.
- Finalize the literature review on the use of carbon fiber composite cables/rods in civil infrastructure.
- Start installing hardware at the bridge site.