Quarterly Progress Report:
Project Number and Title: 3.10 Assessment and Optimization of Double CT Bridge Girder Sections with Longitudinal Precast Decks
Research Area: Thrust Area 3
PI: W. Davids, UMaine
Co-PI(s): H. Dagher, UMaine
Reporting Period: 4/1/2021 – 6/30/2021
Submission Date: 6/30/2021

Overview: (Please answer each question individually)

*Provide **BRIEF** overview and summary of activities performed during the reporting period.*
During the reporting period, significant progress has been made toward the completion of all tasks of this project:

Task1: This task was completed during the previous reporting period

Task 2: The data collected during fatigue and quasi-static failure testing of each of the five specimens were analyzed and results reported. This effectively completes this task.

Task 3: Creep measurements of the first instrumented double CT girder continued to be taken at regular intervals. In addition, the girder's instantaneous defection and deformations due to concrete shrinkage have been estimated for comparison to the final creep levels.

Task 4: The double CT girder has been moved under the loading frame and instrumentation is being installed. This is in preparation to do the characterization test of the module before casting the remainder of the concrete deck.

Task 5: The testing plan for the CT girder specimen has been finalized. The approval of the work instruction describing the lab-related work and final instrumentation (beyond what was setup for Task 4) is currently under way.

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

Task 2: Analysis of the data recorded during testing allowed the long and short-term behavior of the ridged shear connection and various uplift-resisting devices to be better characterized for future use and design. Reporting on these analyses and forming conclusions allows these results to be better communicated to the research and engineering communities.

Task 3: Creep monitoring helps with our understanding of the stiffness of the composite section. Furthermore, this dictates how much creep deflection should be accounted for in engineering the final grade profile and camber of a bridge project.

Task 4: Setup and instrumentation of the specimen before casting the additional concrete deck helps with our understanding of the stiffness of the section with only the partial precast concrete deck.

Task 5: The test plan is designed to load the specimen up to its moment capacity. The analysis of recorded data will provide additional understanding of the strength and failure mode of the composite section.

Describe any accomplishments achieved under the project goals…

Task 2: Analysis and reporting have been finished, closing work on this task.

Task 3: The creep deflection of the first double CT specimen has continued to be monitored at regular intervals, leading to data from which the girder's creep behavior over time can be determined.

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: Specimen Design and Fabrication	7/1/2020	8/30/2020	100%
Task 2: Girder Shear Connector Testing	9/1/2020	12/30/2020	100%
Task 3: Girder Creep Testing	9/1/2020	11/31/2020	90%
Task 4: Girder Construction Performance Testing	9/1/2020	2/28/2021	40%
Task 5: Girder Strength Testing	3/1/2020	8/31/2021	25%
Overall Project:	3/2019	8/31/2021	70%

Table 2: Budget Progress		
Project Budget	**Spend – Project to Date**	**% Project to Date***
$240,376	????	????

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.

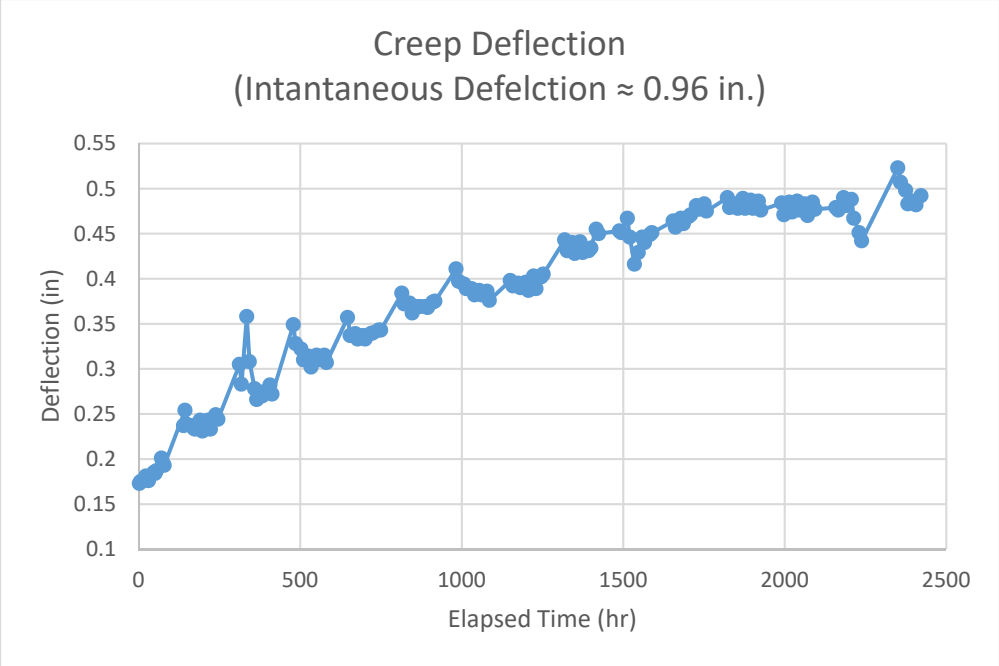
Describe any activities involving the dissemination of research results (be sure to include outputs, outcomes, and the ways in which the outcomes/outputs have had an impact during the reporting period. Please use the tables below for any Publications and Presentations in addition to the description of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

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

No results have been disseminated due to the project's current scheduling.

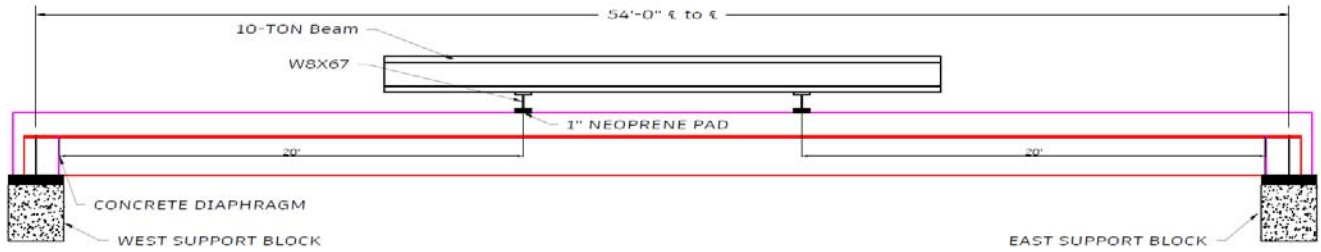
Encouraged to add figures that may be useful (especially for the website)…



To-date Creep Girder Deflection

Creep Testing Girder Specimen

The double CT girder module under the loading frame



Test setup for Task 5

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, report results
Jacob Clark		Senior	Civil Engineering	Lab and planning support

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	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 transfer has 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: Ken Sweeney
Title: President
Organization: AIT Bridges
Location (City & State): Brewer, Maine

Email Address: ken@aitbridges.com

Changes:

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

Tasks 4 and 5 have been significantly delayed due to COVID-related issues, but good progress has been made during this quarter.

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

The project has been delayed due to challenges in fabrication as well as slowed lab activity caused by COVID-19. No changes in approach are planned for the foreseeable future.

Planned Activities:

Description of future activities over the coming months.

Task 3: Creep deflections will continue to be monitored until the Task 5 girder has been failed and is removed from the load frame. When monitoring has been completed, data recorded will be analyzed and the results reported.

Tasks 4 & 5 Work instructions will be finalized. The girder specimen will be moved from staging to the load frame when available, and its cast-in-place deck formed and cast. The specimen will be loaded to failure, and load, strain and displacement data gathered.