Quarterly Progress Report:
Project Number and Title: 2.5 - Development and Testing of High / Ultra-High Early Strength Concrete for durable Bridge Components and Connections
Research Area New materials for longevity and constructability
PI: Kay Wille, Ph.D., Associate Professor, University of Connecticut, Department of Civil & Environmental Engineering, Storrs, CT
Co-PI Ramesh Malla, Ph.D., F. ASCE, Professor, University of Connecticut, Department of Civil & Environmental Engineering, Storrs, CT
Reporting Period: 06/30/2021– 09/30/2021
Submission Date: 09/30/2021

Overview: (Please answer each question individually)

- Emphasis has been placed on mixing, testing and analyzing data of New England UHPCs.
- Mechanical testing of the newly developed New England UHPCs have been carried out, especially direct tension, single fiber pullout and compression test.

Provide context as to how these activities are helping achieve the overarching goal(s) of the project…
During the reporting period, research has been focused primarily on testing of mechanical properties and data analysis of the test results of the newly developed New England UHPCs. Based on the obtained and analyzed data a first draft of a journal manuscript has been created in preparation for journal publication.

Describe any accomplishments achieved under the project goals…
The overall goal of the project is the development of a non-proprietary cost-efficient UHPC for the New England area. The investigation of the mechanical properties of the UHPCs and data analysis of these mixes help to finalize cost efficient UHPC mixes with promising mechanical and durability properties. In the meantime, a first draft of a manuscript for journal publication has been created.

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: Literature review	01/01/2019	03/31/2022	85%
Task 2: Testing and Investigating the Performance of current HES	03/01/2019	03/31/2022	100%
Task 3: Developing the next generation of HES mixture designs (Shifting towards New England UHPC)	01/01/2020	03/31/2022	75%
Task 4: Knowledge transfer and practical application	12/01/2019	03/31/2022	25%
Overall Project:	*Enter Actual Start*	*Enter Planned/Actual End*	

Table 2: Budget Progress

Project Budget	Spend – Project to Date	% Project to Date*

Include the date the budget is current to.** **Information in Table 2 is to be determined.

Describe any opportunities for training/professional development that have been provided…
Due to COVID19 the lab still operates under strict COVID19 measures. Despite the challenging situation, following undergraduate students: Cydney-Alexis Delarosa and Dominic Parciasepe continued working during this reporting period.

Cydney-Alexis Delarosa helped in mixing, measuring and preparing samples. Dominic helped in sieve analysis and washing of basalt and some other lab works.

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)
Development and Testing of High / Ultra-High Early Strength Concrete for Durable Bridge Components and Connections	2021 Transportation Infrastructure Durability Conference	Video Presentation	Virtual via Zoom	July 28, 2021
Development of ultra-high performance concrete (UHPC) based on locally available material	3MT Presentation	Video Presentation	The Graduate School, University of Connecticut	August 12, 2021
The Effects of Resonant Acoustic Mixing on the Microstructure of UHPC		Journal		Currently working on it
Performance of Newly Developed UHPC based on locally available material		Journal		Currently working on it

Table 4: Publications and Submitted Papers and Reports

Type	Title	Citation	Date	Status

Encouraged to add figures that may be useful (especially for the website)…
Following are the test set up for the mechanical and durability properties investigation, right now:

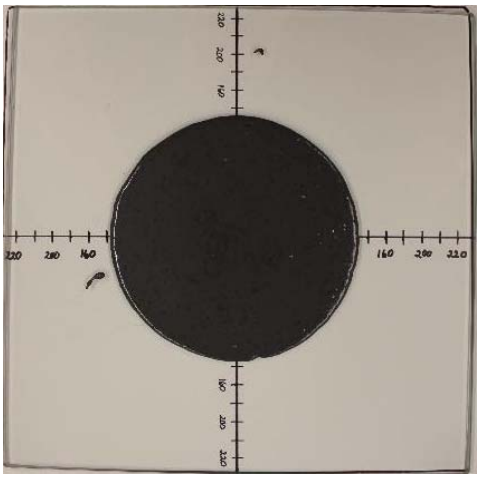

Fig:- Spread Test for Paste Investigation

Fig:- Direct Tension Test Setup

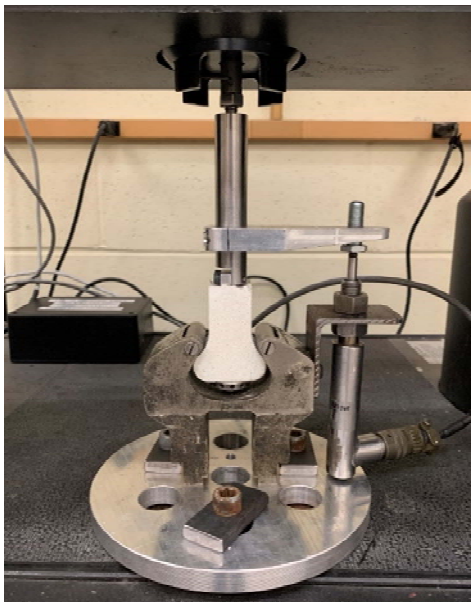

Fig:- Fiber Pullout Test Setup

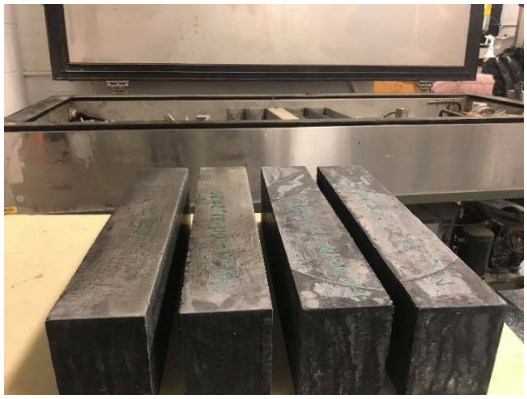

Fig:- Freeze Thaw Table

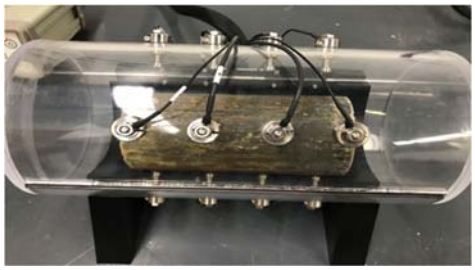

Fig:- Surface Resistivity Test Setup

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**
Kay Wille, Ph.D., Associate Professor	kay.wille@uconn.edu	Civil Engineering	Principal Investigator
Ramesh Malla, Ph.D., F. ASCE, Professor	ramesh.malla@uconn.edu	Civil 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**
Cydney-Alexis Delarosa		Undergraduate-Junior	Biomedical Engineering	Undergrad-RA
Dominic Parciasepe		Undergraduate-Sophomore	Environmental Engineering	Undergrad-RA

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**
Bijaya Rai	Leading the research works	Ph.D.	TBD

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**

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.
Not applicable at this time.

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.)
There is still good rapport with all the suppliers and we are still in good communication. This time, we got many bags of basalts from Tilcon, few buckets of Type II/V cement from LafargeHolcim, and glass powder from Urban Mining. Some of them have requested the preliminary data and report to make sure their materials has been utilized properly in the research and agreed for continuous support as required.

Who is the Technical Champion for this project?
Name: Andy Cardinali, PE
Title: Principal Engineer of Bridge Design
Organization: Connecticut DOT
Location (City & State): Newington, CT
Email Address: andrew.cardinali@ct.gov

Name: Bao Chuong, PE
Title: Supervising Engineer of Bridge Design

Organization: Connecticut DOT
Location (City & State): Newington, CT
Email Address: bao.chuong@ct.gov

Changes:

Discuss any actual or anticipated problems or delays and actions or plans to resolve them…
Our load frame with a maximum load capacity of 400kips gives us some troubles. This testing device is located in CAST 115, the Structural lab at the University of Connecticut. It is used for performing the direct tension test of UHPC specimens. The controller system was sent to the manufacturer and a prior issue was resolved. However, afterwards sensors were not functioning. There is ongoing back and forth communication between the university and manufacturer. This had held back the direct tension testing.
This fall semester, the PI's group is responsible for organizing the structural and applied mechanics (STAM) in person seminar on every Friday in the civil engineering department.

Still research works are continue under the strict COVID19 rules and regulations, social distancing has been maintained while performing the experiments, contact tracing, and many other regulations to prevent the spread of the virus.

Discuss any changes in approach and the reasons for the change…
There are no changes in the research approach in this reporting period.

Planned Activities:

Description of future activities over the coming months.
In these three months, research has been primarily focused on the mechanical testing of the New UHPCs and data analysis of test results. The mechanical testing included direct tension, single fiber pullout and compression testing. More mechanical testing, especially direct tension, will be performed due to the fall out of the 400kip load frame.
In the future, emphasis will be placed on the investigation of durability properties such as freeze thaw resistance. Other planned activities include as follows:

- Data analysis and proceeding with the manuscript for journal publication
- More mixing to investigate durability properties of newly developed UHPC
- Fiber Efficiency of locally available fibers embedded in the New England UHPCs