

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: 03/31/2020– 06/30/2021

Submission Date: 06/30/2021

Overview: (Please answer each question individually)

- Emphasis has been placed on testing and analyzing data and some mixing of New England UHPCs.
- Carried out mechanical testing of the newly developed New England UHPCs such as compression, direct tension and fiber pullout test.

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

In these three months, research has been focused primarily on testing the mechanical properties of the newly developed New England UHPCs. It included compression, direct tension and fiber pullout tests. Testing of UHPC samples were followed by data analysis.

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. In this reporting period, we focused on the investigation of the materials’ mechanical properties such as compressive strength, direct tensile strengths and fiber pullout resistance.

Despite the fact that the consequences of COVID19 significantly set us back in our research activities and continues to impact us in our efficiency to carry out lab experiments, we recently started in person discussions after getting full doses of vaccination.

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	03/31/2021	80%
Task 2: Testing and Investigating the Performance of current HES	03/01/2019	03/31/2021	100%
Task 3: Developing the next generation of HES mixture designs (Shifting towards New England UHPC)	01/01/2020	03/31/2021	70%
Task 4: Knowledge transfer and practical application	12/01/2019	03/31/2021	20%
Overall Project:	<i>Enter Actual Start</i>	<i>Enter Planned/Actual End</i>	
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, Jeet Rosa, Ethan Beattie and Dominic Parciasepe continued working during this reporting period since last fall semester.

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)
The Effects of Resonant Acoustic Mixing on the Microstructure of UHPC		Journal		Currently working on it
Material Efficiency and Cost Reduction in the design of the UHPC	Thesis Defense	Master's Thesis	Department of Civil Engineering-University of Connecticut	Completed - Christopher Boisvert-Cotulio
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:

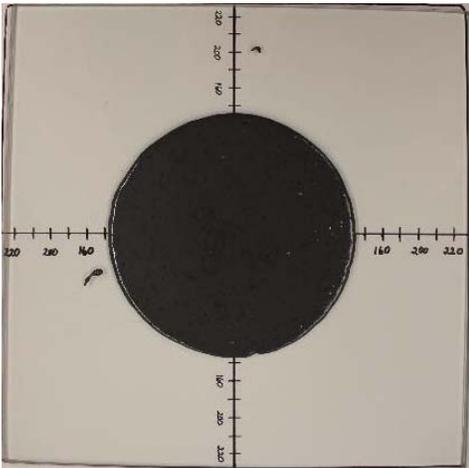


Fig:- Spread Test for Paste Investigation



Fig:- Direct Tension Test Setup

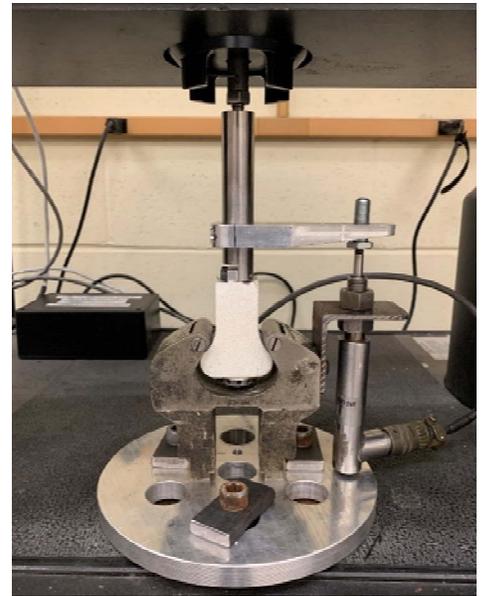


Fig:- Fiber Pullout Test Setup



Fig:- Freeze Thaw Table

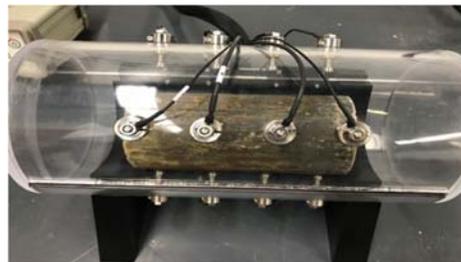


Fig:- Surface Resistivity Test Setup

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
Christopher Boisvert-Cotulio		Master Student	Civil Engineering	Grad-RA
Jeet Rosa		Undergraduate-Senior	Material Science	Undergrad-RA
Cydney-Alexis Delarosa		Undergraduate-Junior	Biomedical Engineering	Undergrad-RA
Dominic Parciasepe		Undergraduate-Sophomore	Environmental Engineering	Undergrad-RA
Ethan Beattie		Undergraduate-Senior	Civil 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 still in good communication. 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.

As per previous commitment, Norchem Silica Fume carried out PSDs analysis as in-kind support for cementitious materials that has been used in the research.

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...

Christopher Boisvert-Cotulio, a master's student who had been actively working in this project, graduated in May 2021. Bijaya Rai, a PhD student who had been leading the project, fell sick for several days as a side effect of Covid vaccine and some seasonal pollen allergies. This had slowed down the work for a while.

Still research works are continue under the strict COVID19 rules and regulations. The new normal is still affecting the research in many ways; everyone has to follow the COVID lab safety plan with a restricted time schedule, social distancing 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 after 28 days of casting. The mechanical properties includes compression, direct tension and fiber pullout strength. Now, the research is gearing towards characterizing those obtained mechanical test results and summarizing the project. The other durability properties such as surface resistivity, freeze thaw durability, air content investigation will continue in the future extensively. Therefore, other planned activities include as follows:

- Data analysis and preparing manuscript for the journal publication
- Extensive investigation of durability properties of newly developed UHPC
- Fiber Efficiency of locally available fibers embedded in the New England UHPCs