

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

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Reporting Period: 06/31/2020– 09/30/2020

Submission Date: 09/30/2020

Overview: (Please answer each question individually)

- Emphasis has been placed on investigating permeability in both conventional concrete and New England UHPCs.
- Setting up test equipment and machines for compression, fiber pullout test and direct tensile test.

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

The research has been primarily focused on investigating the permeability in concrete by measuring electrical resistivity. Lower permeability results from a finer pore network with less connectivity and this will lead to higher electrical resistivity. In this regard our research activities and testing procedure are aligned with Connecticut DOT’s concept of low permeable concrete geared towards increased durability and thus longer service life. Current mixes use locally available materials in the New England area. Our preliminary test results are promising and confirm that we are heading in the right direction. This is an essential step towards the goal of this project to develop a non-proprietary cost-efficient UHPC for the New England area. The research will be continued by investigating other parameters such as fiber pullout strength and direct tension behavior.

Describe any accomplishments achieved under the project goals...

Several concrete mixes, including conventional concrete, tailored ultra-high performance concrete (UHPC) and commercially available UHPC have been mixed and investigated in their electrical resistivity at different ages, including 6hr, 12hr, 24hr and then every day. We are able to achieve more than 30 k-ohm-cm in 5 days with New England UHPCs, ultra-high performance concretes tailored to the New England area. In comparison conventional concrete achieved about 12k-ohm-cm in 60 days. The consequences of COVID19 significantly set back our research activities and continues to impact us in our efficiency to carry out lab experiments and having fruitful in person discussions.

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	01/01/2021	70%
Task 2: Testing and Investigating the Performance of current HES	03/01/2019	01/01/2021	100%
Task 3: Developing the next generation of HES mixture designs (Shifting towards New England UHPC)	01/01/2020	01/01/2021	20%
Task 4: Knowledge transfer and practical application	12/01/2019	05/31/2021	5%
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 operates under strict COVID19 measures. The continued support of our research activities by Christopher Boisvert-Cotulio, graduate student in the master degree program, has been limited due to COVID19. Despite the challenging situation the PI was able to welcome back 2 undergraduate students, Cydney-Alexis Delarosa and Jeet Rosa. In addition the following undergraduate students were recently hired to join this research activities: Paul Mooh Mooh Sr, Dominic Parciasepe, Salaah Dean Kanaan, Omar Badawi and Seerut Mir. Over the next week they will be lab safety trained. One large group meeting via WebEx was held on 09/25/2020 to welcome them to our group and share the basics of the research project with them.

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	TIDC Annual Conference	Presentation	webEx-Virtual Conference	08/12/2020
Development and Testing of High / Ultra-High Early Strength Concrete for durable Bridge Components and Connections	TIDC Annual Student Poster Contest	Poster Presentation	webEx – virtual meeting	submitted on 09/25/2020

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)...

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		Undergraduate-Junior	Biomedical Engineering	Undergrad-RA
Dominic Parciasepe		Undergraduate-Sophomore	Environmental Engineering	Undergrad-RA
Paul Mooh Mooh Sr		Undergraduate-Junior	ACES	Undergrad-RA
Salaah Dean Kanaan		4 th sem	Management Information Systems	Undergrad-RA
Omar Badawi		Undergraduate-Junior	Political Science	Undergrad-RA
Seerut Mir		Undergraduate-freshman	Physiology and Neurobiology	Undergrad-RA
Corey Walker		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
Connecticut Department of Transportation	Division of Material Testing, Central Laboratory	NO	Providing of tests data			

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.)

No contacts have been made this time. All the materials that have been gathered before the lock down are currently being used.

Who is the Technical Champion for this project?

Name: Mary Baker

Title:

Organization: Connecticut DOT

Location (City & State): Newington, CT

Email Address: Mary.Baker@ct.gov

Changes:

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

Research work continued once the labs were re-opened under the strict COVID19 rules and regulations. The new normal has affected the research in many ways; undergraduate students were not allowed to be in campus during summer (until end of August) and 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...

Research activities had been shifted towards addressing the consequences due to the COVID19 pandemic.

Planned Activities:

Description of future activities over the coming months.

Right now, the research is mainly focused on the investigation of permeability in the New England UHPCs at different ages. Therefore, other planned activities include as follows:

- Characterizing the pull out behavior of various fibers embedded in UHPC
- Continue investigating the durability of various UHPC based on freeze thaw conditions
- Continue obtaining locally available materials for tailoring the UHPC for the New England area.