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: 12/31/2019– 03/31/2020
Submission Date: 03/31/2020

Overview: (Please answer each question individually)

- Emphasis has been placed on contacting local material suppliers, obtaining material, designing preliminary mixtures and starting with preliminary mixes.
- Some testing equipment have been purchased in this period.
- Sharing research with Connecticut DOT representatives and material suppliers

Provide context as to how these activities are helping achieve the overarching goal(s) of the project…
Sharing our research progress with ConnDOT and with potential material suppliers will help to obtain locally available materials for the UHPC tailored to the New England area. It directly addresses the main goal of developing a non-proprietary cost-efficient UHPC. The purchase of a surface permeability tester will help in investigating the durability properties of the concrete in an efficient way. The decision to buy this equipment has been made after ConnDOT shared that they use this equipment for their concrete quality control. This will facilitate the comparison of test data.

Describe any accomplishments achieved under the project goals…
The most important accomplishment is that we started to mix several preliminary concrete mixtures, investigated some basic parameters such as spread of fresh concrete, density and compressive strength of the hardened concrete at 28 days. Others accomplishments include the purchase of concrete testing equipment, meeting with ConnDOT material contractors, and presenting research work at the 5th International symposium on ultra-high performance concrete and high performance materials Hipermat 5 (March 2020, Kassel Germany).

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	10%
Task 4: Knowledge transfer and practical application	12/01/2019	05/31/2021	5%
Overall Project:	*Enter Actual Start*	*Enter Planned/Actual End*	

Table 2: Budget Progress		
Project Budget	**Spend – Project to Date**	**% Project to Date***
$280,500	$101,311.16	36.1% (3/31/2020)

Include the date the budget is current to.

Describe any opportunities for training/professional development that have been provided…
During the time period the PI of this project has attended at the 5th International symposium on ultra-high performance concrete and high performance materials Hipermat 5 which was held in Kassel Germany on Mar. 11-13, 2020. Presenting this current research and exchanging knowledge about UHPC had been very beneficial. In addition to this, Bijaya has participated in the Annual Poster Competition organized by School of Engineering at University of Connecticut and supported middle school students in their capstone concrete research project.
Five undergraduate students, Cydney-Alexis Delarosa, Bradley Kelle, Ethan Beattie, Jeet Rosa and Alex Distelman, and one graduate student, Christopher Boisvert-Cotulio, supported the research activities.

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 of New England UHPC	Portland Cement Concrete meeting	meeting	ConnDOT, Division of Material Testing, Rocky Hill, CT	01/16/2020
Development and Characterization of High / Ultra High Strength Concrete	Hipermat 5, 2020	Conference	Kassel, Germany	03/11/2020-03/13/2020
Development and Characterization of High / Ultra High Strength Concrete	Annual Poster Competition, School of Engineering	Workshop	University of Connecticut	03/11/2020

Table 4: Publications and Submitted Papers and Reports				
Type	**Title**	**Citation**	**Date**	**Status**
Two Page Write Up	Development and Characterization of High / Ultra High Strength Concrete	Full citation	01/31/2020	Published in Proceedings (Hipermat 5 2020, International Symposium of UHPC)

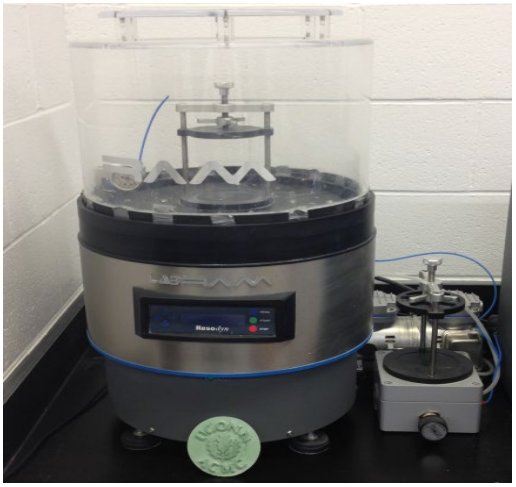


Figure 1: Acoustic Laboratory Size Mixer LabRAM

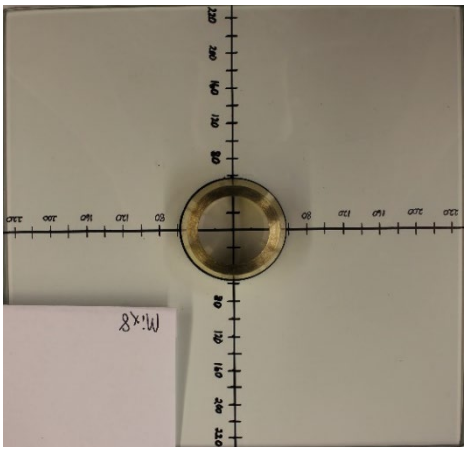
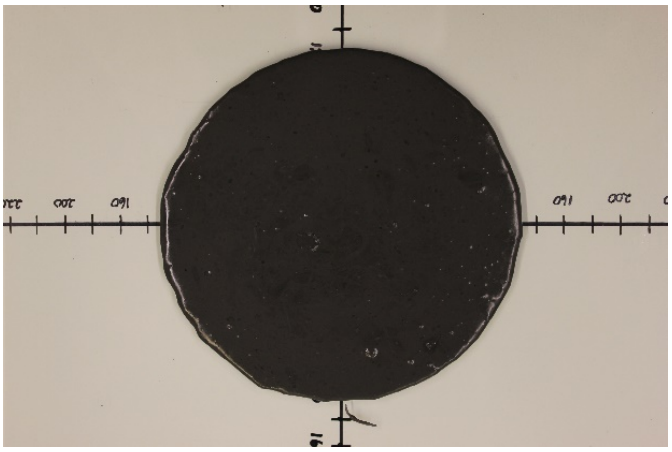


Figure 2: Min spread cone



igure 3: Spread of UHPC matrix

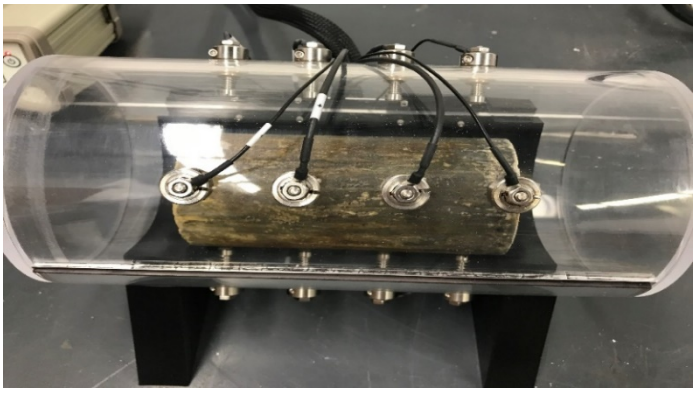


Figure 4: Permeability Test Equipment

Figure 5: 0.75 liter Airmeter

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
Alex Distelman		Undergraduate-Junior	Material Science	Undergrad-RA
Jeet Rosa		Undergraduate-Junior	Material Science	Undergrad-RA
Ethan Beattie		Undergraduate-Junior	Material Science	Undergrad-RA
Bradley Kelle		Undergraduate-Junior	Civil Engineering	Undergrad-RA
Cydney Alexis		Undergraduate-Junior	Biomedical 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	Connection with Material Contractors			
Tilcon Connecticut		NO	Providing of basalt			
Lehigh Cement Company		NO	Providing of cement			
Urban Mining Northeast	New Rochelle, NY	NO	Providing of glass powder			
GCP Applied Technologies Inc.		NO	Providing of high-range water reducer			

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.)
Contact to Steelike® Concrete, Lafarge Holcim, Lehigh Cement Company, GCP Applied Technologies Inc., Tilcon Connecticut and Dragon Cement has been established and material for research purpose has been provided free of charge.

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…
Right now, research work has been paused because of the COVID19 pandemic. The university has been locked down including the advanced cementitious materials and composites (ACMC) lab and structural lab at UConn. This has highly impacted the ongoing research projects. As soon as the University re-opens research activities in the lab will be continued.

Discuss any changes in approach and the reasons for the change…
As the research has been shifted to developing New England UHPC, steps have already been taken towards identifying local material suppliers and purchasing new test equipment.

Planned Activities:

Description of future activities over the coming months.
As soon as campus re-opens, there are many concrete mixture designs that are lined up.
Other planned activities include as follows:

- Characterizing the pull out behavior of various fibers embedded in UHPC
- Continue investigating the workability of various UHPC

- Continue obtaining locally available materials for developing a Connecticut UHPC
- Attend follow up meeting with ConnDOT and concrete suppliers (planned for April 9th, 2020)