

**Quarterly Progress and Performance Indicators Report:**

**Project Number and Title:** 2.20 Efficiency of Fiber Reinforcement in Ultra-high Performance Concrete

**Research Area: Thrust # 2: New materials for longevity and constructability.**

**PI:** Kay Wille, Ph.D., Professor, University of Connecticut, School of Civil & Environmental Engineering, Storrs, CT

**Co-PI(s):**

**Reporting Period:** 04/01/2025-06/30/2025

**Submission Date:** 06/30/2025

**\*\*\*IMPORTANT:** Please fill out each section fully and reply with N/A for questions/sections with nothing to report. For ease of reporting to the USDOT, please do not remove, or change the order of, any sections/text. You may remove/add each rows in tables as needed. Thank you! \*\*\*  
The report is due on the last day of the reporting period in .doc format to tidc@maine.edu.

**Overview:**

Provide **BRIEF** highlights of activities performed during the reporting period. This summary should be written in lay terms for a general audience to understand. This should not be an extensive write up of findings (those are to be included in the final report), but a **high-level overview of the activities conducted during the last three months no more than 3 bullet points at no more than 1 sentence each** ....

- Data analyses were done for Direct tensile tests and fiber pullout tests.
- One manuscript is being prepared from tensile tests data.

**Meeting the Overarching Goals of the Project:**

How did the previous items help you achieve the project goals and objects? Please give one bullet point for each bullet point listed above.

- The goal of the project is to achieve efficient utilization of fibers in UHPC. Direct tensile tests were conducted which can help to characterize the samples in terms of fiber efficiency.
- To get more insights on the bond between fibers and UHPC, fiber pullout tests will support tensile tests to gain more understanding on fiber efficiency.
- A manuscript is being prepared from the tensile tests data.

**Accomplishments:**

List any accomplishments achieved under the project goals in bullet point form...

- Data analyses were done for specimens.
- A manuscript is under preparation.

**Task, Milestone, and Budget Progress:**

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: Title	Start Date	End Date	% Complete

Task 1.1: Obtaining material & setting up testing	10/01/2023	12/31/2023	100%
Task 1.2: Mixing and sample preparation	01/01/2024	12/31/2024	100%
Task 1.3: Mechanical characterization (Compression, pullout, tension)	01/01/2024	12/31/2024	100%
Task 2.1: Analysis of test results	03/31/2024	1/31/2025	80%
Task 2.2: Writing Summary Report	02/01/2025	06/01/2025	0%
Task 2.3: Knowledge Transfer	07/01/2025	07/31/2025	0%

**Table 2: Milestone Progress**

Milestone #: Description	Corresponding Deliverable	Start Date	End Date
Milestone 1: Mechanical characterization and testing	Summary report	01/01/2024	12/31/2024
Milestone 2: Data analysis	Summary report	07/01/2024	07/31/2025
Milestone 3:			
Milestone 4:			
Milestone 5:			
Milestone 6:			
Milestone 7:			
Milestone 8:			
etc.			

**Table 3: Budget Progress**

Project Budget	Spend – Project to Date	% Project to Date (include the date)
Will be provided separately	Will be provided separately	Will be provided separately

**Is your Research Project Applied or Advanced?**

- Applied** (The systematic study to gain knowledge or understanding necessary for determining the means by which a recognized and specific need may be met.)
- Advanced** (An intermediate research effort between basic research and applied research. This study bridges basic (study to understand fundamental aspects of phenomena without specific applications in mind) and applied research and includes transformative change rather than incremental advances. The investigation into the use of basic research results to an area of application without a specific problem to resolve.)

**Education and Workforce Development:**

Answer the following questions (N/A if there is nothing to report):

1. Did you provide any workforce development or training opportunities to transportation professionals (already in the field)? If so, what was the training? When was it offered? How many people attended? (i.e. The research team provided an in the field training for the SAR technology for 3 maintenance crew members of the MassDOT on 3/31/2021. The members learned how to use the technology and interrupt the data.)  
Not this time.
2. Did you hold meetings with any transportation industry organizations or DOTs? If so, what was the meeting’s purpose? When was it offered? How many people attended? (i.e. The research team held a meeting with MaineDOT to update them on the progress of the research findings and how the findings can be implemented on 3/31/2021. 15 DOT maintenance members were present at the meeting.)  
Not this time
3. Did you host/participant in any K-12 education outreach activities? If so, what was the activity? What was the target age/grade level of the participants? How many students/teachers attended? When was the activity held? (i.e. 25 8<sup>th</sup> graders and 2 teachers visited the concrete lab and created small concrete trinkets like Legos on 3/31/2021. They learned about the different types of fibers that can be used in the concrete.)  
ACMC continues to support undergraduate students in their concrete research. They learned about the effect of fibers and multiple cracking in the tensile test of UHPC. They learned about the bond behavior of various fibers in UHPC.

**Technology Transfer:**

*Complete all of the tables below and provide additional information where requested. Please provide ALL requested information as this is one of the most important sections for reporting to the USDOT. **ONLY provide information relevant to this reporting period.***

*Use the table below to complete information about conference sessions, workshops, webinars, seminars, or other events you led/attended where you shared findings as a result of the work you conducted on this project:*

<b>Table 4: Presentations at Conferences, Workshops, Seminars, and Other Events</b>					
<b>Type</b>	<b>Title</b>	<b>Citation</b>	<b>Event &amp; Intended Audience</b>	<b>Location</b>	<b>Date(s)</b>

*Use the table below to report any publications, technical reports, peer-reviewed articles, newspaper articles referencing your work, graduate papers, dissertations, etc. written as a result of the work you conducted on this project. Please list only completed items and exclude work in progress.*

<b>Table 5: Submitted/Accepted Publications, Technical Reports, Theses, Dissertations, Papers, and Reports</b>				
<b>Type</b>	<b>Title</b>	<b>Citation</b>	<b>Date</b>	<b>Status</b>
Journal	Slip hardening behavior of bundled steel fibers in ultra-high performance concrete	<a href="https://doi.org/10.1016/j.cemconcomp.2024.105844">https://doi.org/10.1016/j.cemconcomp.2024.105844</a>	11/07/2024	Published

*Answer the following questions (N/A if there is nothing to report):*

1. Did you deploy any technology during the reporting period through pilot or demonstration studies as a result of this work? If so, what was the technology? When was it deployed?  
N/A
2. Was any technology adopted by industry or transportation agencies as a result of this work? If so, what was the technology? When was it adopted? Who adopted the technology?  
N/A
3. Did findings from this research project result in changing industry or transportation agency practices, decision making, or policies? If so, what was the change? When was the change implemented? Who adopted the change?  
N/A
4. Were any licenses granted to industry as a result of findings from this work? If so, when? To whom was the license granted?  
N/A
5. Were any patent applications submitted as a result of findings from this research? If so, please provide a copy of the patent application with your report.  
N/A
6. Did industry organizations or DOTs provide cost-share (cash or in-kind) to your research during the reporting period? Who was the organization? Please provide an in-kind support invoice from the organization with your report (this is kept confidential and used for record keeping purposes only).  
N/A

*Please add figures/images that can be included on the website and/or in marketing/social media materials to further clarify your research to the general public. This is very important to our Technology Transfer initiatives.*

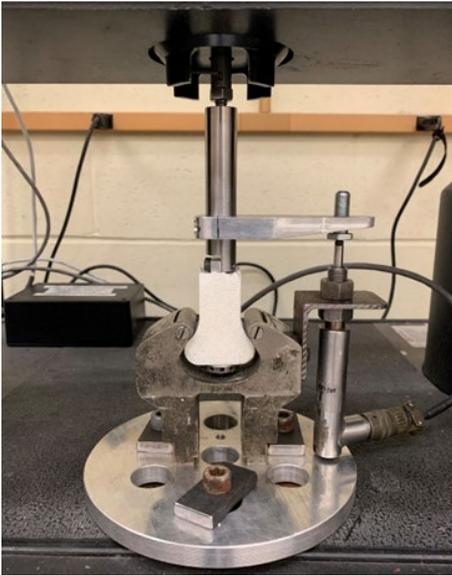


Figure 1. Fiber pullout testing

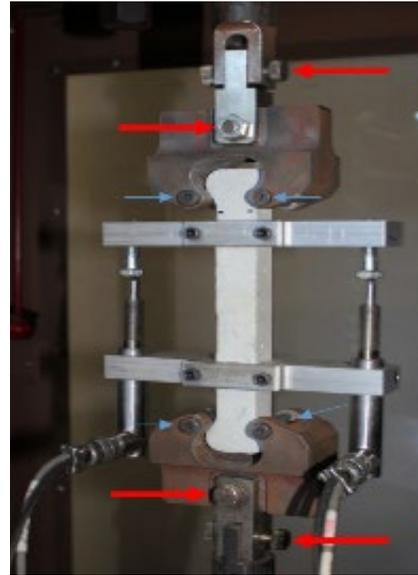


Figure 2 Direct tension testing



Figure 3 Compressive strength testing

Describe any additional activities involving the dissemination of research results not listed above under the following headings:

**Outputs:**

*Definition: Any new or improved process, practice, technology, software, training aid, or other tangible product resulting from research and development activities. They are used to improve the efficiency, effectiveness, and safety of transportation systems. List any outputs accomplished during this reporting period:*

- Not applicable this time

**Outcomes:**

*Definition: The application of outputs; any changes made to the transportation system, or its regulatory, legislative, or policy framework resulting from research and development activities. List any outcomes accomplished during this reporting period:*

- Not applicable this time

**Impacts:**

*Definition: The effects of the outcomes on the transportation system such as reduced fatalities, decreased capital or operating costs, community impacts, or environmental benefits. The reported impacts from UTCs are used for the assessment of each UTC and to make a case for Federal funding of research and education by demonstrating the impacts that UTC funding has had on technology and education. NOTE: The U.S. DOT uses this information to assess how the research and education programs (a) improve the operation and safety of the transportation system; (b) increase the body of knowledge and technologies; (c) enlarge the pool of people trained to develop knowledge and utilize technologies; and (d) improves the physical, institutional, and information resources that enable people to have access to training and new technologies. List any outcomes accomplished during this reporting period:*

- Not applicable this time

**Participants and Collaborators:**

Use the table below to list individuals (compensated or not) who have worked on the project other than students.

<b>Table 6: Active Principal Investigators, faculty, administrators, and Management Team Members</b>				
<b>Individual Name &amp; Title</b>	<b>Dates involved</b>	<b>Email Address</b>	<b>Department</b>	<b>Role in Research</b>
Kay Wille, Ph.D., Professor	Oct. 2023-Present	kay.wille@uconn.edu	Civil and Environmental Engineering	Principal Investigator

Use the table below to list **all** students who have participated in the project during the reporting period. (This includes all paid, unpaid, intern, independent study, or any other student that participated in this project.) **ALL FIELDS ARE REQUIRED.**

<b>Table 7: Student Participants during the reporting period</b>								
<b>Student Name</b>	<b>Start Date</b>	<b>End Date</b>	<b>Advisor</b>	<b>Email Address</b>	<b>Level</b>	<b>Major</b>	<b>Funding Source</b>	<b>Role in research</b>
Mandip Dahal	Oct 2023	TBD	Kay Wille	<a href="mailto:Mandip.dahal@uconn.edu">Mandip.dahal@uconn.edu</a>	PhD	Civil Engineering	TIDC	Lead graduate research assistant
Anthony Koutsitzis	Fall 2024	TBD	Kay Wille	<a href="mailto:anthony.koutsitzis@uconn.edu">anthony.koutsitzis@uconn.edu</a>	Undergrad	Civil Engineering	other	undergraduate research assistant
Luke Pellerin	Summer 2024	TBD	Kay Wille	<a href="mailto:luke.pellerin@uconn.edu">luke.pellerin@uconn.edu</a>	Undergrad	Civil Engineering	other	undergraduate research assistant

Use the table below to list any students who worked on this project and graduated or received a certificate during this reporting period. Include information about the student's accepted employment during the reporting period (i.e. the student is now working at MaineDOT) or if they are continuing their students through an advanced degree (list the degree and where they are attending).

<b>Table 8: Students who Graduated During the Reporting Period</b>			
<b>Student Name</b>	<b>Degree/Certificate Earned</b>	<b>Graduation/Certification Date</b>	<b>Did the student enter the transportation field or continue another degree at your university?</b>

Use the table below to list any students that participated in Industrial Internships during the reporting period:

**Table 9: Industrial Internships**

Student Name	Degree/Certificate Earned	Graduation/Certification Date	Did the student enter the transportation field or continue another degree at your university?

Use the table below to list **organizations** that have been involved as partners on this project and their contribution to the project during the reporting period.

**Table 10: Research Project Collaborators during the reporting period**

Organization	Location	Contribution to the Project				
		Financial Support	In-Kind Support	Facilities	Collaborative Research	Personnel Exchanges
CT Department of Transportation						

Use the table below to list **individuals** that have been involved as partners on this project and their contribution to the project during the reporting period. *(List your technical champion(s) in this table. This also includes collaborations within the lead or partner universities who are not already listed as PIs; especially interdepartmental or interdisciplinary collaborations.)*

**Table 11: Other Collaborators**

Collaborator Name and Title	Contact Information	Organization and Department	Date(s) Involved	Contribution to Research
Bao Chuong, PE	bao.chuong@ct.gov	Connecticut DOT - Bridge Design	Since 10/01/2023	Feedback during advisory and research update meetings
Andy Cardinali, PE	andrew.cardinali@ct.gov	Connecticut DOT - Bridge Design	Since 10/01/2023	Feedback during advisory and research update meetings

Use the following table to list any transportation related course that were taught or led by researchers associated with this research project during the reporting period:

**Table 12: Course List**

Course Code	Course Title	Level	University	Professor	Semester	# of Students
CE 5640	Prestressed Concrete Structures	Grad	UConn	Kay Wille	Spring 25	22

**Changes:**

*List any actual or anticipated problems or delays and actions or plans to resolve them (list no-cost extension requests here)*

*List any changes in approach and the reasons for the change.*

*No changes this time*

**Planned Activities:**

*List the activities planned during the next quarter.*

- The primary focus will be on preparing manuscripts, data analysis, preparing final report and casting specimens if necessary.