Quarterly Progress and Performance Indicators Report:
Project Number and Title: 2.2: Concrete Systems for a 100-Year Design Life
Research Area: New Materials for Longevity and Constructability
PI: *Professor Eric N. Landis, Ph.D., University of Maine*
Postdoctoral Research Associate: *Hosain Haddad Kolour, Ph.D., PE, University of Maine*
Reporting Period: *1/1/2022-3/31/2022*
Submission Date: *31 Mar 2022*

Overview:

*Provide **BRIEF** highlights of activities performed during the reporting period.*

- Presenting project findings in virtual meetings with Maine DOT engineers
- Maine DOT will provide $40k, this will be matched with a fund from TIDC for continuing concrete tests

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.

- Literature review helps better understanding the problem
- New documents and reports from Maine DOT help to understand Maine problems
- Conducting new tests using Maine materials based on meetings with Maine DOT engineers helps to solve the problem using local materials

Accomplishments:

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

- Preparing and submitting a draft proposal to Maine DOT
- Maine DOT will provide $40k, this will be matched with a fund from TIDC

Task Progress and Budget:
Complete the following tables to document the work toward each task and budget

Table 1: Task Progress			
Task Number: Title	**Start Date**	**End Date**	**% Complete**
Task 1: Inventory early age cracking problems	03/01/2020	Continue	90%
Task 2: Inventory longer-term cracking problems	03/01/2020	Continue	90%
Task 3: Develop solutions using alternative concrete mixes	09/01/2020	Continue	90%
Task 4: Examine new technologies	09/01/2020	Continue	90%

Table 2: Budget Progress		
Project Budget	**Spend – Project to Date**	**% Project to Date (include the date)**
$166,557.00	$104,438.00	62.70%

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.)*

Professional Development/Training Opportunities:
Describe any opportunities for training/professional development that have been provided. Did you provide a training to a State DOT/AOT or industry organization? What was the training? When was it offered? How many people attended? Did you meet with a State DOT/AOT or industry organization to inform them of your findings and how these findings could help their organization? When? How many attended the meeting?

- One postdoctoral research associate is working in this project. It will be a great opportunity for him to learn about writing proposals, preparing reports, participating in meeting, attending conferences, and working with professionals in UTC, UMaine Advanced Structures and Composites Center, and MaineDOT.
- Three undergraduate students have been involved in this project. It will be a great experience for them to be familiar with ASTM tests and standards. They will learn how to conduct the experiments, how to follow the standards, and how to work in a team in a real project.
- Usually five to ten engineers participate in our regular meetings with Maine DOT engineers

Technology Transfer:

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 is 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. Based on project results, were any industrial contracts awarded for additional research and development activities? If so, when? How much was awarded? Who awarded the contract?

   N/A

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:

- This project is in its initial research phase. Implementation of Research outcomes will be reported upon completion of initial research.

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:

- This project is in its initial research phase. Implementation of Research outcomes will be reported upon completion of initial research.

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:

- This project is in its initial research phase. Impacts and benefits of the research will be reported after the implementation phase.

Participants and Collaborators:

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

Table 5: Active Principal Investigators, faculty, administrators, and Management Team Members

Individual Name & Title	Dates involved	Email Address	Department	Role in Research
Professor Eric N. Landis	03/01/2020	*landis@maine.edu*	*Civil and Environmental Engineering*	*PI*
Dr. Hosain Haddad Kolour	03/01/2020	*hosain.haddad@maine.edu*	*Civil and Environmental Engineering*	*Perform the experiments and analysis the results*

*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.)*

Table 6: Student Participants during the reporting period								
Student Name	**Start Date**	**End Date**	**Advisor**	**Email Address**	**Level**	**Major**	**Funding Source**	**Role in research**
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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

Table 9: Research Project Collaborators during the reporting period						
Organization	**Location**	**Contribution to the Project**				
		Financial Support	**In-Kind Support**	**Facilities**	**Collaborative Research**	**Personnel Exchanges**
University of Maine	Maine	x	x	x		
Miane DOT	Miane				x	

*Use the table below to list **individuals** that have been involved as partners on this project and their contribution to the project.*
*(**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 10: Other Collaborators				
Collaborator Name and Title	**Contact Information**	**Organization and Department**	**Date(s) Involved**	**Contribution to Research**
Dale Peabody		Maine DOT	03/01/2020 - Present	Technical advisory board
Joseph Stilwell		Maine DOT	03/01/2020 - Present	Technical advisory board
Taylor Clark		Maine DOT	03/01/2020 - Present	Technical champion
Jeff Folsom		Maine DOT	09/30/2021 - Present	Technical advisory board
Richard Myers		Maine DOT	03/01/2020 - Present	Technical advisory board
Robert Haradon		Maine DOT	09/30/2021 - Present	Technical advisory board
Lamont Dutra		Maine DOT	03/01/2020 - Present	Technical advisory board
Ulrich Amoussou-Gueno		Maine DOT	09/30/2021 - Present	Technical advisory board
Richard.Bradbury		Maine DOT	09/30/2021 - Present	Technical advisory board
Michael Redmond		Maine DOT	03/01/2020 – 11/01/2021	Technical champion

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

Table 11: Course List

Course Code	Course Title	Level	University	Professor	Semester	# of Students
CIE 110	Materials	UG	University of Maine	*Professor Eric N. Landis*	Fall 2021	130
CIE 111	Materials Laboratory	UG	University of Maine	*Dr. Hosain Haddad Kolour*	Fall 2021	130

Changes:

- Michael Redmond retired. Taylor Clark is new technical champion based on our Nov. 18 meeting with Maine DOT engineers.
- Because of COVID 19 pandemic, we started our project in June, not in March.

Planned Activities:

- Interpreting the results. Following up new draft proposal and starting some new tests following our meeting with MaineDOT engineers.