

Quarterly Progress and Performance Indicators Report:

Project Number and Title: C9.2019: A new method of determining payment for in-place concrete with double-bounded compressive strength pay factors

Research Area: Thrust 3: New systems for longevity and constructability

PI: James L. Sullivan, UVM Transportation Research Center

Co-PI(s): David C. Novak, UVM Grossman School of Business

Eric Hernandez, UVM College of Engineering and Mathematical Sciences

Reporting Period: 9/1/2021 - 12/31/2021

Submission Date: January 3, 2022

*****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**

- Task 2 of the project scope were completed during this reporting period
- The final project report was continued during this reporting period
- A journal article was begun during this reporting period

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.

- Task 1 was the technical approach for the project, so it was critical to complete it first. The second and third tasks utilize the new approach. The third task was conducted before the second so that additional testing and troubleshooting of the MS Excel tool could be conducted during the execution of Task 2.
- A journal article is currently being developed for submission in a peer-reviewed journal to advance the technology transfer goals of the project.
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Accomplishments:

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

- The MS Excel tool that is needed to put the new approach into practice is complete and ready to use. The tool is being used to complete Task 2 as further testing of its quality.

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	Start Date	End Date	% Complete
Task 1:	October 1, 2020	March 31, 2021	100
Task 2:	April 1, 2021	September 30, 2021	100
Task 3:	October 1, 2021	March 31, 2022	100
Reporting:	January 1, 2022	March 31, 2022	75
Overall Project:	October 1, 2020	March 31, 2022	90

Table 2: Milestone Progress

Milestone #: Description	Corresponding Deliverable	Start Date	End Date
Milestone 1:			
Milestone 2:			
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*
\$166k	\$149k	90%

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.)
 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.)
- I.
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 8th 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.)
- II.

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:

Table 4: Presentations at Conferences, Workshops, Seminars, and Other Events				
Title	Event	Type	Location	Date(s)
Double-bounded compressive strength pay factors for determining payment of in-place concrete	2020 VTrans Research and Innovation Symposium	Symposium	Virtual	September 9, 2020
A new method of determining payment for in-place concrete with double-bounded compressive strength pay factors	2021 VTrans Research and Innovation Symposium	Symposium	Virtual	September 8-9, 2021

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.

Table 5: Submitted/Accepted Publications, Technical Reports, Theses, Dissertations, Papers, and Reports

Type	Title	Citation	Date	Status
i.e. Peer-reviewed journal, conference paper, book, policy paper, magazine/newspaper article	Publication title	Full citation		i.e. Submitted, accepted, under review (by org. submitted to)

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?
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?
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?
4. Were any licenses granted to industry as a result of findings from this work? If so, when? To whom was the license granted?
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.
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).

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.

Insert figures here

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:

- Examples: New sensing technology was developed. This technology will... A UAV was created to hold new monitoring technology. This will allow maintenance crews to... A new college course was created based on the research findings. This will train future transportation professionals to...

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:

- Example: The developed sensing technology was installed in Bridge A in town, state on 1/1/2021. This installation will... The UAV was successfully used by ___ Organization to inspect ___ Bridge in in town, state on 1/1/2021... The newly created college course was taken/completed by ___ students in the 2021 fall semester.

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:

- Example: The developed sensing technology’s successful deployment resulted in the adoption of the technology by the StateDOT. The technology will be installed in all new bridge installments of this type. This adoption will... The new UAV monitoring technology was adopted by ___ organization to be used for ___ bridges inspections. This will allow inspectors to... The college course has been adopted by another member university...

Participants and Collaborators:

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

Table 6: Active Principal Investigators, faculty, administrators, and Management Team Members			
Individual Name	Email Address	Department	Role in Research
James L. Sullivan	james.sullivan@uvm.edu	Transportation Research Center	Primary analyst & principal investigator
David C. Novak	david.novak@uvm.edu	Grossman School of Business	Technical advisor & co-principal investigator
Eric Hernandez	eric.hernandez@uvm.edu	College of Engineering and Mathematical Sciences	Technical advisor & co-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.**

Table 7: Student Participants during the reporting period				
Student Name	Email Address	Class	Major	Role in research
James L. Sullivan	<hr/>	Ph.D.	Civil Engineering	Primary analyst & principal investigator

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).

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

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?
			Please list the organization or degree

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
Vermont Agency of Transportation,	Barre, Vermont		X			

Materials & Certification Section						
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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	Contribution to Research
Nicholas Van Den Berg, Materials & Certification Manager	Nick.VanDenBerg@vermont.gov	VTrans Materials & Certification Section (Construction & Materials Bureau)	Technical Champion

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
i.e. CE 123		Grad or undergrad?	Where was the course taught?	Who taught the course?	Enter Spring, Fall, Summer, Winter and the year	How many students were enrolled in the class?

Changes:

List any actual or anticipated problems or delays and actions or plans to resolve them (list no-cost extension requests here)...None

List any changes in approach and the reasons for the change...None

Planned Activities:

List the activities planned during the next quarter.

- We plan to complete work on the project in the next quarter.
- We also plan to convene the third meeting of the project TAC in the next quarter.