

Quarterly Progress Report:

Project Number and Title: 1.8: Enhancing Intelligent Compaction with Passive Wireless Sensors

Research Area: Thrust # 1, Monitoring and Assessment for Enhanced Life

PI: Ehsan Ghazanfari, The University of Vermont

Co-PI(s): Hamid Ossareh, The University of Vermont

Reporting Period: 1/1/2021 to 3/31/2021

Submission Date: 3/30/2021

Overview:

During the past quarter, we continued to analyze the intelligent compaction (IC), pavement quality indicators, and nuclear gauge density data that we collected from field tests in Route 117 (Vermont) reclaimed asphalt pavement project as well as the data collected from another reclaimed stabilized base project in Vermont. The reliability of IC measurement values (ICMVs) and utilization of ICMVs as a function of vibration amplitude and frequency in the control system to optimize the compaction process and minimize the spatial variability of the ICMVs were investigated. The preliminary testing of the pressure sensor in underway and exploring viable options for the design/ruggedization of the sensor to survive the extreme pressure and temperature during compaction process is ongoing. The performed work in previous months helps us move closer toward the next steps of the project and to improve the IC performance and facilitate the process of geomaterial compaction and pavement performance monitoring.

Table 1: Task Progress			
Task Number	Start Date	End Date	% Complete
Task 1: IC in sub-base/asphalt	07/01/2018	08/30/2020	90%
Task 2: Passive sensor	06/01/2019	09/30/2021	70%
Task 3: Integration options/performance eval.	09/01/2020	12/31/2021	25%
Overall Project:	07/01/2019	12/31/2021	70%

Table 2: Budget Progress		
Project Budget	Spend – Project to Date	% Project to Date*
\$254,732	\$170,115	71.6%

Table 3: Presentations at Conferences, Workshops, Seminars, and Other Events				
Title	Event	Type	Location	Date(s)
Presentation title	Name of event (i.e. TIDC 1 st Annual Conference)	i.e. Conference, Symposium, Seminar,		

Table 4: Publications and Submitted Papers and Reports				
Type	Title	Citation	Date	Status
The revised version of the submitted conference paper (4 th International Conference on Transportation Geotechnics), reported in previous quarterly report, is accepted for publication.				

Participants and Collaborators:

Table 5: Active Principal Investigators, faculty, administrators, and Management Team Members			
Individual Name	Email Address	Department	Role in Research

Ehsan Ghazanfari	Ehsan.ghazanfari@uvm.edu	Civil & Environmental Engineering	Principal Investigator
Hamid Ossareh	Hamid.Ossareh@uvm.edu	Electrical and Biomedical Engineering	Co-Principal Investigator

Table 6: Student Participants during the reporting period

Student Name	Email Address	Class	Major	Role in research
Maziar Foroutan		Ph.D.	Civil & Environmental Engineering	Graduate Research Assistant
Ahmad Ghazanfari		M.S.	Electrical and Biomedical Engineering	Graduate Research Assistant

Table 7: Student Graduates

Student Name	Role in Research	Degree	Graduation Date
None			

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
None						

Table 9: Other Collaborators

Collaborator Name and Title	Contact Information	Organization and Department	Contribution to Research

Name: Callie Ewald

Title: Geotechnical Engineering Manager

Organization: Vermont Agency of Transportation

Location (City & State): Berlin, Vermont

Email Address: callie.ewald@vermont.gov

Changes:

None.

Planned Activities:

(i) analysis of the collected data from IC field tests aiming at IC performance improvement

(ii) continue sensor testing and improving the design and ruggedization of the sensor in IC compaction