RESEARCH, DEVELOPMENT & TECHNOLOGY TRANSFER
QUARTERLY PROGRESS REPORT

Wisconsin Department of Transportation
DT1241 4/2010

INSTRUCTIONS:
Research project investigators and/or project managers should complete a quarterly progress report (QPR) for each calendar quarter during which the projects are active.

WisDOT research program category: ☐ Policy research ☐ Wisconsin Highway Research Program ☒ Other ☐ Pooled fund TPF#		Report period year: 2011 ☐ Quarter 1 (Jan 1 – Mar 31) ☒ Quarter 2 (Apr 1 – Jun 30) ☐ Quarter 3 (Jul 1 – Sep 30) ☐ Quarter 4 (Oct 1 – Dec 31)
Project title: Superhydrophobic Engineered Cementitious Composites for Highway Bridge Applications: Phase I		
Project investigator: Konstantin Sobolev	Phone: (414) 229-3198	E-mail: sobolev@uwm.edu
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WisDOT project ID: n/a	Other project ID: CFIRE 04-09	Project start date: 10/1/2010
Original end date: 9/30/2011	Current end date: 9/30/2011	Number of extensions: 0

Project schedule status:
☒ On schedule ☐ On revised schedule ☐ Ahead of schedule ☐ Behind schedule

Project budget status:

Total Project Budget	Expenditures Current Quarter	Total Expenditures	% Funds Expended	% Work Completed
$75,786.00	$35,617.00	$64,969.300	86%	75%

Project description:
The strength and durability of highway bridges are the key components in maintaining a high level of freight transportation capacity on the nation's highways. Highways, bridges, and other critical transportation infrastructure works are rapidly deteriorating due to loading and deformation, aging, de-icing, and other detrimental factors in addition to rebar corrosion. production and recycling of basic concrete materials.
The focus of the research project is to develop a new hybrid engineered cementitious composite (ECC), using polyvinyl alcohol fibers and hydrophobic compounds, to create a substitute concrete which can provide the strength and durability demanded in key regions of highway bridges.
The superhydrophobic hybridization approach is a highly effective method for controlling the durability of concrete with large volumes of mineral additives or byproducts used as cement replacements. The developed superhydrophobic ECC will meet the top sustainability benchmarks and serve as the next technological level for sustainable concrete infrastructure with high performance and long service life.
The first task of the project is to identify the composition and technological approach to produce the ECC with improved ductility and strain-hardening response. The next task is to produce different types of superhydrophobic admixtures and investigate the performance of ECCs with different dosages of superhydrophobic admixture (0.01 - 0.1% of cement weight).

Progress this quarter (includes meetings, work plan status, contract status, significant progress, etc.):

We produced different types of hydrophobic/superhydrophobic admixtures. ECC with different dosages of hydrophobic/superhydrophobic admixture were produced and tested. The experimental program assessed the effects of the type/dosage of PVA fibers and superhydrophobic admixture, as well as mix design parameters on flow, air-void structure,

compressive and flexural strength of investigated mortars (according to ASTM standards). We produced ECC specimens for express evaluation of durability performance.

Anticipated work next quarter:
We will perform the express evaluation of durability (freze-thaw and RCP). We will evaluate the effect of mineral additives on performance of portland cement mortars and ECC at the cement replacement level of 25 and 50%. Selected ECC with superhydorpohobic admixtures will be used for larger beam bending tests to prove the performance in an approach slab.

Circumstances affecting project or budget:
none

Attach / insert Gantt chart and other project documentation

FOR WISDOT USE ONLY

Staff receiving QPR:	Date received:
Staff approving QPR:	Date approved:

Activities by month		2010			2011									Progress
		10	11	12	1	2	3	4	5	6	7	8	9	
Task 1	Purchase and Install Lab Equipment													100
	Develop Test Procedure for ECC													100
	Produce and Test ECC													100
Task 2	Produce and Test superhydrophic admixtures													100
	Establish Online Production of SHA													100
	Test the mechanical behavior of superhydrophobic ECC													75
	Characterize Mortars with SHA													75
	Optimize the characteristics of superhydrophobic ECC													50
	Perform the express evaluation of ECC durability													10