

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: <input type="checkbox"/> Policy research <input type="checkbox"/> Wisconsin Highway Research Program <input checked="" type="checkbox"/> Other <input type="checkbox"/> Pooled fund TPF#		Report period year: 2011 <input checked="" type="checkbox"/> Quarter 1 (Jan 1 – Mar 31) <input type="checkbox"/> Quarter 2 (Apr 1 – Jun 30) <input type="checkbox"/> Quarter 3 (Jul 1 – Sep 30) <input type="checkbox"/> 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
Administrative contact: Greg Waidley	Phone: (608) 262-2013	E-mail: gwaidley@engr.wisc.edu
WisDOT contact: Jim Parry	Phone: 608-246-7939	E-mail: james.parry@dot.wi.gov
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	\$24,347.04	\$29,352.04	39%	45%

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 have conducted background research into ECC mixes and effect of mix proportions on performance. Based on that work, initial mixes of ECC materials have been prepared and are being examined.

We produced different types of hydrophobic/superhydrophobic admixtures. Portland cement mortars with different dosages

of hydrophobic/superhydrophobic admixture were produced and tested. The experimental program assessed the effects of the dosage of superhydrophobic admixture and mix design parameters on flow, heat of hydration, air-void structure, compressive and flexural strength of investigated mortars (according to ASTM standards).

Anticipated work next quarter:

We will finalize the ECC mix and conduct beam bending tests to prove the performance in an approach slab. Then we will add the superhydrophobic admixtures and re-evaluate the performance of superhydrophobic ECC. 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%.

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		■	■	■	■	■								75
Task 2	Produce and Test superhydrophic admixtures			■	■	■	■	■							50
	Establish Online Production of SHA				■	■	■	■	■						50
	Test the mechanical behavior of superhydrophobic ECC					■	■	■	■	■	■				50
	Characterize Mortars with SHA						■	■	■	■	■				15
	Optimize the characteristics of superhydrophobic ECC							■	■	■	■	■	■	■	0
	Perform the express evaluation of ECC durability									■	■	■	■	■	0