



SPR Quarterly Progress Report
April 1, 2009 through June 30, 2009

Date July 26, 2009

TO: Technical Advisory Committee Members:

James Garrard, ODOT
Ray Bottenberg, ODOT
Steven Soltesz, ODOT
Tim Rogers, FHWA
Bernie Covino, NETL

FROM: Steve Soltesz, Research Engineer, phone: (503) 986-2851

1. Project

Replacing Thermal Sprayed Zinc Anodes
SPR # 682

2. Key Dates

Start Date for ODOT: July 2008
Completion Date for ODOT: September 2010

3. Principal Investigator

Xianming Shi, PhD, PE
Associate Research Professor
Corrosion and Sustainable Infrastructure Laboratory
Western Transportation Institute
Montana State University
Bozeman, MT 59717-4250

4. Progress

- Task 1: Survey of the current practice (98% complete)

The research team has conducted a comprehensive literature review to gather existing information relevant to this project, including CP basics, concrete surface preparation, anode material options, methods of testing anode performance and

predicting anode service life, methods of anode application/installation and replacement, methods of monitoring performance of CP systems, and other advancements in the CP technologies. A detailed Internet-based search was conducted, using online databases; and a draft literature review report has been prepared. On the basis of the literature review, the research team has also designed and widely distributed two online surveys aimed to identify key contacts and to capture the CP field experience of ODOT and other identified agencies, with particular emphasis on their successes or failures with the use of thermally sprayed zinc to protect bridge substructures and methods for old anode removal and surface preparation before the new anode application. CP experience of other industries such as those protecting naval facilities and parking structures were sought, through the survey of consulting firms (such as Corrpro and Vector) and targeted practitioners and researchers. The two surveys were delivered to the TAC for review and comments and then the revised surveys were distributed to the identified contacts and professional forums. In the last reporting period, we obtained the survey responses and completed the literature review report draft (submitted along with the last progress report).

- Task 2: Investigation methods of zinc anode removal and concrete surface preparation (25% complete)

The research team coordinated with ODOT and NTEL to identify the samples from previous research projects related to this topic and obtained the concrete samples. Experiments have been designed to conduct the preliminary laboratory investigation, on the basis of the information gathered from the comprehensive literature review and the surveys. We also identified ways of renting critical equipment needed for the laboratory experiments. Some trials were conducted to explore the reasonable ranges of influential factors. In the last quarter, an amendment to the work plan and its revised version were submitted to ODOT, to follow up on the May 15, 2009 teleconference between the project P.I. and the technical advisory committee (TAC). The amendment to the work plan for the experimental effort deals with best practices for removal and re-application of arc spray zinc corrosion protection. The work is separated into three main tasks including: 1) Determination of the physical and electrochemical condition of the NETL samples; 2) Determination of the bond strength of the zinc arc spray coating, electrical resistance and gas permeability as a function of residual reaction layer thickness; and 3) if determined necessary from the 2nd task, investigating the development and application of a cement “skin primer” mix design for resurfacing the concrete before re-applying arc spray zinc. This cement skin will need to be tested to verify that it does not reduce the overall performance of the corrosion protection system. The experiments have been in progress and will continue in the next quarter.

- Task 3: Final report and presentation (0% complete)

5. Problems

- None encountered so far. It should be noted, however, that the actual research contract was not signed until August 7, 2008, which caused some delay in the project schedule. The research team at WTI-MSU got the thermal spray equipment from ODOT but it was not the appropriate type; as such, we will use the combined option of renting equipment vs. subcontracting some thermal spray work.

6. Work Planned for Next Quarter

- We plan to accelerate the progress on Task 2 in the next quarter. In the WTI Corrosion and Sustainable Infrastructure Laboratory, the research team will experiment various methods to remove existing TS-Zn anodes and methods to further treat the concrete surface prior to the new TS-Zn anode application, using hundreds of specimens cored from reinforced concrete slabs provided by the NETL, which feature TS-Zn anode coating electrochemically aged to various degrees.

7. Finances

VENDOR	FY'09	FY'10	FY11	FY'12	TOTALS
ORIGINAL BUDGET	\$ -	\$ -			\$ -
REVISED BUDGET	\$ 92,000	\$ 98,000	\$ -		\$ 190,000
EXPENDITURES - VENDOR	\$ 65,200	\$ -	\$ -	\$ -	\$ 65,200
BALANCE	\$ 26,800	\$ 98,000	\$ -	\$ -	\$ 124,800
ODOT	FY'09	FY'10	FY11	FY'12	TOTALS
ORIGINAL BUDGET	\$61,250	\$122,500	\$61,250		\$ 245,000
REVISED BUDGET	\$8,993	\$5,000	\$0		\$ 13,993
EXPENDITURES - ODOT	\$ 8,993	\$ -	\$ -	\$ -	\$ 8,993
BALANCE	\$ -	\$ 5,000	\$ -	\$ -	\$ 5,000
PROJECT	FY'09	FY'10	FY11	FY'12	TOTALS
ORIGINAL BUDGET	\$ 61,250	\$ 122,500	\$ 61,250	\$ -	\$ 245,000
REVISED BUDGET	\$ 100,993	\$ 103,000	\$ -	\$ -	\$ 203,993
EXPENDITURES - PROJECT	\$ 74,193	\$ -	\$ -	\$ -	\$ 74,193
BALANCE	\$ 26,800	\$ 103,000	\$ -	\$ -	\$ 129,800

	Budget	Curr Period	To Date	Encumb	Total Commit
Receipts:	190,000.00	.00	58,893.16		
Expenditures:					
Salaries	78,585.00	5,345.93	37,453.88	5,205.96	42,659.84
Benefits	25,934.00	2,004.99	14,647.85	1,539.34	16,187.19
Travel	6,192.00	.00	.00	.00	.00
Communication	200.00	.00	71.18	.00	71.18
Contracted Services	.00	88.40	403.40	.00	403.40
Supplies	13,000.00	27.94	645.11	.00	645.11
Subcontracts	10,365.00	.00	.00	.00	.00
Direct Cost	134,276.00	7,467.26	53,221.42	6,745.30	59,966.72
Facilities and Admin	55,724.00	3,173.59	22,619.10	.00	22,619.10
Total	190,000.00	10,640.85	75,840.52	6,745.30	82,585.82
Cash Balance:		-16,947.36	Free Balance:	107,414.18	
Total Expenditures	75,840.52	Total Billed	Total Unbilled	Total Hold	Total Payments
	75,840.52	65,199.67	10,640.85	.00	58,893.16

WTI Expenditures

	Budget	Curr Period	To Date	Encumb	Total Commit				
Receipts:	30,000.00	.00	12,548.56						
Expenditures:									
Salaries	13,685.00	3,325.00	14,810.75	3,325.00	18,135.75				
Benefits	4,516.00	1,334.44	5,830.56	974.23	6,804.79				
Supplies	3,000.00	.00	.00	.00	.00				
Direct Cost	21,201.00	4,659.44	20,641.31	4,299.23	24,940.54				
Facilities and Admin	8,799.00	1,933.67	8,566.13	.00	8,566.13				
Total	30,000.00	6,593.11	29,207.44	4,299.23	33,506.67				
Cash Balance:		-16,658.88	Free Balance:	-3,506.67					
Total Expenditures	29,207.44	Total Billed	22,614.33	Total Unbilled	6,593.11	Total Hold	.00	Total Payments	12,548.56