

## ***December 2008 Project Update***

PennDOT Project #070202

Project Title: Inspection Methods & Techniques to Determine Non Visible Corrosion of Prestressing Strands in Concrete Bridge Components (LU ID 541671)

Contract #: 355I01

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Lehigh University / ATLSS Research Center

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### **Overview**

This interim report provides an update on the progress of PennDOT Project: Inspection Methods & Techniques to Determine Non Visible Corrosion of Pre Stressing Strands in Concrete Bridge Components. The project initiated in December 20, 2007 and is scheduled to be completed on December 19, 2009. This report covers the time period from the November 18, 2008 to December 15, 2008.

### **Organizational Modifications**

As requested the resumes of Lehigh University technicians involved in the project were submitted to PennDOT. No organizational modifications occurred in this time period. The project has continued to operate with the original upper level staff. The project is being conducted by Clay Naito (PI), Stephen Pessiki (co-PI), Richard Sause (co-PI), and Ian Hodgson (co-PI). Brandon Sullivan and Jordan Warncke continue to work as engineering assistants.

### **Project Tasks**

In the past month work has progressed in two areas. A PennDOT visual inspection was conducted and NDE inspection was conducted by two of the three identified firms. The ongoing half-cell inspection was put on hold to accommodate the NDE studies.

#### ***PennDOT Visual Inspection***

The visual inspection was completed by Leon Lai a co-investigator on the project. His engineering firm has a number of PennDOT certified bridge inspectors with many years of bridge inspection experience, including many prestressed concrete non-composite adjacent box beam bridges.

The goal of the inspection is to summarize the condition of the beams in accordance with Pennsylvania Department of Transportation requirements. This information was acquired prior to any NDE or destructive testing to create a record of the existing condition of the beams. In addition, the inspection record will be compared to the upcoming destructive and non-destructive evaluations conducted to assess the capability of the standard procedures in identifying problems. This work will be summarized in a standard PennDOT inspection report and incorporated into the Lehigh work

#### ***NDE Methods***

As mentioned in the October update, Professor Pessiki has taken the lead on identifying and organizing NDE inspections. A request was sent out to NDE inspection companies as well as organizations and individuals which develop inspection equipment. The request resulted in only three organizations that had promising technologies:

1. Physical Acoustics Corporation
2. Professor Al Ghorbanpoor, University of Chicago
3. Malcolm K. Lim, Universal Construction Testing, Ltd

Physical Acoustics Corporation will be visiting Lehigh University in the next month. Professor Ghorbanpoor completed his inspection of the beams using a magnetic flux leakage technique that he has

used successfully to test multi-strand post-tensioned beams. Malcolm Lim completed his inspection of the beams using a new technique which may have potential.

### Upcoming Schedule

- The final NDE method will be completed on the beams staged at Lehigh University.
- The half cell potential study will be completed.
- Recommendations for the destructive phase of the forensic investigation will be developed.

The overall schedule is included below. The schedule represents the current status of the project. Start and end dates of completed and future tasks have been modified to represent the work completed to date. The project is progressing well and is expected to be completed on schedule.

NTP: Dec.20, 2007		Months Relative to Notice to Proceed																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		2008												2009											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Task 1	Literature Search				a		a1		a2		a3														
Task 2	Method Evaluation																								
2a	ID and Beam Prep.							b	b1																
2b	Visual and Material Eval.					c			c	c1	c1	c2													
2d	NDE Evaluation								e1	e1	e1	e2	e2	e2					f						
2e	Destructive Eval. Of Beams													d	d	d	d								
Task 3	T-18 Reporting															re				g			re		re
Task 4	Inspection Training																						h		
Task 5	Draft Final Report																					i			
Task 6	Final Report																								j
Task 7	Invoicing	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

ID	Est. Due Date	Deliverable
a	Month 4	Synthesis report of findings submitted to PennDOT including database.
a1	Month 6	Draft Literature Review Report submitted awaiting Review
a2	Month 8	Receive Review on Literature Review
a3	Month 10	Submitted Literature Review Report
b	Month 7	Locate, prepare, and deliver beam specimens of varying condition for evaluation
b1	Month 8	Beams Delivered and Staged at Lehigh University
c	Month 8	Visual Inspections of Beams
c1	Month 10	Half Cell potential mapping of beams
c2	Month 11	PennDOT type inspection of beams
e1	Month 10	Identification of NDE methodologies
e2	Month 11-13	NDE evaluation of available technologies
d	Month 13-16	Destructive testing of beams to validate visual inspection, NDE, and other inspections.
f	Month 17	Task Report ranking the candidate methods, including basic operating principles, advantages and disadvantages, operator expertise required, and the degree of qualitative versus quantitative results will be submitted to PennDOT. Visual inspection procedures will be recommended.
g	Bi-Annual	Presentation to AASHTO T-18 Subcommittee and others.
h	Month 21	A written Training Plan, and Specifications and Sample Bid Documents will be provided to PennDOT.
i	Month 20	Draft Final Report will be submitted to PennDOT.
j	Month 24	Final Report submitted to PennDOT.
x	Months 1 - 24	Monthly Invoices to PennDOT.