

## *June 2008 Project Update*

# **PennDOT Project: Inspection Methods & Techniques to Determine Non Visible Corrosion of Pre Stressing Strands in Concrete Bridge Components (541671)**

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Lehigh University / ATLSS Research Center

## **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 initiation of the project to May 2008.

## **Organizational Modifications**

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 (PI), and Ian Hodgson (co-PI). As noted in the budget the project also makes use of an assistant research engineer. From the time period of January 2008 to May of 2008 Ratna Alapati supported the project in this effort. He has since been moved to another ATLSS Center project. As a replacement Jordan Warncke has been hired to provide assistance during the summer months. The supporting paperwork has been forwarded to Tony Laratonda at PennDOT.

## **Project Tasks**

Work has been progressing in three areas. These include the Literature Survey, Beam Procurement, and identification of NDE methods. A summary of the progress on each facet is discussed in detail.

### *Literature Survey*

A literature survey of corrosion issues in prestressing beams is being worked on and will be completed in mid-July. This survey contains reference reports and journal papers that are organized in twelve sections:

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| 1. Summary of Report                   | 7. General Study of Corrosion of Steel in Concrete |
| 2. American Concrete Institute Reports | 8. Publications Related to Chloride and Corrosion  |
| 3. NCHRP Reports                       | 9. Publications Related to Carbonation of Concrete |
| 4. Inspection and Repair Methodologies | 10. NDE Techniques                                 |
| 5. Testing Methods Relate to Corrosion | 11. Summary of Strand Corrosion Indicators         |
| 6. Bridge Deterioration Reports        | 12. Summary of PennDOT Survey                      |

These are the main topics for each section. Sections two-ten contain the references that have been and will be used throughout this project. All of the pdf files for these references have been collected and will be included. Section eleven is a written summary that discusses in depth the conditions of corrosion in concrete (i.e. carbonation, chloride, etc). Section twelve is a summary of the PennDOT survey on Non-Composite Adjacent Prestressed Concrete Box Beam Bridges conducted in 2006.

### *Beam Procurement*

All twelve PennDOT district offices were contacted to determine if any box girder bridges were in the process of being decommissioned or replaced in 2008. Of the twelve districts only District 9 and District 12 had beams available. Details of the bridge and shop drawings for each bridge type were provided by the district offices. The goal is to assess the properties of a variety of beams fabricated by different manufacturers at different times. Beams from three bridges are being procured. A summary of the beams is listed in Table 1.

- Bridge 1: Clearfield Creek Bridge Cambria County PA  
Type: Three Span Adjacent PS Box Beam Bridge

Feature Intersected: Clearfield Creek (One span over creek and two spans over flood plane)  
 Bridge ID: 11102101801351  
 Year Built: 1956  
 Company: New Enterprise Stone and Lime Company

- Bridge 2: Lakeview Drive Bridge Washington County, PA  
 Type: Four Span Adjacent PS Box Beam Bridge  
 Feature Intersected: Interstate 70 (two Spans over traffic and two approaches)  
 Beam Manufacturer: Spancrete  
 Year Built: 1960
- Bridge 3: Main Street Bridge Washington County, PA  
 Type: Four Span Adjacent PS Box Beam Bridge  
 Feature Intersected: Interstate 70 (two Spans over traffic and two approaches)  
 Bridge ID: 62404900301265  
 Beam Manufacturer: Spancrete  
 Year Built: 1961

Bridge	Beam	Span	Section Length	Cross Section	Condition Description
Clearfield	3	1	15ft	42x36 Box	Longitudinal cracking with rust staining.
Clearfield	3	2	15ft	42x36 Box	Large longitudinal crack with spalling visible.
Lakeview	7	1	15ft	48x27 Box	Heavily damaged section with spalls and cracks. The section was full of water. Examine potential for delamination
Lakeview	16	2	12ft	48x42 Box	No cracking or corrosion visible on section however other areas of beam have significant corrosion.
Lakeview	19	3	12ft	48x42 Box	Longitudinal crack with heavier corrosion. Hairline and larger distributed cracks Use for visual assessment.
Main St	2	3	15ft	48x42 Box	Heavy corrosion on bottom flange without longitudinal cracking. Large patches. Determine if corrosion adjacent to patch exists using NDE methods.
Main St	3	3	15ft	48x42 Box	Longitudinal crack with heavy splitting. Examine damage formation and NDE study.

Two of the seven beams have already been cut and have been transported to the ATLSS research facility. An extension for procuring additional beams from District 12 has been approved by PennDOT. Swank Construction has been contracted. They have been given drawings of the beams to assist in locating the cut regions needed. They are in charge of obtaining the other five beams and are currently working on cutting the beams. When beams have been cut, a trucking company will be called and the beams will be delivered to our building. The last five beams are scheduled to be delivered by the week of July 7<sup>th</sup>.

### ***Identification of NDE Methods***

When the beams are obtained they will go through a series of NDE testing methods. The first type of testing will be completed using a half-cell potential. The basis for this testing method is ASTM C876. Alternate methods of NDE investigation are being identified and will be summarized in the next update.