22 September 2008

Dear Colleague:

Lehigh University is presently working under a research contract from the Pennsylvania Department of Transportation to identify and develop inspection methods and techniques to detect and quantify non-visible corrosion of prestressing strands in adjacent box beam bridges. The research is motivated by recent catastrophic failures of prestressed precast box beam bridges that have occurred in a number of states in the north east region of the United States.

Our research seeks to identify nondestructive inspection methods, techniques and equipment to detect and evaluate corrosion that is otherwise undetectable by visible inspection methods. As part of our work, we seek participation by industry practitioners and academic researchers in our work. In particular, we have obtained sections of actual corroded bridge girders for laboratory testing. We are seeking to engage outside experts such as you that may have nondestructive evaluation technologies appropriate for this problem.

I am writing now to invite you to participate in our study. Attached please find a document, prepared by one of my colleagues, that describes the girder sections we have obtained for testing.

I will contact you by telephone to discuss this project further. Or, if you prefer, you may contact me at contact points given above. Thank you for the consideration you give to this request for help. I look forward to hearing from you and hope to have the chance to work with you on this project.

Kind regards.

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Non-Destructive Evaluation

Inspection Methods & Techniques to Determine Non Visible Corrosion of Prestressing Strands in Concrete Bridge Components

Decommissioned beams from three adjacent non-composite prestressed precast concrete bridges have been procured. The beams are staged at Lehigh University ATLSS Research Center in Bethlehem, PA. A total of seven beams are included in the study. A general overview of the bridge beams and the visible damage is summarized in Table 1. PennDOT issued bridge drawings and manufacturer drawings are included as an attachment. The quality of the drawings is in some cases limited.

<table>
<thead>
<tr>
<th>Bridge</th>
<th>Beam</th>
<th>Span</th>
<th>Section Length</th>
<th>Cross Section</th>
<th>Condition Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearfield</td>
<td>3</td>
<td>1</td>
<td>15ft</td>
<td>42x36 Box</td>
<td>Longitudinal cracking with rust staining.</td>
</tr>
<tr>
<td>Clearfield</td>
<td>3</td>
<td>2</td>
<td>15ft</td>
<td>42x36 Box</td>
<td>Large longitudinal crack with spalling visible.</td>
</tr>
<tr>
<td>Lakeview</td>
<td>7</td>
<td>1</td>
<td>15ft</td>
<td>48x27 Box</td>
<td>Heavily damaged section with spalls and cracks. The section was full of water.</td>
</tr>
<tr>
<td>Lakeview</td>
<td>16</td>
<td>2</td>
<td>12ft</td>
<td>48x42 Box</td>
<td>No cracking or corrosion visible on section however other areas of beam have significant corrosion.</td>
</tr>
<tr>
<td>Lakeview</td>
<td>19</td>
<td>3</td>
<td>12ft</td>
<td>48x42 Box</td>
<td>Longitudinal crack with heavier corrosion. Hairline and larger distributed cracks</td>
</tr>
<tr>
<td>Main St</td>
<td>2</td>
<td>3</td>
<td>15ft</td>
<td>48x42 Box</td>
<td>Heavy corrosion on bottom flange without longitudinal cracking. Large corrosion patches.</td>
</tr>
<tr>
<td>Main St</td>
<td>3</td>
<td>3</td>
<td>15ft</td>
<td>48x42 Box</td>
<td>Longitudinal crack with heavy splitting.</td>
</tr>
</tbody>
</table>

1.1. *Clearfield Creek Bridge, Cambria County, PA*

Type: Three Span Adjacent Non-Composite PS Concrete Box Beam Bridge  
Feature Carried: Carries Bear Valley Road (state route 1021)  
Feature Intersected: Clearfield Creek (One span over creek and two spans over flood plane)  
Bridge ID: 11102101801351  
Year Built: 1956  
Beam Manufacturer: New Enterprise Stone and Lime Company  
Samples: Two beams were obtained (Span 1 Beam 3, Span 2 Beam 4) as illustrated in Figure 1.
1.2. Lakeview Drive Bridge, Washington County, PA

Type: Four Span Adjacent Non-Composite PS Concrete Box Beam Bridge
Feature Carried: Lakeview Drive (state route 1014) in South Strabane Township
Feature Intersected: Interstate 70 (two Spans over traffic and two approaches)
Year Built: 1960
Beam Manufacturer: Spancrete Dickerson Structural Concrete Corporation
Samples: Three beams were obtained (Span 1 Beam 7, Span 2 Beam 16, Span 3 Beam 19) as illustrated in Figure 2.

1.3. Main Street Bridge Washington County, PA

Type: Four Span Adjacent Non-Composite PS Concrete Box Beam Bridge
Feature Carried: Carries Main street, state route 4049 (local route 798)
Feature Intersected: Interstate 70 (two spans over traffic and two approaches)
Bridge ID: 62404900301265
Year Built: 1961
Beam Manufacturer: Spancrete Dickerson Structural Concrete Corporation
Samples: Two beams were obtained (Span 3 Beam 2, Span 3 Beam 3) as illustrated in Figure 3.
2. Staging

The beams are staged outdoors adjacent to the ATLSS research facility on Lehigh University Mountain Top campus. They are elevated 4 ft. off the ground and are supported at their ends with 10 in. of bearing on each side. The bottoms of the beams are accessible for inspection and evaluation. The cut ends of the beams will be sealed to prevent visual or physical access the strands. The beams will be allowed to go through any and all NDT methods. However, there will be no destructive testing without pre-approval by Lehigh University staff. The layout of the beams is illustrated in Figure 4 and Figure 5.
Figure 5: Beam layout at ATLSS Center
### List of Materials

<table>
<thead>
<tr>
<th>Item</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>Steel reinforcing bars</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>12 mm diameter</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>10 mm diameter</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>8 mm diameter</td>
</tr>
</tbody>
</table>

### Reinforcing Bar Layout

Reinforcing bars are as follows:

- 12 mm diameter bars at 300 mm centers
- 10 mm diameter bars at 300 mm centers
- 8 mm diameter bars at 300 mm centers

### Reinforcing Detail

- Beam edges with reinforcing bars as detailed.
- Beam tops with clear reinforcement as shown.
- Beam ends with shear reinforcement as indicated.