Tunnel Assessment Best Practices
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Agenda

• Why assessments are important
• What is a review and assessment
• Examples of assessments
• Benefits of a review and assessment
Why Assessments are Important

• “No one ever goes down there but us.”
• “I’ve been complaining about the condition of these tunnels since I started here and nothing ever changes.”
• “It’s been that way for as long as I can remember.”
• “It would cost too much to repair it now.”
Why Assessments are Important

• If you don’t like unexpected / emergency costs resulting from failures, you have some options:
Why Assessments are Important

1. Continue to ignore and hope for the best.

2. Predict the future:

3. Implement a tunnel assessment program.
What is a Review and Assessment

- Observe Distress in the tunnels
  Cracks, delaminations, spalls, leaks, corrosion, heaving, etc.

- Document Distress
  Record general condition
  Each location

Procedure follows ACI 201.1R-08
“Guide for Conducting a Visual Inspection of Concrete in Service”
What is a Review and Assessment

• Assess Condition

Does distress pose an immediate risk?
What likely caused distress?
Is cause of distress still present?
Is anything changing in vicinity of distress?
What are consequences of structural failure?
What are consequences of loss of steam?
What is likely mode of failure?
Examples of Assessments

Corrosion due to deicing salts and interior environment

2004

2016
Examples of Assessments

Corrosion due to deicing salts and interior environment

2016
Examples of Assessments

Corrosion due to deicing salts and interior environment

2016

2016
Examples of Assessments

Rate of deterioration

January 2014

January 2015
Examples of Assessments

Rate of deterioration

August 2015

March 2016
Examples of Assessments

Small distress but critical location

January 2014
Examples of Assessments

Small distress but critical location

August 2015

February 2017
Examples of Assessments

Cosmetic repairs

November 2013

January 2015
Examples of Assessments

Cosmetic repairs

March 2016

September 2016
Examples of Assessments

Cosmetic repairs

February 2017

September 2017
Examples of Assessments

1999

2017
Examples of Assessments

1999

2017
Examples of Assessments

1999

2017
Examples of Assessments

2017
Examples of Assessments

1999

2017
Examples of Assessments

1999

“It has been that way for as long as I can remember.”

2017
Examples of Assessments

What’s wrong with these pictures
Examples of Assessments

Changing conditions
Examples of Assessments

Changing conditions
Examples of Assessments

Changing conditions
Examples of Assessments

Changing conditions
Benefits of a Review and Assessment

Identify safety concerns

Identify security concerns
Benefits of a Review and Assessment

- Develop maintenance plans
- Prioritize repairs

<table>
<thead>
<tr>
<th>Tunnel</th>
<th>Location</th>
<th>Priority</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tunnel A</td>
<td>2+00 to 3+00</td>
<td>4</td>
<td>Monitoring heaving floor. Area is in flood zone adjacent to Water Plant.</td>
</tr>
<tr>
<td></td>
<td>10+50 to 11+00</td>
<td>3</td>
<td>Monitoring roof delaminations and spalls. Area is under a pedestrian path adjacent to railroad bridge.</td>
</tr>
<tr>
<td></td>
<td>15+00 to 16+00</td>
<td>1</td>
<td>Monitoring wall delaminations and spalls. Area is under Avenue. Cosmetic repairs completed on west wall in summer of 2016. Performance of these repairs will be monitored. Delaminations found in repairs.</td>
</tr>
<tr>
<td></td>
<td>20+50 to 21+50</td>
<td>4</td>
<td>Monitoring wall delaminations and spalls. Area is under parking lot south of</td>
</tr>
<tr>
<td></td>
<td>25+15 to 25+50</td>
<td>4</td>
<td>Monitoring roof delaminations and spalls. Area is adjacent to footbridge abutment.</td>
</tr>
<tr>
<td></td>
<td>27+90 to 28+10</td>
<td>4</td>
<td>Monitoring roof delaminations and spalls. Area is under sidewalk and adjacent to __________ St.</td>
</tr>
<tr>
<td>Tunnel B</td>
<td>8+50 to 14+82</td>
<td>1</td>
<td>Deterioration rate appears to be accelerating.</td>
</tr>
<tr>
<td></td>
<td>21+00 to 21+50</td>
<td>4</td>
<td>Monitoring concrete roof delaminations and spalls in brick arch tunnel. Area is under grass adjacent to a sidewalk northwest of __________ Hall.</td>
</tr>
</tbody>
</table>
Benefits of a Review and Assessment

- Planning
  - Incorporate work into other projects
  - Determine the rate of deterioration
  - Develop budgets for repairs
  - Estimate remaining service life
  - Make future design decisions
Benefits of a Review and Assessment

• Convey information
  • Trained, unbiased, third party opinion to those not typically in tunnels but making decisions regarding their maintenance
• Simplify complex condition
• Describe general conditions
• Quick reference
• Collect information in one location
Benefits of a Review and Assessment

- Potential Scope Items
  - Observe and record distress by station
  - Locate and review all steam anchors
  - Locate and review tunnel access hatches
  - Locate and review tunnel ventilation
  - Locate tunnel obstructions
  - Locate missing or damaged insulation
  - Locate insufficient light levels
  - Locate steam or condensate leaks
  - Record temperature data
  - Assess tunnel condition
  - Prioritize repairs, provide costs
  - Summarize findings
  - Document changes in follow up reviews
Thank you

- Observe
- Document
- Assess
- Plan
- Monitor
- Repair