The Pennsylvania Rapid Bridge Replacement Project

PennDOT P3 Rapid Bridge Replacement Project
Mid-Atlantic Quality Assurance Workshop
Hershey Lodge
325 University Dr.
Hershey, PA 17033

Presenter:
George W. McAuley, Jr., P.E. - Deputy Secretary for Highway Administration

www.P3forPA.pa.gov
Project Status To-Date: Overall Design Effort

- Total Number of Design Submissions
  - Received: 12,566
  - Accepted/Approved: 11,240

- Early Completion Bridges (ECBs)
  - Major Design Deliverables Approved for all 87 ECBs
  - NTP3 Issued for 85 of 87 ECBs

- Remaining Eligible Bridges (REBs)
  - Preliminary Engineering: 464 complete
  - NEPA: 451 complete
  - ROW: Acquisition complete for 315 bridges
  - DEP Permits Received: 267 Issued
  - D-419s Cleared: 274 Issued
  - Final Design: 424 complete
  - NTP3: 119 Issued
Project Status To-Date: Design Expectations vs. Reality

- Less use of Precast Elements
- Changes to Department’s ECB Designs
- Less use of Standardized Designs
- E-Builder submission process
- Design Manual Fitness for Design-Build
## Project Status To-Date: Overall Construction Effort

### Through December 31, 2016

#### Total Program - Construction

- **Bridges Remaining**: 378
- **Under Construction**: 172
- **Open to Traffic**: 10

#### 2016 Construction Season (133 Starts)

- **Bridges Remaining**: 128
- **Under Construction**: 10
- **Open to Traffic**: 0

#### Total Program - Construction Summary (By District)

<table>
<thead>
<tr>
<th>District</th>
<th>Open To Traffic</th>
<th>Under Construction</th>
<th>Remaining</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1-0</td>
<td>6</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>District 2-0</td>
<td>20</td>
<td>44</td>
<td>0</td>
</tr>
<tr>
<td>District 3-0</td>
<td>30</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>District 4-0</td>
<td>13</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>District 5-0</td>
<td>19</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>District 6-0</td>
<td>0</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>District 7-0</td>
<td>15</td>
<td>0</td>
<td>76</td>
</tr>
<tr>
<td>District 8-0</td>
<td>8</td>
<td>40</td>
<td>0</td>
</tr>
<tr>
<td>District 9-0</td>
<td>14</td>
<td>23</td>
<td>0</td>
</tr>
<tr>
<td>District 10-0</td>
<td>30</td>
<td>1</td>
<td>54</td>
</tr>
<tr>
<td>District 11-0</td>
<td>17</td>
<td>7</td>
<td>64</td>
</tr>
<tr>
<td>District 12-0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
Through December 31, 2016

Total Program - Construction
- Bridges Remaining: 378
- Under Construction: 10
- Open to Traffic: 172

Total Program - Substantial Completions (SC)
- Remaining SC: 388
- Pending SC: 25
- Completed SC: 147

Total Program - Final Acceptance (FA)
- Remaining FA: 388
- Pending FA: 109
- Completed FA: 63
Polyester Polymer Concrete (PPC)
  - Alternate Technical Concept vs. Epoxy overlay
  - Service Life > 25 years

Advantages
  - Good adhesion and cures fast (2 to 4 hours)
  - Good long-term durability
  - Good chemical resistance and against corrosion
  - Low permeability / reduce chloride intrusion
  - Variable depth (1/2” to 12”)

Project Use
  - All bridge decks – 3/4” thickness (∼ 380 bridges)
  - All 2015 Bridges (44) completed and some of the 2016 Bridges (11 of 74)

Future Adjustments
  - Evaluating time reduction between deck cure & PPC placement (28 to 21 days).
  - Place PPC on bridges to reduce number of wintering over
Polyester Polymer Concrete (PPC) Placement
Project Status To-Date: Project Innovation – PPC Overlay

- Surface preparation – Blast track to expose aggregate /open pores
Project Status To-Date: Project Innovation – PPC Overlay

- Keys to Placement of PPC – Compressed air free of oil / moisture
Project Status To-Date: Project Innovation – PPC Overlay

- Surface Preparation – Exposed aggregate / Open pores
Project Status To-Date: Project Innovation – PPC Overlay

- High Molecular Weight Methacrylate (HMWM) Resin Primer
Project Status To-Date: Project Innovation – PPC Overlay

- PPC Placement
• **Project Management Plans**

  - The Development Entity was required, prior to NTP2, to submit and receive approval for a number of Project Management Plans.

  - Quality Management Plan
    - Established policies and requirements for a Quality Management System

  - Design Quality Management Plan
    - Establishes Design Quality Control and Quality Review procedures

  - Construction Quality Management Plan (CQMP)
    - Established Construction Quality Control and Quality Assurance procedures

  - Maintenance Management Plan
    - Frames Maintenance Phase quality parameters
The Pennsylvania Rapid Bridge Replacement Project

Construction Quality Metrics: Remove and Replace Approach

- **Deviation from Typical Practice**
  - Department, Publication 408 provisions allow for the assessment of financial damages in lieu of removal and replacement of nonconforming work.

- **Allowable outcomes in RBR PPA:**
  - Leave as-is
  - Repair
  - Remove and Replace

- **Affect on Quality in RBR Project**
  - Ensures 408 as minimum
  - Development Entity’ risk
• **Construction Quality Management Plan (CQMP)**
  
  – Level 3 Documents
    • Inspection and Test Protocols (ITPs)
    • Forms
    • Standard Operating Procedures (SOPs)
    • Source of Supply (SOS) – electronic system developed

  – Deploying a Culture Change

  – **Concepts for the future of PENNDOT**
    • Encouraging industrywide adoption
    • Build owner's confidence in QC processes
    • Prove increased consistency and higher quality
    • Result in increased asset life cycle
    • Different risk transfer
    • Different contracting mechanisms
Overview of Noncompliance Regime

- The principle purpose of the Noncompliance regime is incentivize Development Entity compliance with the Project Documents

- Applicable during:
  - Design and Construction Phase
  - Maintenance Phase

- Cure Periods and Interval of Recurrence

- 2016 Evaluation of Noncompliance Event ID 19
  - Repair – Solution
  - Remove/Replace
  - Leave as is
  - Agreement between parties
NCR / NCE for Noncompliance Event ID 19 Flow Chart
Starts w/ “Is there a potential that work product was negatively impacted relative to acceptance requirements”
• Cold Joint formation due to out of specification concrete
2016 Noncompliance Metrics

- E-Builder System used to Manage NCR/NCE Process
- Total Items = 1146
  - NCRs = 868
    - Construction = 683
    - Construction (Concrete Specific) = 60
    - Design Related = 7
    - Environmental Related = 5
    - Fabrication = 112
    - Other = 1
  - NCEs = 278
    - Construction = 116
    - Construction (Concrete Specific) = 4
    - Design Related = 4
    - Environmental Related = 55
    - Fabrication = 7
    - Other = 42

- Major Trends
  - MPT Compliance (Proper Signage, MPT installation)
  - Environmental (In-Stream compliance, E&S)
  - Guiderail End Treatments/Offsets
  - Labor Compliance issues

- Majority cured within allowable cure period
Development Entity CQMP: Role of CQAF (Acceptance)

- **Description of Intent of CQAF Role**
  - Independent quality acceptance material testing and acceptance inspection
  - Certify that the Work meets Development Entity’s acceptance criteria

- **Challenges/Struggles of CQAF to Date**
  - Not at bridge 100% of the time
  - Not always same person for hold points and for acceptance

- **2016 Pilot Program**
  - CQAF full time presence on site to provide quality control and acceptance, monitor environmental compliance and maintenance of traffic
Construction Quality Metrics: At Risk Approval Process

At-Risk Approvals

- Removal and Replacement of nonconforming Work may not always be the ideal choice

- Allows Development Entity to choose to correct nonconforming or noncompliant Work at their own risk:

- Should work progress At-Risk and fail to cure problem, the Development Entity may be required to remove and replace

- Process goal is to ensure Department buy-in to avoid situations where risky cure methods force Department to make undesirable decisions.
Construction Quality Metrics: The Good

- Acting like an Owner
• Acting like an Owner
The Pennsylvania Rapid Bridge Replacement Project

- Development Entity is responsible for:
  - carrying out winter snow and ice removal activities on the Project to facilitate general traffic flow.
  - Accommodate Department winter maintenance activities in travel lanes with respect to bridge width requirements and expected plow width;
  - remove obstructions that can create standing water or hazardous ice buildup in the travel way associated with the all Department activities
Structures Wintering Over Without a PPC Overlay

- Bituminous material placed at a depth of $\frac{3}{4}$” approximately 1 ft. onto the deck then tapered down to nothing

- **Issues**
  - Drainage off of the structure
  - Raveling of the tapered material which creates a noticeable bump on and off of the structure
  - Snow plows during winter maintenance snow removal operations
Handback Process: Substantial Completion Requirements

- Elements related to the Replacement Bridge are either an Early Handback item, or a Handback Item

- Handback period (Early or otherwise) begins at Substantial Completion of each Replacement Bridge

- Early Handback Items:
  - Upon Final Acceptance of Replacement Bridge:
    - Signs and marker not attached to structure
  - 1 Year beyond Final Acceptance of Replacement Bridge:
    - Vegetation and landscaping
  - 5-6 years beyond Substantial Completion:
    - Flexible pavement

- Handback Item: Everything else
**Handback Process: NBIS and Condition Assessments**

- **NBIS condition assessments**
  - At Substantial Completion: NBIS Structural Evaluation is required to be rated as an eight (8) or higher (per bridge); and
  - At the end of the Term: NBIS Structural Evaluation is required to be rated as a seven (7) or higher for 98% of all Replacement Bridges, and at least six (6) or higher for the remaining 2%
    - The rating of the superstructure must meet or exceed a seven (7) for all Replacements Bridges.

- **General Inspection Requirements**
  - Visual inspections after the occurrence of an Emergency, Incident, or a severe weather event;
  - Coordination with Department audits and inspections;
  - Biannual NBIS inspections and condition assessments in accordance with Publication 100A;
  - Development Entity must identify and plan its inspection activities in their Maintenance Management Information System.
The Development Entity is required to comply with the Maintenance Performance Requirements:

- **Major Elements:**
  - Roadway;
  - Drainage, Storm Water Elements, Stream Channel, and Vegetation;
  - Replacement Bridge Elements and Structures;
  - Guiderails, Safety Barriers, and Impact Attenuators;
  - Traffic Signals, Signs and Markings;
  - Fences, Walls, and Sound Abatement;
  - Earthworks, Embankments, and Cuttings;
  - All Elements / Extreme Inclement Weather Response;
  - All Elements / Emergency and Incident Response;
  - Response to Patrons Enquiries
  - Lighting; and
• **Questions/Comments?**

**George W. McAuley**  
Deputy Secretary for Highway Administration  
Email: [gmcauley@pa.gov](mailto:gmcauley@pa.gov)