



# 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**



## 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

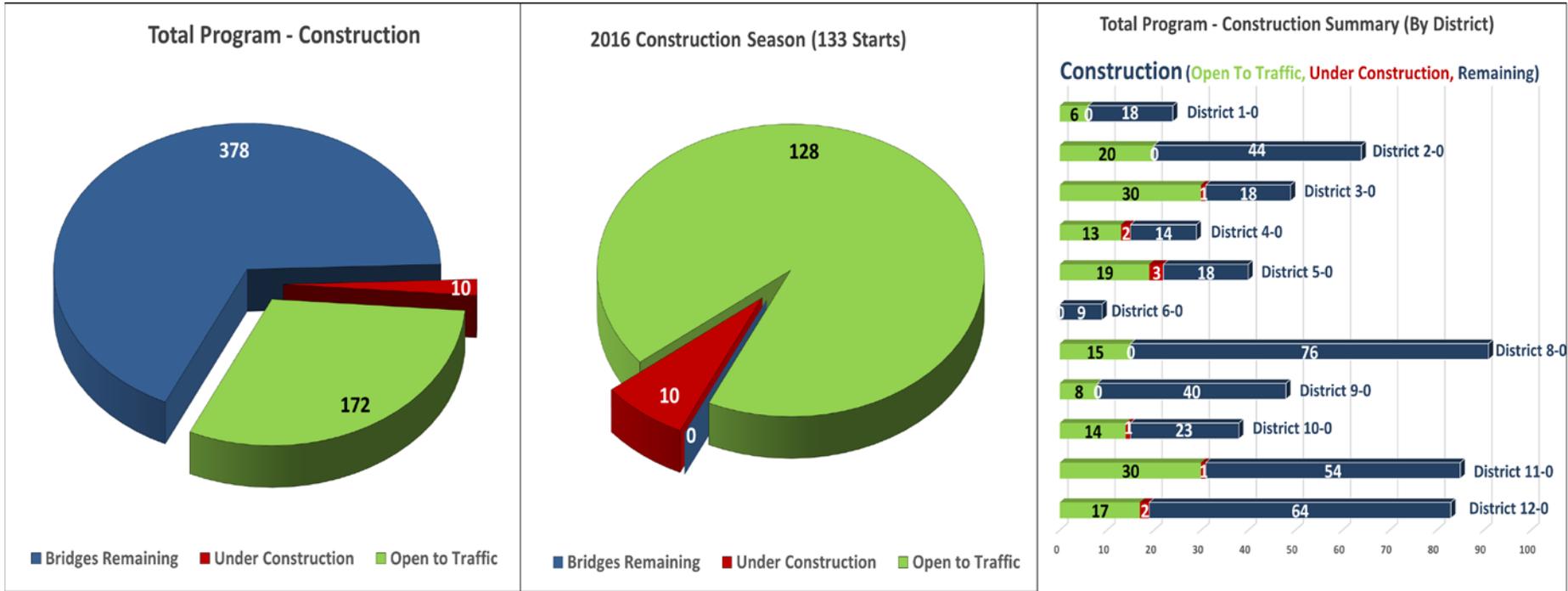
- Less use of Precast Elements
- Changes to Department's ECB Designs
- Less use of Standardized Designs
- E-Builder submission process
- Design Manual Fitness for Design-Build





# Project Status To-Date: Overall Construction Effort

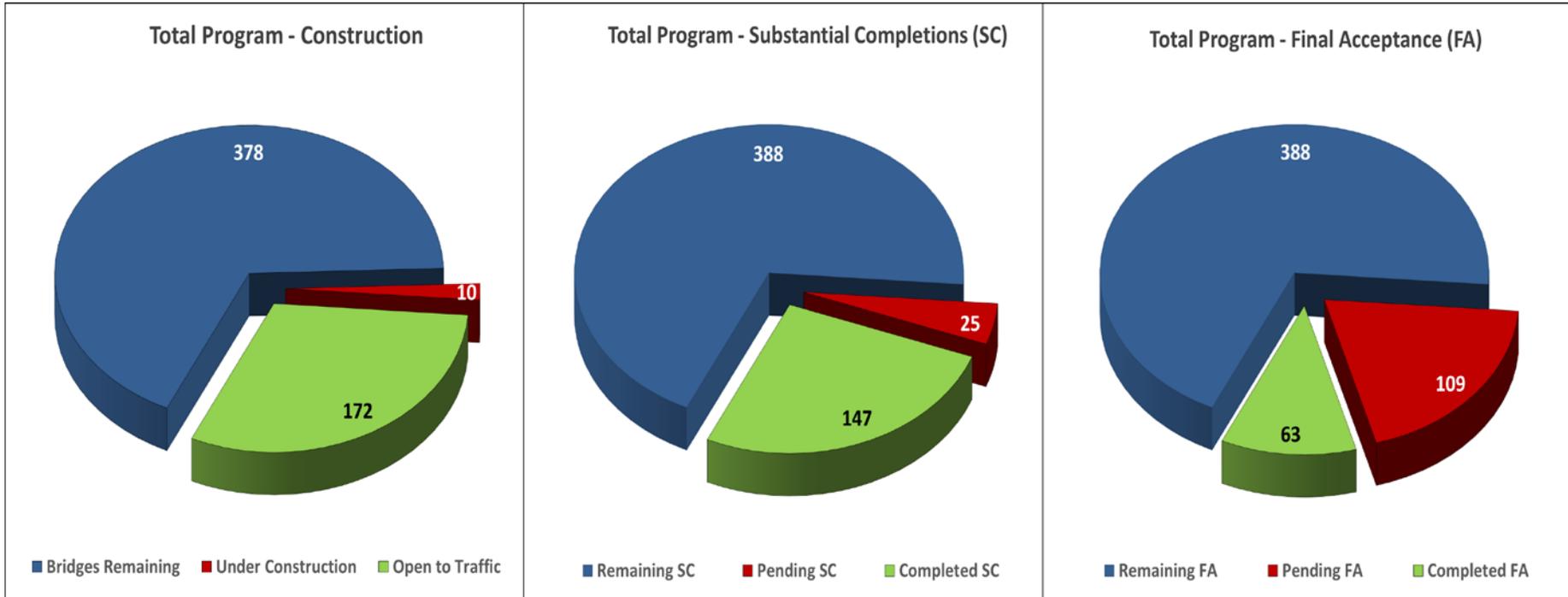
## Through December 31, 2016





# Project Status To-Date: Overall Construction Effort

## Through December 31, 2016



- 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 ( $\approx$  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



- Surface preparation – Blast track to expose aggregate /open pores



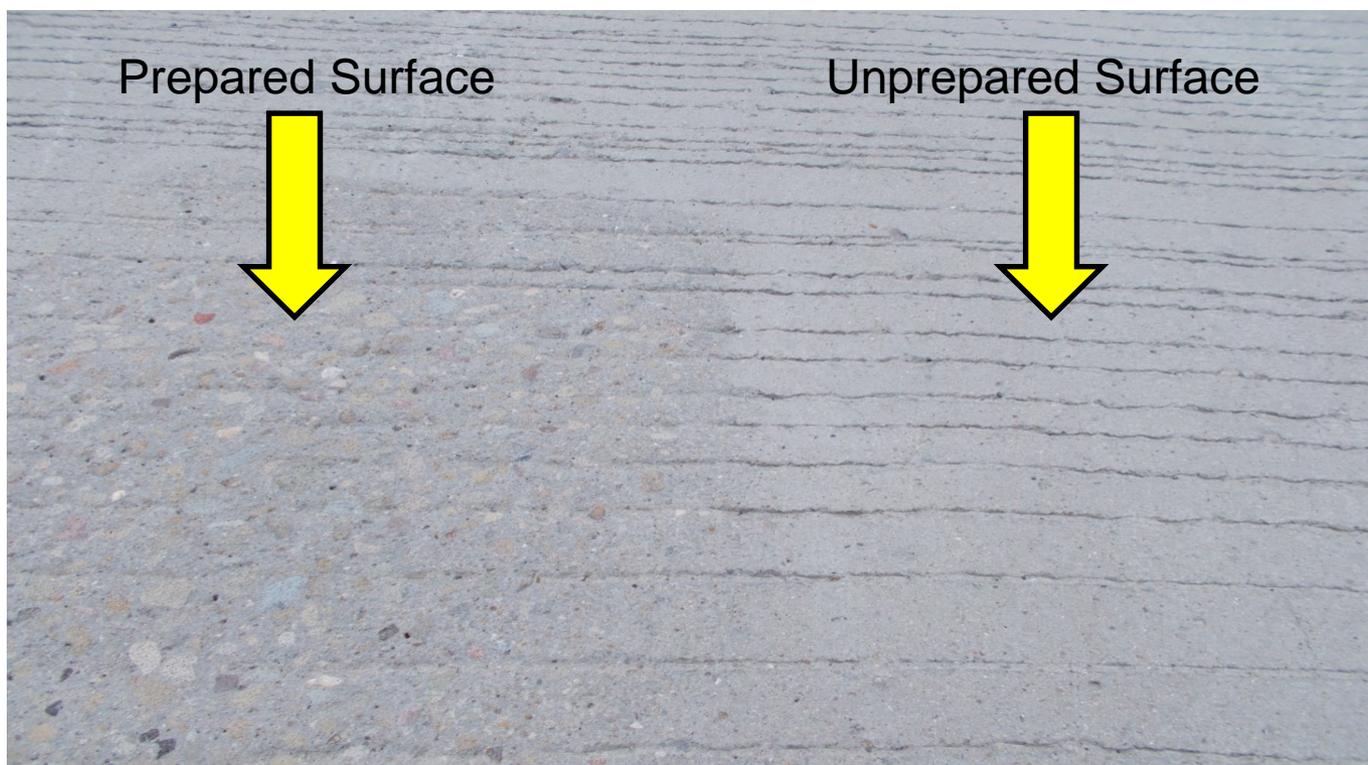
Blast track

## Project Status To-Date: Project Innovation – PPC Overlay

- Keys to Placement of PPC – Compressed air free of oil / moisture



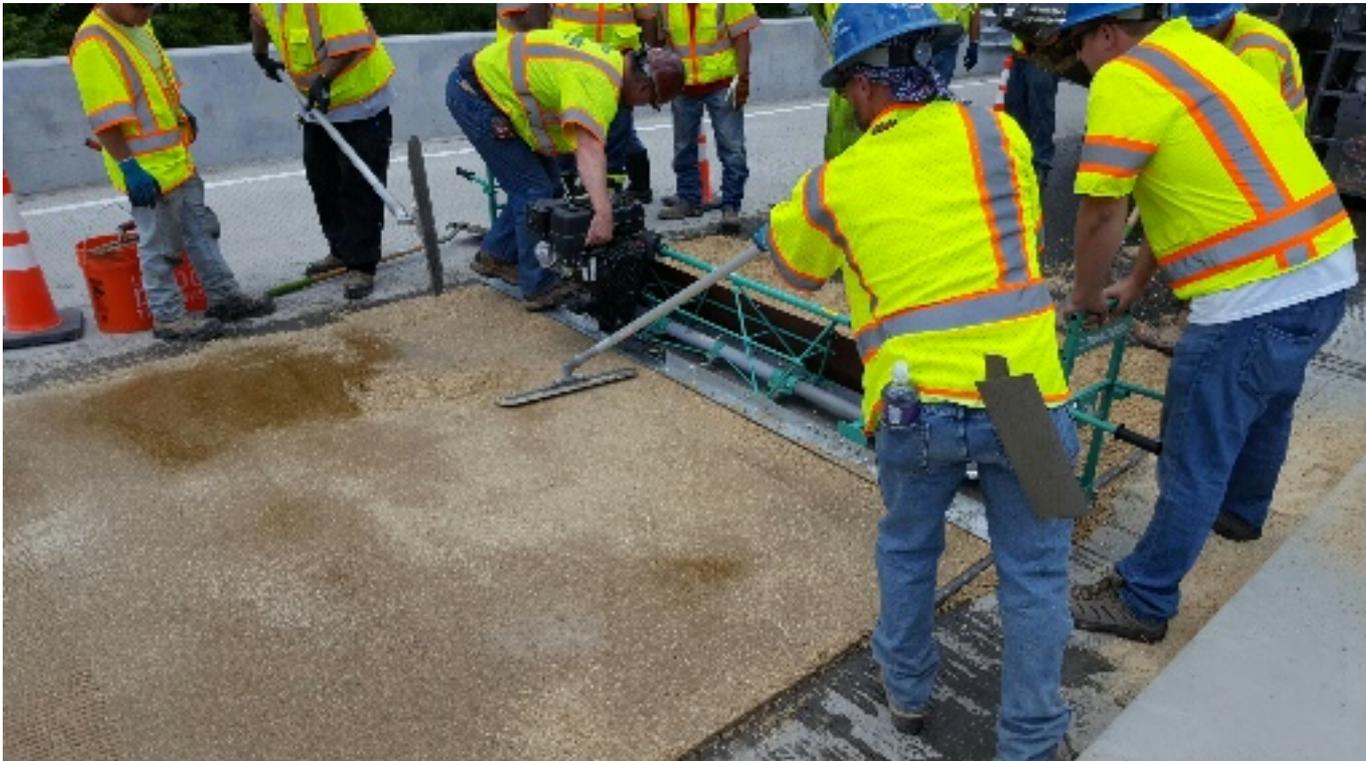
- Surface Preparation – Exposed aggregate / Open pores



- High Molecular Weight Methacrylate (HMWM) Resin Primer



- PPC Placement





# Development Entity CQMP: Overview of Contract Requirements

- **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



- **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





## Development Entity CQMP: Evolution of CQMP

- **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**

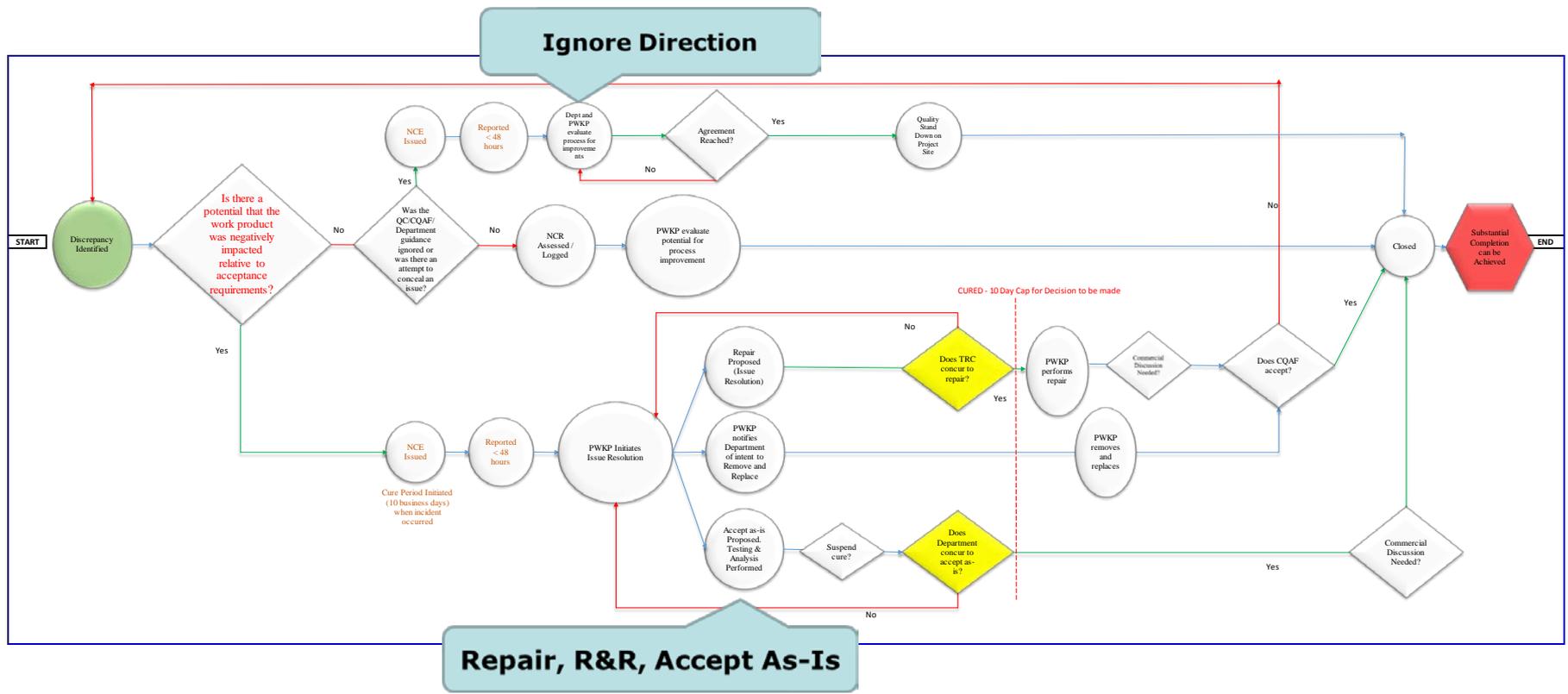
- The principle purpose of the Noncompliance regime is incentivize Development Entity compliance with the Project Documents
- **Applicable during:**
  - Design and Construction Phase
  - Maintenance Phase
- **Cure Periods and Interval of Recurrence**
- **2016 Evaluation of Noncompliance Event ID 19**
  - Repair – Solution
  - Remove/Replace
  - Leave as is
  - Agreement between parties



# Development Entity CQMP: Evolution of Noncompliance Regime

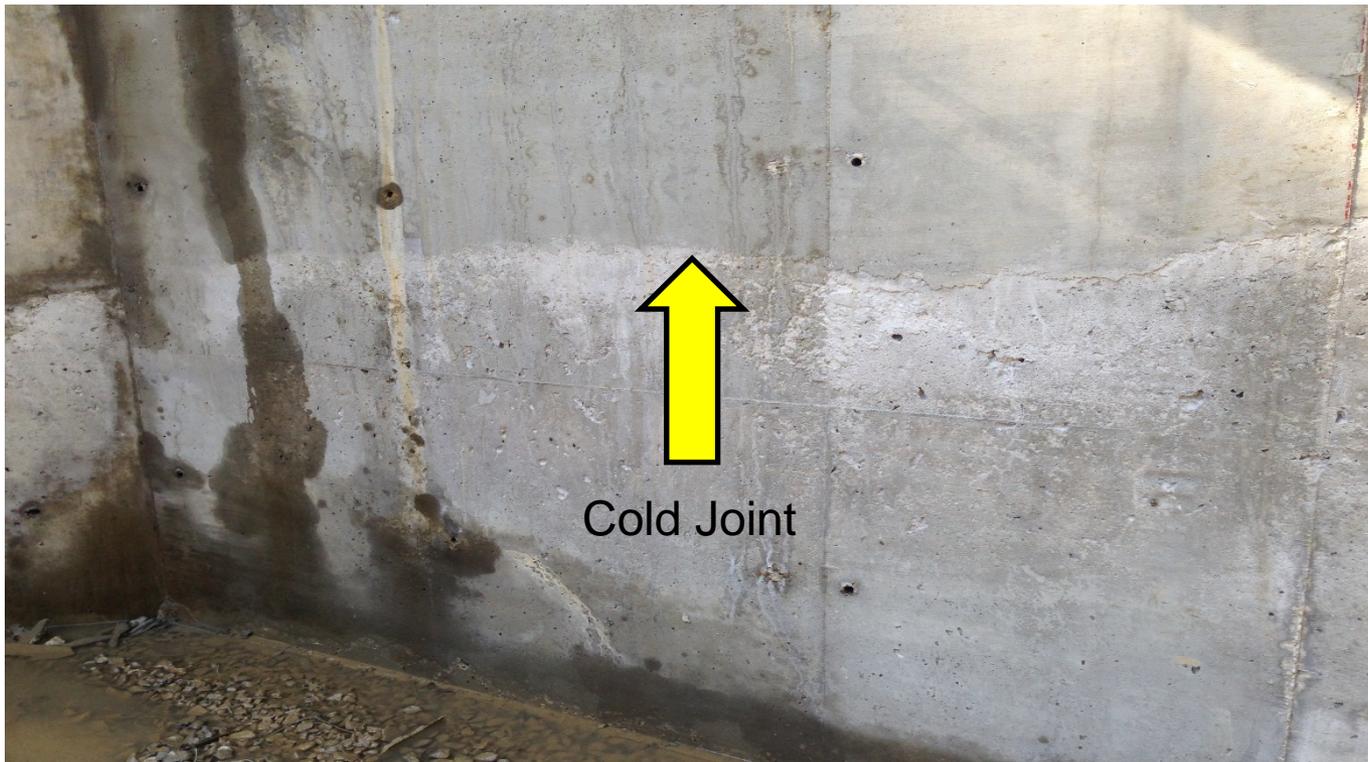
## NCR / NCE for Noncompliance Event ID 19 Flow Chart

Starts w/ "Is there a potential that work product was negatively impacted relative acceptance requirements"



## Construction Quality Metrics: Remove & Replace Example

- Cold Joint formation due to out of specification concrete





# Development Entity CQMP: Evolution of Noncompliance Regime

- **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



## 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.



- Acting like an Owner



## Construction Quality Metrics: The Good

- Acting like an Owner



- **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.



## Handback Process: Maintenance Performance Requirements

- **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
    - Fuel Spills/ Hazardous Materials Releases.





## Questions/Comments

- Questions/Comments?

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