Investigation of Iowa DOT Epoxy Injection of Bridge Deck Overlays

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Outline

- Introduction and Motivation
- Iowa Epoxy Injection History
- Epoxy Injection Procedure
- BEC Objectives and Progress
- Summary
Introduction and Motivation

- Concrete overlays used on bridge decks since the 1970’s
- Typically overlays last 15 to 20 years
- Often repaired by DOT maintenance staff by epoxy injection
- Observation by DOT field crews suggests 5 to 10 years of additional deck life before repair
- No data to substantiate these observations
- DOT maintenance crews unable to repair decks at the same pace they need repair
Iowa Injection History
Iowa DOT Districts
General Procedure
1. Step 1: Identify Locations Requiring Epoxy Injection
2. Step 2: Mark Injection and Venting Port Locations
3. Step 3: Drill Port Locations
4. Step 4: Insert Injection Port Tap
5. Step 5: Inject Epoxy Resin into Injection Ports
6. Step 6: Complete Injection Process
Project Sequence

Phase 1
• Sound previously injected decks

Phase 2
• Identify best injection practices

Phase 3
• Revisit newly injected decks over multi-year period

Phase 4
• Develop specifications and methods of measurement
Deck Condition

Sounding Tools  Deck Marking  Delamination Map
Best Practice Observations

- Sounding tools
- Port locations
- Port Drilling
- Epoxy materials
- Injection pressure
- Injection temperatures
Comparison
Re-visit Condition Observations

- All re-sounded bridges have a minimal amount of remaining voids
- Often the voids are located at injection locations
- Remaining voids were generally small and shallow
- Only occasionally a larger void would be found
Re-visit Condition Observations

- It is believed the remaining voids are attributable to the following reasons:
  - Air pockets remained in the void during injection
  - Concrete fines blocked epoxy pathways
  - Pump was not left on the port for needed duration
  - Pressure within the void decreased slowly after pump was removed from port
  - Void was considered too minimal to initially inject
Injection Field Manual

**Injection Field Manual**

**Manual of Best Practices and Procedures for Conducting Grout/Injection of Bridge Deck Cracks**

The manual provides a comprehensive guide for the injection process, detailing steps, precautions, and best practices for ensuring a successful and safe grout injection. The manual is intended for use by engineers, technicians, and contractors who are involved in the repair and rehabilitation of bridge decks. It covers various aspects of the grout injection process, including the selection of appropriate grout, the preparation of the injection site, the injection procedure, and post-injection inspection.

### Step 1: Select Injection Sites

The injection sites should be carefully selected to ensure effective grout placement. The criteria for selecting injection sites include the size and location of the cracks, the type of grout, the condition of the bridge deck, and the environmental conditions. The injection sites should be marked with temporary markers to guide the grout injection process.

### Step 2: Prepare the Injection Site

Before grouting, the injection site should be cleaned and prepared to ensure a smooth and even injection. The area around the injection site should be cleared of debris, and the crack should be cleaned to remove any loose material. The crack should be widened to accommodate the grout, and the injection ports should be installed.

### Step 3: Mix the Grout

The grout should be carefully mixed to ensure a uniform consistency. The grout should be mixed according to the manufacturer's instructions, and the mixing should be done in a dry and clean environment.

### Step 4: Grout Flow Check

Before injecting the grout, a flow check should be conducted to ensure that the grout flows freely through the injection ports. The flow check should be done using a small quantity of grout and should be performed at a moderate rate to ensure that the grout flows smoothly.

### Step 5: Grout Injection

The grout should be injected slowly and evenly to ensure a uniform distribution. The injection pressure should be monitored closely, and the injection should be stopped if the pressure drops or if any unexpected problems occur.

### Step 6: Post-Injection Inspection

After the grout has been injected, a post-injection inspection should be conducted to ensure the effectiveness of the grout injection. The inspection should include visual inspection, crack width measurement, and other relevant tests to determine the quality of the grout injection.

The manual also provides a comprehensive list of safety guidelines and best practices for the grout injection process. It is important to follow these guidelines to ensure a safe and effective grout injection process.

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**Step 5: Grout Injection Sites**

The grout injection should be performed in a dry and well-ventilated environment. The injection ports should be placed at regular intervals along the crack, and the grout should be injected in a controlled manner to ensure a uniform distribution.

### Step 6: Post-Injection Inspection

After the grout has been injected, a post-injection inspection should be conducted to ensure the effectiveness of the grout injection. The inspection should include visual inspection, crack width measurement, and other relevant tests to determine the quality of the grout injection.

The manual also provides a comprehensive list of safety guidelines and best practices for the grout injection process. It is important to follow these guidelines to ensure a safe and effective grout injection process.

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**Step 6: Post-Injection Inspection**

The grout injection should be performed in a dry and well-ventilated environment. The injection ports should be placed at regular intervals along the crack, and the grout should be injected in a controlled manner to ensure a uniform distribution.

### Step 7: Post-Injection Inspection

After the grout has been injected, a post-injection inspection should be conducted to ensure the effectiveness of the grout injection. The inspection should include visual inspection, crack width measurement, and other relevant tests to determine the quality of the grout injection.

The manual also provides a comprehensive list of safety guidelines and best practices for the grout injection process. It is important to follow these guidelines to ensure a safe and effective grout injection process.

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**Step 8: Post-Injection Inspection**

The grout injection should be performed in a dry and well-ventilated environment. The injection ports should be placed at regular intervals along the crack, and the grout should be injected in a controlled manner to ensure a uniform distribution.

### Step 9: Post-Injection Inspection

After the grout has been injected, a post-injection inspection should be conducted to ensure the effectiveness of the grout injection. The inspection should include visual inspection, crack width measurement, and other relevant tests to determine the quality of the grout injection.

The manual also provides a comprehensive list of safety guidelines and best practices for the grout injection process. It is important to follow these guidelines to ensure a safe and effective grout injection process.
Future Work

- Develop specification and methods of measurement
- Continue observation of injected decks
- Provide option to contract injection process
Summary

- Identified past performance
- Observed current procedures
- Identified best practices
- Investigating current performance
- Developing specification
Thank You

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