

JOINT TRANSPORTATION RESEARCH PROGRAM

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Implementing Epoxy Injection in Concrete Overlaid Bridge Decks

Introduction

Concrete overlays have proven to be an effective maintenance treatment as they slow the penetration of de-icing chemical and water into the original deck surface. Typically, due to vibration, structural flexibility, and weak bond between the concrete overlay and deck concrete (potentially from poor construction), de-bonding develops at the boundary between the original deck and overlay. This de-bonding creates voids, providing a reservoir for chloride-laden water to fill after it penetrates cracks in the surface. Displacing this liquid solution and filling these cracks with epoxy helps reduce freeze/thaw cycling and spalling.

The epoxy material protects the bridge deck from moisture and helps support the overlay and prevents it from failing under traffic loads. This leads to an extension of the asset life span and an increase in the life cycle cost benefit. Overall, the bridge infrastructure performance improves significantly because of greater mobility and fewer traffic interruptions from repairs to bridges on roadway infrastructures. Epoxy injections helps extend the service life of bridge decks and reduces the need for emergency bridge deck patching and, as a result, improves the safety of road users.

Motivation

Out of the approximately 6,000 state-owned/maintained bridges, 1,575 bridges currently have latex modified concrete (LMC) overlays, and 770 of those overlays have a condition rating of 5 or 6, which may make them good candidates for epoxy injection. These numbers support epoxy injecting for a minimum of ten (10) concrete overlaid bridge decks per district per year in perpetuity.

Benefits

Displacing water and filling voids at the interface of concrete overlays and concrete decks with epoxy reduces

INDIANA DEPARTMENT OF TRANSPORTATION DIVISION OF MAINTENANCE WORK PERFORMANCE STANDARD		2490	
ACTIVITY	Other Bridge Maintenance	CODE	2490
Purpose	Complete other bridge maintenance or repair that is not identified with a separate activity.	Category	Bridge
		<input type="checkbox"/> PM <input type="checkbox"/> QA <input type="checkbox"/> Plan Location	
Scheduling & Coordination			
Schedule this work throughout the year as needed. Observe weather and temperature limitations for individual activities.			
Reporting	Asset to Report to	Reporting Units	Person Hours
	Bridge Structures		
<ul style="list-style-type: none">• Accomplishment is the total person hours worked.• Report to the specific bridge asset each time this activity is performed.			
Crew Size	Workers	QTY	P.P.E.
Crew size determined by sub-activity being performed			PPE determined by sub-activity to which will be performed
			Materials
			Materials determined by sub-activity to which will be performed
Job Specific Equipment	QTY	Other References	
Job specific equipment determined by sub-activity being performed		Silica Exposure Plan (WPS Preface)	
Sub Activities			
830 – Scour repair (Rip Rap placement)		837 – Repair of slopewall	
832 – Bearing Assembly / Bridge Seat repair (bearing lubrication, reset bearings, mudwall repair, Seal abutment)		838 - Repair to drainage component (curb and gutter, drains, drain extensions)	
833 - Channel maintenance (log jam removal, debris removal, etc.)		839 -Repair to traffic safety component (handrail, sidewalk, guardrail attachments, bridge barrier)	
834 - Graffiti Removal		840 - Replacing riprap	
835 – Joint replacement		841 – Epoxy Injection	
836 – Repair joint material		840 – Bridge Approach Repair	
Average Daily Production	Person Hours	EFFECTIVE DATE	8/10/2022

The current INDOT Maintenance Work Performance Standards, epoxy injection is included as Sub activity 841 under Activity 2490-Other Bridge Maintenance.

emergency bridge deck patching and extends the service life of bridge decks.

INDOT Strategic Goals

Epoxy injection of bridge decks impacts the agency in the following strategic areas.

- *Safety*: ensures the road safety for motorists, contractors and INDOT personnel.
- *Asset sustainability*: enhances ability to manage and maintain assets throughout their life cycle.
- *Innovation and technology*: harnesses technology and innovation to develop more effective transportation solutions.

The following are keys to successful epoxy injection of bridge decks:

- selecting the ideal bridge deck candidates,
- personnel with proper training,
- proper materials,
- proper equipment, and
- proper procedures.

The following are ideal bridge deck candidate selection criteria for epoxy injection:

- debonded rigid concrete overlay,
- tight surface cracks,
- light to no cracking on soffit,
- very little to no spalls,
- delamination/debonding not exceeding 30% of the deck area,
- deck rating greater than or equal to 5, and
- wearing surface condition rating greater than or equal to 4.

Implementation

Based on the findings of this research, guidelines have been provided for a step-by-step injection operation (see Chapter 7). Bridge asset engineers for each district have

already started incorporating epoxy injection activity into their maintenance work plans. We have a quantity purchase award agreement (QPA) in place for districts to order epoxy material. Bridge maintenance crews in all six districts have been trained to epoxy inject bridges effectively. Currently, we have two fully equipped epoxy trailers stored in a central equipment yard. All districts have the ability to reserve these trailers for use. It is recommended that each district epoxy injects a minimum of five (5) bridge decks each fiscal year. Epoxy injection work should be added to the annual Maintenance Work Plan by the bridge asset engineers. The proposed maintenance life cycle for a typical bridge deck, which incorporates epoxy injection, is as follows.

- Year 0: new bridge.
- Year 3: maintenance silane spray and crack filling.
- Year 6: maintenance silane spray and crack filling.
- Year 10: thin deck overlay #1.
- Year 20 to 25: thin deck overlay #2.
- Year 30 to 40: LMC overlay #1.
- Year 45 to 55: epoxy injection.
- Year 50 to 60: potential LMC overlay #2.
- Year 60 to 70: potential epoxy injection.
- Year 50 to 75: deck replacement.
- Repeat deck cycle treatments.

Recommended Citation for Report

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