

Making Use of the Bridge Preservation Pocket Guides

Developed in conjunction with the FHWA BPETG



**2019 Northeast Bridge Preservation
Partnership Meeting
Bridge Preservation NOW!**

South Burlington, VT September 9 –11, 2019



Pocket Guides Categories

- Thin Polymer Overlay Systems
- Bridge Cleaning
- Bridge Joint Systems
- Removal & Replacement of Bridge Coatings



Development of the Pocket Guides

- Subject matter experts
- Sub-groups chosen - experts within each category
- Content developed - checklist format
- Focus - potential failure mechanisms
- Preliminary draft developed – sent out for review
- GPI - awarded the contract to develop and produce the PG's



Who are the Intended Users?

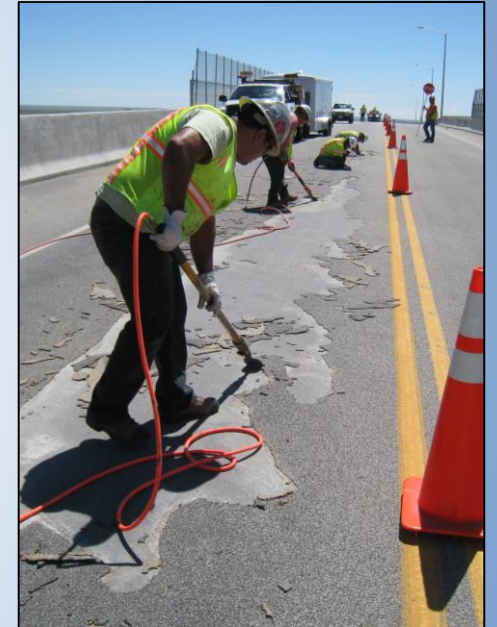
- Design – Spec writers
 - Understanding of QA/QC language and “best practices”
- Inspectors
 - Understand proper installation procedures
- Contractors/Installers
 - Guidance to “best practices”
- Maintenance crews



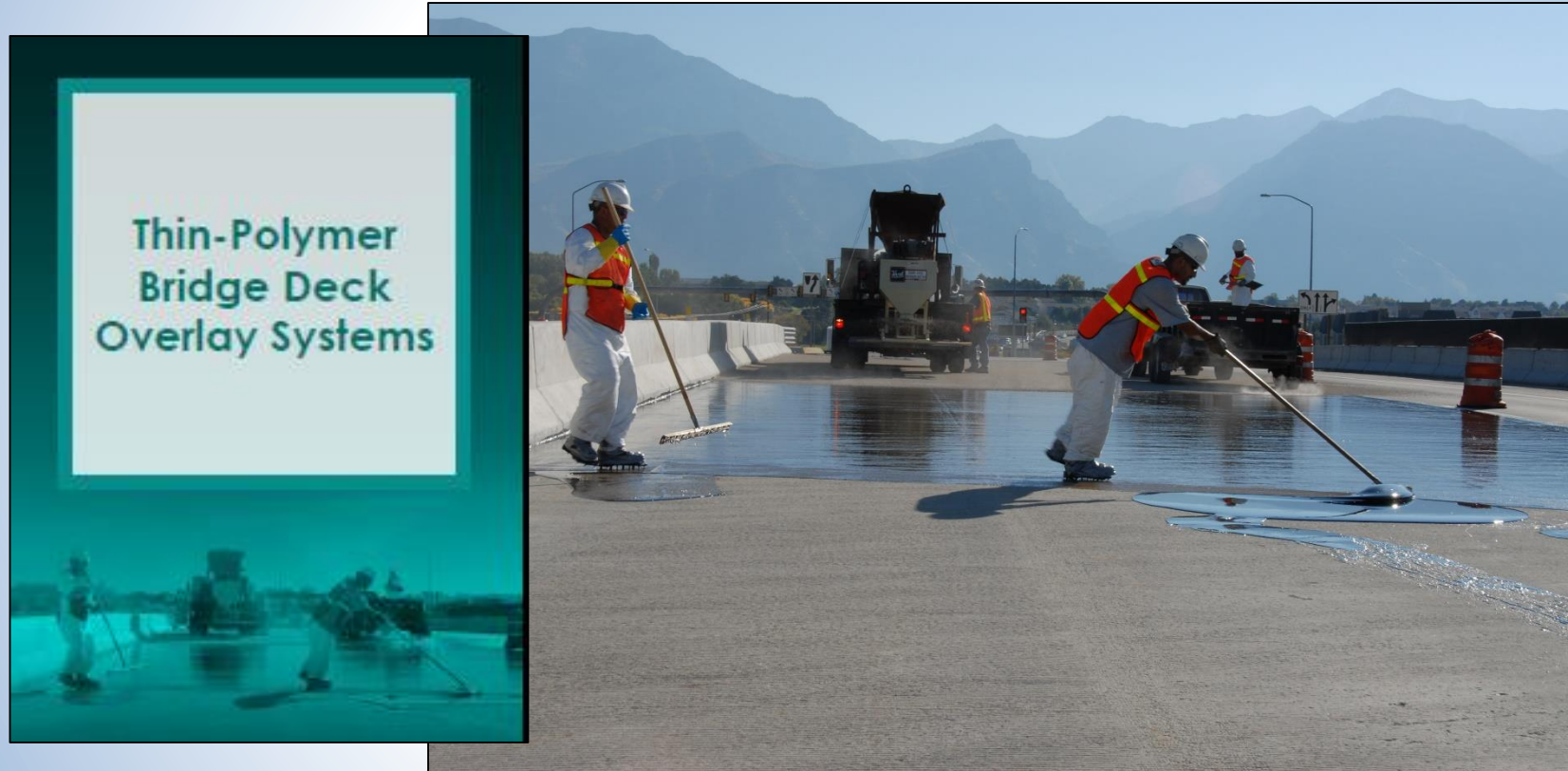
Intent of the Pocket Guides

Checklist Format

- Installation guidelines
- Equipment and tools
- Limitations & restrictions
- Avoiding potential failure mechanisms
- Recommended training
- Required technical support
- Recommended QA/QC



Thin Polymer Overlay Pocket Guide



Thin Polymer Overlay Pocket Guide

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THIN POLYMER OVERLAYS

Concrete Bridge Deck

Thin-Polymer Overlay Systems

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Thin-Bonded Polymer Overlay

Application Checklist

Preview

Surface Preparation

Equipment and Tool Checklist

Pre-application and Staging

Surface Preparation – Final Checklist

Staging

Personnel

Application – Manual Method

Mixing

Placing

Broadcasting of Aggregate

Clean-up – First Course

Removal of Excess Aggregate

Second Course

Clean-up – Second Course



Intent of the Thin-Polymer Overlay (TPO) PG

Concrete Bridge Deck

Thin-Polymer Overlay Systems

This guide has been developed to encourage a better understanding of the use of thin-polymer overlay (TPO) systems for the preservation of concrete bridge decks.

A TPO refers to a multi-layer overlay system that includes a polymer resin binder with polish-resistant aggregates broadcasted or seeded into the wet polymer prior to gelling or curing. The aggregate acts to provide friction for the wearing surface. This is typically applied in two layers at a specified coverage rate. A primer or pretreatment is sometimes used to seal cracks and act as an adhesion promoter for the TPO. The TPO system is typically 3/8 inches in thickness when properly installed. Thickness may vary slightly dependent upon the gradation of broadcast aggregates specified for the project.

- What is a TPO?
- Why a Thin-Polymer Overlay System (TPO)?
- How to Use a Thin-Polymer Overlay (TPO)



Design Intent - Thin Polymer Overlay PG (Overview)

A TPO is designed to:

- Minimize the intrusion of moisture, de-icing chemicals, carbonation, and other potential sources of the premature degradation of concrete bridge decks.
- Provide a protective, durable, skid-resistant wearing course for a concrete bridge deck.

This guide is intended to educate the designer, owner, contractor, and inspectors about TPO installation best practices. By acting with a better understanding of their designed intent, the bridge owner can capitalize on the potential benefits of these overlay systems.

Although some broad guidance is suggested as to bridge deck condition assessment, this subject is not the primary intention of this guide. The same holds true with the selection of TPO materials.



Condition Assessment

Condition Assessment

From a life cycle perspective, TPO candidates should be sound, free from high levels of chloride contamination, and exhibit minimal signs of deterioration due to expansion of corroding steel reinforcement. This recommendation is based on the consideration that preemptive preservation activities should protect the deck from the intrusion of moisture, de-icing chemicals, freeze-thaw damage, and other cumulative conditions that lead to the early-age degradation of a bridge deck.

Typically, a high level of surface deterioration may coincide with underlying issues that lead to the premature failure of a TPO. For example, while widespread surface deterioration due to temperature and shrinkage stresses are often acceptable for a TPO, surface deterioration due to structural and material deficiencies are typically not acceptable. Further testing can be performed to determine the cause of deterioration, like tensile strength of the deck concrete, chloride content, corrosion potential of steel reinforcement, and the existence of alkali-silica reactivity and/or other forms of crystalline growth. Proper consideration should always be taken into the cause of the surface deterioration prior to the placement of a TPO.

While this guide does not go into specifics regarding proper deck repair, patching, and crack repair, repair techniques and material evaluation are critical to a successful TPO application. The International Concrete Repair Institute (ICRI) offers good guidance on making proper repairs and evaluating materials for this use. Discuss options with the resin binder manufacturer to make sure all systems and methods of repair are acceptable prior to application.

Although an FHWA national bridge inventory deck condition rating of 6 or greater may provide some basic guidance when considering a TPO, many sources are available referencing further condition assessment relative to the use of bridge deck preservation treatments. The FHWA National Highway Institute Bridge Maintenance Reference Manual and National Cooperative Highway Research Program (NCHRP) Project 20-07, Task 234, may provide helpful information.

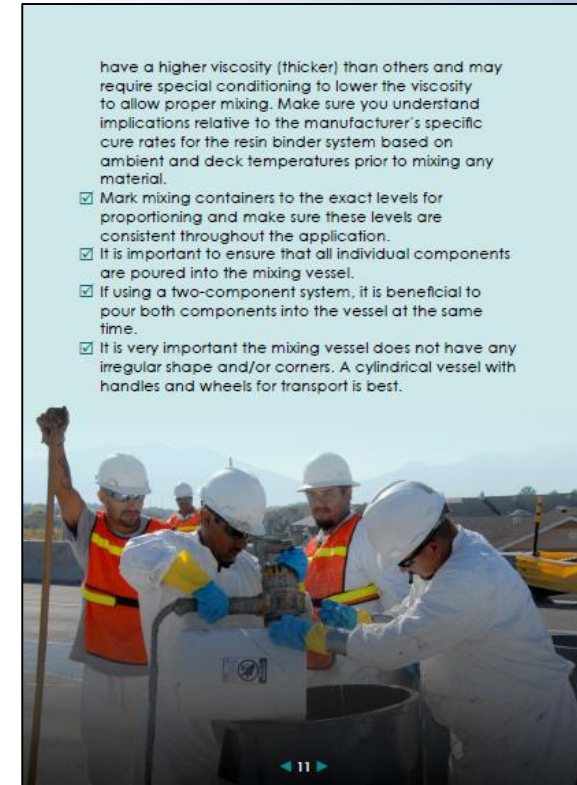
- Provide broad guidelines as to which bridges are better candidates for TPO
- Provide further sources for further information



Application Checklist

Thin-Polymer Overlay Application Checklist

This checklist is intended to provide a review procedure for a TPO installation. This list is not comprehensive, but is rather a list of items and considerations that emphasizes potential problem areas. The introduction of mechanical and automated installation processes has become more commonplace, therefore this guide may not be relevant to all installation methodologies. Rather than write a separate guide for all variations, the contents of this guide includes basic options for mixing and placing a TPO.



Application Checklist

1. Preview
2. Surface Preparation
3. Equipment & Tool Checklist
4. Pre-application & Staging
5. Staging cont.
6. Personnel
7. Mixing
8. Placing
9. Broadcasting of Aggregate
10. Clean-up (First Course)
11. Removal of Excess Aggregate
12. Second Course
13. Clean-up (Second Course)
14. Final Inspection

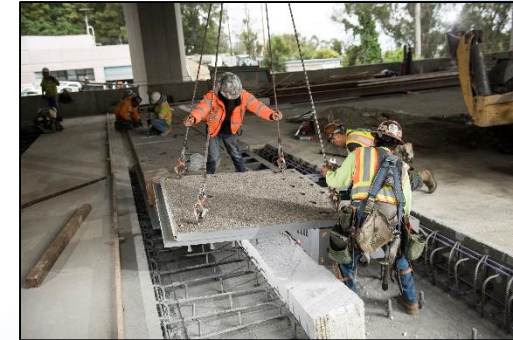


Bridge Expansion Joints Pocket Guide

(Under Revision)

Contents:

- Bridge Expansion Joint Application Checklist – review procedures
- Joint Seal Proper Installation Guidelines – general and by joint types
- Recommended Repair Procedures - inspect, maintain, repair by joint type



Bridge Expansion Joints Pocket Guide

(Under Revision)

Content:

- Limitations, Restrictions and Potential Failure Mechanisms – common areas and by type
- Recommended Training and Technical Support for Proper Installation – general recommendations



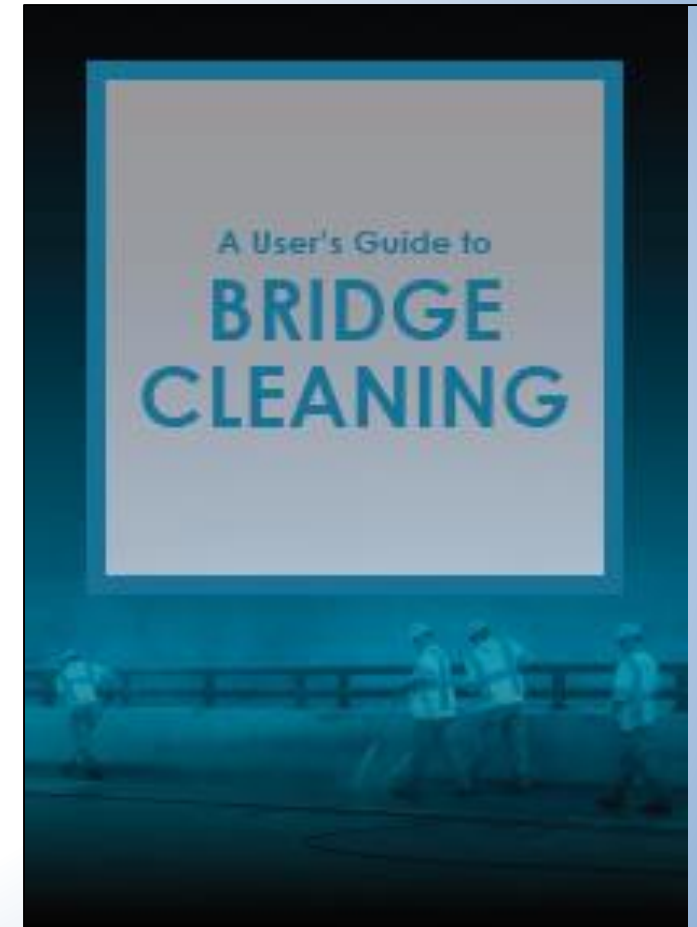
Bridge Cleaning Pocket Guide - Status

Purpose and Scope

Will identify limits of topic: e.g., may include discussion of vegetation growth and removal, but will not address the accumulation of large debris from flooding, etc.

Background

Overview of exposure and accumulation of debris and contaminants and impacts on functionality and durability of various bridge components over service life, as well as safety and environment. Relate benefits of programmatic cleaning.



Bridge Cleaning Pocket Guide - Status

Accumulations of Contaminants

Types of contaminants (debris, salts, excrement); effects of specific contaminants on different structural elements and material types (e.g., Decks, gutters, drainage appurtenances, joints, abutment seats, pier caps, bearings, bridge girders; splash zones [areas on piers and abutments that have water and snow that had been treated with deicing chemicals splashed or plowed toward the concrete.])

Cleaning Methods

Sweeping (manual, powered), shoveling, vacuuming, high pressure water, and high volume water (both high and low pressure flushing)

Complying with Environmental Regulations

Run-off containment; bats and other animal/bird issues – nesting – seasonal restrictions; difference between states as well as federal regulations

Bridge Cleaning Pocket Guide - Status

Disposition of Contaminants and Effluents

Geography, water body types; methods, exclusions and limitations

Frequency of Cleaning/Washing

Geographic/meteorological influences; coordination with other operations (e.g., safety inspection); frequency by element

Access and Maintenance and Protection of Traffic

Access to substructures, bridge seats, and operations on decks

Worker safety; training, MPT procedures and references

Costs and benefits

Costs of cleaning by activity and element

Benefits of cleaning on operations, service life, maintenance costs

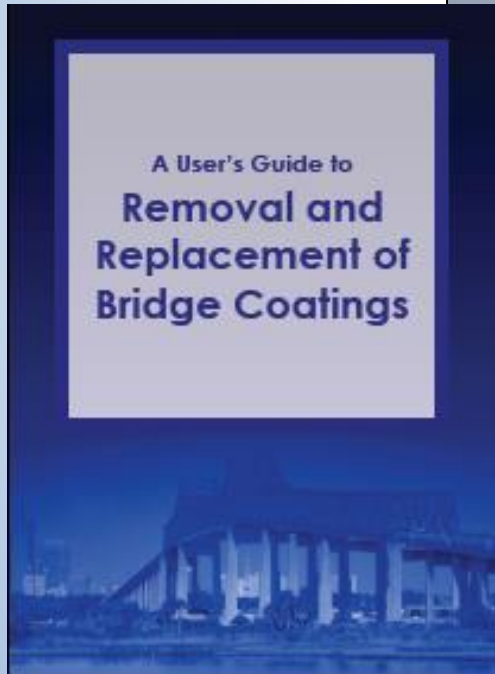
References

Provide hyperlinks to resources and relevant regulations

List of cited references in narrative



Removal and Replacement of Bridge Coatings



Removal and Replacement of Bridge Coatings

Objective – Oversight & guidance to bridge maintenance personnel on maintenance painting of structural steel bridges.

Guidance - maintenance painting of steel bridge structures.

- Removal of existing coatings
- Preparation for subsequent coating applications
- When the extent of corrosion and coating deterioration warrants full removal and replacement of the existing coating system and a full new coating system is applied.
 - Rule of thumb - Remove and replace the existing coating system when corrosion is greater than 10% of the coated area.

This guide is not intended to address the environmental or personnel protection issues associated with bridge painting operations.

Removal and Replacement of Bridge Coatings

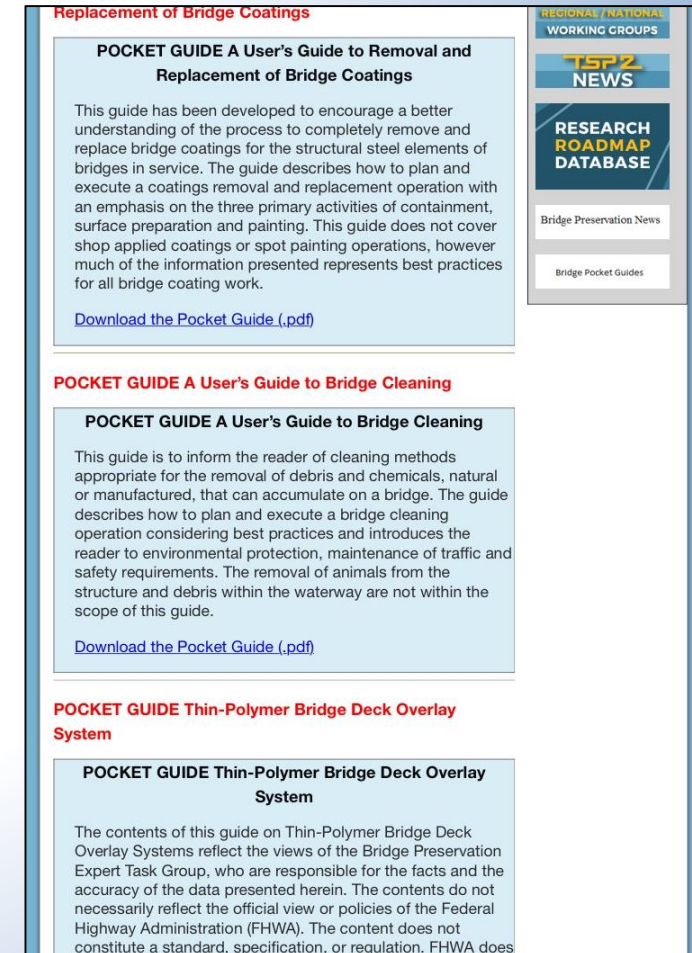
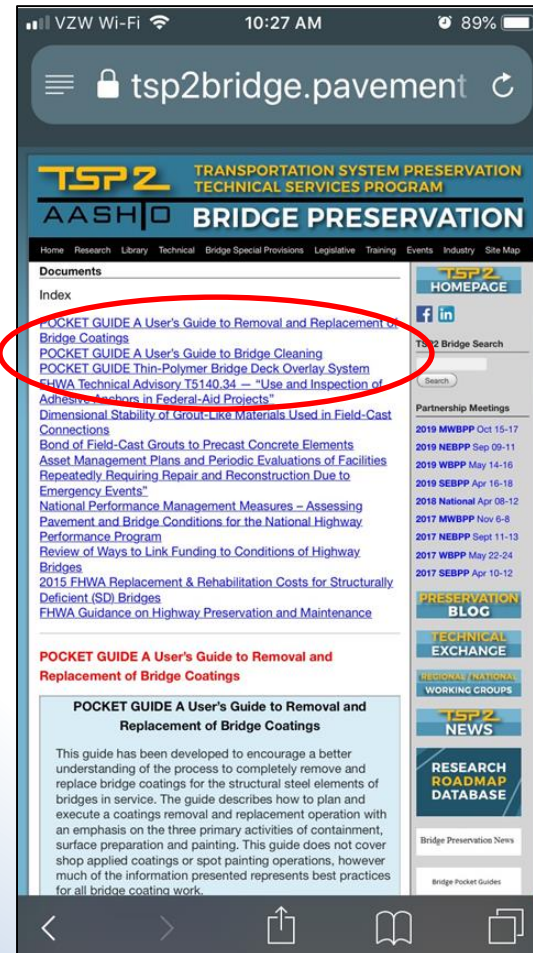
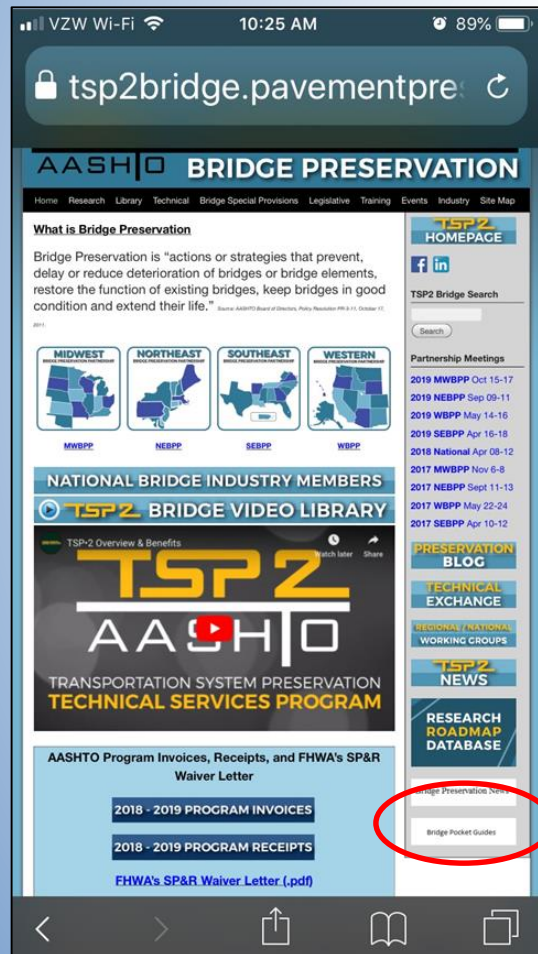
Introduction

- Condition Assessment
- Site Assessment/Site Organization
- Traffic Control
- Surface Preparation
- Solvent cleaning
- Hand tools
- Power tools
- Abrasive blasting
- Wet abrasive blasting
- Coating Selection
- Coating Application
- Brushing
- Stripe Coating
- Rolling
- Spray Application
- Coating Storage and Handling
- Coating Mixing
- Thinning
- Pot Life
- Recoat Window
- Failure Mechanisms
- Inspection
- Quality Control
- Quality Assurance
- Equipment and Tools
- Reference Standards

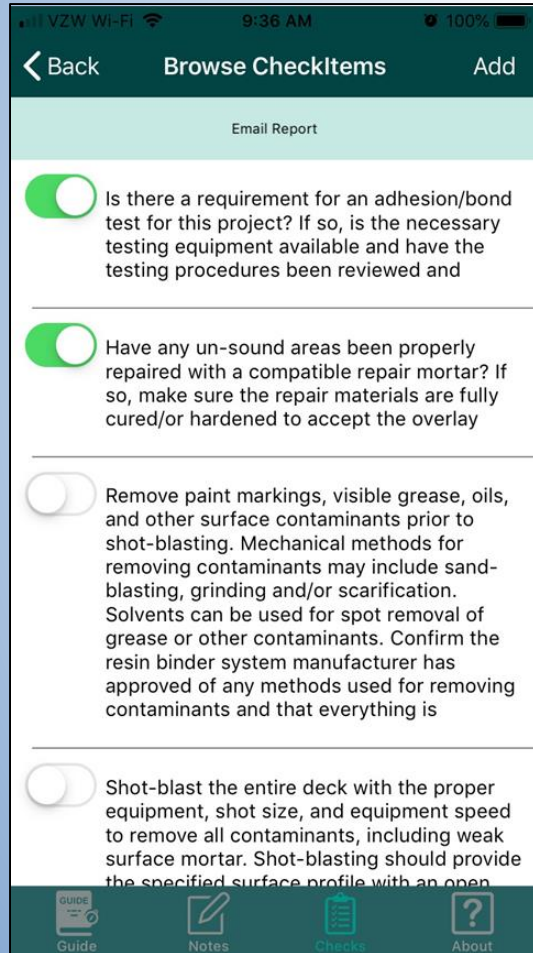


Pocket Guides Available @

<https://tsp2bridge.pavementpreservation.org/technical/fhwa/documents/>



Pocket Guide Phone Apps

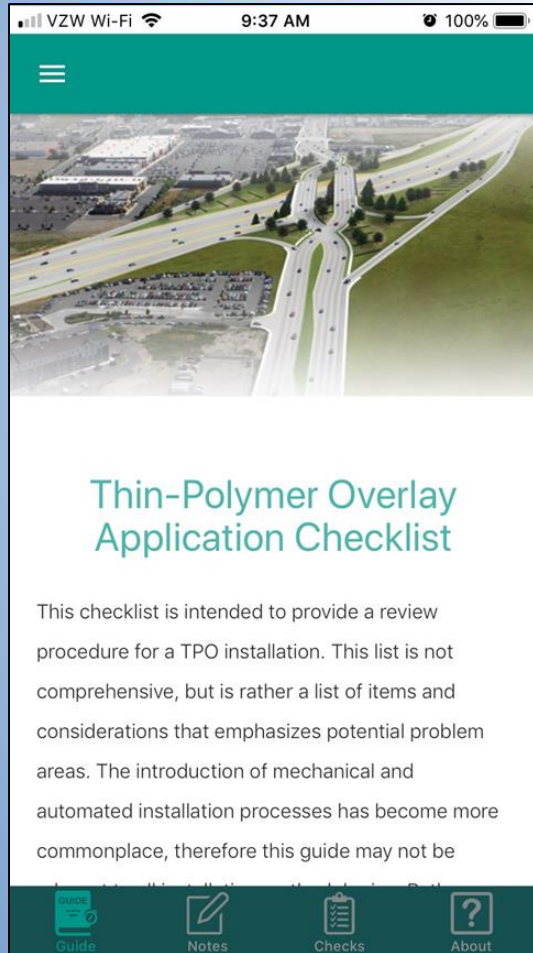


Now available for I-Phone and Android phones:

- Thin Polymer Overlay PG
- Bridge Cleaning & Washing PG
- Bridge Coating PG

Pocket Guide Phone Apps

Phone app pocket guides are now useable and e-mailable from your smart phones



Implementation Plan

- Coordinate AASHTO TSP₂, Regional Partnerships, Local Agency Outreach & BPETG efforts
- Webinars
- Industry presentations to owner agencies
- Videos – TC₃, FHWA
- Phone apps now available
 - Thin Overlay App
 - Bridge Cleaning & Washing
 - Bridge Painting



Now available for
I-Phone or Android
phones



What's next?

Follow-up Pocket Guides:

- Spot Zone Repair of Bridge Coatings (Draft Under Review)
- Substructure Preservation (Outline Developed)
- Bridge Deck Patching (Draft Under Development)
- Small Movement Joint Systems (Under Revision & Update)



Other News – FHWA BPETG

8-minute video to promote bridge preservation



<https://www.youtube.com/watch?v=E8xHWtTkVOI&feature=youtu.be>

Any Questions?



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