Bridge Preservation / Decks
Better Understanding the Installation Methods of Multi-Layer, Polymer Overlay Systems
Tools to Minimize Return to Traffic Time and Mitigate Potential Failures

WESTERN BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2015
Common Terminology for Installation Methods

Various installation techniques can be implemented in the application of a Thin-Bonded, Multi-Layer, Polymer Overlay System.

Hand Applied  Machine Applied  Fully Automated
Surface Preparation

- Various rates of speed & capability will determine what equipment is needed
- Shot-blasting rates may vary from 1,000 sf/hour – 12,000sf/hour
- Stripe removal
- Sand-blasting
- Taping & protection of joints/drains
- Air wash
Hand Applied - Mixing

Import Considerations - Return To Traffic/Limitations

- Batch size is limited
- Mixing station is typically stationary
- Limited to one batch at a time unless crew size is increased
- Proper mix ratio is controlled by multiple variables
- Viscosity of polymer controlled by the temperature
Machine Applied – Pump/Squeegee

Import Considerations - Return To Traffic/Limitations

• Can often be mixed as fast as crew can squeegee
• Pump & seals must be maintained
• Aggregate broadcast must be efficient enough to keep up
• Longitudinal terminations still need to be taped
• Rapid embedment of the aggregate is critical on a hot day
• The wrong tires can make permanent tread marks in the overlay
Fully Automated Installation

Import Considerations - Return To Traffic/Limitations

- Not efficient for smaller projects
- Full lane width coverage with polymer and aggregate
- No taping of longitudinal terminations needed
- Pumps & seals must be properly maintained
Sweeping Excess Aggregate

Really?

If you sweep too aggressively before the system is ready, be prepared to lose some integrity, and aggregate
Polymer Binder – Cure Rates

With most polymer binder systems colder temperatures will slow the setting time while warmer temperatures will accelerate the set

Common cure rates for epoxy (polymer type) binder systems
• 40°F (up to 24 hours / tack free time) * often limited to >50°F minimum
• 60°-65°F (5-8 hours)
• 80°-84°F (1.5-3 hours)

Typical free radical cure (polymer type) binder systems
• Can be adjusted to cure in <2 hours at temperatures below 40°F
Production Rate Variables - Summary

• **Surface Prep** — Equipment & size of crew

• **Staging** — Mixing, aggregate, re-loading

• **Mixing Method** — Hand mixing, pumps, crew size, full automation

• **Aggregate Broadcast** — hand, mechanical, full automation

• **Cure Rate of Polymer for Each Course** — polymer type

• **Removal of Excess Aggregate** — Equipment

• **Traffic Control**
Potential Failure Mechanisms
Polymer Overlay Systems

- Thermal incompatibility with deck substrate
- Poor surface preparation
- Unknown contamination, or site conditions
- Poor deck condition
- Improper mix ratio
- Return to traffic prior to proper gain in strength
- Exceeding the materials limitations during installation
How to Mitigate Potential Failure Mechanisms

Thermal incompatibility

- Do not exceed 2 layers
- Make sure that the deck substrate is in acceptable condition
How to Mitigate Potential Failure Mechanisms

Poor Surface Prep

- Follow specified guidelines
- Clean out concrete dust from equipment away from the prepared deck
- Do not mix on the deck without the proper protection
- Shot-blasting will only remove surface contaminants
Shot-blasting
ICRI CSP Chips for Guidance

- An ICRI CSP surface profile is sometimes specified for a polymer overlay
- Shot-blasting will remove surface contamination only
- Various equipment, size of the shot and speed will control the surface profile

CSP Chips on prepared surface
How to Mitigate Potential Failure Mechanisms

Poor Substrate Condition

• A tensile strength test should be performed on a deck with extensive cracking, patching and delaminating (follow guidelines)

• A deck with >5% delaminated and/or patched may be a sign of poor candidacy for a thin polymer overlay
How to Mitigate Potential Failure Mechanisms

Polymer mixed off-ratio

- Use a Jiffy type mixer for hand mixing
- Pre-condition binder to proper temperature
- Mix in appropriate vessel and maintain pumping equipment
- Mix for the appropriate duration of time
How to Mitigate Potential Failure Mechanisms

Premature wear in the wheel path
- Mix material properly
- Return to traffic only when the system has reached proper strength
- Pre-condition materials to the proper temperature
- Do not exceed the limitations of the binder system
- Consider the potential of a shorter life cycle if exposed to heavy studded tire and chain traffic
Questions?

WESTERN BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2015

Thank You!
Gregg Freeman
Kwik Bond Polymers