

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
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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



Drywall mud mixer



Jiffy Mixer



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

Machine Applied – Aggregate Broadcasting



- 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



Important 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



CSP Ships on prepared surface

- 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

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?

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Thank You!
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