Why waterproof?

Protect deck from corrosion due to:
• Moisture
• Salt
• Chemicals
Why Waterproof?

Why Waterproof?
Why Waterproof?

Why Waterproof?
Why Waterproof?

Create a PROTECTIVE BARRIER
Hot Applied Waterproofing

- Used in instances where an ASPHALT OVERLAY will be used.
- Formulated to meet CGSB 37.50 M89 specification.
- Hot applied waterproofing membrane.
- Typically used to waterproof concrete structures in horizontal applications.
- Thick, seamless, easy to detail and bonds tenaciously to the substrate.
Advantages

- Completely monolithic – no seams!
- Fully bonded
- Conforms to all surface irregularities and bonds tenaciously to acceptable substrates eliminating lateral migration of water.
- Tough, flexible, thick, self-healing membrane
  - 100% Solids - One component
- No solvents means no on-site cure failures
  - No two part mixing
  - No VOC restrictions
- LONG LIFE

Advantages

- Can be installed at temperatures as low as 0°F (-18°C)
  - Provided the substrate is clean, dry, free of snow and frost
- Typically installed at 200-215 mils thick with Reinforced Fabric Assembly
  - This is more than three times thicker than most other waterproofing membranes. Thickness is an important benefit in that HOT APPLIED WATERPROOFING exhibits the ability to self-heal and better accommodate developing cracks in concrete substrates.
- Can also be used in a single layer application – typically installed at 165+ mils.
Hot Applied System

**Asphalt Pavement Overlay**
- Asphaltic Protection Board
- Membrane
- Reinforcing Fabric
- Membrane
- Primer

*Concrete Bridge Deck*
Installation Requirements

- Surface must be clean and dry with no lingering moisture or contaminants in cracks.
- Surface must be relatively smooth which have had defects treated or repaired.
- Surface must be structurally sound and stable.
- Surface should be sufficiently level without protrusions or depressions, ensuring a seamless, stronger bond to the surface.

Installation Requirements

- Primer application improves membrane adhesion during cooler application conditions and when surface conditions are not optimal.
- Asphalt Primer or equivalent (ASTM D41) is to be brushed, rolled or sprayed on when required.
- Primer must be completely cured prior to membrane application and should be applied the same day the primer has cured.
**Primer Application**

Primer should be spray applied. Allow primer to dry thoroughly.

**Membrane Application**

- Use a double-jacketed melter with mechanical agitation.
- Treat construction joints and cracks greater than 1/16” with a 125 mil coat of membrane.
- All detail work should be completed prior to application of the membrane.
- May be squeegee applied on horizontal surface.
- Hand troweled or roller applied on vertical surfaces.

Initial membrane application: 90 mils
Reinforcing Fabric

Reinforcing fabric is embedded into the membrane while it is still warm and tacky.

Rubberized Waterproofing Membrane

- A second coat of membrane is then applied at a minimum thickness of 125 mils.
- Be sure to fully encapsulate the reinforcing fabric within the membrane.
Membrane Application

Install the protection board in a cross pattern.
Protection Board
Geo Composites

What are they?

- Basic philosophy
- Combine best features of different materials.
  - SEPARATION
  - REINFORCEMENT
  - FILTRATION
  - DRAINAGE
  - CONTAINMENT
Geocomposites

What are they?

WATERPROOFING MEMBRANES
Peel-and-stick
Heavy Duty
High Strength

Uses:
- Used in instances where an ASPHALT OVERLAY will be used.
- To reduce reflective cracking in asphalt overlays
- Reinforce pavement joints and cracks
- Waterproof joints/cracks, bridges and parking decks
Geocomposites

Advantages of GeoComposites

- Provides a Stress Relief Layer
- Significantly Reduces Reflective Cracking which Increases overlay-life
- Reduces moisture penetration
- Waterproofs joints/cracks
- Reduces further structural deterioration
- Prolong the life of the pavement
- Decrease pavement maintenance costs

Typical Waterproofing Membrane Detail
Bridge Deck Application

- Prepare deck
- Primer or Tack Coat (Bonding Adhesive)
- Apply primer to deck by roller, spray, brush, or squeegee
- Application rate of 200-400 \( \frac{Y_2}{\text{gallon}} \)
- Completely wetted with no puddling
- Place Membrane

Bridge Deck Application

- Position & roll out
- Keep material taunt
- Start at curb or gutter
- Shingle from low side (curb/gutter) to crown (high)
- Remove release liner
Bridge Deck Application

- Pressure rolled
- Check for deficiencies and repair
- Make sure membrane is FULLY ADHERED
- Seal all edges
- Tack coat prior to paving

- Roll membrane with rubber tire or static steel drum roller
- 3 Passes
- HMA overlay bonding to Geotac
Tack, Pave, & Roll

- Apply tack coat 0.10 to 0.12 gsy
- Apply HMA overlay
- Roll overlay with dual drive roller
- Amplitude set low & frequency high

Advantages / Disadvantages

Seams vs. No Seams
Equipment Needs
Traffic while in process
Level of protection
Questions?

Single-Component Asphaltic Plug Bridge Joint System
Types of Bridge Joints

- **Open Joints**
  - Butt Joint
  - Sliding Plate Joint
  - Finger Joint

- **Closed Expansion Joints**
  - Field Molded
  - Compression Seal
  - Strip Seal
  - Cushion Seal
  - Inflatable Neoprene Seal
  - Modular Joint
  - *Asphaltic Plug Joint*
Factors considered when designing or specifying a particular expansion joint:

- Movement Range
- Bridge Span
- Type of Bridge
- Joint performance and previous experience
- Durability
- Maintenance requirements
- Bridge Alignment
- Joint details at curbs
- Initial costs
- Climate conditions
- Expected Joint Life
- Installation time
- Life-cycle costs
- Type of bridge supports
- Service level

2003 National Cooperative Highway Research Program Synthesis 319- Bridge Deck Performance Survey Response from 34 states and 10 Canadian Provinces

No consensus as to which type of closed joints work best. Most common factor considered when design and specifying a particular expansion joint is “movement range”.

Asphaltic Plug Joint is one of the preferred joint types for short to moderate length spans
Asphaltic Plug Joint
What is it?

- Watertight bridge expansion joint system placed in the deck surfacing layer
- Blend of Polymer Modified Asphalt and select aggregate
- System includes primer, bridging plates, mastic and cover aggregate
- ASTM Specification- D6297
- Two types- Field blended and pre-packaged
Asphaltic Plug Joint
Where is it used?

- Expansion, fixed end, and pressure relief joints in new construction and rehabilitation projects
- AC and PCC pavement
- Joints with maximum movement of +/- 3/4”
- Joints on skews up to 30 degrees (45 degrees with low ADT)

Asphaltic Plug Joint
Material- CRAFCO MATRIX 501

- Single component- prepackaged / premeasured
- Polymer modified asphalt with select aggregate
- Flexible
- Good extension
- Resists tracking and shoving
Asphaltic Plug Joint

- Pre-packaged, pre-measured- no field blending of components
- Fewer Components to inventory and handle
- Easy to apply
- High Production
- Less equipment
- Less Manpower
- No compaction required
- Easy to maintain
Asphaltic Plug Joint

INSTALLATION
Asphaltic Plug Joint

Finish lift is leveled to pavement surface and allowed to cool

Asphaltic Plug Joint

Finished Joint is smooth and waterproof
Asphaltic Plug Joint

Finished Joint is smooth and waterproof

Asphaltic Plug Joint
QUESTIONS?

Flexible Concrete Repair
FOCUS- Partial Depth Spall Repair
As defined by the American Concrete Pavement Association;

“Patches for restoring localized areas of surface deterioration; Usually for compression spalling problems, severe scaling, or other surface problems that are within the upper one-third of the slab depth.”

FOCUS- Partial Depth Spall Repair
Types of damage appropriate for spall repair:

CORNER BREAKS
FOCUS- Partial Depth Spall Repair

DETERIORATED JOINTS

LONGITUDINAL CRACKING

TRANSVERSE CRACKING
FOCUS- Partial Depth Spall Repair

D-CRACKING

POPOUTS

Partial Depth Spall Repair

Materials Currently Used Include:

- Concrete Repair Material, Portland Cement Based
- Rapid Hardening Concrete Repair Material
- Cementitious / Non-cementitious
- Class D Concrete Out of Truck
- Hot Mix Asphalt
Considerations for Repair Material Selection

• Repair Material Properties
• Climatic Conditions
• Repair Time Frame
• Expected Service Life
• Cost
• LIKELIHOOD OF SUCCESS

REPAIR TIMEFRAME

3+ Days
Class D Concrete out of truck
Overnight up to 24 hours; Concrete Repair Material, Portland Cement Based

2 – 3 Hours
Rapid Hardening Concrete Repair Material
Pre-Asphalt Overlay or Very Old Pavement;
Hot Mix Asphalt
Installation of Conventional Materials

Identification of repair area – sounding
Pavement Preparation:
- Perimeter saw cutting – 2” – 4” depending on material selected
- Removal of concrete - uniform depth
- Sand Blasting – drying/cleaning
- Application of bonding agent / primer material preparation
- Field blending - Per manufacturers Instructions
- Extend with aggregate / water
- Mix multiple components
- Install per manufacturers Instructions
- Establish joints / cracks – seal after material sets / cures

LIKELIHOOD OF SUCCESS

Most common causes of partial depth patch failure include:
(FHWA Report No. FHWA-RD-99-152)

- Improper selection of repair materials.
- Lack of bond between patch and pavement. (Adhesive failure)
- Compression failure. (Loading of pavement by vehicle traffic)
- Variability of repair material. (QC/QA – Field blending)
- Improper use of repair materials.
**LIKERIHOOD OF SUCCESS**

Most common causes of partial depth patch failure include:

(FHWA Report No. FHWA-RD-99-152)

- Insufficient consolidation.
- Incompatible thermal expansion between the repair material and the original slab. *(differences in expansion/contraction coefficients)*
- Feathering of the repair material.
- Incompatibility between the joint bond breaker and the joint sealant material.

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**LIKERIHOOD OF SUCCESS**

Most common causes of partial depth patch failure include:

(FHWA Report No. FHWA-RD-99-152)
LIKELIHOOD OF SUCCESS

Most common causes of partial depth patch failure include:
(FHWA Report No. FHWA-RD-99-152)

Conventional Repair Materials;
Advantages / Disadvantages

Advantages

- Readily available
- Wide cost range- some inexpensive
- Current Workforce Familiar with use and installation
- No Specialized Equipment
Conventional Repair Materials; Advantages / Disadvantages

Disadvantages

- History of Poor Performance
- Rely on field personnel to properly handle, proportion, extend, mix
- Joints or cracks through repair area must be re-established (maintained and sealed or saw and sealed)
- Success of patch often affected by performance of seal
- Failures are difficult to maintain

INCREASE LIKELIHOOD OF SUCCESS

FLEXIBLE PCCP SPALL REPAIR MATERIAL

- Pre-blended Polymer Modified Resin extended with select aggregate
- Flexible
- Compressive Resistant
- High Tensile Strength
- Excellent Adhesion - PCCP and ACP
- Fast Set time
- Spans cracks and joints
- Resistant to Deicing Chemicals
- Waterproof
FLEXIBLE PCCP SPALL REPAIR MATERIAL

REPAIR CANDIDATES

- CORNER BREAKS
- POTHOLES
- DETERIORATED JOINTS
- LONGITUDINAL CRACKING
- CENTER SLAB CRACKING
- D CRACKING
- POP-OUTS
- DAMAGED JOINT HEADERS
- SPALLS

Repair area preparation similar to that for conventional materials.
FLEXIBLE PCCP SPALL REPAIR MATERIAL

Saw cut perimeter 2” min. depth
Remove concrete to sound pavement

FLEXIBLE PCCP SPALL REPAIR MATERIAL

Abrasive Clean
Dry
Clean with compressed air

Apply primer
Allow time to dry
FLEXIBLE PCCP SPALL REPAIR MATERIAL

Apply material to repair area

< 3” depth - 2 lifts

> 3” multiple 2” lifts

FLEXIBLE PCCP SPALL REPAIR MATERIAL
FLEXIBLE PCCP SPALL REPAIR MATERIAL

Material is brought to within 1” – ½” of pavement surface.

FLEXIBLE PCCP SPALL REPAIR MATERIAL

Final lift is ironed to grade.
FLEXIBLE PCCP SPALL REPAIR MATERIAL

If specified- cover aggregate is broadcast on surface while material is still hot

Bauxite cover adds skid resistance, UV protection, aesthetic value

When material cools excess aggregate is recovered and pavement is ready for traffic.

1 ½ - 3 hours depending upon depth and surface and air temperatures
Why does IT work?
They increase the **LIKELIHOOD OF SUCCESS**
Most common causes of partial depth patch failure include:
(FHWA Report No. FHWA-RD-99-152)

- Improper selection of repair materials.
- Lack of bond between patch and pavement. (Adhesive failure)
- Compression failure.
- Variability of repair material. (QC/QA – Field blending)
- Improper use of repair materials.

FLEXIBLE CONCRETE REPAIR increases the **LIKELIHOOD OF SUCCESS**
Most common causes of partial depth patch failure include:
(FHWA Report No. FHWA-RD-99-152)

- Insufficient consolidation.
- Incompatible thermal expansion between the repair material and the original slab. (Differences in expansion/contraction coefficients)
- Feathering of the repair material.
- Incompatibility between the joint bond breaker and the joint sealant material.
Flexible materials cannot be subjected to test methods of conventional materials. Their flexibility, low modulus, tensile strength and high adhesive characteristics require a shift in thinking.

Cementitious Materials

Why does IT work? They increase the **LIKELIHOOD OF SUCCESS**

Techcrete applied on Rt 17 in Corning, NY in 2001. This picture taken 2011.

Repairs span cracks.

Repair functioning 100% adhesively and cohesively.

Repair remains waterproof.
Techcrete installed in upper repair in 2001. Picture taken 2011. Lower patch originally repaired with Class D concrete. It has been removed and replaced with various materials at least 3 times since 2001. Currently maintained with HMA
Repair of PCC Pavements with
FLEXIBLE CONCRETE REPAIR

LIKELIHOOD OF SUCCESS
EXCELLENT

- Prepackaged
- Flexible
- Highly adhesive
- Waterproof- resistant to deicing chemicals
- Compressive resistant
- Produces no compressive or tensile stress on surrounding pavement
- Spans cracks and joints

Repair of PCC Pavements Through
Non-Conventional Flexible Materials

LIKELIHOOD OF SUCCESS:
EXCELLENT

FLEXIBLE CONCRETE REPAIR

QUESTIONS?
Safe Travels Today

Lisa M. Zentner
Technical Product Manager – Specialty Materials

Ed Myers
Territory Sales Manager