Surface Treatments –
Keys to Success

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To steal from one is plagiarism. To steal from many is research.
Surface Treatments

- Types/Terminology
- Purpose
- Treatment Selection
- Keys to Success
- Resources
Terminology

- Surface Treatment
- Seal Coat
- Bituminous Surface Treatment
- Ultra-Thin, Hot Mix Bonded Overlay
- Thin Functional/Maintenance Overlay
Types

- Seals
  - Fog
  - Rejuvenating
  - Slurry
  - Chip
    - Cape
    - SAM
    - Scrub

- Microsurfacing
- Ultra-Thin HMA (Bonded Wearing Course)
- Thin, Maintenance Overlay
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<th>Treatment Purpose</th>
<th>Fog</th>
<th>Rejuvenator</th>
<th>Slurry</th>
<th>Chip</th>
<th>Microsurfacing</th>
<th>Thin Overlay</th>
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Treatment Selection

- Pavement Age & Condition
- Climate
- Traffic – Current & Future
- Available Funding
- Agency Policy
Surface treatments should be applied to a distress-free to moderately distressed pavement surface.
Fog & Rejuvenating Seals

Light Application of an Emulsion
Fog & Rejuvenating Seals – Keys to Success

- **Materials**
  - Generally CSS-1h & SS-1h
  - Proprietary for Rejuvenator

- **Site Conditions**
  - No Rain!

- Pavement - 60°F
- Ambient - 50°F
Fog & Rejuvenating Seals – Keys to Success

A CLEAN Surface!
Fog & Rejuvenating Seals – Keys to Success

Correct & Uniform Application
Properly Functioning Equipment
Slurry Seals & Microsurfacing

Asphalt Emulsion, Well-Graded Fine Aggregate, Additives
Slurry Seals & Microsurfacing – Keys to Success

- **Materials**
  - Generally QS-1h, CQS-1h
  - PMCQS (Microsurfacing)
  - Clean, Angular & Durable Aggregate
  - Mix Design

- **Surface Prep**
  - Remove Rubber Crack Sealant & Thermo-place Markings
  - Sweep or Pressure Wash
Slurry Seals & Microsurfacing – Keys to Success

- Site Conditions
  - Ambient Temp - 50°F
  - Humidity ≤60%
  - No Rain or Freezing Temps!
  - No NIGHT work…unless Microsurfacing
Slurry Seals & Microsurfacing – Keys to Success

1. Aggregate Bin
2. Filler Bin
3. Aggregate Flow Gate
4. Aggregate Conveyor Belt
5. Emulsion Injector
6. Water Injector
7. Pugmill
8. Slurry
9. Spreader Box

Properly Calibrated Equipment
Slurry Seals & Microsurfacing – Keys to Success

- Pneumatic roller to limit stone loss
- Sweeping to avoid windshield damage
Chip Seals
Chip Seal Variations

- Single
- Double
- Triple (armor coat)
Chip Seal Variations

- Slurry Seal
- Existing Pavement
- Binder

Binder Application

- Slurry Seal
- Tack Coat
- Paving Fabric
- Existing Pavement
Cape Seal

Chip Seal Followed by Application of Slurry Seal
Chip Seals – Keys to Success

- **Binders**
  - Asphalt Cement
  - Emulsion (RS-1, RS-2, CRS-2h)
  - Modified (Polymer, Rubber)

- **Aggregates**
  - One Size
  - Clean, Cubical and Durable
  - Limit Flat & Elongated Particles (~25%)
  - Limit Fines (~1%)
Gradation – 1 Size (semi-log scale)

Percent Passing

Sieve Size Opening (inch)

0 5 100
95

1/4 1/2
Chip Seals – Keys to Success

Ambient Temp ≥ 55°F
Humidity ≤ 50%

Triple Overlap
Chip Seals – Keys to Success

Broom Excess Aggregate
Ultra-Thin Hot Mix Overlay – Bonded Wearing Course (BWC)

- HMA Asphalt Overlay of Polymer Modified Emulsion Membrane
- Placed in a Single Pass
- Open to traffic in 15 to 30 minutes
Existing Pavement

- Emulsion membrane “wicks up” around the HMA aggregate.
- The emulsion cures, bonding the mix to the existing pavement.

3/4- to 1-inch Typical Mix Thickness

Existing Pavement
BWC – Keys to Success

- Gap-graded – Mountainous, Daily Freeze-Thaw Cycles
- Open-graded – Frequent or Heavy Rainfall
BWC – Keys to Success

- Max Size of Aggregate (Thickness $\geq 2-3X$ max aggregate size)
- Sand Patch Test – Application Rate of Emulsion
BWC – Keys to Success

- Seal/Fill Cracks > $\frac{1}{4}$ - inch
- Fill Surface Irregularities Deeper than 1-inch with Dense-graded HMA

1 Month before Paving
BWC – Keys to Success

Sweep with Rotary Broom
BWC – Keys to Success

- Equipment Calibration
  - Spray Paver
  - Spray Bar
BWC – Keys to Success

- Damp, but Not Wet Surface
- Minimum Surface Temp – 60°F
- Minimum Ambient Temp
  - 45°F to 50°F (binder dependent)
  - 55°F for Open-graded and Rubberized Mixes
- No freezing Temps within 24 Hours
Resources

http://pavementinteractive.org

http://fhwapap34.fhwa.dot.gov/NHI-PPTCG/index1.htm

http://www.nhi.fhwa.dot.gov/training
FHWA-NHI-131110 Pavement Preservation Treatment Construction
Resources

MAINTENANCE TECHNICAL ADVISORY GUIDE
Volume I – Flexible Pavement Preservation
Second Edition

http://www.bnibooks.com
Review
Surface Treatments – Keys to Success

- Condition of Existing Surface – Type and Severity of Distress
- Material Selection & Mix Design
- Surface Prep – Crack Sealing/Filling, Localized Patching, Clean
- Placement Conditions – Temp, Precip & Humidity
- Equipment – Properly Functioning & Properly Calibrated