

Surface Treatments – Keys to Success



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Road Science™
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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**

Treatment Purpose

	Fog	Rejuvenator Slurry	Chip	Microsurfacing	Thin Overlay	BWC
seal or waterproof						
raveling & weathering						
appearance						
aging and oxidation						
skid resistance						
bleeding						
temp base course cover						
minor surface irregularities						
ride quality						
lane/shoulder demarcation						
noise reduction						
speed of construction						
night work						
splash & spray						

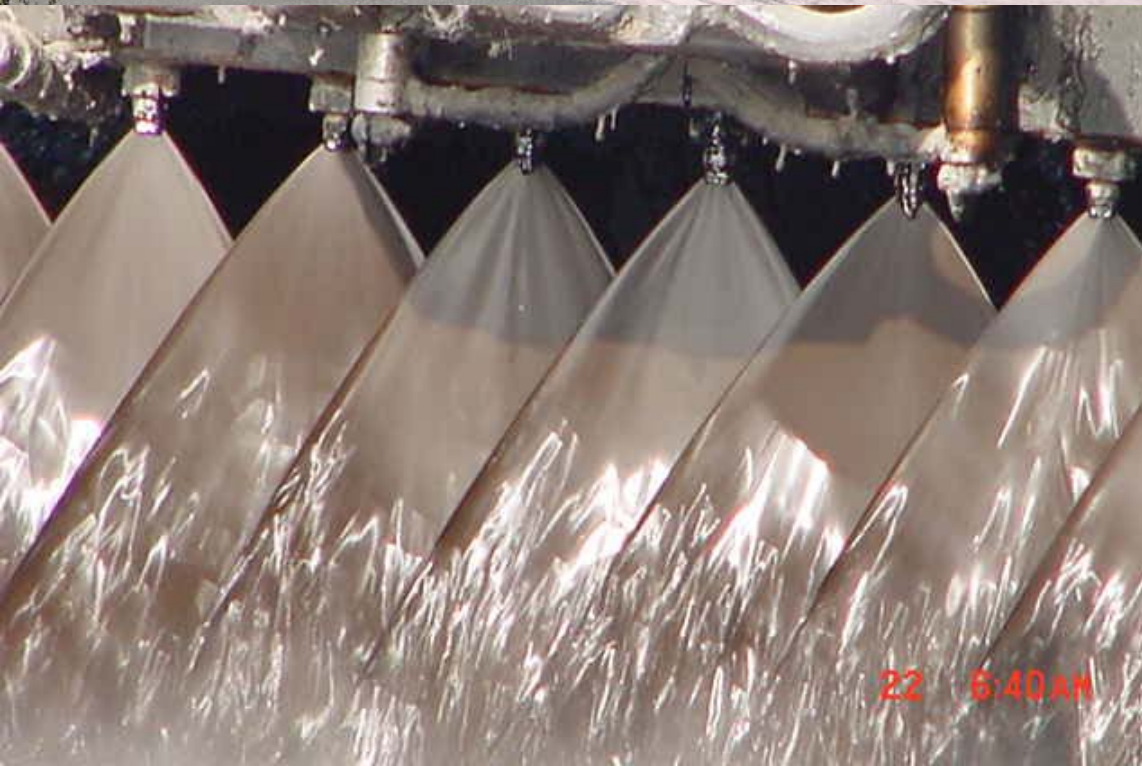
Treatment Selection

- **Pavement Age & Condition**
- **Climate**
- **Traffic – Current & Future**
- **Available Funding**
- **Agency Policy**





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**



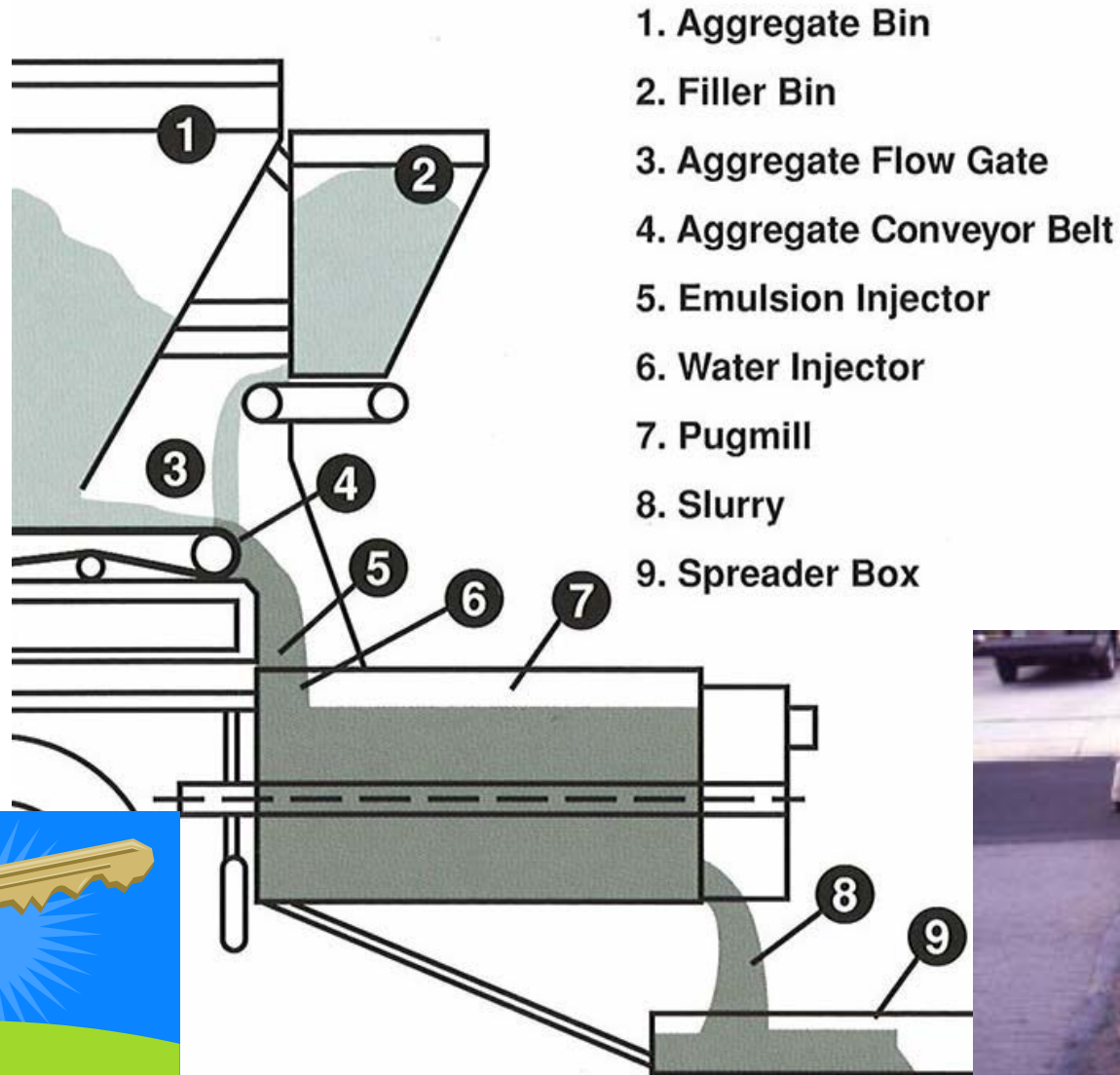
Slurry Seals & Microsurfacing – Keys to Success

- **Site Conditions**

- ❑ **Ambient Temp - 50°F**
- ❑ **Humidity $\leq 60\%$**
- ❑ **No Rain or Freezing Temps!**
- ❑ **No NIGHT work...unless Microsurfacing**



Slurry Seals & Microsurfacing – Keys to Success



**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



Existing Pavement

Binder

Second
Binder
Application

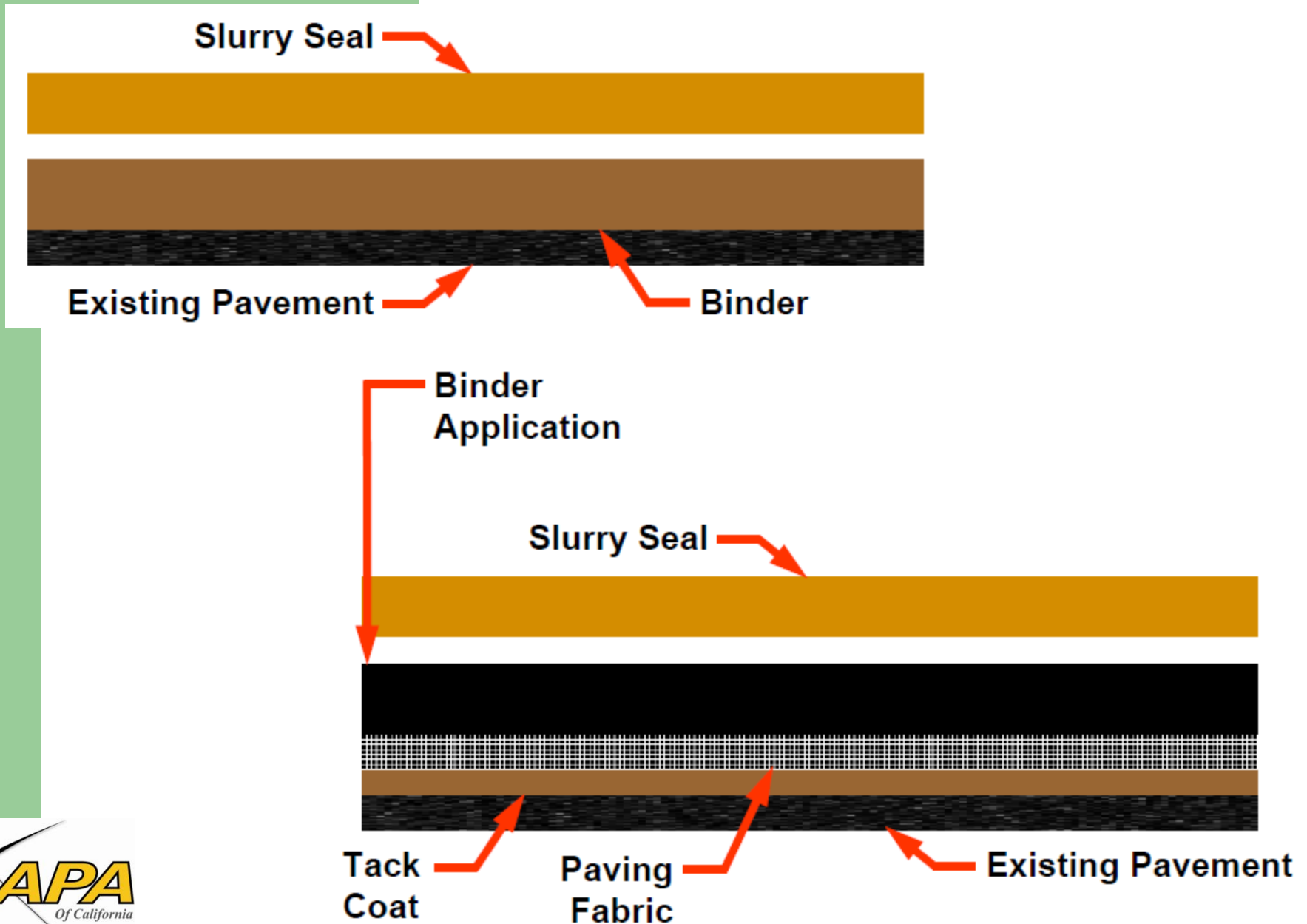
- Single
- Double
- Triple (armor coat)



Existing Pavement

Binder

Chip Seal Variations





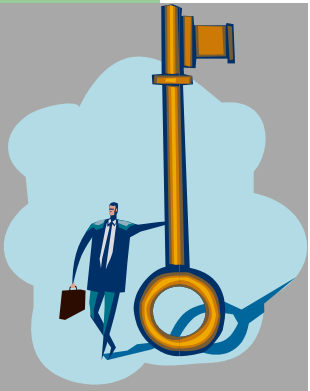
Cape Seal



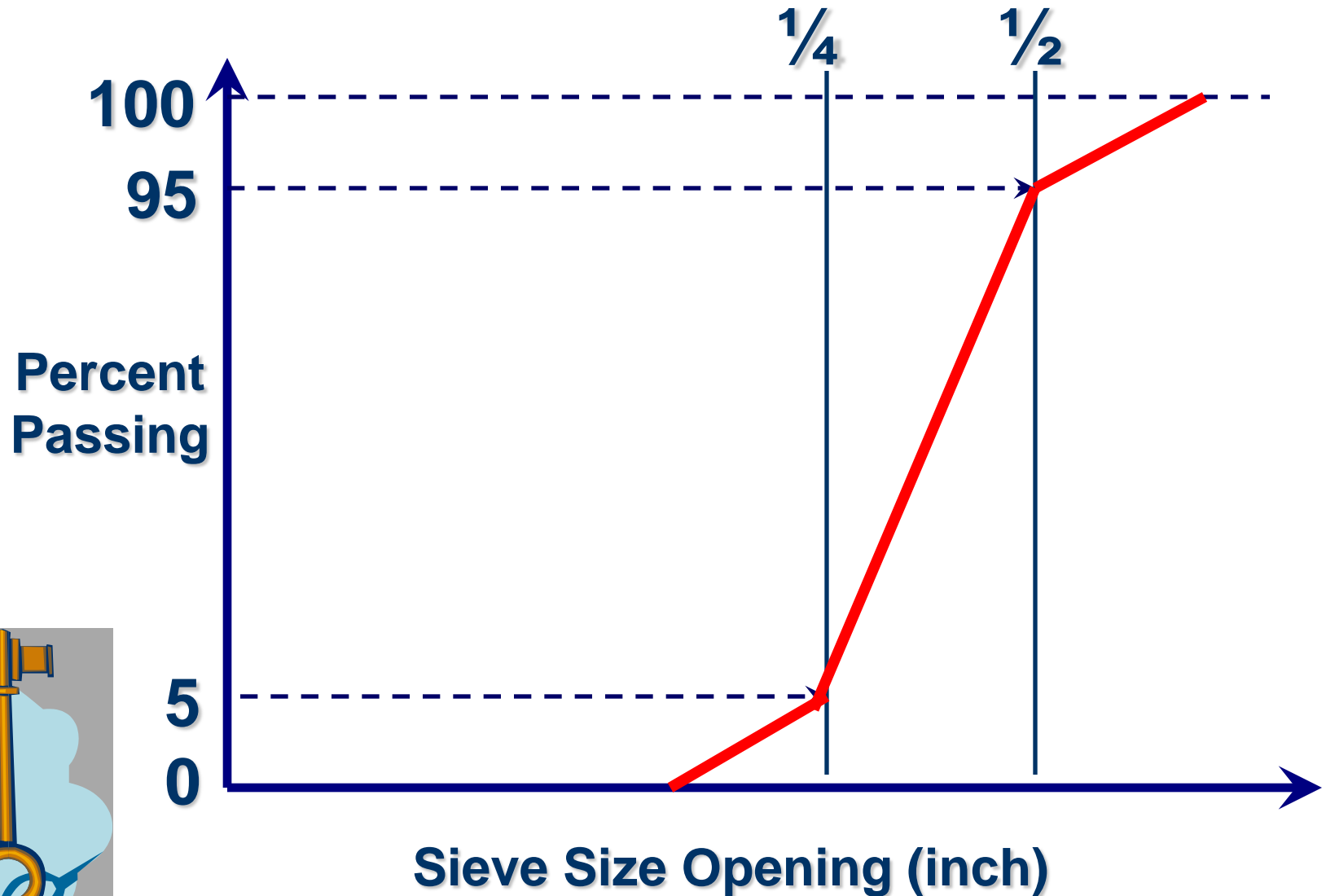
**Chip Seal Followed by
Application of Slurry Seal**

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)



Chip Seals – Keys to Success



Ambient Temp $\geq 55^{\circ}\text{F}$
Humidity $\leq 50\%$

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

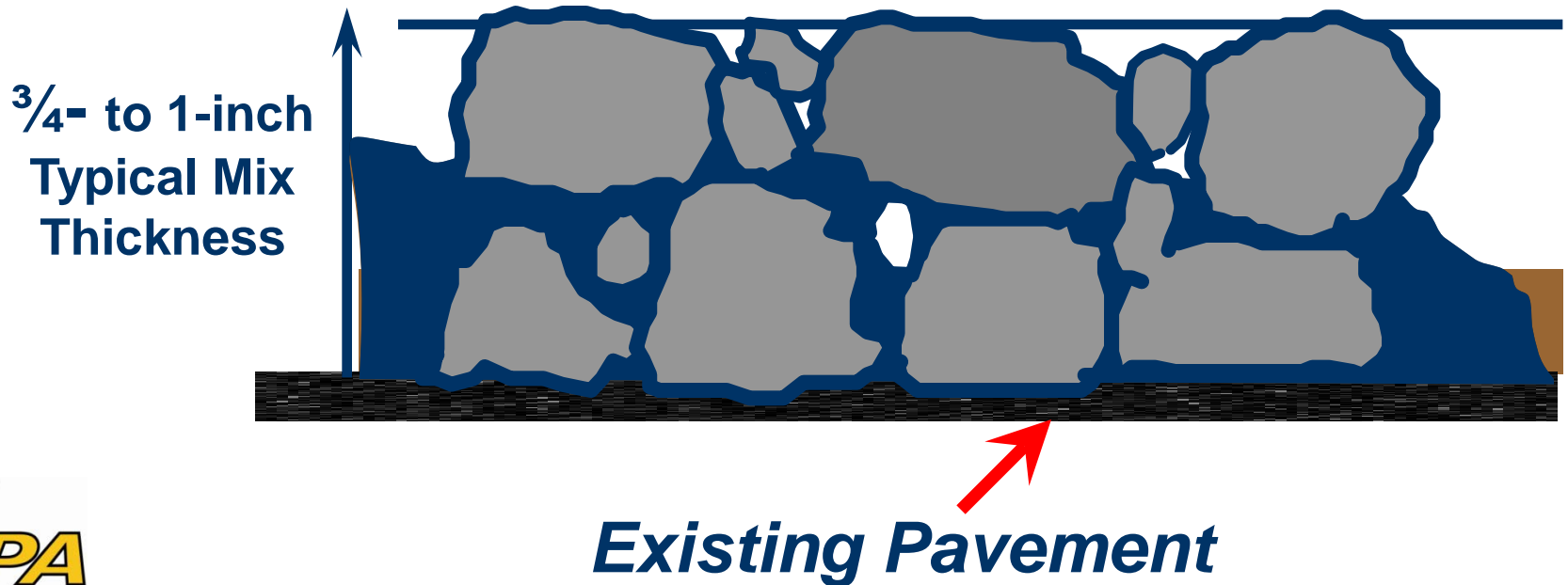
HMA



Emulsion Membrane

Bonded Wearing Course

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



BWC – Keys to Success

- **Gap-graded – Mountainous, Daily Freeze-Thaw Cycles**
- **Open-graded – Frequent or Heavy Rainfall**



US 50 Lake Tahoe



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

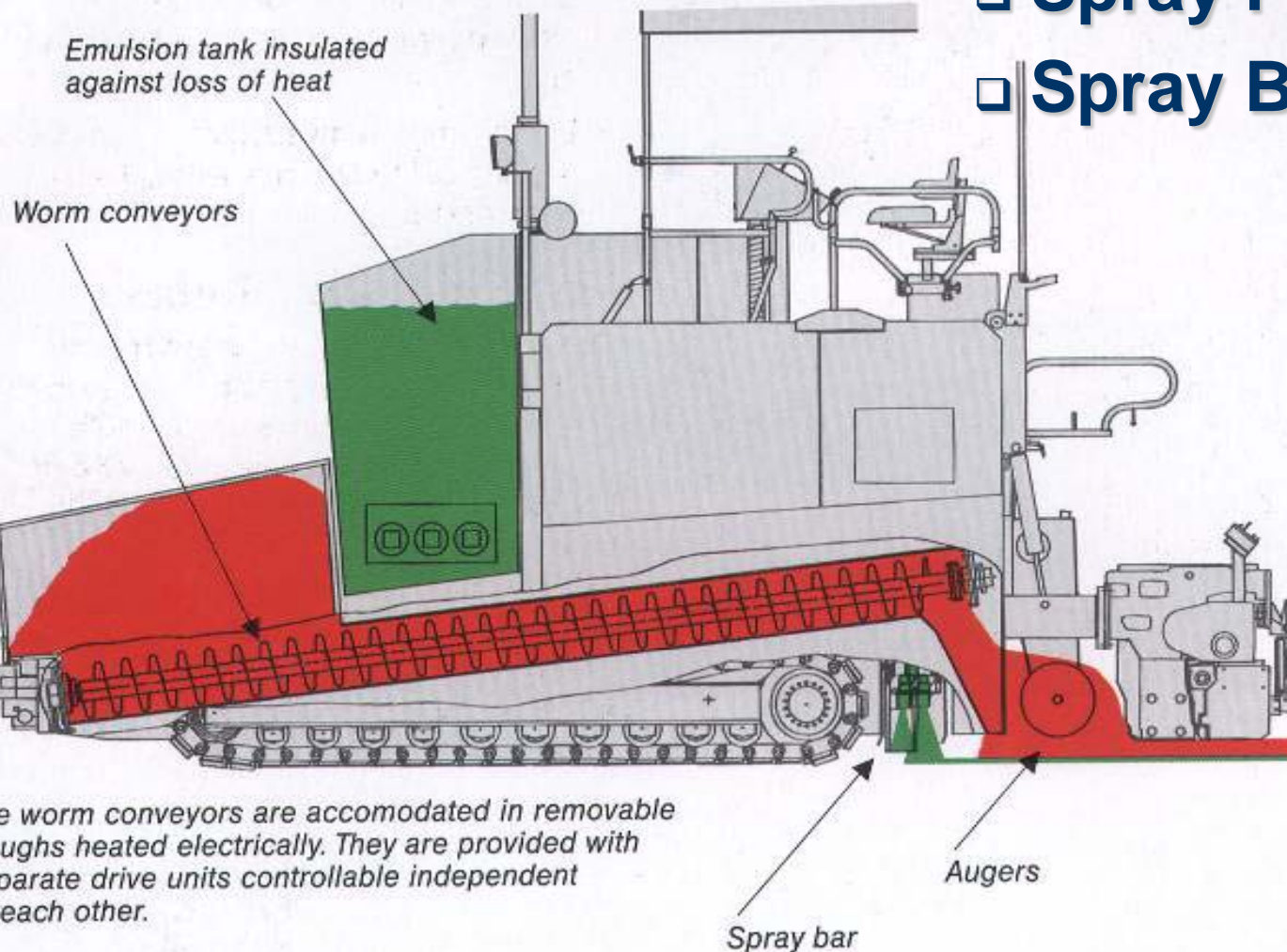


Sweep with Rotary Broom



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

Pavement Preservation
Checklist Series

2

**Chip
Seal
Application**

3

**Thin
Hot-Mix
Asphalt
Overlay**

4

**Fog
Seal
Application**

Pavement Preservation
Checklist Series

<http://www.fhwa.dot.gov/pavement/preservation/ppcl00.cfm>

Pavement Preservation
Checklist Series

5

**Microsurfacing
Application**

Pavement Preservation
Checklist Series

13

**Slurry Seal
Application
Checklist**



**Foundation for
Pavement
Preservation**



Resources

NCHRP **SYNTHESIS 342**

**NATIONAL
COOPERATIVE
HIGHWAY
RESEARCH
PROGRAM**

Chip Seal Best Practices

http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_342.pdf

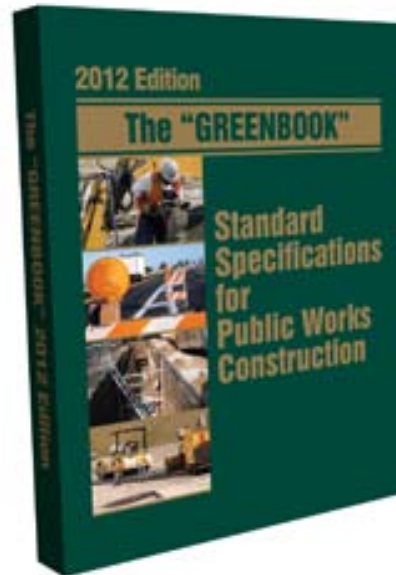


Resources



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

http://www.dot.ca.gov/hq/maint/MTA_GuideVolume1Flexible.html



<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**



Questions?

