Everything you need to know about Chip Seals and Fog Seals

Strategy To Minimize Costs

Preventive maintenance treatments

Rehabilitate
Pavement Preservation

- The “right” treatment
- At the “right” time
- On the “right” road

What Is the “Right” Treatment?
Treatments options

Chip seal
Fog seal
Micro seal
Slurry seal
Cape seal
Overlay

Problem

Public perception
- “Fixing good roads”
- And not “fixing bad roads”
Are We Stepping Into the Same Old Trap?

This is what we’ve always done so why change now?

Chip Seals

- A Solution for Every Road
A Good Chip Seal Can...

- Protect the underlying pavement
- Waterproof the roads surface
- Seal small cracks
- Improve safety
  - By improving skid resistance
- Extend service life
What To Expect

- Seals Small Hairline Cracks
- Reduces Oxidation of Existing Surface
- Low Cost Pavement Preservation

What Not To Expect

- Seal Large Cracks
- Change Ride Characteristics
- Long Term Repair of Major Structural Problem
- Add structural strength to existing road or base
- Glue raveled road back together
Seal Coat Quality Depends On

- Surface preparation
- Equipment
- Application techniques
- Traffic control

The Existing Pavement Must

- Structurally sound
- Repaired, patched, allowed to cure
- Clean, no loose fragments
- Relatively dry
- Proper drainage
Severely fatigued pavement needs rehabilitation, not a chip seal
Design? Is it Important?

- Understand Existing Traffic Count
  Current Traffic Count

- Future Traffic Load

- Material Locally Available
  Materials currently in place
New Construction

- Proper base – structurally sound
- Clean – no loose fragments
- Proper profile with good drainage
- Relatively dry
- Primed →

Base Compaction
Importance of Drainage

- Remember that chipseal is a “seal” designed to seal the existing surface from water and to add a wear surface and skid resistance.
- Water damage is the #1 cause of failures of chipseals
- Keep the water out!!!!
Base Work and Drainage

- Importance of Drainage
  Water standing near shoulder
  Culverts open
  Road lower than surrounding area

- Crown in Road
Drainage Problem?
Prime Coat

- Coat and bond loose particles on the base
- Holds needed moisture in base
- Helps waterproof the base
- Provide adhesion between the base and the chip seal

Prime Coat

- AEP – Asphalt Emulsified Prime
- MC–30, MC–70
- Rate = .10–.30 gallons per square yard depending upon surface conditions
- Cure time 24–48 hours or longer
- Reduce traffic as much as possible
New construction order of events

- Shape base
- Compact base
- Prime coat
- Prime cure
- Single chip
- Double chip
- Fog seal

Chipseal over existing surfaces

- Shape shoulders and ditches
- Repair failures
- Crack fill
- Single chip
- Double chip
- Fog seal
Failures?

A chip seal won't fix drainage problems.
Repair Failures

- Hot Mix Cold Lay: Should Cure – 60 days
- Hot Mix Hot Lay: Should Cure 2 week
- Remove All Loose Material – Sweep
- Sterilize And Remove Vegetation

Seal Coat Components

Binder: hot asphalt, cutback, emulsion
  - Adhesive
  - Sealing
  - Waterproof Membrane

Aggregate:
  - Durable Wearing Surface
  - Surface Texture
Binder

- Emulsions
- Cutback
- Asphalt cement
- Polymer modified emulsion

Use Best Possible Binders

- Develop strength quickly
- Strong bonding to both aggregate & existing surface
- Adequate wetting & embedment of aggregate
- Avoid bleeding & shelling
- Low temperature susceptibility
- Durability of polymers
Binder

- Proper Temperature of oil
- Proper Amount Per Sq. Yard

- Don’t cheat on the binder to save money…it will cost you later
ASPHALT CEMENT
AC
325° – 400°
Multiple Grades

CUT BACKS
AC
FUEL
• DIESEL
• BENZENE
• NAPTHA
70° – 210°
SC, MC, RC
Proper Clothing — MSDA Sheets

Let's Be SAFE
Asphalt Emulsions
**Tack coat emulsions**

- Slow set emulsion = typically ~2/3 asphalt + 1/3 water
- Residual asphalt is critical: It is the amount of actual tack coat that remains on the pavement after water or solvents have evaporated

**Types of Chipseal Emulsions**

- Anionic (negative charged)
- Cationic (positive charged)
- Rapid set
- Slow set
- Polymer modified
Rapid Setting
(Cationic Rapid Setting)

- CRS–2, CRS–2S, CRS–2P
- Used for seal coats, (Chip Seals, Armor Coats)
- The emulsion should start breaking as it is applied to the road
- Mechanism of break: mostly chemical, partially evaporation

Rapid Setting, cont.

- The emulsion is formulated with a minimum of emulsifier, so that it will break quickly after being sprayed.
- If the emulsion doesn’t break quickly enough, the chips won’t stick.
Slow Setting and Cationic Slow Setting

- SS–1, CSS–1
- A variety of uses: soil stabilization, fog seals, tack coats
- Mechanism of breaking is purely water evaporation
Chip Seal Design

- Binder Shot Rates
- Aggregate Rates

Design Depends Upon...

- Aggregate size
- Aggregate porosity
- Aggregate voids
- Old surface condition
  - Dry? flushed?
- Traffic
- Weather!
Application Rates

- Rates **always** depend on surface conditions
- 3/8 chips = .30 – .40 shot rate
- 5/8 chips = .35 – .45 shot rate
- 3/4 chips = .45 – .50 shot rate
- 1” chips = .50 – .55 shot rate
- Chip embedment
  - 1/2 of chip should be embedded in emulsion after rolling

Shot Rate Adjustments

<table>
<thead>
<tr>
<th>Pavement Condition</th>
<th>Factor</th>
<th>Adjustment</th>
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<tbody>
<tr>
<td>Flushed asphalt surface</td>
<td>0.70</td>
<td>-0.03 gal/ycf</td>
</tr>
<tr>
<td>Smooth, non-porous surface</td>
<td>0.90</td>
<td>0.00 gal/ycf</td>
</tr>
<tr>
<td>Slightly porous, oxidized surface</td>
<td>0.94</td>
<td>+0.02 gal/ycf</td>
</tr>
<tr>
<td>Slightly pocked, porous surface</td>
<td>0.90</td>
<td>+0.04 gal/ycf</td>
</tr>
<tr>
<td>Badly pocked, porous, oxidized surface</td>
<td>0.90</td>
<td>+0.06 gal/ycf</td>
</tr>
</tbody>
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Seal Coat Aggregates

- One-sized
- Cubical
- Clean
- Angular
- Durable
- Non-polishing

Aggregate

- Clean, Washed, One Sized...Proper Amount
Aggregate

- Wearing Surface
- Skid Resistance
- Enhance Surface Appearance

Aggregate for Seal Coat

- One-sized
- Cubical
- Clean
- Angular
- Non-polishing
Design

- Chip Embedment at Least \( \frac{1}{2} \) of Chip in the Oil, After Rolling
Real World Seal
Stock Piles

- Stager Stock Piles
- Keep Contamination out of Stock Pile Area
- Allow 10% Waste
- Keep Chip Pile Damp
- Load from center of pile

Aggregate Should Not Be Too Dusty or Too Wet

- Used Your Water Truck
- Keep chips damp
- No water running water out of dump trucks
- No dust clouds
Aggregate Application & Rates

- Spread immediately behind distributor
- Uniform distribution
- Aggregate rates
  - 18 to 28 lbs. per square yard
Excess Aggregate

- Safety hazard
- Waste of money
- Detrimental to new surface
Weather

- Temperature, Ambient and Surface Night Time for Curing....

- Rain, Not Expected for 4 Hours Minimum

- Ample Time for Curing
Variables effecting Performance

- Weather
- Aggregate
- Binder
- Design

Equipment – Distributor
Basic Functions

1. Fill the tank.
2. Heat material in tank.
3. Circulate material in tank.
4. Circulate material in spray bar.
5. Spray a metered amount of material.
6. Handspray.
7. Suck-back material from spray bar.
8. Wash out.
Metering System

Four important features need to be considered:

1) Desired Application Rate - Gallon/Yard
2) Forward Ground Speed - Feet Per Minute
3) Asphalt Pump Output - Gallons Per Minute
4) Width of Spray - Feet
WHAT ARE WAYS TO CHECK YOUR DISTRIBUTOR CALIBRATION?
Before checking your volume by sticking the tank, make sure the distributor is level.
Calibrating your equipment components to consider

- Strainers
- Radars
- Pump sensors
- Spray bar height
- Nozzle angle
- Nozzle size

Chip Spreaders
Chip Spreader

Tire Pressure
Radial Tire
Will Bounce
If Pressure Too High
(Rub Board)
Gate Opening
Calibrating Rate
Center Seam
Roll Immediately

- Roll Immediately After Aggregate is Applied

Rolling

- Immediately after chipping
  - Orients chips on their flat side
- Pneumatic tires – 60 psi
- 12 ton minimum
- Stop after set
- Moderate speed
The first rollers -- the trucks!

**Dump Trucks**

- Stagger Wheel Paths When Backing
- Exercise Caution When Turning
- Speed Under 25 MPH
Broom

- Light brooming removes excess chips
- Time before brooming varies
- Excess chips can dislodge other chips
  - Can also damage windshields

Sweeping of Pavement
Brooming or Sweeping

- Joint Brooming
  - Joint may need Broomed before Next Pass & Lifts
  - Next Morning Remove Loose Chips Early Morning When Binder is Tougher
Traffic Control

- Control Traffic to Ensure Safety of Workers
- Keep Speed Below 30 MPH
- Signage: Loose Rock, Fresh Oil, and Men Working

Fog Seal

- What is “fog seal”?
- Light application of emulsion over existing surface
FOG SEAL

- Typically Emulsion SS1 OR CSS1
- Diluted 50/50 with water
- .08 gal/yd² to .12 gal/yd²
- Application depends on surface

FOG SEAL

- Curing time depends on weather +/ 2 hrs
- Applied with asphalt distributor truck
- Inexpensive way to extend the life of pavement or chipseal
FOG SEAL

- Studies have shown that a Fog Seal over a Chip Seal provides many benefits. When properly applied, a Fog Seal is proven to offer all of the following advantages
  - Provides lasting protection
  - Reduced claims from loose chips
  - Increased embedment of cover material
  - Accelerated curing of completed project
  - Decreased snowplow damage
  - Increases visibility of stripes
FOG SEAL

- Locks down marginally embedded chips
- Reduced raveling
- Prolongs the service life
- Quicker snow and ice melt
- Improved pavement marking visibility
- Appearance preferred by traveling public

Fog Seal

- Fog Seal is Chip Seal best friend!
FOG SEAL

- *Rejuvenating* Fog Seal Emulsion
- Gives oxidized asphalt surface new life
- Application depends on surface
- Used on existing road surface hot mix or chipseal

FOG SEAL

- Applied with asphalt distributor
- Use proper nozzle size for rate/speed
- Make sure even coverage no drilling
- Applied in one direction or depending on surface texture apply $\frac{1}{2}$ desired rate in both directions for complete coverage
PROBLEMS AND SOLUTIONS

What Happened Here?

Loss of Cover Aggregate

- Dirty aggregate
- Insufficient asphalt
- Chips spread too late
- Unequal spray bar distribution
Proper Application

- Educated, trained & motivated crew
- Properly calibrated & maintained equipment
- Traffic control

Workmanship

- Equipment calibrated? Correct rate?
- Spray bar set right?
- Chips spread at the right amount & time?
- Rolling, rolling, rolling
- The whole crew on the same page
Success Is Insured With Teamwork!

- Teamwork Is the Difference Between Success and Failure

*NOT MY JOB!*
Questions?

Thanks for your Participation

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Remember to mark these upcoming events on your calendar!

March 7-11, 2017
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