

QUICK REFERENCE GUIDE

CHIP/SCRUB SEAL & FOG SEAL



**KENTUCKY TRANSPORTATION CABINET
Division of Maintenance
Operations and Pavement Management Branch
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TRANSPORTATION
CABINET

MAINTENANCE REFERENCE GUIDE TO CHIP/SCRUB SEAL & FOG SEAL

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INTRODUCTION

Chip/Scrub Seal

Chip Seal is one of the many treatments in the Preventive Maintenance Tool Box. Quality chip seals help extend the life of our pavements. A chip/scrub seal is an application of emulsified asphalt, followed by a single layer of aggregate chips. Chip/Scrub Seal have several purposes 1) seal small cracks, 2) slow further oxidation, 3) improves skid resistance, 4) extend pavement life, and 5) provide new wearing surface.



TERMINOLOGY

Chip Seal – Emulsified asphalt followed by a single layer of crushed aggregate. Common emulsions used are RS-2, CRS-2, CRS-2P, CMS-1P and CMS-1PC.

Scrub Seal – A chip seal using a CMS-1P or a CMS-1PC. When using a broom behind the distributor.

Double Chip Seal – First layer of emulsion should be a CMS-1P unless there is crack seal on existing roadway, then use CRS-2P. Second layer of emulsion should be a CRS-2P. The second layer of chip seal shall not be applied until three days after placement of the first layer.

Cape Seal – A chip seal or scrub seal followed by a single course microsurface or a thin lay asphalt.

Fog Seal – A single application, typically light, of emulsion to an existing asphalt surface or to a newly constructed chip seal.

EMULSIONS

RS-2 – An anionic rapid setting emulsified asphalt.
Common applications for KYTC chip sealing shoulders and/or asphalt seal coats.

CRS-2P – A cationic rapid setting emulsified asphalt.
Common application for chip sealing roadways that HAVE existing crack seal applied to the pavement surface.

CMS-1P – A cationic medium setting emulsified asphalt.
Common applications for chip sealing roadways that DO NOT have existing crack seal applied to the pavement surface.



PRECONSTRUCTION

- Approved mix design/compatibility test
- Public Relations Information on project
- Proper Signs (Loose Gravel & Reduce Speed if needed)
- Equipment Calibration
 - Distributor
 - Chip Spreader
- Staging Lot/Stockpile
- Proper Emulsion
 - If Crack Seal exists on pavement use CRS-2P
- Sample Materials
 - Aggregate Informational Test (Pretest for gradation and -200 wash test)
 - Emulsion ensure that Lot Number is on Bill of Lading (Green Sheet)
- Traffic Control
 - Pilot Truck
 - Sweeping operation



CALIBRATION & WALK AROUND

I. DISTRIBUTOR

- Proper nozzle size
<https://etnyre.com/wp-content/uploads/2021/09/a-149-19.pdf>
- 30 degree angle
- 12" height of bar from pavement
- Temperature of material (usually 150)
- Application rate usually **.33 to .34** gallons per square yard
- Look for leaks of any fluids
- Verify calibration of application rate
- Emulsion weight per gallon provided on Bill of Lading (Green Sheet)
- <https://transportation.ky.gov/Construction/Pages/Preventive-Maintenance-Resources.aspx>

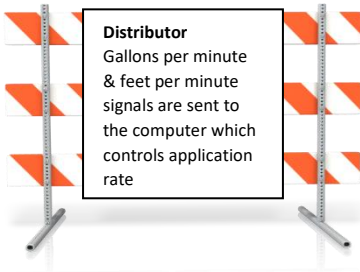


II. CHIP SPREADER

- Check for screen in hopper of chip spreader
- Chipper must be variable width by hydraulic controls
- Computer rate control
- Locking device for dump truck
- Inspect all machinery for leaks
- Calibrate chip spreader
 - i. Tarps placed right and left side of chip spreader
- Application rate is typically 16 to 18 lbs. (ideally have chipper at 17 lbs.)

III. ROLLERS

- 2 Pneumatic tire rollers are required
- 1 Double steel drum roller (5 to 8 tons)
- Inspect for any fluid leaks (hydraulic will keep material from setting up).



SURFACE PREPARATION

- Remove all thermoplastic and raised pavement markers
- Clean and fill holes where raised pavement markers were
- Clean any vegetation, loose material and dirt from existing roadway
- Clean edges of pavement removing any over growth and brush
- If crack seal exists, utilize CRS-2P emulsion
- Ensure that pavement surface is dry



TRAFFIC CONTROL

- Proper signs (Loose Gravel)
- Reduce speed signs (Are you reducing speed?)
- Pilot Car (Is this a project that would benefit?)
- Flagger (Understanding when to move up)
- Brooms (Broom core is not worn)
- Approach Roads & concrete driveways (Have you swept?)



WEATHER

- Air temperature 50 degrees and rising
- Surface temperature 70 degrees
- Ambient temperature not forecast below 35 degrees within 24 hours
- Stop operation with if rain is forecast within next 4 hours
- In case of pop up shower stop distributor immediately and cover emulsion with aggregate



MATERIALS

- **Emulsion**
 - 2 one gallon containers per project unless lot number changes or you have material issues (Is the material running across the road?)
 - Weight per gallon and lot number provided on Bill of Lading (Green sheet)
 - Emulsion should be heated between 120 and 180 degrees.

- **Aggregate**
 - Sample every 50,000 square yards(about 450 tons)
 - Aggregate should be damp but NOT wet (water should not be running out of tailgate of truck)
 - Is aggregate too dirty?

IF ANY MATERIAL IS QUESTIONAL ALWAYS SAMPLE!

STOCKPILE

- Limit aggregate movement from the source to application.
- Ensure no foreign material in stockpile by the loader (Mud on tires, buildup in bucket, bucket digging into dirt or other debris). Bucket should stay 3" from bottom of stockpile.
- Be sure source material is properly separated from other material stockpiles
- Check stockpile for oversized aggregate
- Inspect truck beds for contamination



CONSTRUCT CHIP SEAL

- Sweep roadway before starting production each day
- Use tar paper or plastic to protect manhole lids, water valves, bridge ends, and to create crisp ending joints
- Stagger rock trucks, not traveling in same wheel path. This will minimize bleeding and pickup
- Keep distributor within 150' of chip spreader
- Keep communication between chip spreader and distributor operator. It is important when chipper runs out of rock that distributor operator knows so operator will not continue applying emulsion
- When constructing in more than one pass, sweep longitudinal edge or do NOT place aggregate to the edge of emulsion
- Roll aggregate within 5 minutes to ensure proper embedment (emulsion should cover 2/3 height of aggregate after rolling)
 - 2 complete passes with rubber tire rollers
 - 1 pass with steel drum roller
- Roller speed is not greater than 5 mph
- Chip Seal should have a salt and pepper look (40% emulsion and 60% aggregate)
- Sweep when aggregate goes from gray to white
- Sweeping is required at the end of each day
 - This includes side roads and approaches
 - Curb & gutter may need a pickup broom or vacuum truck

- Ensure broom head is NOT worn
- May have to sweep more than once
- If you are doing a cape seal always sweep again prior to microsurface or thin lay

DO NOT STRIPE A ROADWAY THAT HAS NOT BEEN SWEPT.

WHEN CONSTRUCTING A **CAPE SEAL & ASPHALT LEVELING IS REQUIRED, APPLY CHIP SEAL FIRST AND PLACE ASPHALT LEVELING ON TOP OF CHIP SEAL. NEW ASPHALT WILL ABSORB EMULSION AND PAVEMENT WILL NOT RETAIN AGGREGATE!**



TROUBLESHOOTING

- **INCONSISTENT AGGREGATE COVERAGE**
 - Chip Spreader calibration is off (left to right side of chip spreader)
 - Oversized aggregate lodged in gate
 - Gates not opening and closing properly
 - Dusty/dirty aggregate
 - New Asphalt patches (will absorb emulsion and not enough emulsion to retain aggregate)
- **EMULSION RUNNING OFF ROADWAY**
 - Application rate too high
 - Calibration off
 - Temperature of emulsion too high (range between 140 to 180 degrees) (usually around 150 degrees is good)
 - Viscosity too low
- **CRUSHED AGGREGATE**
 - Ensure proper weight of double steel drum roller (5 to 8 tons)
 - Excessive rolling with double steel drum roller
- **RETENTION OF AGGREGATE**
 - Distributor calibration off
 - Application rate of emulsion too low
 - Viscosity too low and emulsion running away
 - Delayed roller time (add additional rubber tire rollers or slow production down)

- Traffic on chip seal before properly cured. (flagger moving up to soon)
- Sweeping operation before chip seal is properly cured (aggregate goes from gray to white)
- Dusty/Dirty aggregate

BLEEDING OR FLUSHING CHIP SEALS

- 1** - Use aggregate passing #4 sieve in conjunction with lime water.
 - Do work in the heat of the day.
 - Use a steel drum roller to push aggregate into emulsion.
- 2** – Use crushed stone screenings or bottom ash (must be completely dry)
 - Don't use too much crushed stone or bottom ash, you want to see voids.
 - Pavement temperatures between 140 – 165 degrees
- 3** – Spray lime water on roadway. May need to be applied multiply times. Color of asphalt will change when working.
 - Allow lime to dry before traffic is allowed. (can damage vehicle paint)
 - Lime should be a minimum of type A.

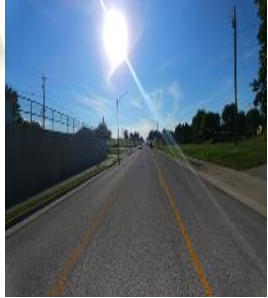
- Use 250lbs lime per 1000 gallons in tank capable of circulating with a spray bar.
- Spray lime on roadway during the heat of the day

Hydraulic Leaks from Equipment

- Remove equipment from roadway immediately.
- Broadcast cement, lime sand or bag lime over the hydraulic oil and brush in.
- May need to repeat several times.
 - Chip seal will not setup with hydraulic oil in it.
 - If this is a cape seal it can damage or create bonding issues for thin lay asphalt or microsurfacing.
- If it is a large area you may need to remove the chip seal.



Emulsion shouldn't be running off roadway or into adjacent lane. If you see this you need to stop production. Check temperature of emulsion and/or sample for viscosity.



FOG SEAL

- **Fog Seal for a chip seal**
 - Diluted between 28-32%
 - Apply 5 to 10 days after chip seal is completed
 - Application rate is .05 to .08 gallons per square yard
 - Chip seal should be thoroughly swept
 - Use tar paper or plastic to cover manholes, water valves and to create crisp end joints
 - Use proper nozzle size in distributors
<https://etnyre.com/wp-content/uploads/2021/09/a-149-19.pdf>
 - No sample needed material is diluted

- **Fog Seal for Shoulders**
 - Undiluted
 - Application rate is .10 gallons per square yard
 - Shoulder should be thoroughly swept
 - Use tar paper or plastic to cover manholes, water valves and to create crisp end joints
 - Sample because this is undiluted material



Fog seal on a chip seal. Improves appearance, locks in any remaining loose aggregate and improves visibility of striping.



Fog seal on shoulder looks great for a minimum cost and slows down oxidation.