



# Preventive Maintenance for Flexible and Rigid Pavements

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# Overview

- Typical preventive maintenance treatments
  - Crack Sealing (Strauss)
  - Chip Seal (Carlie)
  - Patching (Strauss)



# Crack Sealing



# Benefits of Crack Sealing

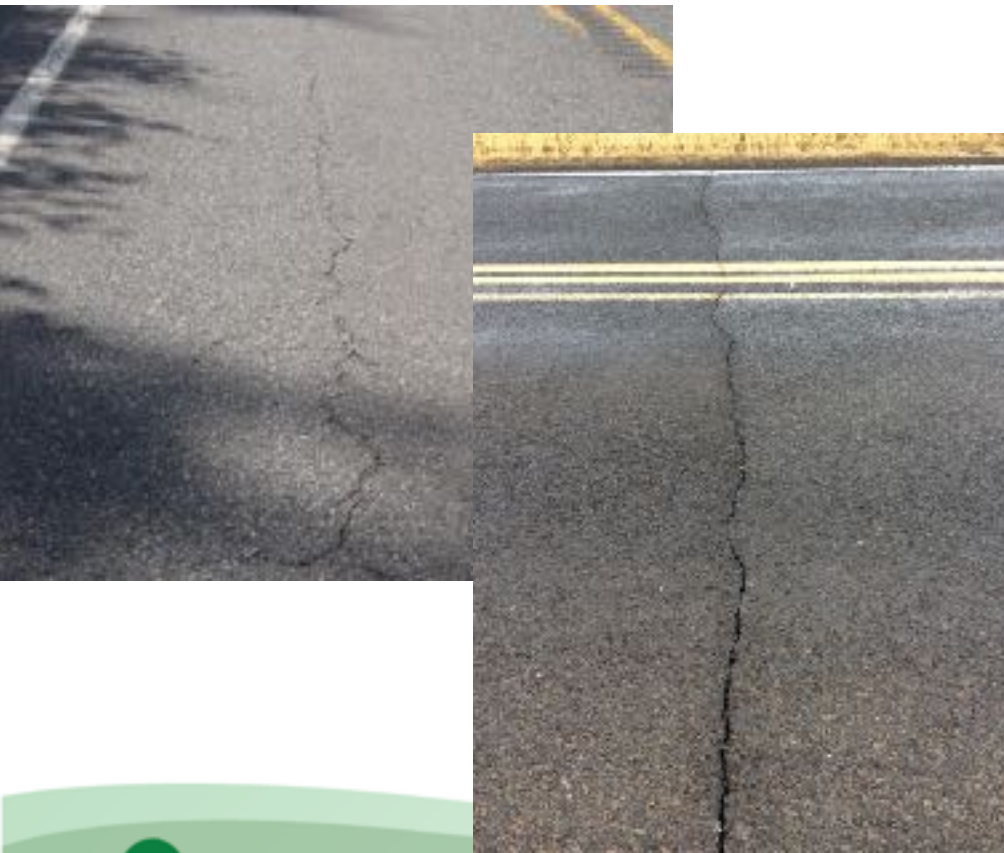
- Drainage: Minimize water intrusion into pavement structure and incompressibles into cracks
  - This reduces the crack growth and raveling
- Maintain: Extend pavement life by limiting future deterioration
  - Slows spalling at cracks
  - Prevents potholes too!
- Maintains pavement structure
- Protects agency's investments

Typically extends pavement life 1-4 years



# Amount of Cracks for Sealing

**Acceptable**

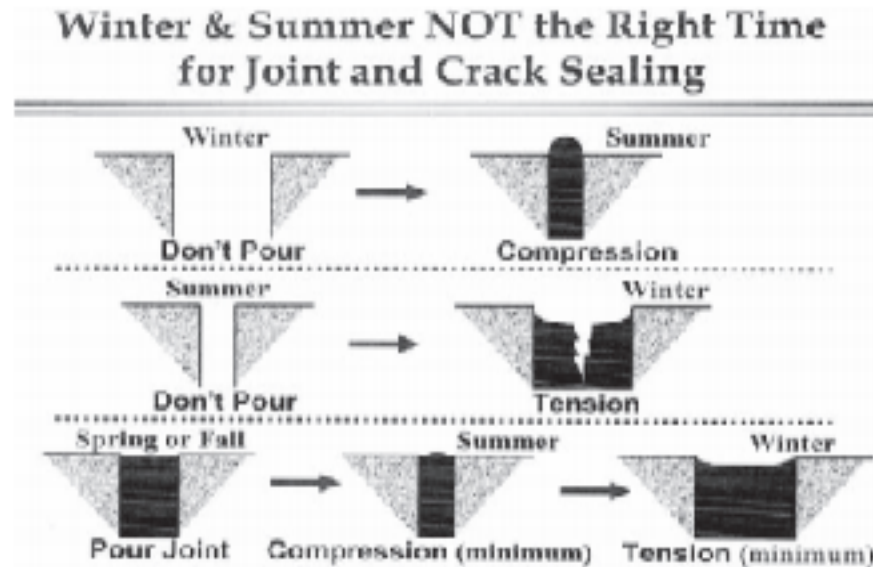


**Too Many!**



# Best Time of Year for Sealing

- Crack sealing is most effective when the cracks first appear
  - Keeps water intrusion to a minimum
- Crack sealing is most effective in early spring (dry) or fall when the cracks are at their optimum width



# Transverse Cracks

- Form perpendicular to lane
  - Thermal
  - Reflective
- Typically caused by environmental factors or by reflection of underlying pavement condition
- Often experience extreme movement (worse on the east side of the state) from freeze-thaw





# Transverse Cracks





# Longitudinal Cracks

- Form parallel to lane
  - Construction Joint
  - Reflective
  - Wheel path
- Typically caused by construction of pavement joint or traffic loading
- Can also be exacerbated by environmental conditions



# Longitudinal Cracks/Joints



# Block Cracking

- Typically form in older pavements
  - Hardening of asphalt
  - Thermal/shrinkage of asphalt in cold weather
  - Form in traffic and non-traffic areas





# Top Down Cracking

- The majority of our pavements have top-down cracking
- Typically occurs with thicker pavements (6''+)





# How Best to Seal a Crack

- Flush with pavement or *slight* overband
  - Flush works best where snow plows are expected...



# Installation Instructions

## SAFETY FIRST:

- Always follow the equipment and product manufacturer's recommendations
  - Sealant must be applied at the proper temperature
    - Typically between 375°F and 400°F
- Wear recommended personal protective equipment
- Set up proper traffic control for roadway and situation

# Applicator Tips

## Flush Fill Tip



For flush fill applications, you will need enough room to get the material in the crack.

## Overband Tip



Tips come in all shapes and sizes. It depends on the amount of flow you need or the width of the top band (to cover raveling or small cracks).

# Crack Preparation

## Preparation is the most important part of crack sealing!

- Clean
  - Use stiff-bristled broom to remove vegetation
  - Blow debris out of crack with compressed air (can use vacuum system)
- Dry
  - Can use heat lance if needed to burn weeds and dry a moist pavement (up to 40°F)
  - DO NOT crack seal if the pavement is wet!
- Pavement temperature is 40°F and rising
- Bondable – check for excessive raveling
- Routing the crack is an option





# Crack Preparation

- Using a stiff wire brush is a great first step to cleaning the crack
- Follow with compressed air



# Air Lance





# Burning Weeds



# When NOT To Crack Seal

- High severity (deep) longitudinal or transverse cracks
  - Can seal cracks about  $\frac{1}{4}$ " or greater but nothing spalled or depressed
  - Some transverse cracks wider than  $\frac{3}{4}$ " get crack filled or a mastic is used





# Doesn't Treat All Distress



# Distress Needs More Than Just Crack Seal





# Examples of bad crack seal





# Flexible: Chip Seals

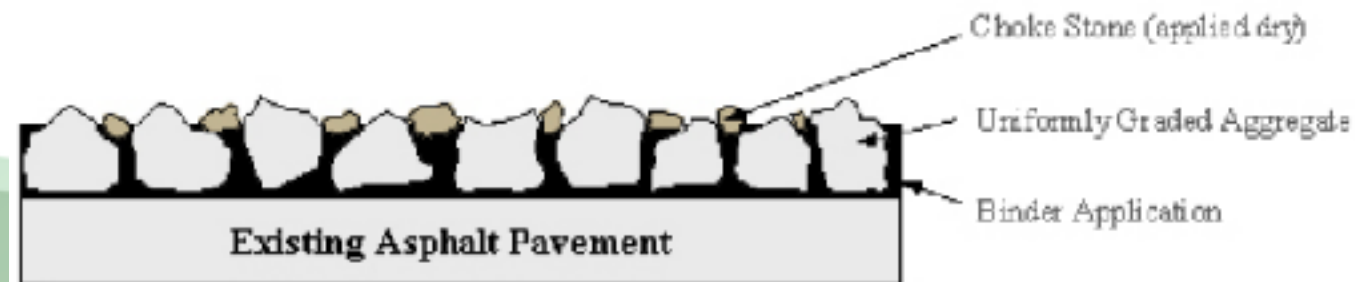


# Benefits of Chip Seals

- Preventive maintenance restores the function of the existing pavement and extends the service life
  - Does not increase the structural capacity or strength
- Seals the minor cracks to prevent water intrusion
- Not for major cracking, but can be used in conjunction with patching and crack sealing
  - Best to wait for a season after crack sealing if using rubberized materials
- Can be used as rut filling

# Best Time to Seal?

- In general, it's best to put chip seals down between May 1 – August 15
- Need good weather - No rain
- Air temperature is 60°F and rising
- Minimum surface temperature is 55°F
- Maximum surface temperature is 130°F
  - May need choke stone...
- Beware of wind
  - Can cause issues with binder placement





# Pavement Preparation

- Pavement needs to be clean and dry
- If crack sealing or pavement repair done, ideal if completed well before the chip seal
  - Pavement repair at least 3 months prior
  - Crack seal at least 6 months prior
- Can chip seal over rumble strips
- Remove thermoplastics
- Cover manholes, monuments, etc.



# Pavement Preparation (cont)

- Protect driveways, sidewalks, curb and gutters
- Choose locations wisely
  - Intersections (stop and go, turning movements)
  - Acceleration/deceleration lanes
  - Steep grades
  - High traffic volume



# Reflective Tabs

- Place reflective tabs the day before the project
  - Common spacing is 100 feet
  - Less on curves
- If not using tabs, have temporary tape available on site





# Traffic Control

- Traffic control is critical!
- Speed should be limited to 25 mph or less
- The longer you can keep the speed down, the better
- Having the vehicles on the fresh chip seal is fine
  - Actually helps set the aggregate
  - Just need to keep the speed down as well as start/stops and turning movements
- No conflicts in signage!



# Chip Seal Start





# Distributor





# Emulsion

- Make sure you calibrate the distributor!
- Ensure distributor truck is clean
- CRS-2P
  - Do NOT dilute
  - Application rate is approximately 0.45 gal/sy for a 3/8"-#4 aggregate
  - Application temperature between 165-180°F



# Spray Bar

# Aggregates

- Aggregate surface should be wet without a sheen
- Too much water will not allow the chip seal to set up
  - LONGER traffic control!
  - MORE chip loss
- Add 10% to what you need for stockpile





# Loader Operator

- Loader should penetrate from near bottom of stockpile, but not scraping the ground
- Do not contaminate stockpile
- Keep wheels off the stockpile
- If excessive dust, lightly water stockpile



# Chip Spreader

- Calibrate your chip spreader!
- Aggregate application rate should be between 20-30 lbs/sy for 3/8"-#4 gradation
  - Typical application rate is 25-28 lbs/sy
  - 20-35 lbs/sy for 1/2"-#4
  - 4-6 lbs/sy for choke (#4-0)





# Aggregate Application Rate

Want some voids  
between the rock  
after rolling





# Rollers

- Pneumatic rollers
  - Ensure tire pressures are all the same
- 2 to 3 rollers needed
  - 2 complete coverages
- Keep them moving at 4-8 mph
- Need to seat the aggregate as quickly as possible
- Looking for an embedment depth of 50-70%
- You cannot over roll



# Brooming

Brooming operations take place after the binder cures

Can happen as late as the following day for an emulsion-based chip seal



Pick up broom



Side Cast

# Considering Choke and Fog Seal?

- Choke fills the voids and prevents larger aggregate from dislodging
  - Prevents tracking and pick up
  - Provides a finer wearing course
  - Helps prevent fly rock
  - Helps prevent plow damage
- Fog seal is a light application of emulsion
  - Typically CSS-1 or CSS-1h, diluted rate of 0.10-0.18 gal/sy
  - Helps prevent shedding, fly rock
  - Applied 3-14 days after new chip seal
  - Brooming done prior to fog seal



# Rut Fill

- Chip seal used as a filler for ruts
  - Best when ruts do not exceed 3/8" but has been used for ruts up to 2"
  - Not for pavements with shoving issues



# Rut Fill





# Chip Seal Issues: Cornrowing





# Chip Seal Issues: Snow Plow Damage



# Chip Seal Issues: Hot Weather



# 5 Keys to Success

- Repair old surface ahead of time
- Calibrate equipment prior to use
- Inspect surface to determine appropriate rates (preferably the day of application)
- Choose the right materials
- Timely application of emulsion and aggregate to optimize the aggregate embedment





# Pavement Patching



# Benefits of Patching

- Preventive maintenance restores the function of the existing pavement and extends the service life
  - Does not increase the structural capacity or strength
- Focus on two types of preventive preservation:
  - Strategic preservation
  - Emerging needs preservation
- Other preservation component: Reactive
- Two repair methods:
  - Remove and replace the pavement deficiency (**preferred**)
  - Cover the deficiency

# Mill and Fill

- Full or partial depth
- Removes the deficiency
- Full depth:
  - Re-compact base
  - Tack edges
  - Multiple lifts if needed
    - No lift should exceed 3"
  - Compaction is key
- Partial depth:
  - Tack everywhere
  - Multiple lifts if needed
  - Compaction is still key!





# Partial Depth Repairs



# Full Depth Repairs





# Mill and Fill

- Remove all pavement deficiencies
- Don't leave a small area in between





# Mill and Fill



Ideal



# Tack Coat





# Why Tack is Important



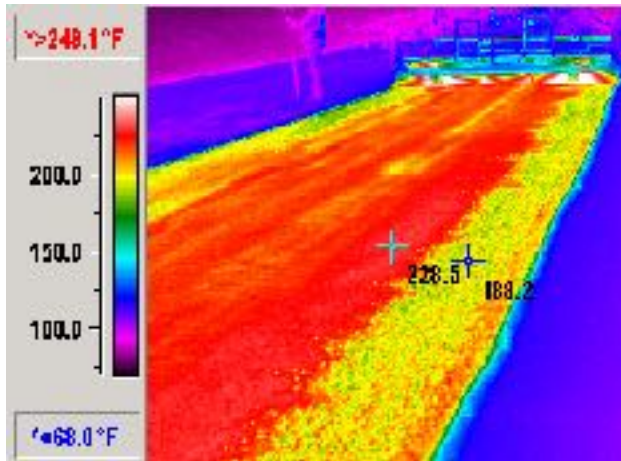
Delamination





# Raking/Compacting Joint

- “Bumping” the joint
- Compaction
  - Minimum three passes
    - One pass is up and back



# Compaction

- One of the most important aspects of working with HMA is getting adequate compaction!
- Ensure the mix is hot
- Compact quickly
- Minimum of 3 passes
- Do not vibratory compact under 175°F
- If a lot of handwork, more compaction will likely be needed





# Compaction: What We Don't Want to See

Roller  
Edge cut  
into mat



Mix too  
cold



Cold mix,  
windy

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# Today's Presentation

- Typical preventive maintenance treatments
  - Crack Sealing
  - Chip Seal
  - Patching



# Questions?

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