

# Crack Treatments Inspection and Best Practices

Mark Waits  
NCPP



MICHIGAN STATE  
UNIVERSITY

# Introduction to Crack Treatments

- ▶ What is a Crack Treatment?
- ▶ What is Crack Sealing?
- ▶ What is Crack Filling?
- ▶ Why do it?
- ▶ Benefits
- ▶ Use as a Pre-treatment
- ▶ Best Practices



# What is a Crack Treatment

- ▶ Crack Treatments are cost-effective pavement preservation methods that extend pavement life by limiting future deterioration and preventing potholes.
- ▶ Crack treatments usually use Hot Applied (generally rubberized asphalt) or Cold Applied (generally Silicone based) Materials.
- ▶ There are two types of Crack Treatments:
  - Crack Sealing
  - Crack Filling



What is a Crack Treatment

# Crack Sealing vs Crack Filling

*What's the difference?*



# Crack Sealing

Placement of Specialized Treatment Materials (Sealant) above or into cracks using unique configurations to Prevent the intrusion of water and incompressible materials into the crack.



# Crack Sealing

These sealant materials should meet ASTM, State, and Federal Standards and are generally a “hot pour” application using specialized boiler type melters that can control the temperature and application rate.



## Crack Sealing

Crack *Sealing* addresses cleaning & sealing *working* cracks *greater than 1/8" wide*. A working crack is defined where *2 sides are moving annually in a motion greater than 1/8"*.

A working crack needs a more *specialized treatment* that seals the crack against moisture while allowing the 2 sides to continue flexing up and down or left or right.

# Crack Filling

Placement of ordinary treatment materials into low-moving cracks to reduce infiltration of water and to reinforce the adjacent pavement



# Crack Filling

Generally, crack *Filling* consists of cleaning and sealing **non-working cracks**, which are cracks that display almost no annual vertical or horizontal motion between the 2 sides of the crack (less than 1 / 8" wide).

Because these cracks **stationary**, they can be filled with an **AC or asphalt emulsion** to keep water out of the crack space and reinforce the material on either side of the crack.





Crack Sealing	Crack Filling
Seals the crack to prevent the intrusion of water and incompressible materials	Fills some of the void in the crack to reduce intrusion of water and incompressible materials
Specialized treatment materials	Ordinary treatment materials
Highly-elastic and flexible material	Rigid material or semi rigid
Endures vertical & horizontal movement	Can not endure vertical & horizontal movement
Crack preparation to assure long service life of sealant	Cursory crack preparation
Sealant placement configuration	Fill crack void, then dust with sand
Considered semi-permanent	Considered temporary
Seals routed/working crack (Life average of 5 years. Up to 10 years on new pavements)	Filling not recommended for moving cracks, unable to accommodate movement
Seals overbanded/non-working crack (Life approximately 2 to 5 years)	Fills non-working crack (Life approximately a few months up to 1 year)
Modification to perform in a wide variety of climatic temperatures	More susceptible to environmental conditions



Crack Sealing Materials	Crack Filling Materials
Asphalt rubber (ASTM D 5078 or State Specifications)	Asphalt cement (Paving Grade or Roofing Grade)
Rubberized asphalt (ASTM D 6690 type 1,2 & 3 or State Specification)	Asphalt cutback (MC-30, 70 and 250)
Low-modulus rubberized asphalt (ASTM D 6690 type 4 or State Specifications)	Asphalt emulsion (SS-1, SS-1h, CSS-1, and CSS-1h)
	Fiberized asphalt
	Mineral-filled (stone, lime, flyash dust) asphalt
	Sand-asphalt mixes

# Special Provision Change

## ALABAMA DEPARTMENT OF TRANSPORTATION Project Specific Special Provision

DATE: November 17, 2024

PSSP No. 22-PS0022

SUBJECT: Filling and Sealing Joints and Cracks in Asphalt Pavement,  
Project No. NH-0013(619), Marengo County & NH-0013(623), Mobile County,

Alabama Standard Specifications, 2022 Edition, shall be amended by the addition of a new Section 461 as follows:

### SECTION 461 FILLING AND SEALING JOINTS AND CRACKS IN ASPHALT PAVEMENT

#### 461.01 Description.

This Section shall cover the work of Filling and Sealing joints and cracks in existing asphalt pavement. Generally, crack Filling consists of cleaning and sealing non-working cracks, which are cracks that display almost no annual vertical or horizontal motion between the two sides of the crack (less than 1/8" wide). Because these cracks are stationary, they can simply be filled with an AC or asphalt emulsion to keep water out of the crack space and reinforce the material on either side of the crack.

Crack Sealing addresses cleaning and sealing working cracks greater than 1/8" wide. A working crack is defined where the two sides are moving around annually in a motion greater than 1/8". A working crack, such as a transverse crack, needs a more specialized treatment that seals the crack against moisture while allowing the two sides to continue flexing up and down or left and right.

#### 461.02 Materials.

The filler for non-working cracks shall come from Table 5 in Section 804, Asphalt Materials, unless otherwise specified in the plans.

The sealant for working joints and cracks shall meet the requirements given in Section 832 for "Hot Applied Joint and Crack Sealant". A certified test report showing actual test results shall be furnished with each lot of sealant furnished to each project. Each lot of sealant shall be delivered in containers plainly marked with manufacturer's name or trademark, type of sealant, lot number, and date of manufacture. The Department may perform any or all tests deemed necessary to verify the quality of the sealant.

#### 461.03 Construction Requirements.

##### (a) Evaluation of the Need for Filling or Sealing.

The Engineer will measure the width of the cracks and evaluate the extent of the deterioration to determine if a crack must be filled or sealed. Typically cracks greater than 1/8" wide shall be sealed. The maximum crack or joint width should not exceed the manufacturer's recommendations.

##### (b) Weather Requirements.

Cleaning, filling and sealing shall not be conducted on a wet surface or when the ambient temperature is below 40°F unless approved otherwise by the Engineer.

##### (c) Cleaning.

The crack or joint shall be thoroughly cleaned of all debris prior to the application of the filler or sealant. Dust and debris shall be blown from the crack with a power brush or blower or with compressed air with a minimum pressure of 100 psi. If compressed air is used, the pneumatic tool lubricator shall be bypassed, and a filter shall be installed on the discharge valve to keep water and oil out of the lines.

The crack shall be completely clean and dry immediately prior to the application of the filler or sealant.

PSSP No. 22-PS0022  
Page 2 of 2

#### (d) Application of Sealant.

The crack filler may be placed with a wand, bucket and spout, or other means used to direct the filler material into the crack, near to the top.

The crack or joint sealant shall be placed utilizing a "V" shaped wand tip, or other acceptable means approved by the Engineer. The approved equipment should allow the penetration of the sealant into the joints and cracks from the bottom up. The joints and cracks shall be completely filled, and any overfilling shall be squeegeed or struck so no residual top layer greater than 1/16" thick is left.

#### (e) Striping Protection

Any striping damaged or removed due to crack sealing operations will be replaced in kind by the contractor, unless otherwise noted in the plans.

#### 461.04 Method of Measurement.

##### (a) Filling Joints and Cracks in Asphalt Pavement.

The filling of cracks and joints will be measured by the gallon of material placed for filling the cracks.

##### (b) Sealing Joints and Cracks in Asphalt Pavement.

The sealing of cracks and joints will be measured by the lane mile or linear foot.

#### 461.05 Basis of Payment.

##### (a) Unit Price Coverage.

Filling and Sealing joints and cracks in asphalt pavement will be paid for at the contract unit price which shall be full compensation for cleaning, disposal of debris, sealant and for all equipment, tools, labor and incidentals necessary to complete the work.

##### (b) Payment will be made under Item No.:

- |       |   |
|-------|---|
| 461-A | Filling Joints and Cracks in Asphalt Pavement - per gallon      |
| 461-B | Sealing Joints and Cracks in Asphalt Pavement - per lane mile   |
| 461-C | Sealing Joints and Cracks in Asphalt Pavement - per linear foot |
| 461-D | Sealing Joints and Cracks in Asphalt Pavement - per pound       |

# Special Provision Change

## 461.01 Description.

This Section shall cover the work of Filling and Sealing joints and cracks in existing asphalt pavement. Generally, crack Filling consists of cleaning and sealing non-working cracks, which are cracks that display almost no annual vertical or horizontal motion between the two sides of the crack (less than 1/8" wide). Because these cracks are stationary, they can simply be filled with an AC or asphalt emulsion to keep water out of the crack space and reinforce the material on either side of the crack.

Crack Sealing addresses cleaning and sealing working cracks greater than 1/8" wide. A working crack is defined where the two sides are moving around annually in a motion greater than 1/8". A working crack, such as a transverse crack, needs a more specialized treatment that seals the crack against moisture while allowing the two sides to continue flexing up and down or left and right.

## 461.02 Materials.

The filler for non-working cracks shall come from Table 5 in Section 804, Asphalt Materials, unless otherwise specified in the plans.

The sealant for working joints and cracks shall meet the requirements given in Section 832 for "Hot Applied Joint and Crack Sealant". A certified test report showing actual test results shall be furnished with each lot of sealant furnished to each project. Each lot of sealant shall be delivered in containers plainly marked with manufacturer's name or trademark, type of sealant, lot number, and date of manufacture. The Department may perform any or all tests deemed necessary to verify the quality of the sealant.

# Special Provision Change

the contractor, unless otherwise noted in the plans.

## 461.04 Method of Measurement.

### (a) Filling Joints and Cracks in Asphalt Pavement.

The filling of cracks and joints will be measured by the gallon of material placed for filling the cracks.

### (b) Sealing Joints and Cracks in Asphalt Pavement.

The sealing of cracks and joints will be measured by the lane mile or linear foot.

## 461.05 Basis of Payment.

### (a) Unit Price Coverage.

Filling and Sealing joints and cracks in asphalt pavement will be paid for at the contract unit price which shall be full compensation for cleaning, disposal of debris, sealant and for all equipment, tools, labor and incidentals necessary to complete the work.

### (b) Payment will be made under Item No.:

- 461-A Filling Joints and Cracks in Asphalt Pavement - per gallon
- 461-B Sealing Joints and Cracks in Asphalt Pavement - per lane mile
- 461-C Sealing Joints and Cracks in Asphalt Pavement - per linear foot
- 461-D Sealing Joints and Cracks in Asphalt Pavement - per pound

# 502.04. Measurement and Payment.

Pay Item

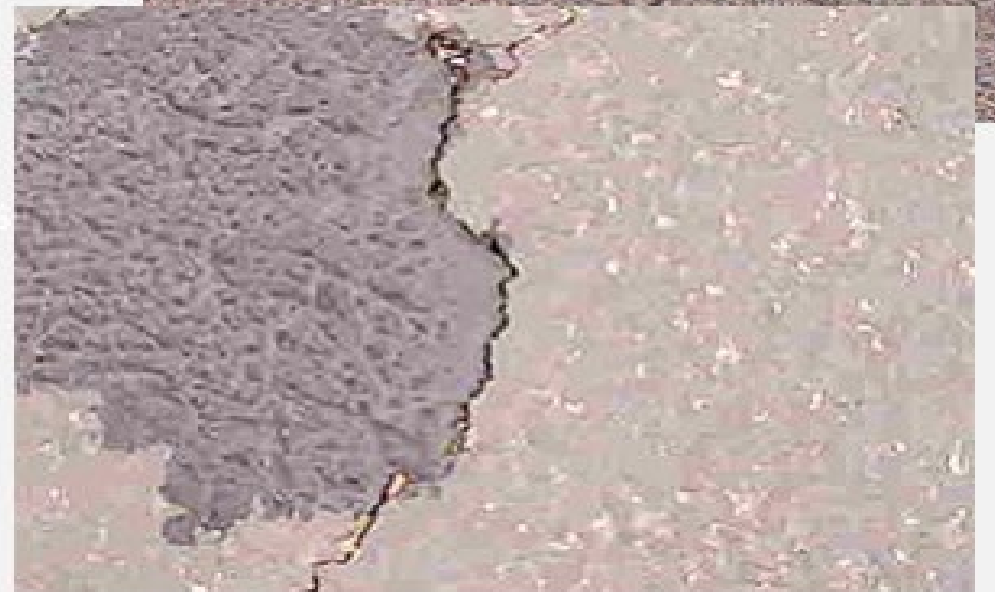
Pay Unit

Overband Crack Fill, Roadbed .....	Roadbed Mile
Overband Crack Fill, Ramp .....	Roadbed Mile
HMA Crack Treatment, Roadbed .....	Roadbed Mile
HMA Crack Treatment, Ramp .....	Roadbed Mile

# Why Crack Seal?

***"Crack Sealing is the single most cost effective preventive maintenance tool available" ~ FHWA***

- Protect your investments (roads, bridges, parking lots, etc.)
- Maintains pavement structure
- Limits future deterioration, prevents potholes





# ***WHY CRACK SEAL?***

# WHY CRACK SEAL?



# WHY CRACK SEAL?



# WHY CRACK SEAL?



# WHY CRACK SEAL?



# WHY CRACK SEAL?



# WHY CRACK SEAL?



SO, ... HOW'S YOUR DAY GOING?

# WHY CRACK SEAL?



# WHY CRACK SEAL?



Why Crack Seal?

# WHY CRACK SEAL?



# WHY CRACK SEAL?



# ***WHY CRACK SEAL?***



# ***WHY CRACK SEAL?***



# WHY CRACK SEAL?



# ***WHY CRACK SEAL?***



# WHY CRACK SEAL?



# WHY CRACK SEAL?



# ***WHY CRACK SEAL?***



# ***WHY CRACK SEAL?***



# WHY CRACK SEAL?



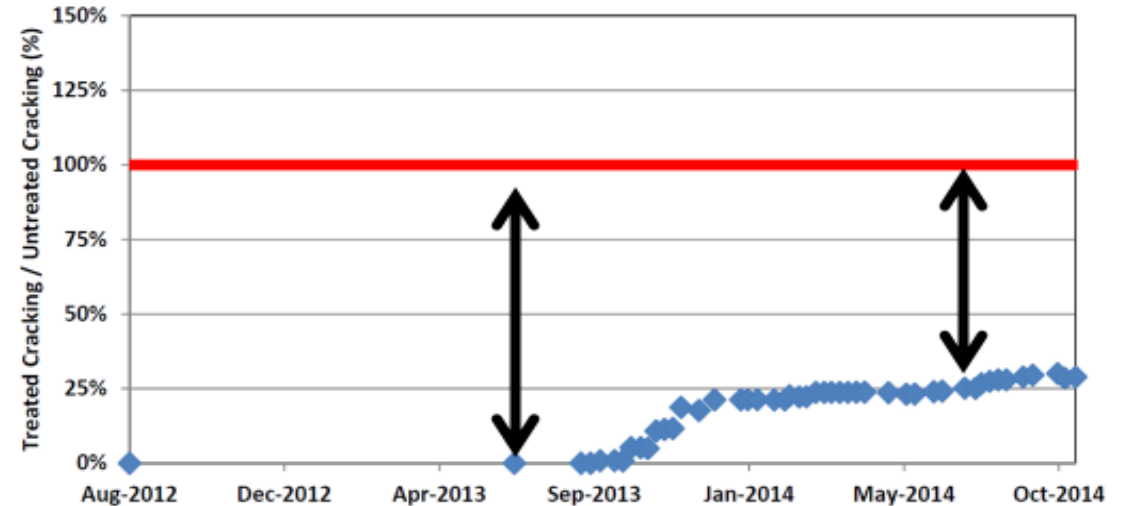
# WHY CRACK SEAL?



# Proven Performance Success Metrics

- Extend sealant service life by 7 years+<sup>1-7</sup>
- Pavement service life extension 2-10 yrs.<sup>1-7</sup>
- An annual crack sealing program may reduce cracking 100% vs. no treatment<sup>8</sup>

Cracking in Section L5's Crack Seal on Lee Road 159  
as a Percentage of Cracking If No Treatment Had Been Applied



**100% Less  
Cracking**  
compared  
to Control  
Section

**~75% Less  
Cracking**  
compared  
to Control  
Section

# Proven Performance Success Metrics

- Reduced interconnected cracking, and reduced subgrade moisture<sup>1-3</sup>
  - Without crack sealing 75% of cracks form into potholes in <3 years
  - With crack sealing 1% of cracks form into potholes in <3 years



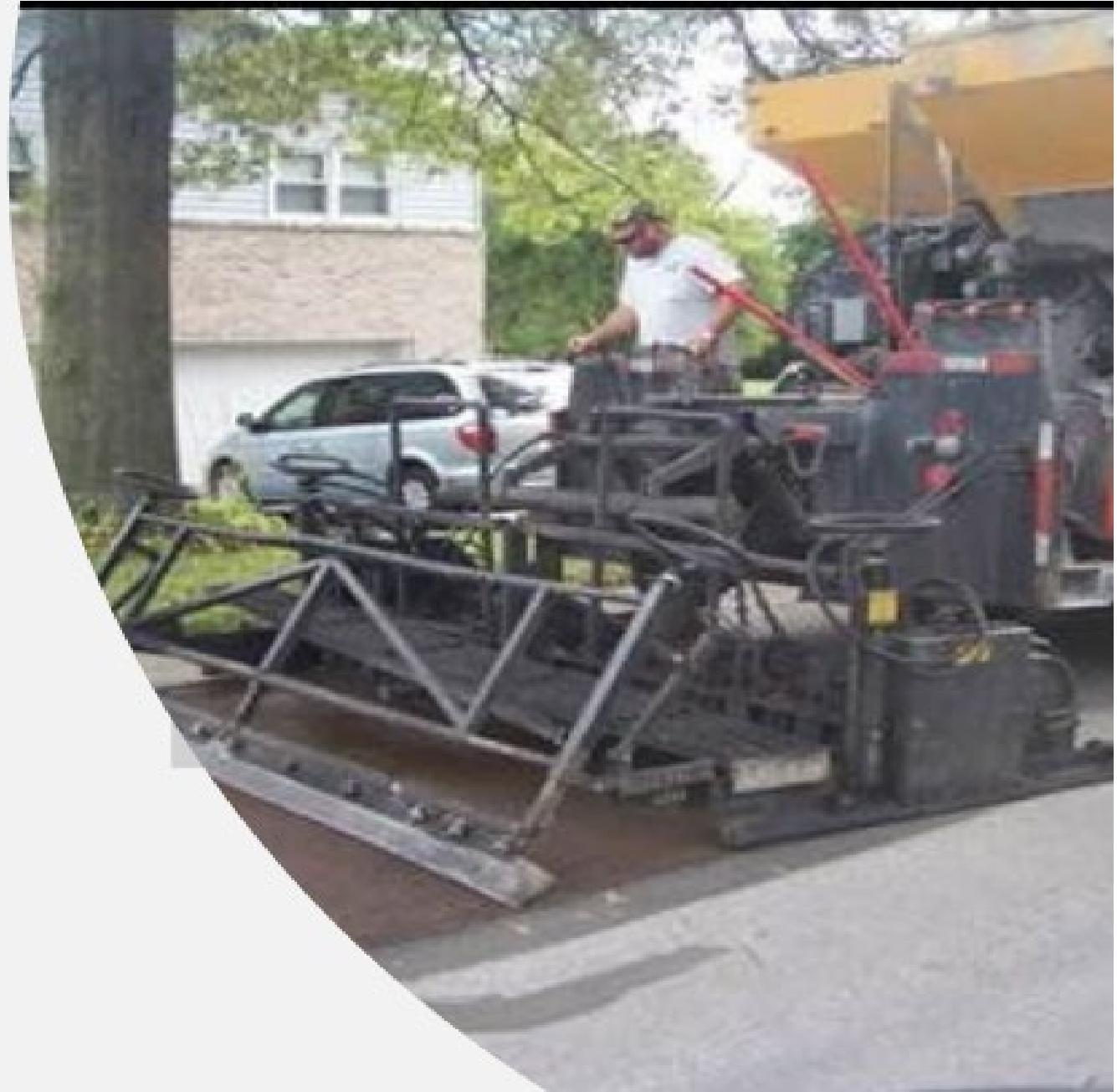
# Proven Performance Success Metrics



- Extended pavement smoothness for 5 years<sup>1</sup>
  - A sealed crack provides better sustained smoothness over a 5-year period vs. an unsealed crack measured by International Roughness Index (IRI)
- Reduced raveling of pavement<sup>2</sup>
- Makes other surface treatments significantly more effective as proven by NCAT<sup>3</sup>

# Crack Sealing as a Pre-Treatment

- Crack Treatments are commonly used as a pre-treatment in conjunction with surface treatments
- Sealing prior to surface treatments enhances the treatment and further extends the pavement life.<sup>9</sup>



# Crack Sealing as a Pre-Treatment



# Crack Sealing as a Pre-Treatment



# Crack Sealing as a Pre-Treatment



# Crack Sealing as a Pre-Treatment



# Crack Sealing as a Pre-Treatment



# Crack Sealing as a Pre-Treatment

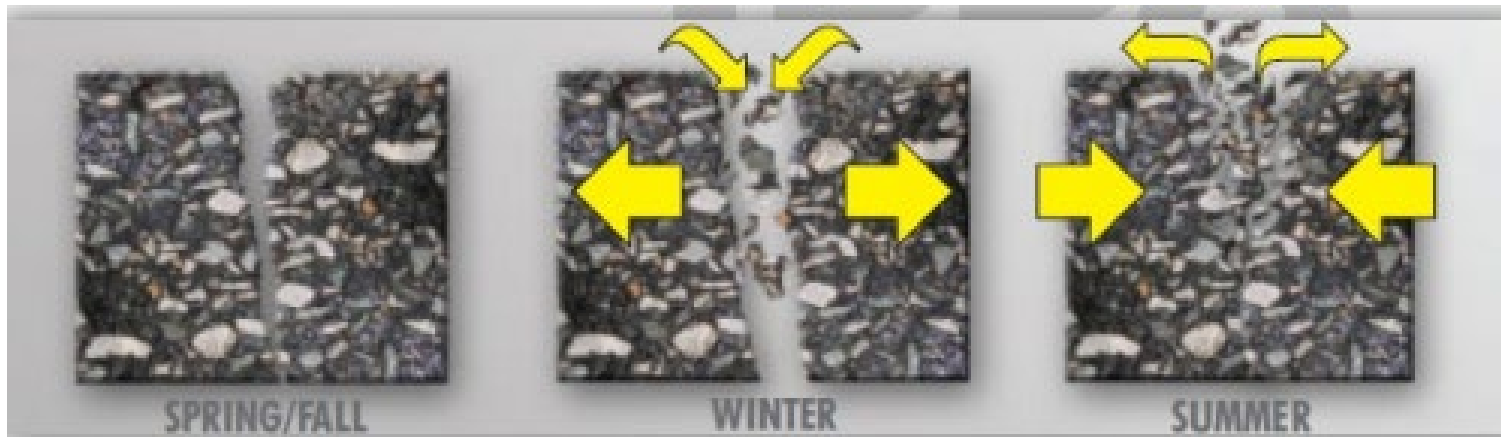


# Project Selection & Design



# Crack Movement

- ▶ Horizontal Thermal Movement
  - Temperature Changes



- ▶ Vertical Movement
  - Up and down movement
  - Caused by traffic loads

**Cracks can open up to 100% of original width as the pavement temperature changes from summer to winter extremes**

Rate	0 - 0.004 mm/min
Daily	0 - 2 mm
Seasonal	0 - 25 mm

# Low Moving Cracks

- ▶ Defined as annual movement less than  $1/8$ " per year.
- ▶ Types are typically:
  - Fatigue (alligator)
  - Block
- ▶ Low moving cracks grow an average of  $1/16$ " per year.



# High Moving Cracks

- ▶ Defined as annual movement greater than or equal to 1/8"
- ▶ High Moving Cracks
  - Transverse are always moving
  - Other Moving Cracks
    - Reflective
    - Thermal
    - Longitudinal
    - Edge
- ▶ May move up to 1" each year



# Crack Growth



- ▶ Cracks tend to widen or grow over time.
  - Asphalt shrinkage with age
  - Thermal movement
  - Debris ravelers crack face
- ▶ Proper crack sealing will delay and prevent further deterioration and growth of the crack

# Transverse Cracks

- ▶ Transverse cracks form perpendicular to the pavement lane
- ▶ Typically caused by environmental factors and by reflection of underlying joints
- ▶ Often experience concentrated and extreme movement (further spaced the more movement)
- ▶ Crack Sealing and routing when appropriate is recommended to accommodate the expected movement.



# Transverse Cracks

- ▶ **Transverse cracks form perpendicular to the pavement lane**
- ▶ **Typically caused by environmental factors and by reflection of underlying joints**
- ▶ Often experience concentrated and extreme movement (further spaced the more movement)
- ▶ Crack Sealing and routing when appropriate is recommended to accommodate the expected movement.



# Transverse Cracks

- ▶ Transverse cracks form perpendicular to the pavement lane
- ▶ Typically caused by environmental factors and by reflection of underlying joints
- ▶ **Often experience concentrated and extreme movement (further spaced the more movement)**
- ▶ **Crack Sealing and routing when appropriate is recommended to accommodate the expected movement.**



# Longitudinal Cracks

- ▶ Longitudinal cracks run parallel to the pavement lane
- ▶ Typically caused by construction of pavement joint, thermal conditions, and traffic loading
- ▶ Crack Sealing, and routing when appropriate is recommended to prevent intrusion of moisture and debris



# Longitudinal Cracks

- ▶ Longitudinal cracks run parallel to the pavement lane
- ▶ Typically caused by construction of pavement joint, thermal conditions, and traffic loading
- ▶ Crack Sealing, and routing when appropriate is recommended to prevent intrusion of moisture and debris



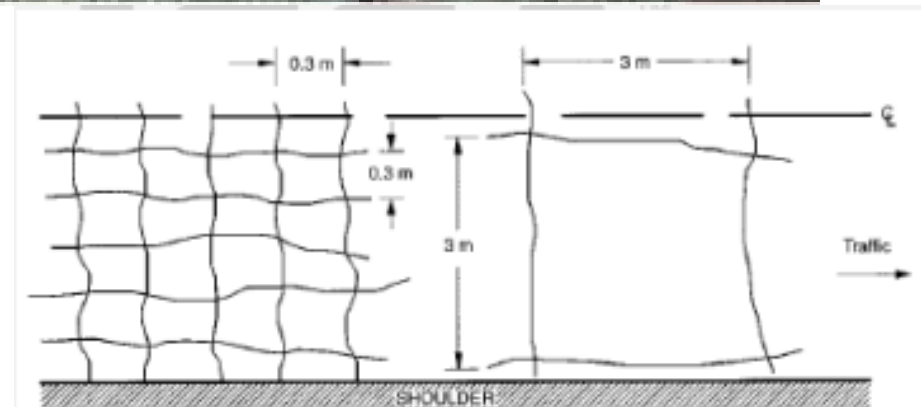
# Longitudinal Cracks

- ▶ Longitudinal cracks run parallel to the pavement lane
- ▶ Typically caused by construction of pavement joint, thermal conditions, and traffic loading
- ▶ **Crack Sealing, and routing when appropriate is recommended to prevent intrusion of moisture and debris**



# Block Cracking

- ▶ **Block cracks typically form in older pavements**
  - Hardening of asphalt
  - Thermal effects / shrinkage of asphalt during cold weather
  - Form in traffic and non-traffic areas.
- ▶ **Effectively treated by crack sealing**



# Edge Cracking

- ▶ **Edge cracks typically form due to:**
  - Lack of lateral support
  - Settlement of underlying material
  - Weak base
  - Heavy traffic along edge
- ▶ **Prevent intrusion of runoff water and debris**



# Fatigue Cracking

- ▶ Fatigue cracks are also known as “alligator” cracks
- ▶ Indication of structural failure
- ▶ Typically occurs later in a pavement’s life due to high traffic loads
- ▶ Crack seal or fill cracks larger than  $1/8$ ” as a pre- treatment to other surface treatments\*



# Crack Treatment vs Pavement Condition

- ▶ **Good**
  - Crack Sealing increases life expectancy
- ▶ **Fair**
  - Crack Sealing increases life expectancy
- ▶ **Poor**
  - Results are inconsistent but Crack Sealing can increase life expectancy

	Good
	Fair
	Poor

# Crack Density

- ▶ Greater than **20% Crack Density**
  - Clean and Seal only
  - Routing is NOT recommended
- ▶ Less than **20% Crack Density**
  - Clean and Seal
  - Routing of moving cracks is recommended to clean/prepare and create a defined sealant reservoir.



# When To Seal?

**Cracks  $> 1/8$ " up to  $1\frac{1}{2}$ "  
Should Be Sealed**



**Cracks  $> 1\frac{1}{2}$ " should  
be repaired with Mastic**



# Seasonal and Environmental Factors

- ▶ Crack Sealing can be accomplished in all 4 seasons:
  - Summer is typical
  - *Spring and Fall are optimal*
  - Winter crack sealing can be done with proper care and if conditions are appropriate.



# Seasonal and Environmental Factors

- ▶ Crack Sealing in winter can be a good alternate
  - Can be performed in virtually any outside air temperature
  - Crack must be dry\* and warmed to 40 F.
    - Hot Air Lance Required



# Sealant Placement Configurations

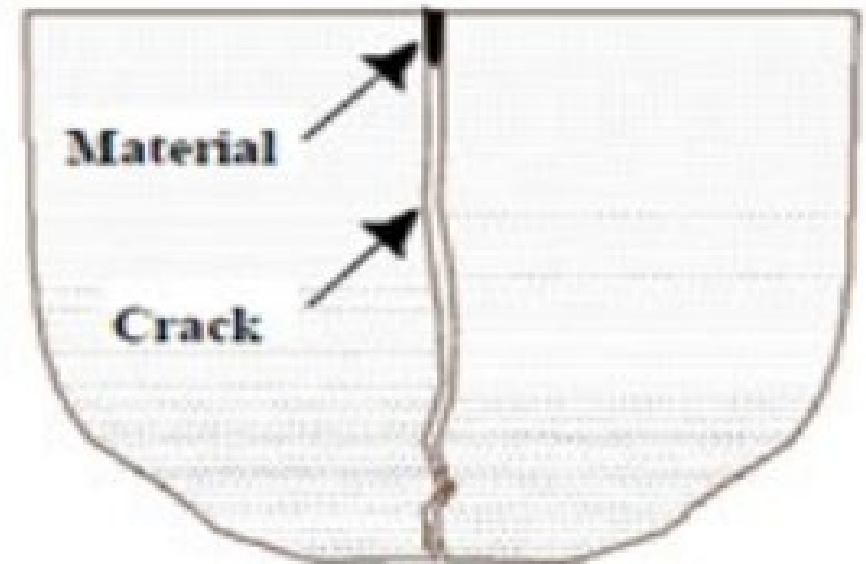
- ▶ There are 4 categories of sealant placement configurations
  - Flush Fill
  - Overband
  - Reservoir
  - Combination



# Flush Fill Configuration

## Flush Fill

- Sealant placed into crack, flush with the pavement
- Any excess is struck off

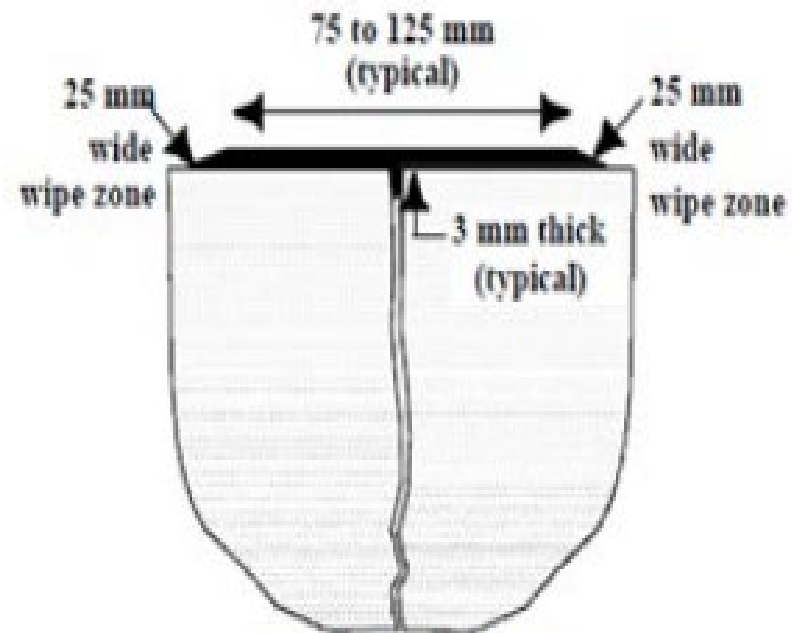


**A. Flush-fill**

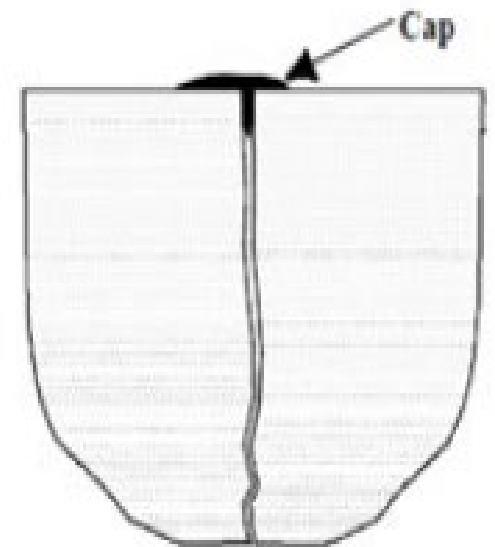
# Overband Configuration

## Overband Configurations

- Squeegeed sealant overband (Figure B)
- Capped overband w/ sealing disc (Figure C)



B. Simple Band-Aid



C. Capped

# **PROPER OVERBAND**

- **Narrow**
- **Tight to the  
pavement**
- **Pavement  
texture  
visible  
through  
sealant**



## 502.03.D.2 Overband

Apply overband material to clean, dry cracks.

Apply overband 4 inches wide and from  $1/8$  inch to  $3/16$  inch thick.

The Contractor may increase the maximum application width to 6 inches for coverage of multiple cracks, with Engineer's prior written approval.

## 502.03.D.2 Overband

Apply overband as follows unless otherwise required:

- a. **Stand Alone Overband Crack Fill.** If no other surface treatment is required on the pavement, fill visible cracks in the road **less than 1 ¼ inch wide.**
- b. **Micro-Surfacing Preparation.** If preparing the pavement for a micro-surface overlay, fill visible cracks in the road **less than 1 ¼ inch wide.**

**Chip Seal Preparation.** If preparing the pavement surface for a single or double chip seal, fill cracks **greater than 1 / 8 inch wide or 3 feet long**. Seal cracks with varying widths and portions at least 1 / 8 inch wide, along the entire length.

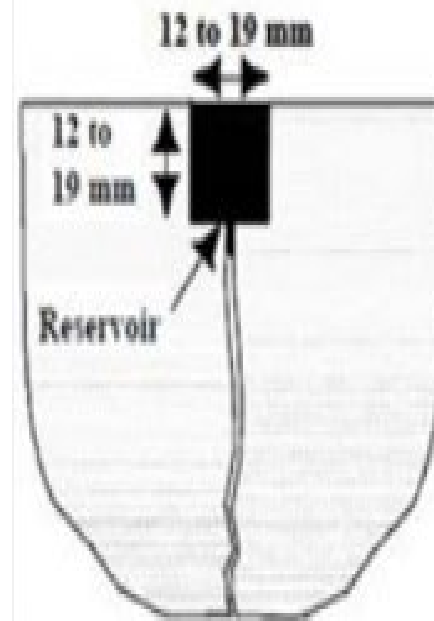
**Paver Placed Surface Seal.** If preparing the pavement for a paver placed surface seal, fill cracks with **widths from 1/4 inch to 1 1/4 inch**.

**HMA Ultra-Thin Overlay.** If preparing the pavement for an HMA ultra-thin overlay, fill visible cracks **less than 1 1/4 inch wide**.

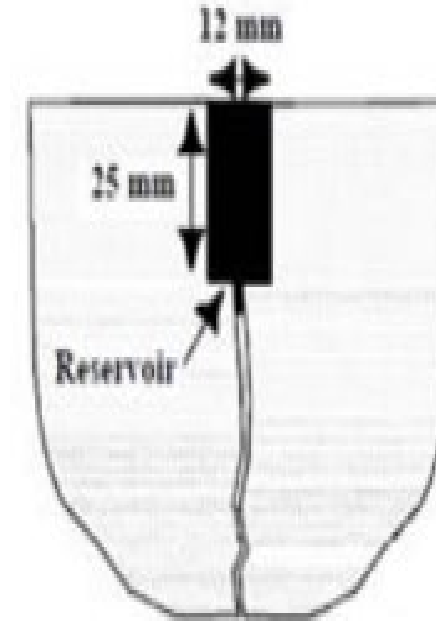
# Reservoir Configurations (Routing)

## Reservoir Configurations

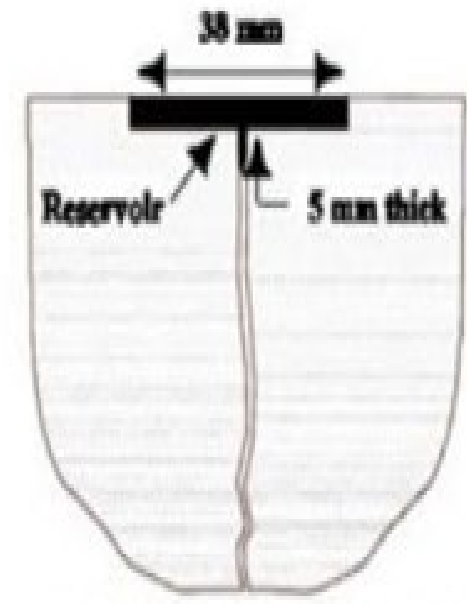
- Standard Flush
- Deep Flush
- Shallow Flush



D. Standard Flush



E. Deep Flush



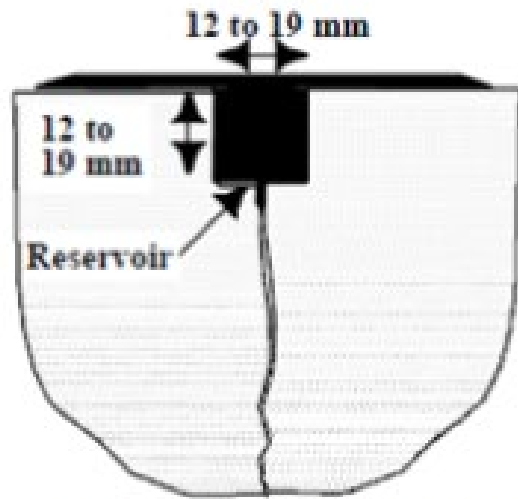
F. Shallow Flush



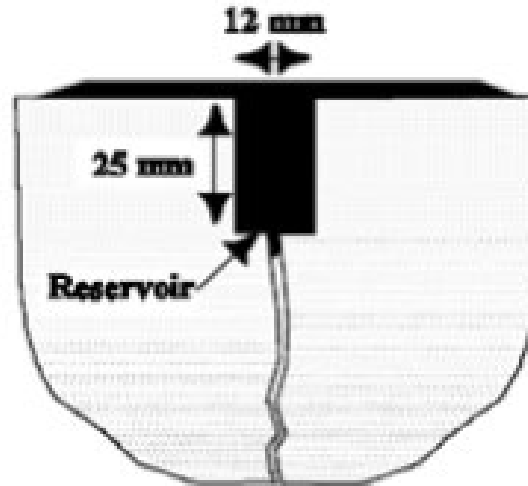
# Combination Configurations

## Combination Configurations

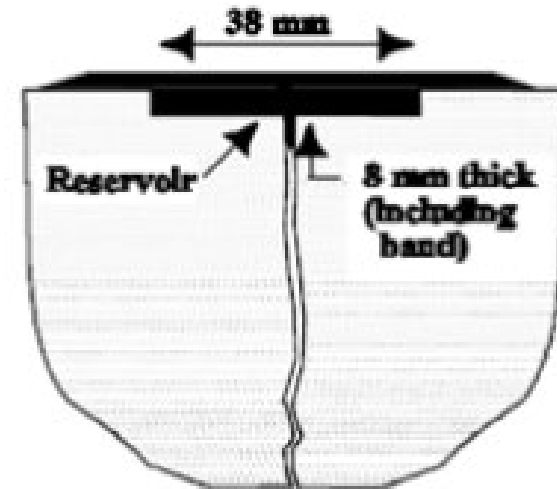
- Designed Reservoir (Routed Crack)
- Material placed into and over the reservoir
- Material shaped into an overband with the squeegee or disc
- Overband centered over crack reservoir



I. Standard Recessed Band-Aid



J. Deep Recessed Band-Aid



K. Shallow Recessed Band-Aid

Moderate Climate

Cold Climate

# Factors Influencing Sealant Selection

**Crack Sealant is subjected to a variety of stresses:**

- Horizontal expansion and contraction
- Vertical movement from traffic loads
- Exposure to water from rain and snow
- Aging environmental effects
- Abrasion (traffic, street sweeping, snowplows)
- Temperature extremes between seasons



**Effective performance calls for sealant properties that will permit functionality under these stresses.**

# Properties Influencing Sealant Selection

► These general property requirements can be separated into specific characteristics which are important for selection:

1. Adhesion
  2. High Temperature Stability
  3. Low Temperature Flexibility / Elongation
  4. Elasticity
  5. Viscosity / Application Consistency
- 

**In order to achieve the properties needed to withstand these stresses, the asphalt must be modified/engineered with polymer, rubber, or other materials which make it a specialized material, designed to prevent the infiltration of water and non-compressible materials in pavement**



# Properties Influencing Sealant Selection

## 502.02. Materials

- ▶ A. *Saw or Rout and Seal*. Provide hot-poured joint sealant that meets the requirements of subsection 914 .04 .02.B.1 for sealing sawn or routed cracks.
- ▶ B. *Overband*. Provide overband material as specified in subsection 502 or subsection 502 .02.B.2 .

# 502.02. Materials

**B. Overband.** Provide overband material as specified in subsection 502 or subsection 502 .02.B.2 .

Unless you are applying a field blended mixture, use Section 502.02.B.1 Overband (Alternate 2).

Provide an asphalt rubber product selected from the **Qualified Product List**. Do not allow prepackaged material to exceed 400 °F.

Most likely meets ASTM D 6690



# Preparation Best Practices

- **Structurally sound pavement**
- **Dry Crack**
- **Clean Crack**





# Clean Crack

- **Surfaces Need To Be Clean**
- **Pavement surface and crack walls free from dirt and debris**
- **Dirt will prevent proper adhesion**

# Crack Cleaning

- Compressed Air
- Vacuum in combination with compressed air
- Hot Air Lance
- Wire Brushing

*\*Cleaning operations should take place immediately before crack sealing*



# Compressors

- High pressure air compressors are effective at cleaning out cracks prior to sealing; an important step in the application process
- Ensure compressor capacity to maintain effective high pressure



Cleaning shall use high pressure 90 psi minimum / 100 CFM minimum\*, dry, oil free compressed air to remove any remaining dust. If compressed air is used, the pneumatic *tool lubricator shall be bypassed*, and a *filter shall be installed* on the discharge valve to keep water and oil out of the lines.

## Compressors

- High pressure air compressors are effective at cleaning out cracks prior to sealing; an important step in the application process
- Ensure compressor capacity to maintain effective high pressure



## 502.03. Construction.

A. Equipment. Provide equipment, in accordance with section 107 and this subsection, capable of meeting the requirements of this subsection.

1. Compressed Air System. Provide and use a compressed air system that produces a continuous, high-volume, high-pressure stream of clean, dry air to prepare cracks. Equip the air compressor with a moisture separator to remove oil and water from the air supply. Provide a compressor capable of producing at least \*100 psi at a continuous air flow of 150 cfm.

# Vacuum Systems

- Vacuum systems
- Environmentally Friendly
- Required in certain areas that have PM10 regulations
- Injects compressed air into crack removing debris and then vacuums debris into vacuum. Fines are filtered and cleaner air is released into atmosphere



# Hot Air Lancing

- Hot Air Lancing
  - Removes debris, burns weeds, removes moisture, and warms pavement
- NEVER to be used to continue work during rain or when pavement surface is saturated
- Conditions where hot air lancing is frequently recommended:
  - Moist climates
  - Nighttime crack treatment projects
  - Temperatures below the dew point



# Reservoir Cutting

- Routing is an effective method to cut a designed reservoir and is also an effective method to clean crack face, provides ability for sealant to accommodate crack movement
- Straight, uniform reservoir is best
- Production depends on pavement conditions but in studies has ranged from: 220 meters (~720 linear feet/hr) up to 300-600 meters (1,000-2,000 linear feet/hr)



# Rotary Impact Router

- Most widely used reservoir cutting equipment
- High productivity of 600-800 linear feet per hour
- Follows meandering cracks well
- Depth control
- Variety of models and options available



# Reservoir Cutting

- ▶ Reservoir dimensions should follow the project design.

- ▶ **Best Practices:**

- Produce an equal cut centered over the crack for uniform bond.
  - Rout at least 1/8" from each side of crack
- Cold weather climates may require wider reservoirs
  - Reservoirs should never be greater than 1 1/2" wide and never less than 3/8" deep.
- Stop if excessive spalling occurs
  - Router should easily follow crack
  - Minimize spalling and cracking



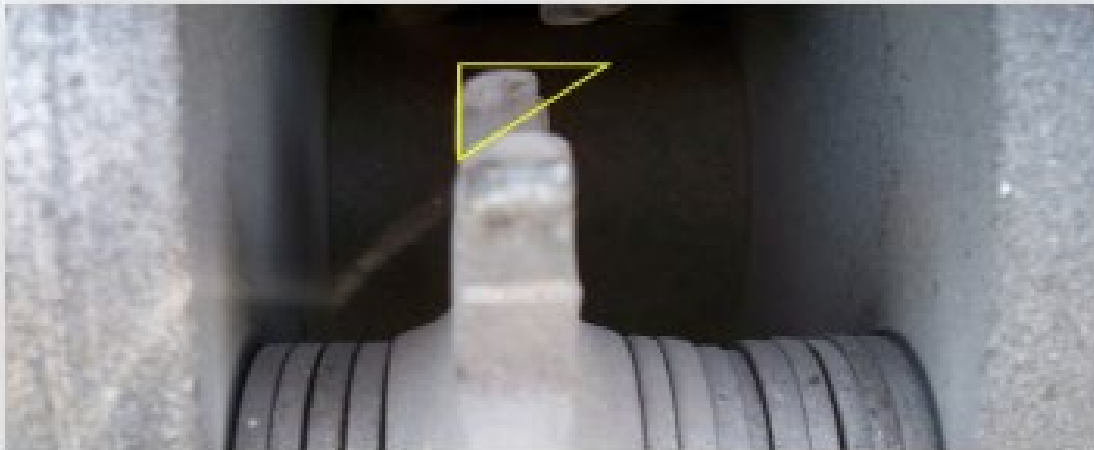
# Reservoir Cutting

- ▶ Reservoir dimensions should follow the project design.
- ▶ **Best Practices:**
  - Produce an equal cut centered over the crack for uniform bond.
    - Rout at least 1 / 8" from each side of crack
  - Cold weather climates may require wider reservoirs
    - Reservoirs should never be greater than 1 ½" wide and never less than 3 / 8" deep.
  - Stop if excessive spalling occurs
    - Router should easily follow crack
    - Minimize spalling and cracking

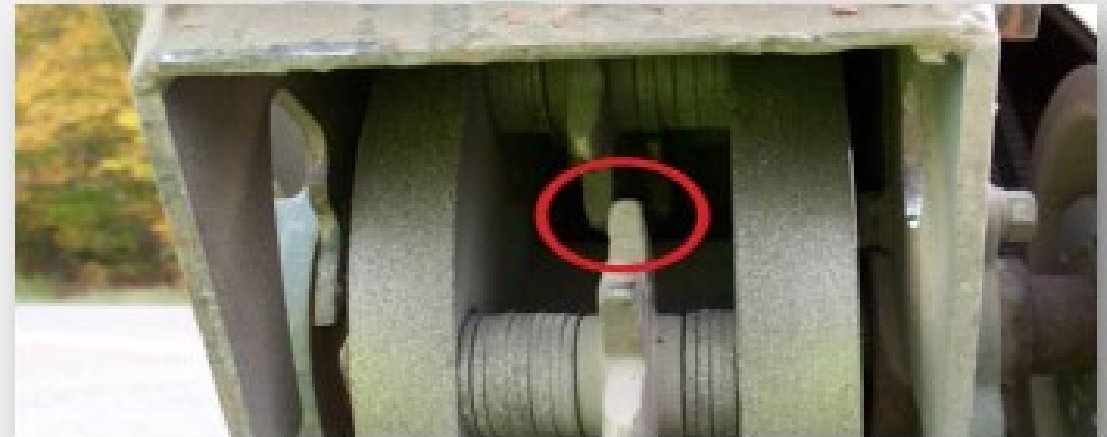


# Reservoir Cutting

- ▶ Check cutters frequently during use (rotate when appropriate)
- ▶ Pay attention to excessive vibration
- ▶ Reduce “wobble” by using correct number of spacers
- ▶ Avoid routing alligatored areas or poor pavement conditions



This cutter is rounded and needs to be replaced



This cutter has rounded edges on the inside and shows how it was rotated to provide a square outside cutting edge

# Proper Sealant Temperature

- ▶ Follow the Manufacturer's recommended application range!
  - *Common Minimum – Maximum application range is 380F – 400F*
- ▶ Over-heating or under-heating will result in limited performance.



# Application Equipment

- ▶ Most hot applied sealants are heated and installed using oil jacketed double boiler melters:
  - Heats and melts sealant to application temperature
  - Agitates sealant inside tank
  - Pumping System to feed material through hose, wand and into crack
  - Temperature control system provides safer and more controlled method of heating sealant.



# Application Equipment

- ▶ Most hot applied sealants are heated and installed using oil jacketed double boiler melters:
  - Heats and melts sealant to application temperature
  - Agitates sealant inside tank
  - Pumping System to feed material through hose, wand and into crack
  - Temperature control system provides safer and more controlled method of heating sealant.



# Application Equipment

- ▶ Most hot applied sealants are heated and installed using oil jacketed double boiler melters:
  - Heats and melts sealant to application temperature
  - **Agitates sealant inside tank**
  - **Pumping System to feed material through hose, wand and into crack**
  - **Temperature control system provides safer and more controlled method of heating sealant.**



# Application Tools

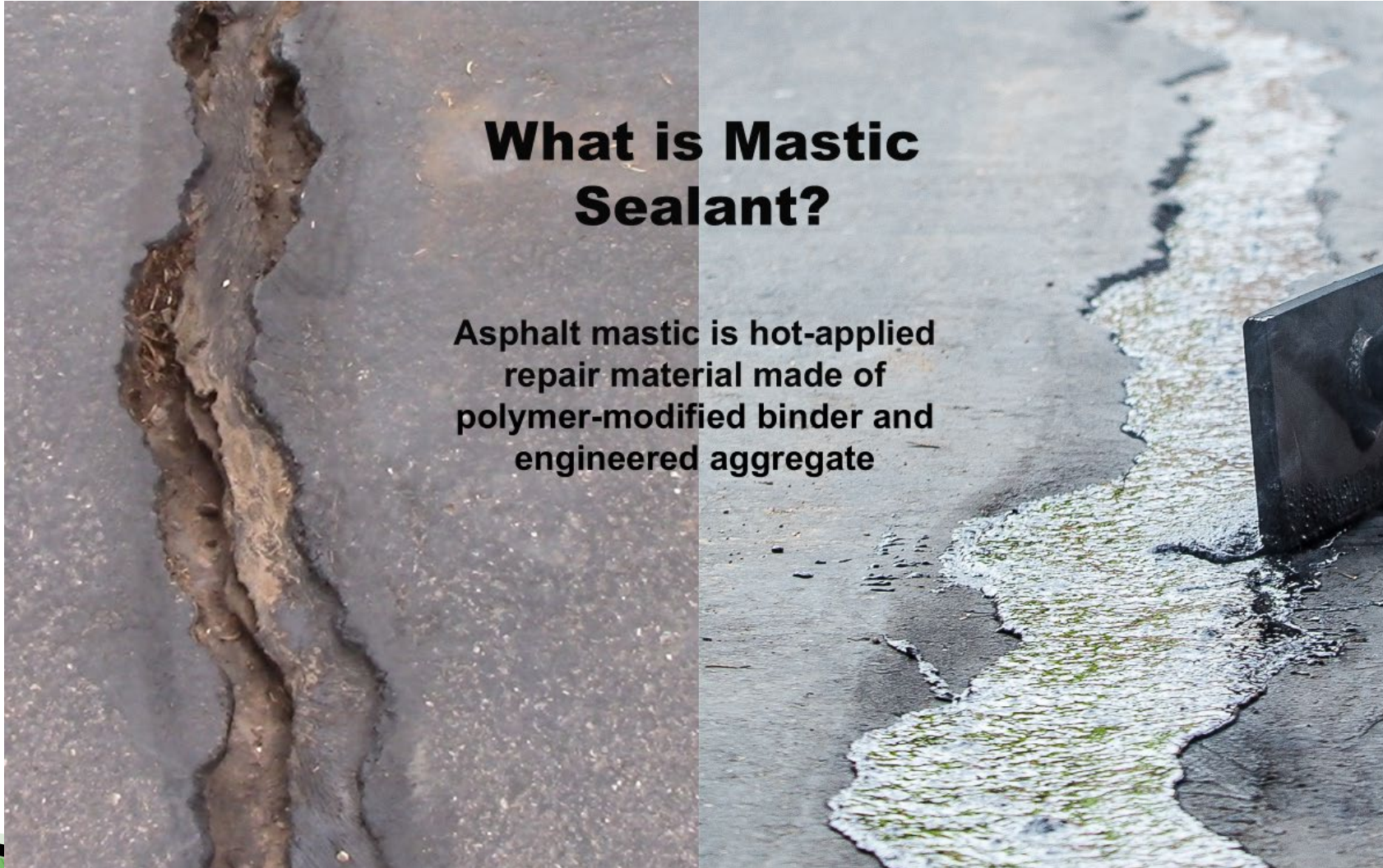
- ▶ Hoses and Wands
- ▶ Wand Tips
- ▶ Squeegees



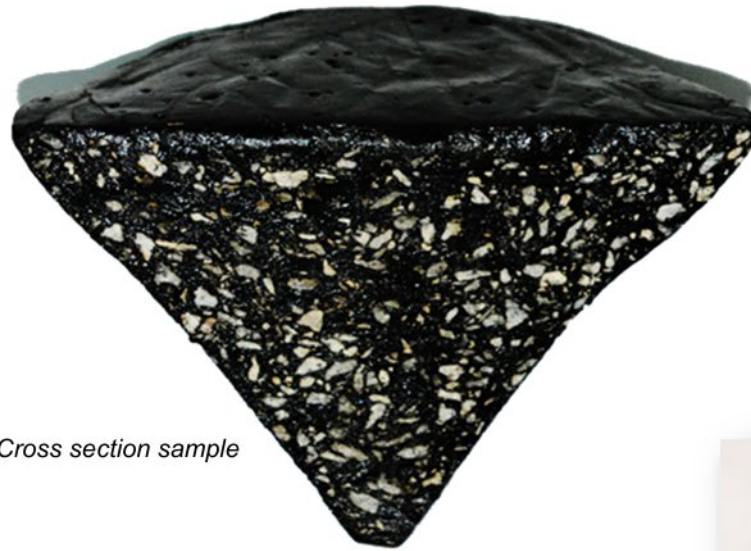
# Mastic Sealant

## What is Mastic Sealant?

Asphalt mastic is hot-applied repair material made of polymer-modified binder and engineered aggregate



# Mastic Sealant



*Cross section sample*

**Feature:  
Aggregate Filled**

## **BENEFIT:**

- The aggregate component gives the product mass and stability.
- Provides a long-term solution.



# Mastic Sealant

## Feature: Highly Adhesive

### BENEFIT:

- Highly adhesive material.
- Bonds to both asphalt and concrete.
- Provides a long-term repair.
- Does not require a primer.



# Mastic Sealant




**Feature:**  
**Flexible**

## **BENEFIT:**

- Mastic moves with the pavement instead of struggling against it.
- Resilient in all temperature extremes.

# Mastic Sealant



**Feature:  
Pre-Packaged**

**Easy to Use**

No field proportioning  
or blending required!



**BENEFIT:**

Designed in premeasured  
packages for consistency and  
maximum performance.

# Mastic Sealant



## **Feature: Flowable/Pourable**

### **BENEFIT:**

- Highly flowable product makes for easier application.
- Fills all the gaps and voids.



# Mastic Sealant

## Feature: Waterproof

### BENEFIT:

- A Mastic should be impermeable to water and air.
- Helps prevent pavement deterioration.

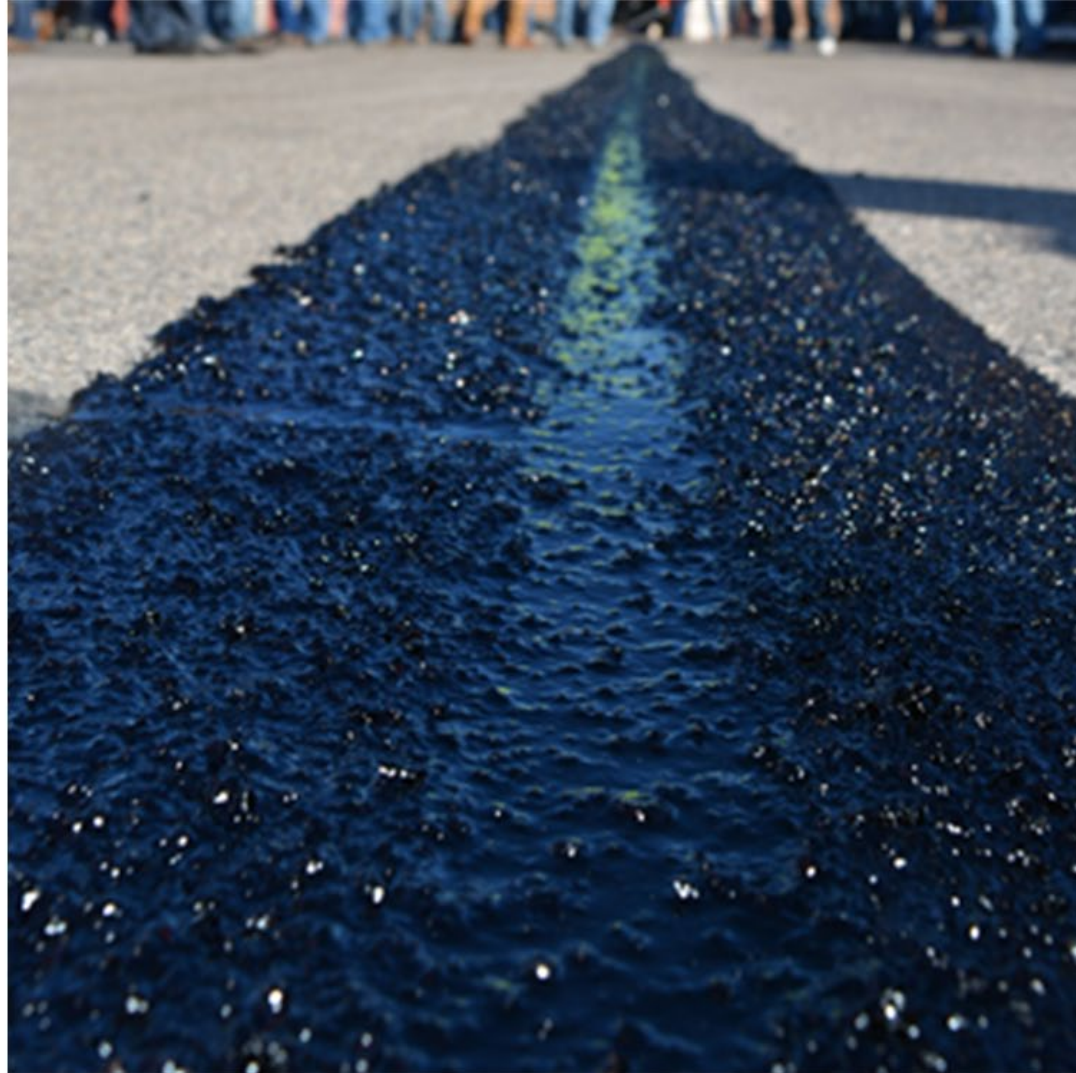


# Mastic Sealant

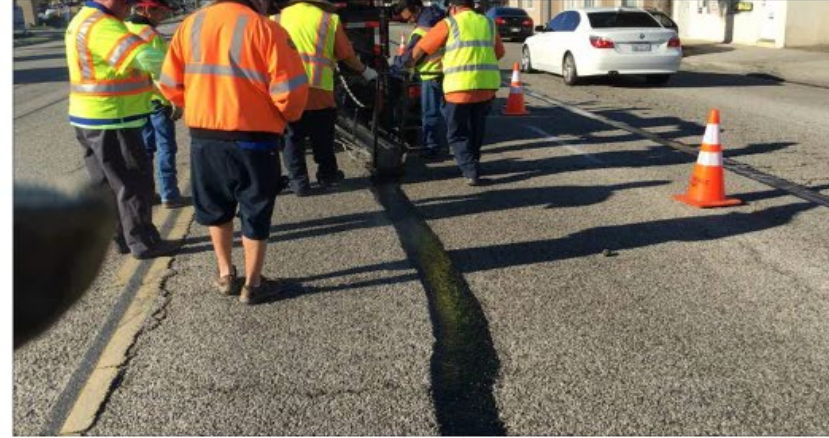
## **Feature: Rapid Set**

### **BENEFIT:**

- Highly track resistant.
- Ready for traffic as soon as it has cooled.



# Mastic Sealant



## Longitudinal Cracks

- Longitudinal cracks run parallel to the pavement lane.
- Longitudinal cracks include edge cracks and joint failures.

# Mastic Sealant



**Edge Joint Repair**

# Mastic Sealant



## Transverse Cracks

- As with longitudinal cracks, Mastic repair will waterproof transverse cracking and extend the life of the pavement.
- A Mastic Type 2 is best suited for use in areas that experience thermal movement such as wide transverse cracking.

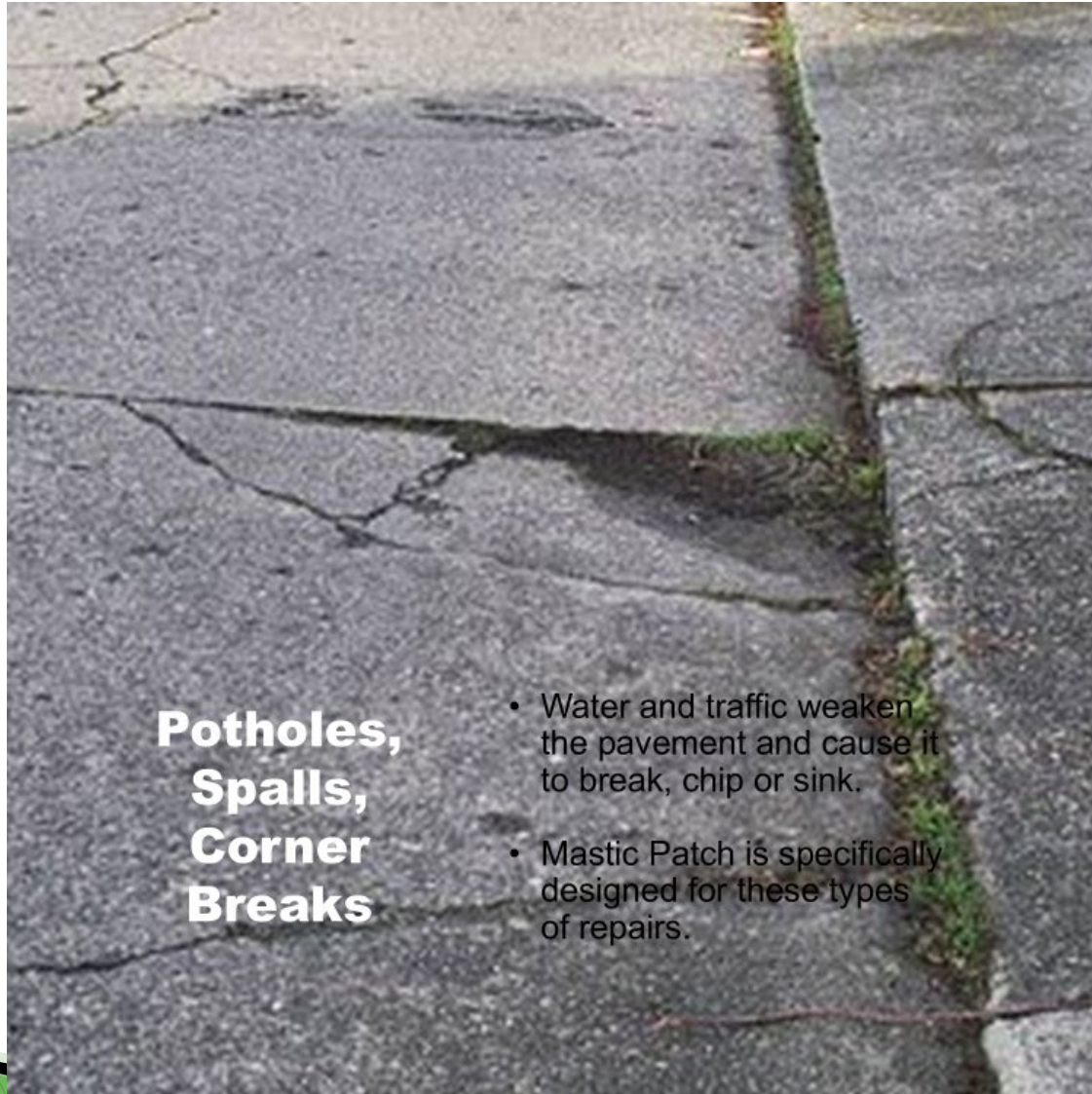
# Mastic Sealant



## Recessed Thermal Cracks

- Mastics will fill voids and improve ride quality, especially for wide thermal cracks.

# Mastic Sealant



**Potholes,  
Spalls,  
Corner  
Breaks**

- Water and traffic weaken the pavement and cause it to break, chip or sink.
- Mastic Patch is specifically designed for these types of repairs.



# Mastic Sealant

## Parking Lots



- 
- Level pavement to remove trip hazards.
  - Repair areas with parked or static traffic, such as parking spots or drive-thru lanes.

# Mastic Sealant

## Bridge Deck Approaches

- Mastics are used to taper bridge entry points, increasing driver safety and making the ride smoother.



# Mastic Sealant

## **Fatigue Cracking**



- Treat fatigue cracks are also known as “alligator” cracks.
- A Mastic waterproofs repair area; bonds the pavement together.

# Mastic Sealant

## **Alligatored Areas**





**It's Quitting Time**

































Michigan Department of Transportation

# Questions?



# Questions?



Mark Waits  
On Call Pavement Specialist, NCPP  
[Waitsmar@msu.edu](mailto:Waitsmar@msu.edu)  
334-399-2828