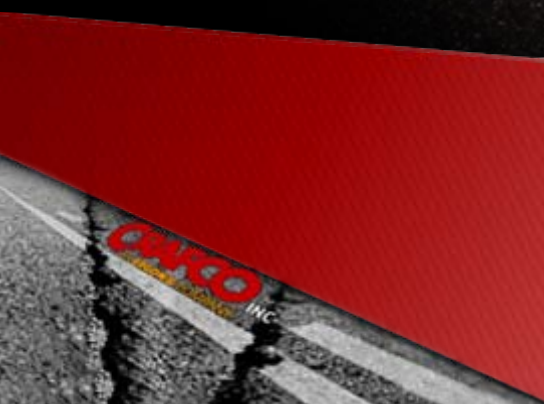
Introduction to Crack Treatments The Crafco Way

Greg Sharp, Crafco, Inc.

Introduction to Crack Treatments

Crack treatment overview

- Why treat cracks
- When to treat cracks
- Selecting a Treatment
- Selecting Sealant
- Proper equipment



Why treat cracks

" Cracks are inevitable, and neglect leads to accelerated cracking and potholing, further reducing pavement serviceability."

(FHWA-RD-99-147)

Why treat cracks

Prevents water intrusion into the sub-base.

Why treat cracks

Prevents incompressible intrusion.

Improves ride quality smoothness.

When to treat cracks

- **Soon after they appear**… any crack opening will allow moisture penetration into pavement foundation (sub-base).
- At minimum all cracks ≥1/8”.

Why & When?

- Protect one of your largest investment, Roads
  - *Pavement failure is imminent!*
- Extends pavement life.
  - *Crack treatments are cost-effective, up to 9 years of performance.*
- Throughout the life cycle of your pavement.
  - *Early, Middle, End*

Crack Sealing will Reduce: Pavement Life Cycle Cost, Traffic Interruptions, Worker's Exposure to Traffic

Selecting a Treatment

Pavement evaluation to pick the right treatment.

There are two categories for cracks.

"Working" (high movement)
- ≥ 3mm movement
- -Thermal

"Non-working" (low or no movement)
- < 3mm movement
- -Longitudinal
- -Block
- -Fatigue

Type 1

Working Crack-"thermal (*transverse*)"

Moving cracks formed by temperature related pavement/sub grade movement.
Generally in transverse direction. (perpendicular to center line)
Generally full width of street or road.
Generally >20 foot spacing.
Considered "working" cracks- ≥ 3mm movement.
Will develop in 2-7 years on most new pavements, 1-3 years on overlaid concrete.

" **Working"** cracks - [10% of cracks]

Crack Sealing

Working Crack Treatment

"The placement of specialized treatment materials above or into working cracks using unique configurations to prevent the intrusion of water and incompressibles into the crack."
(FHWA-RD-99-147)
Crack Sealing

Crack Sealing Treatment

Crack Sealing

In thermal cracks.

Routed reservoirs.

Pavements in good condition- >20’ transverse crack spacing, minor other cracking.

Sealants that are flexible and extensible at lowest temperatures encountered.

Type 2
Non Working Cracks

In longitudinal, block, fatigue and closely spaced transverse cracks
(< 20’ spacing).
In wheel paths and high traffic areas.
Stiffer more “traffic resistant” product.
Routed or non-routed reservoirs (use discretion), over-band application.
Pavements in fair to poor condition.

Non-working ” cracks - [90% of cracks]

Performance Crack Filling

Non Working Cracks

"The placement of ordinary treatment materials into non-working cracks to substantially reduce infiltration of water and to reinforce the adjacent pavement."
(FHWA-RD-99-147)
Crack Filling

Crack Type – "*Longitudinal*"

Definition:

- Can develop in 2-5 years along with thermal cracks.
- Occur in longitudinal (parallel to center line) direction.
- Caused by thermal movement, construction joints and edge joints.
- Considered low movement, "non-working" cracks- < 3mm movement.

Crack Type - "*Fatigue (alligator)*"

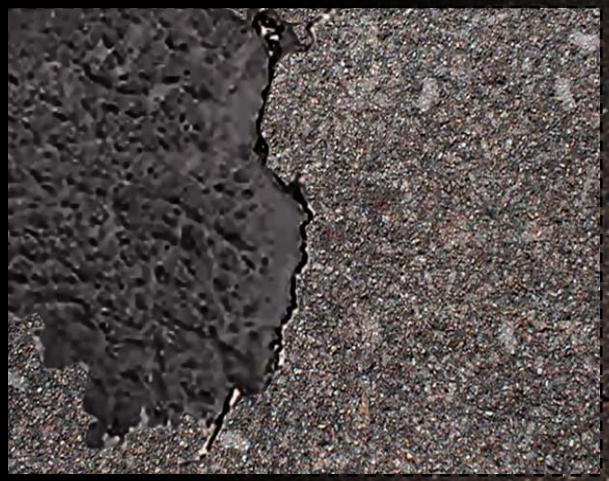
Non Working Cracks

Definition:

Caused by repeated traffic loading
Occurs in heavy traffic areas and wheel paths.
Cracks form in closely spaced, interconnecting block patterns.
Sure sign of pavement structural failure.
Considered low or no movement "non-working" cracks- < 3mm movement.

What cracks to treat?

All Cracks - With the right treatment.



Proper Equipment

Tools depend on what you are doing.

- Rout or Not
  Size of Rout
- Cleaning
  Air
  Heat Lance
- Flush Fill / Overband

CRACK PREPARATION

Proper Equipment – Routing
PAVEMENT CUTTER

Proper equipment - Routing

Worn Cutters will not provide a good reservoir.

New Cutter

Worn Cutter

DON'T LET IT FOOL YOU

- MOST OPERATORS WANT TO WORK UPHILL
- THE MACHINE WILL PULL ITSELF
- AND YOU DON'T HAVE TO FIGHT IT

- ROUT FROM CENTERLINE TO THE EDGE OF THE ROAD
- DO NOT LET THE MACHINE PUSH YOU INTO TRAFFIC
- DUST MASKS OR VENTILATORS ARE HIGHLY RECOMMENDED

CHOOSE YOUR WORKING CRACKS

FOLLOW THE CRACK AS BEST AS YOU CAN

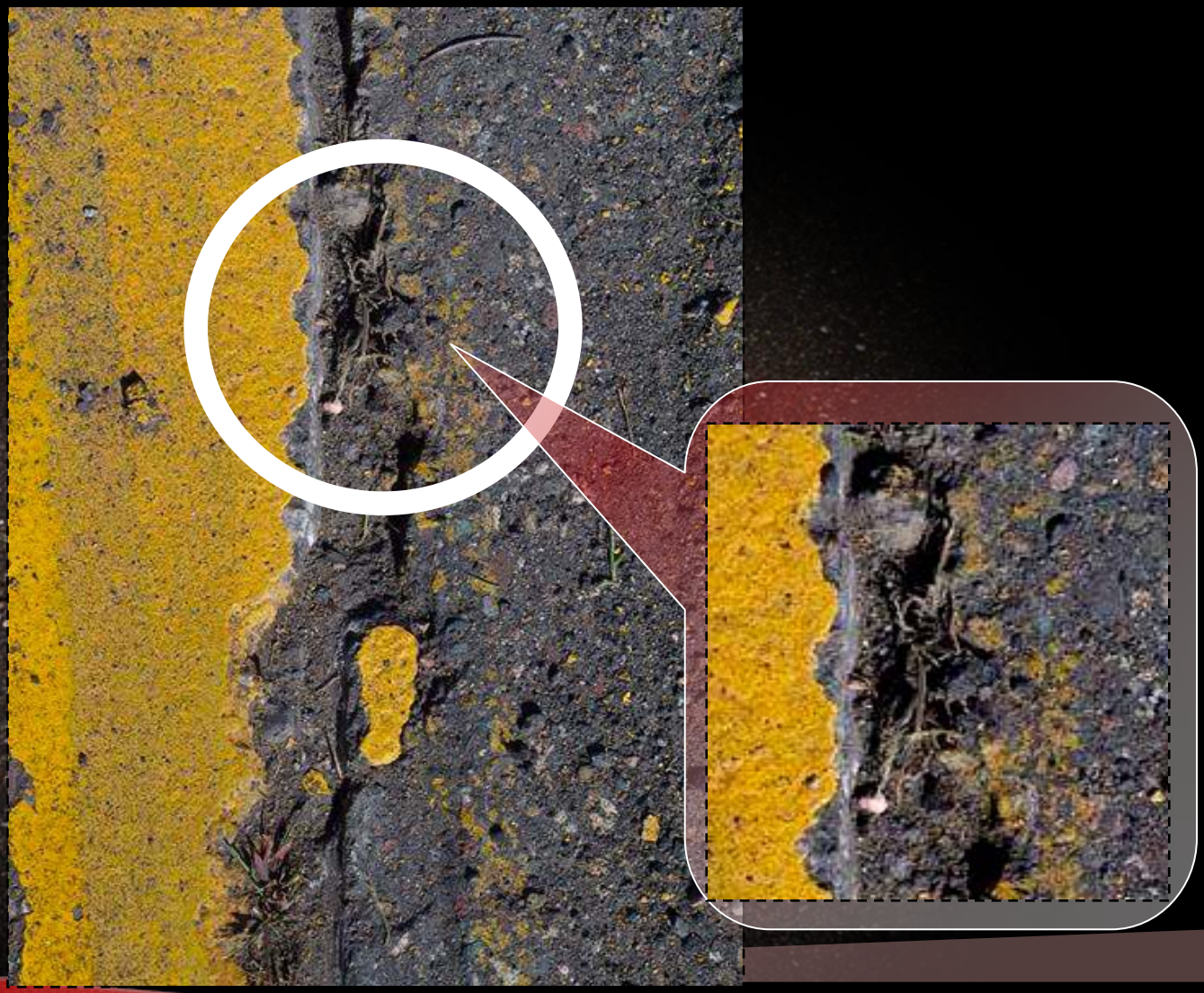
Cleaning Methods

Unclean Crack

- Compressed air - sufficient pressure and velocity
- Vacuum - in combination with compressed air
- Heat lance - used to warm pavement when needed

Clean Crack

- SOMETIMES PART OF THE CRACKS ARE MISSED
- WHILE THE ROUT MIGHT NOT COVER IT, THE OVERBAND FILLER SHOULD



- WHAT DO YOU DO WITH WEEDS?

- SOME WEEDS CAN BE LEFT BEHIND
- THEY SHOULD BE REMOVED BY
  - *THE HIGH PRESSURE AIR*
  - *OR THE HEAT LANCE*

THIS ROUT IS AFTER A NEW SET OF BLADES IS INSTALLED – NOTICE THE CLEAN EDGES

- THE EDGES ARE NOT ONLY SQUARE, BUT THE BOTTOM OF THE ROUT IS ALSO SQUARE, INCREASING ADHESION OF THE FILLER

THE TOP EDGE CAN ALSO BE RAGGED IF YOU ALLOW THE ROUTER TO ADVANCE TOO QUICKLY

NOTE THAT THE BOTTOM INSIDE EDGE IS STILL QUITE SQUARE.

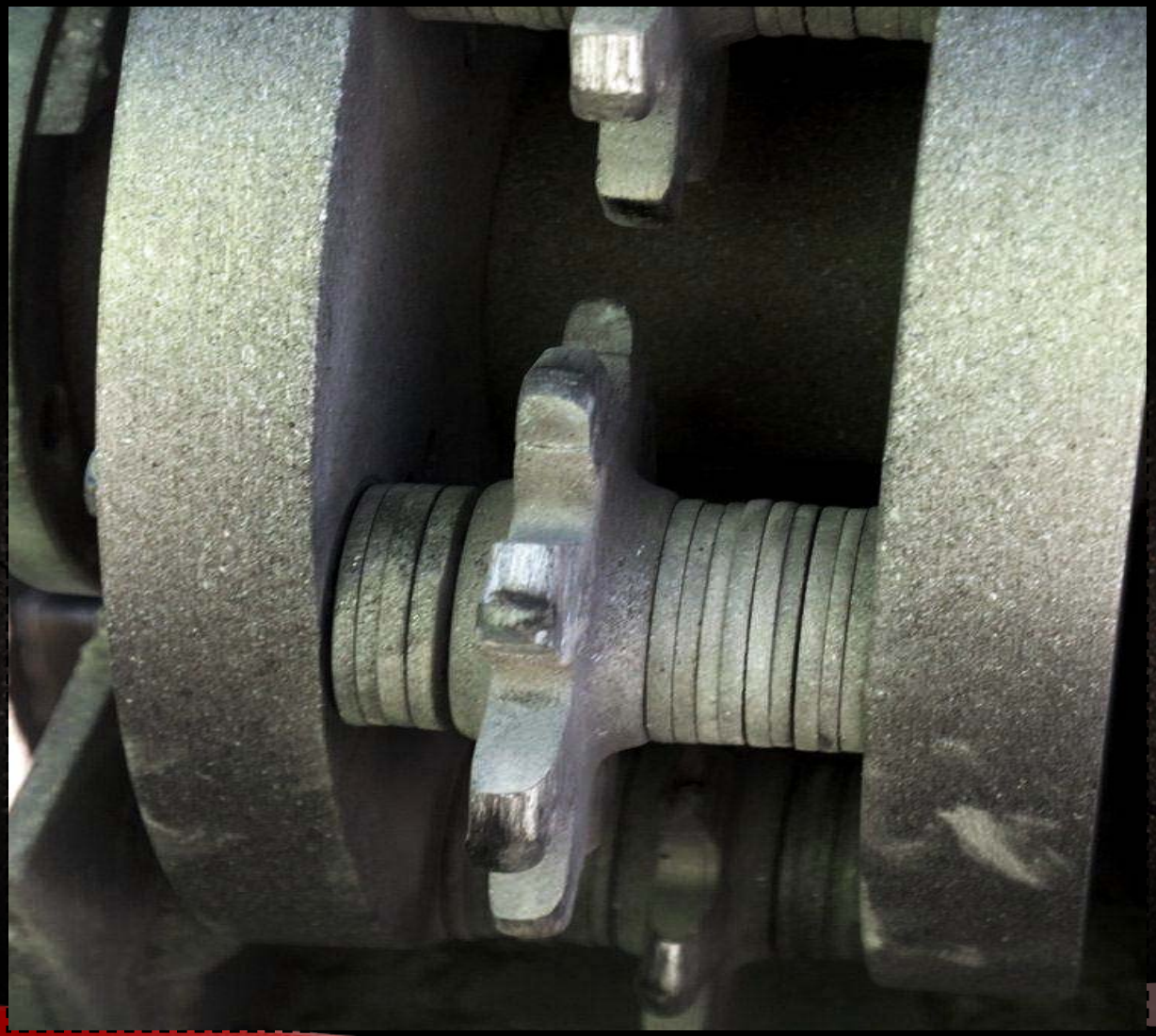
THIS IS THE SAME CRACK, AFTER IT HAS BEEN BLOWN CLEAN

- THIS IS THE RESULT OF WORN BLADES

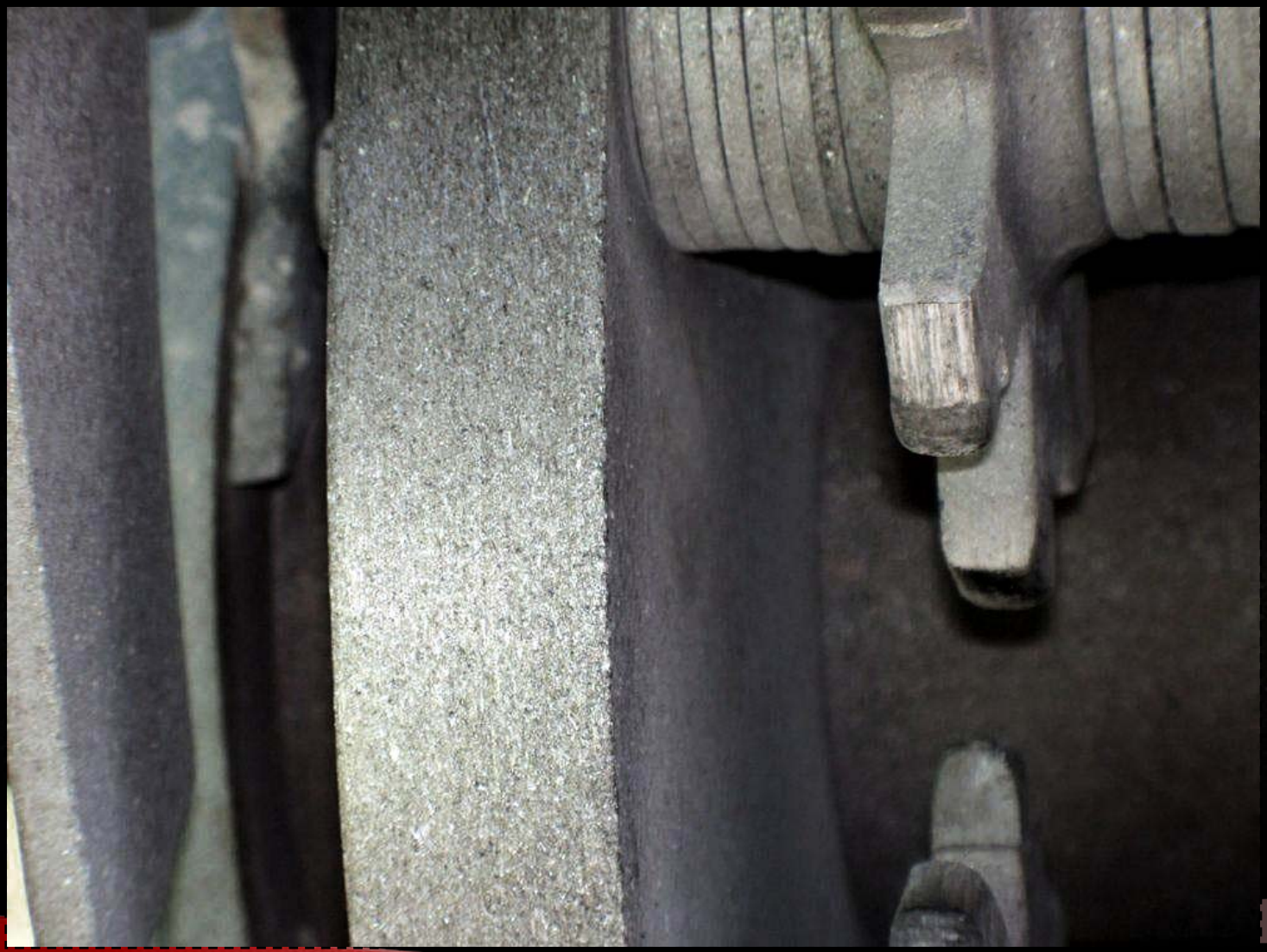

A CLOSEUP SHOWS HOW A POOR ROUT CAN BE ROUNDED AND CHEWED UP
THIS IS NOT GOOD FOR LONG TERM ADHESION

- SOME ROUTS ARE QUITE NARROW
- THIS DEPENDS ON THE OWNER'S REQUIREMENTS

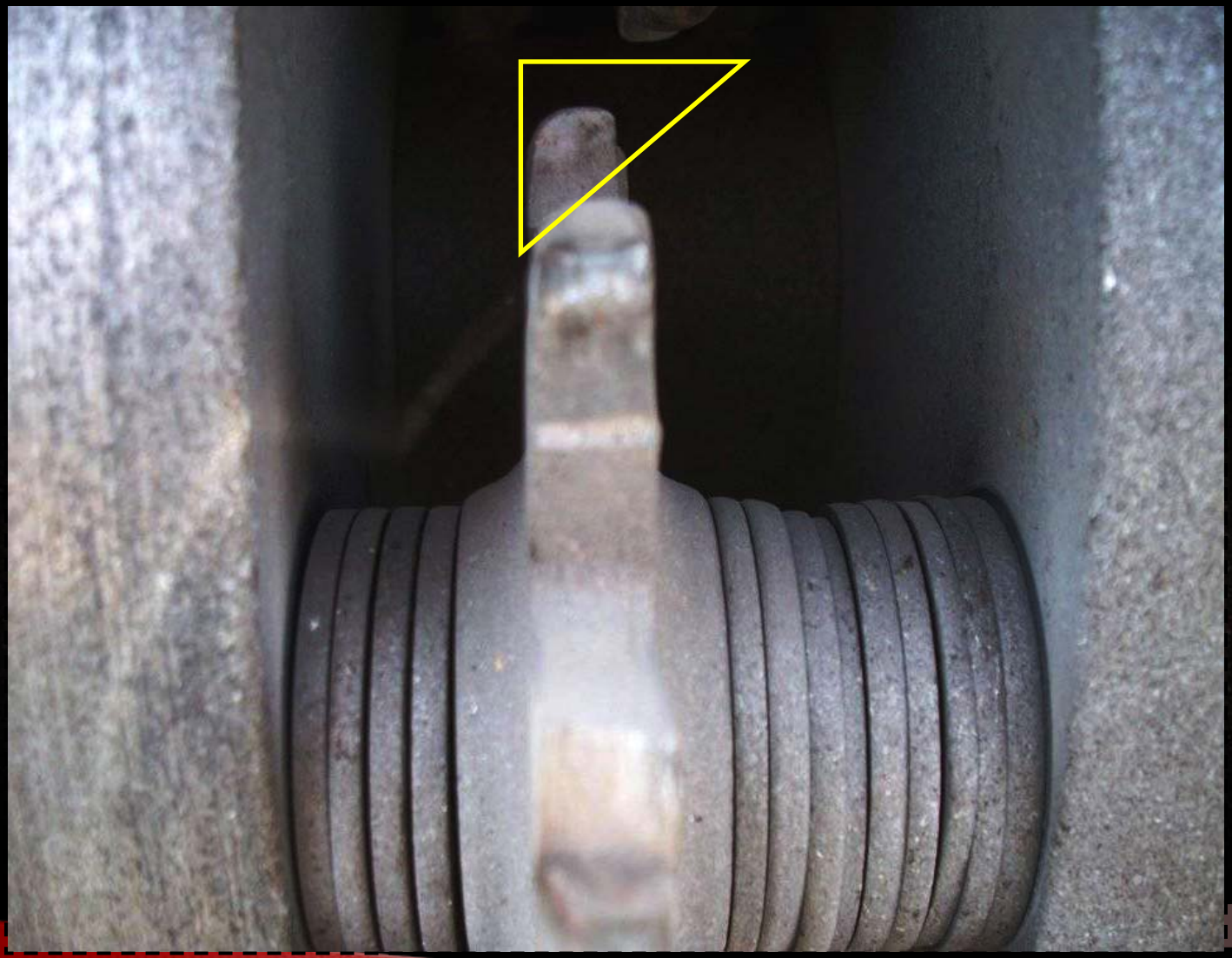
- ROUTING WIDTH CAN BE ADJUSTED USING SPACERS
- KEEP ROUTER BLADES SQUARE AND TIGHT



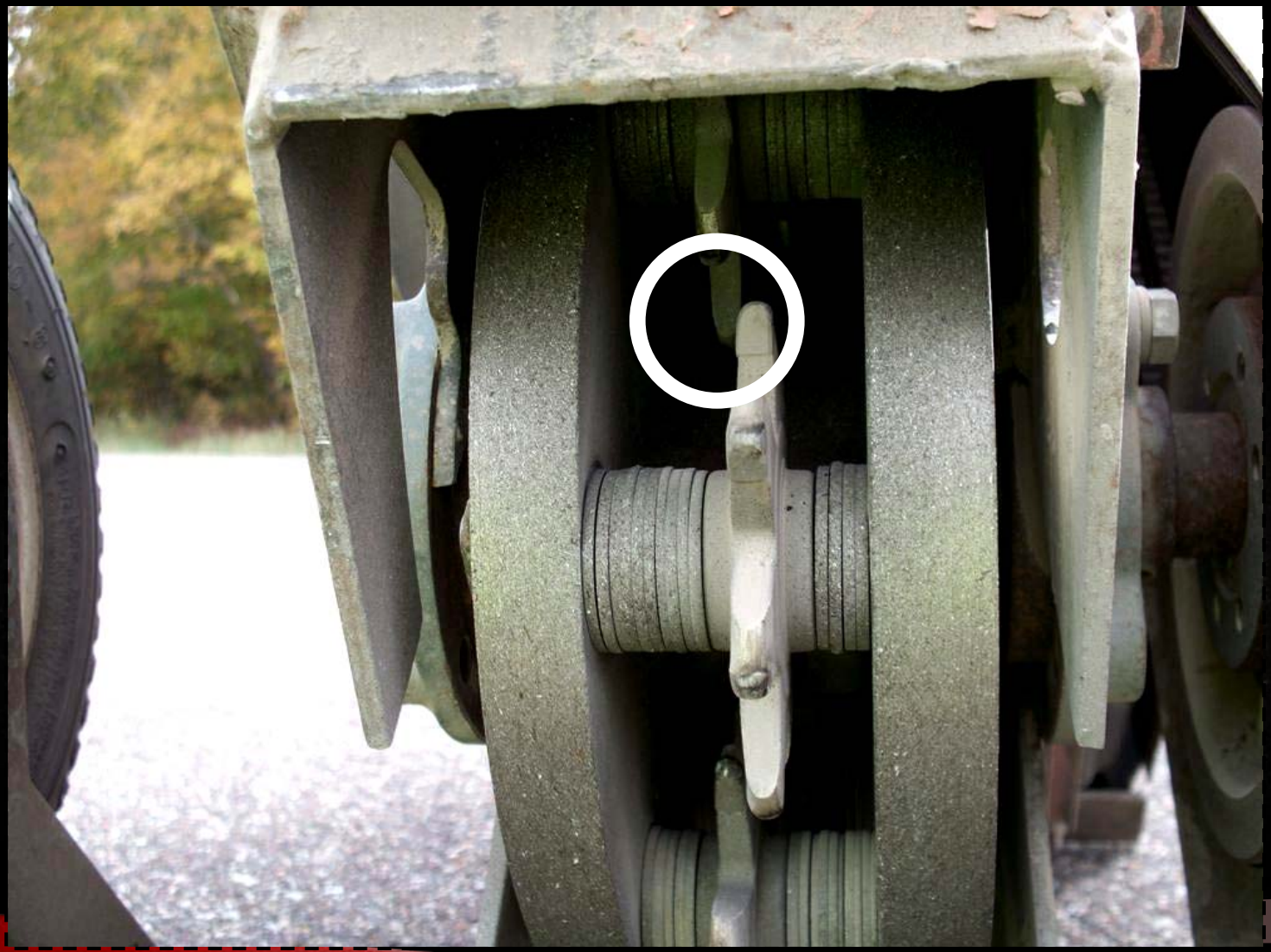
FREQUENTLY CHANGE WORN SPACERS AND PINS. THE MORE YOU SQUARE UP, THE LONGER THE BLADES LAST AND THE SMOOTHER THE EDGE.
THIS ALSO SAVES ON THE VIBRATION YOU PUT YOUR BODY THROUGH



- NEW CUTTER IN EARLY STAGES OF WEAR



THIS BLADE IS ROUNDED AND NEEDS TO BE REVERSED



- THIS ROUTER HAS ROUNDED EDGES ON THE INSIDE AND SHOWS HOW THEY WERE ROTATED TO PROVIDE A SQUARE OUTSIDE CUTTING EDGE

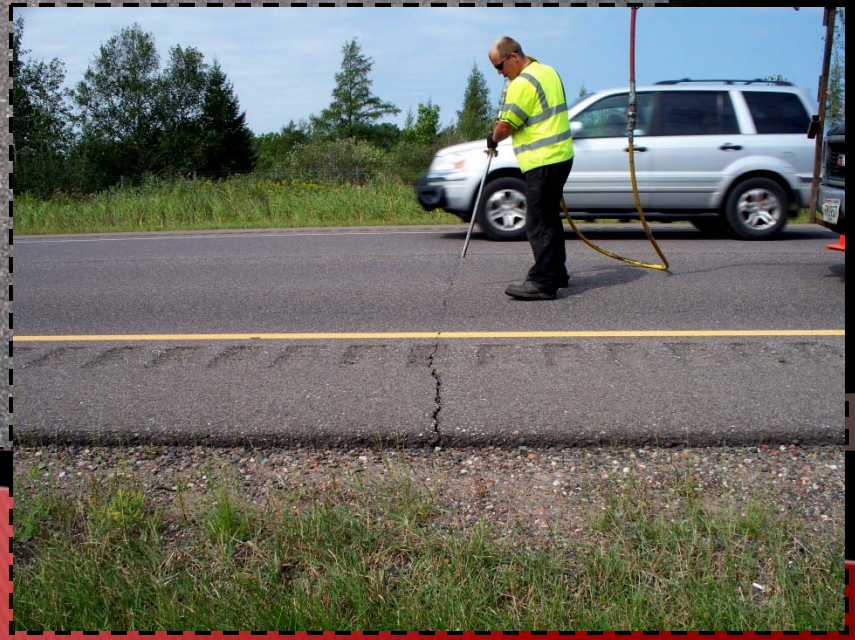
Proper Equipment - Cleaning

Compressed Air

- THE CRACK NEEDS TO BE CLEAN AND DRY
- SOMETIMES TWO PASSES ARE NEEDED TO CLEAN BOTH SIDES OF THE JOINT

THE COMPRESSED HIGH PRESSURE AIR CLEANS THE CRACK OF DUST AND DEBRIS

- THE GOAL IS TO KEEP THE DEBRIS FROM THE TRAVELING PUBLIC



- Vacuuming is a alternative to blowing out cracks. This will contain dust and be PMIO compliant.

Cleaning Methods

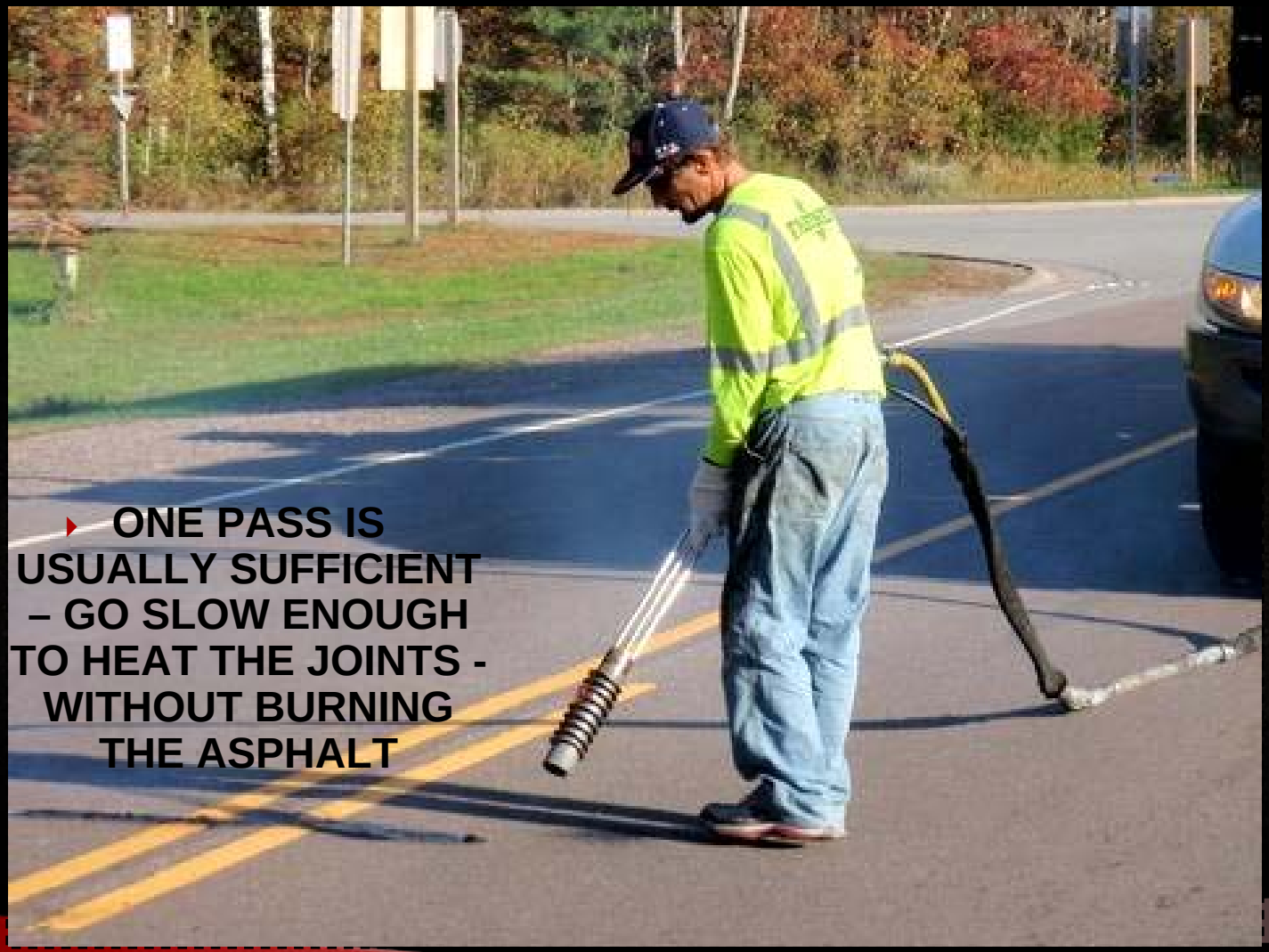
HOT-AIR LANCE

Hot Air Lances should be used to dry slightly moist pavement or heat pavement up to 40°F.

- THIS PAVEMENT IS TOO WET. HOT-AIR LANCE WILL NOT BE EFFECTIVE. MOISTURE WILL RE-ENTER CRACK BEFORE SEALANT IS APPLIED.

- MOST HEAT/AIR LANCES PROVIDE COMPRESSED AIR ALONG WITH THE REQUIRED HEAT TO DRY THE CRACK AND PREP THE EDGES

- SOME APPLICATIONS REQUIRE COMPRESSED AIR ALONG WITH A HEAT LANCE THE HEAT LANCES DRY DAMP CRACKS AND HEAT THE SURFACE OF THE ROUT TO ENHANCE ADHESION OF THE FILLER


ONE PASS IS USUALLY SUFFICIENT – GO SLOW ENOUGH TO HEAT THE JOINTS - WITHOUT BURNING THE ASPHALT

Selecting Sealant

APPLICATIONNOTES

Using LTPPBind to Improve Crack Sealing in Asphalt Concrete Pavements

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The Challenge

Repairing cracks in asphalt concrete pavements is essential to insuring pavement performance and reducing life-cycle maintenance and replacement costs. One of the ways to extend pavement life is to include crack-sealing treatments as part of pavement preventive maintenance practice. The effectiveness of these treatments depends on many factors, including the properties of sealant materials, installation methods, temperature extremes, pavement conditions, traffic levels, and crack movements.

Sealants with different properties are needed in different climates. Warm climates require stiff sealants to resist hot summer temperatures. If the sealant is too soft, it may flow or be pulled from the crack by vehicle tires. Softer, more flexible sealants are more appropriate for cold climates in which pavements are prone to large crack movements, especially during the winter. In any given climate, sealant materials must function over the range of temperatures from summer to winter.

Installation methods also vary by climate. Correct installation ensures that the sealant can conform to crack movements in the pavement. The tendency of pavement cracks to widen or move in the winter increases as the distances between existing cracks and variations in winter and summer temperatures increase. If the installation is not correct, cracking or debonding may develop as cracks widen in the winter.

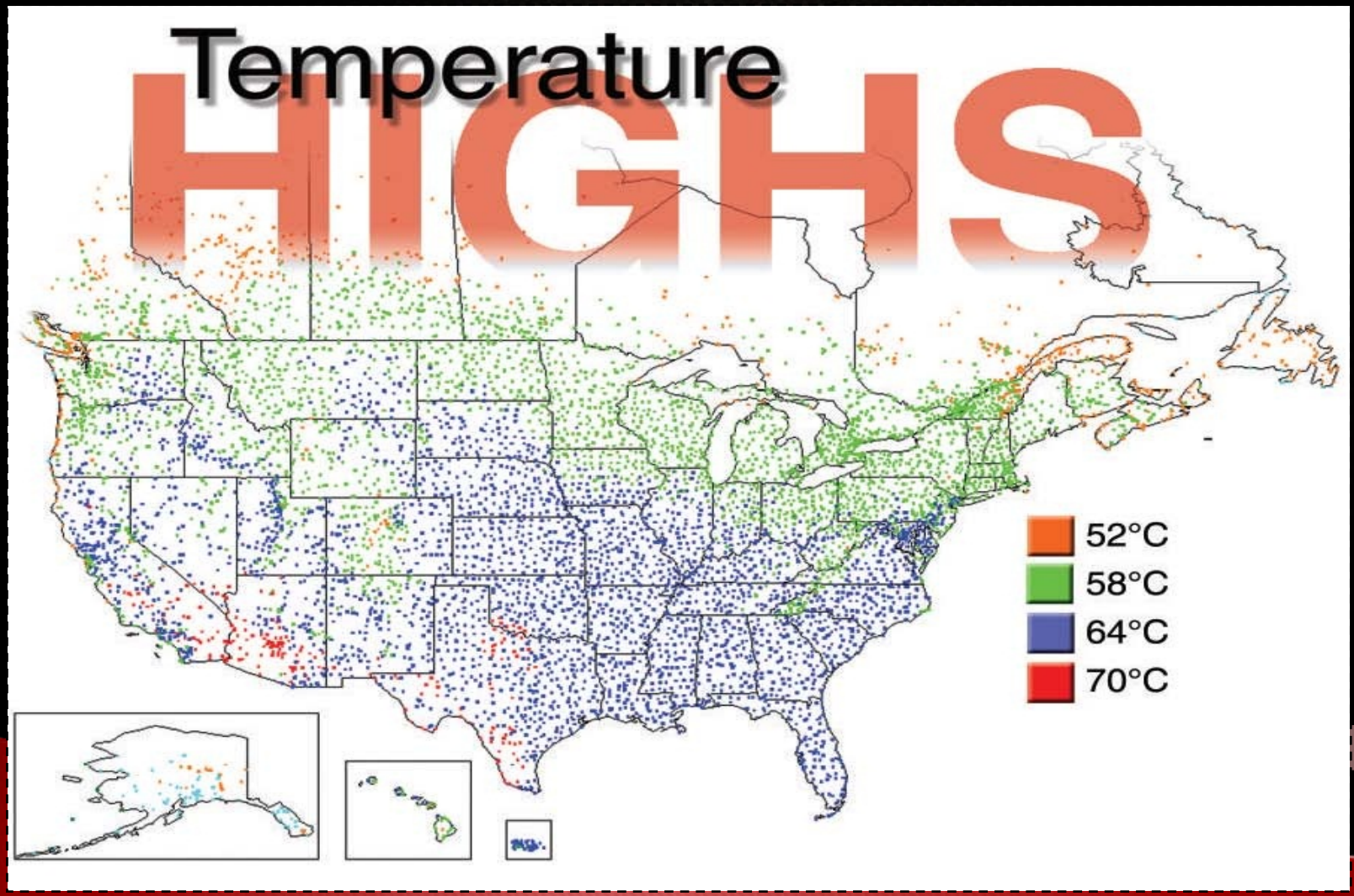
Pavements in good condition that demonstrate transverse thermal cracking, but otherwise have minimal cracking, are best treated with rout and seal procedures. These procedures use very flexible and extensible sealants in widened reservoirs with working cracks that move more than 3 millimeters (mm) throughout the year. For pavements with more extensive cracking, such as longitudinal, block, fatigue, and closely spaced transverse cracks in which crack movement is minimal (less than 3 mm a year), techniques such as crack filling, clean and seal, and overband are appropriate. These techniques use stiffer, more traffic-resistant sealant materials in cracks that generally are not widened.

In the past, highway agencies from across the United States have developed area-specific crack-sealing treatment procedures through a series of test sections, evaluating and investigating sealant types and installation methods by trial and error. Selecting sealant materials for specific climates has been based on approximate descriptions of temperature ranges in hot, moderate, or cold climates, and with some general air temperature highs and lows.

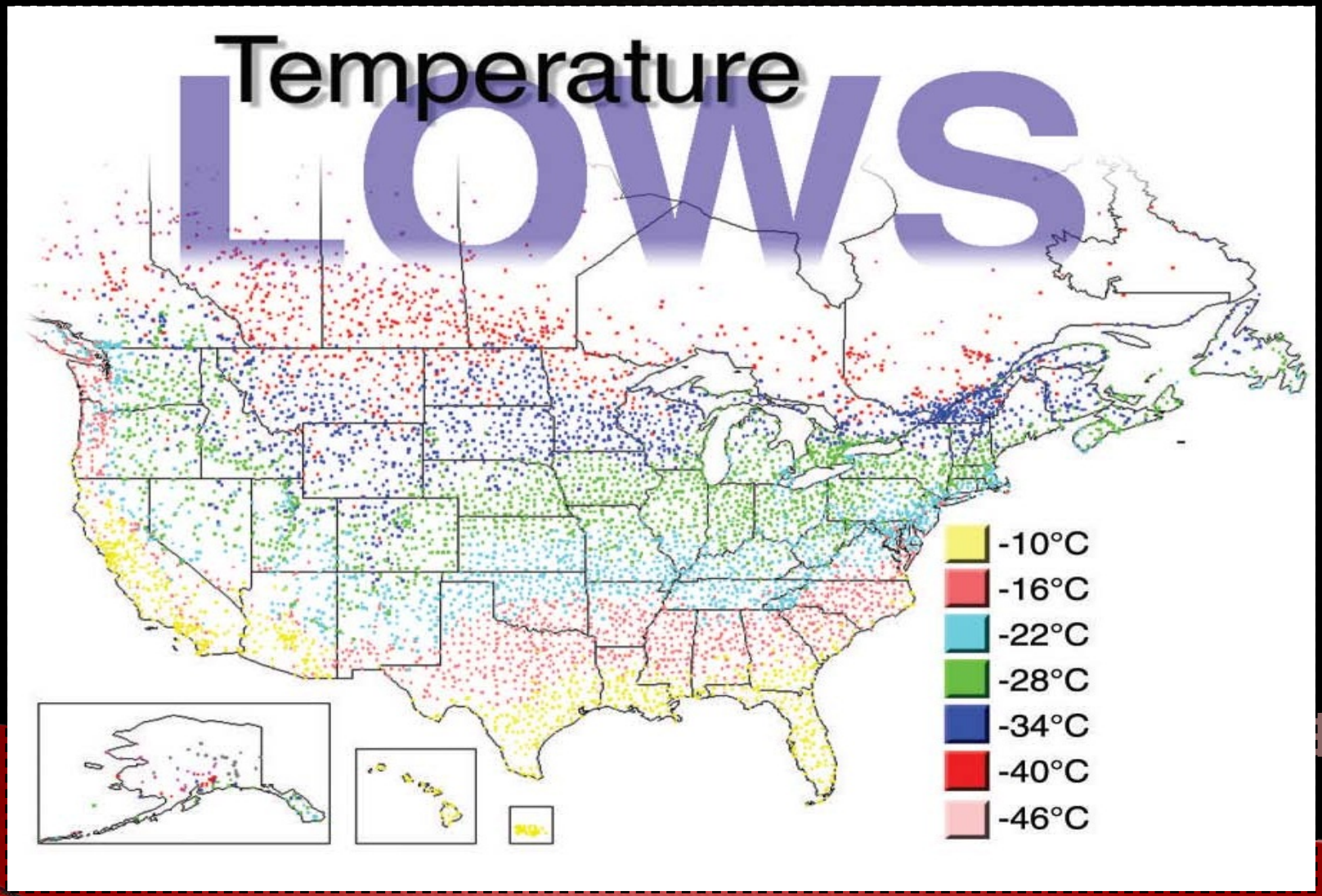
U.S. Department of Transportation
Federal Highway Administration

- Crack sealants and crack fillers need to remain functional over the range of anticipated pavement temperatures.
- Determine temperature ranges with LTPPBind
  - www.tfhrc.gov/pavement/ltpp/reports/03080/
  - www.tfhrc.gov/pavement/ltpp/ppt/bind.ppt
  - www.fhwa.dot.gov/pavement/ltpp/bind/dwnload

Selecting Sealant



Selecting Sealant



Material Selection

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PRODUCT DATA SHEET

ROADSAVER 211

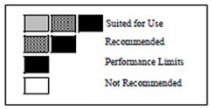
PART NO. 34211

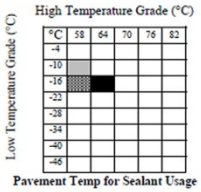
JANUARY 2008

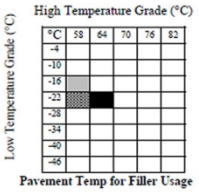
READ BEFORE USING THIS PRODUCT

GENERAL Crafco RoadSaver 211 is a hot-applied asphalt based product which is used to seal and fill cracks and joints in asphalt or portland cement concrete pavements in moderate climates. RoadSaver 211 is supplied in solid form which when melted and properly applied forms an adhesive and flexible compound that resists cracking in the winter and is resistant to flow at summer temperatures. RoadSaver 211 is used in highway, street, and airfield pavements and is applied to pavement cracks and joints using either pressure feed melter applicators or pour pots. At application temperature RoadSaver 211 is a free flowing, self-leveling product. Roadsaver 211 has been an excellent performing quality Crafco product for 25 years. VOC = 0 g/l.

USAGE GUIDELINES RoadSaver 211 pavement temperature performance limits are 64-16 for crack sealing and 64-22 for crack filling. Usage recommendations are shown in Crafco pavement temperature grade charts shown at the right. Refer to Crafco Product Selection Procedures to determine sealant or filler use and pavement temperature grades.







SPECIFICATION CONFORMANCE RoadSaver 211 meets all requirements of ASTM D6690 (AASHTO M324), Type I, "Joint and Crack Sealants, Hot-applied, for Concrete and Asphalt Pavements", (formerly ASTM D1190, AASHTO M173) and Federal Specification SS-S-164. Specifications are as follows:

Test	ASTM D6690, AASHTO M324 Type I Spec. Limits
Cone Penetration	90 max.
Flow	5 mm max.
Softening Point	176°F (80°C)
Bond, 0°F (-18°C), 50% ext.	Pass 5 cycles
Asphalt Compatibility	Pass
Minimum Application Temperature	380°F (193°C)
Maximum Heating Temperature	400°F (204°C)

INSTALLATION The unit weight of Crafco RoadSaver 211 is 10.7 lbs. per gallon (1.28 kg/L) at 60°F (15.5°C). Prior to use, the user must read and follow Installation Instructions for Hot-Applied RoadSaver, PolyFlex, Parking Lot and Asphalt Rubber Products to verify proper product selection, heating methods, pavement preparation procedures, application geometry, usage precautions and safety procedures. These instructions are provided with each pallet of product.

PACKAGING Packaging consists of individual boxes of product which are palletized into shipping units. Boxes contain a non-adherent film which permits easy removal of the product. Each pallet contains 72 boxes which are stacked in six layers of 12 boxes per layer. The weight of product in each box does not exceed 40 lbs. (18kg) and pallet weights do not exceed 2,880 lbs. (1310kg). Pallets of product are weighed and product is sold by the net weight of product. Product boxes are manufactured from double wall kraft board producing a minimum bursting test certification of 350 psi (241 N/cm^2) and using water resistant adhesives. Boxes use tape closure and do not contain any staples. Boxes are labeled with the product name, part number, lot number, specification conformance, application temperatures and safety instructions. Palletized units are protected from the weather using a three mil thick plastic bag, a weather and moisture resistant cap sheet and a minimum of two layers of six month u.v. protected stretch wrap. Pallets are labeled with the product part number, lot number and net weight. Installation Instructions are provided with each pallet in a weather resistant enclosure.

WARRANTY CRAFCO, Inc. warrants that CRAFCO products meet applicable ASTM, AASHTO, Federal or State specifications at time of shipment. Techniques used for the preparation of the cracks and joints prior to sealing or filling are beyond our control as are the use and application of the products; therefore, Crafco shall not be responsible for improperly applied or misused products. Remedies against Crafco, Inc., as agreed to by Crafco, are limited to replacing nonconforming product or refund (full or partial) of purchase price from Crafco, Inc. All claims for breach of this warranty must be made within three (3) months of the date of use or twelve (12) months from the date of delivery by Crafco, Inc. whichever is earlier. There shall be no other warranties expressed or implied. **For optimum performance, follow Crafco recommendations for product installation.**

Selecting Sealant

Flexible Sealant for colder areas

Stiffer Sealants for Warmer/ Hotter areas

Selecting Sealant

Other Factors

Heavy Truck Traffic

Selecting Sealant

Other Factors

Heavy Traffic Volume

Selecting Sealant

Other Factors

Slow moving vehicle traffic and foot traffic

Selecting Sealant

Incorrect Sealant

Too soft for high temperature or traffic loading.

Selecting Sealant

Incorrect Sealant

Too stiff for low temperature

Proper Equipment - Melters

Melter Applicator

- *Oil-jacketed*
- *Thermostatic heat controls*
- *Continuous agitation*
- *Over-heating safety controls*
- *Right size for operation*
- *Many commercial versions…*

**** Construction of HMA Pavements-Asphalt Institute***

Proper Equipment - Melters

Applicator Tips:

Flush Fill

Proper Equipment - Melters

Applicator Tips:

Overband

Applicator Tips:

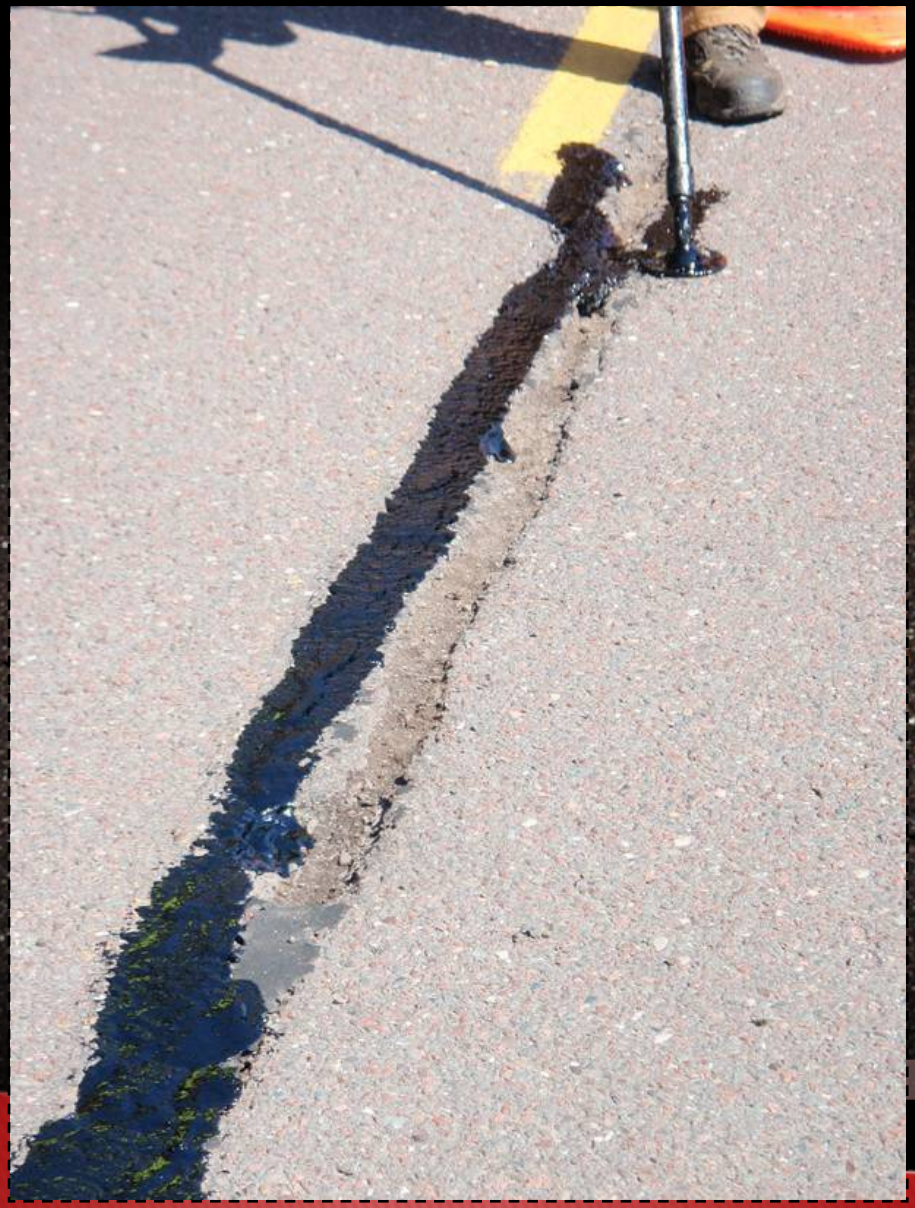
Squeege

- ALL FUNCTIONS CAN BE PERFORMED FROM ONE UNIT

YOU ONLY WANT TO DRIVE OVER THE LANE ONCE!

- SOME JUST REQUIRE TOUCH UP
- OR ARE POSSIBLY JUST BEYOND EFFECTIVE CRACK SEAL APPLICATIONS

- IN TRAFFIC AREAS AND INTERSECTIONS, USE DE-TACK TO KEEP THE FRESH SEALER FROM ADHERING TO CAR TIRES



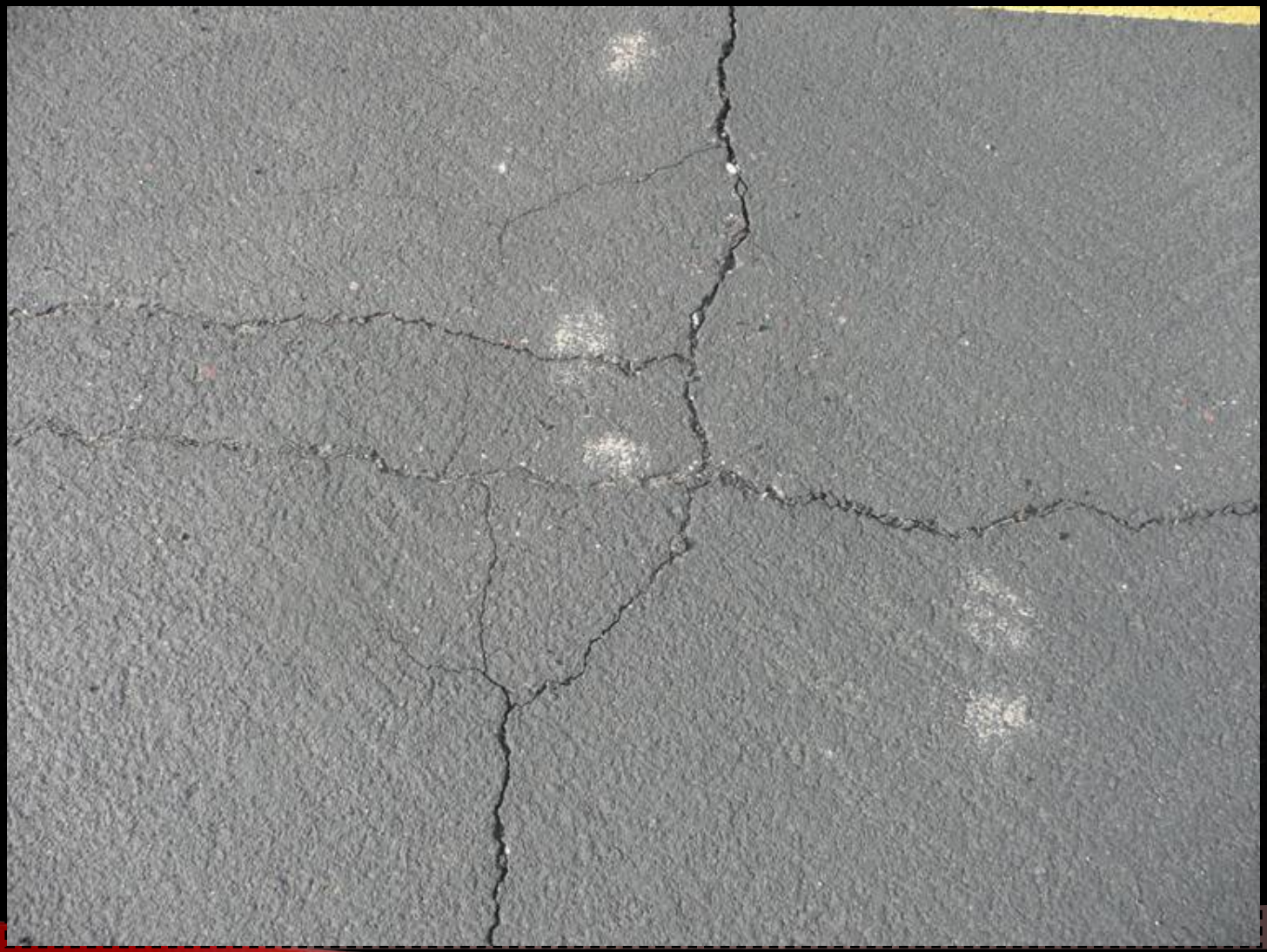
- SOME CRACKS ARE BEYOND THE EFFECTIVENESS OF OVERBAND AND ROUT AND SEAL
- MASTIC WOULD BE A GOOD APPLICATION HERE

- ANOTHER EXAMPLE OF A TIP THAT FILLS AND LEAVES A WIDE OVERBAND
- USUALLY THE TARGE WIDTH IS 1” BEYOND EACH EDGE OF THE CRACK

YOU NEED TO CARRY PROPER FLOW TO THE PAVEMENT EDGE TO ELIMINATE OVERFLOW THAT COULD BE CAUGHT BY SNOWPLOWS

IT CAN BE MESSY

- THIS IS NOT THE PROPER APPLICATION RATE



- SOME CRACK PATTERNS CAN BE CHALLENGING

- ROUTING & CLEANING IS VERY DO-ABLE

- LEAVING AN EFFECTIVE PAVEMENT REPAIR

Fatigue cracking

Same street- slurry seal treatment two years later

Basic Needs Requirements

All Applications

- *Clean*
- *Dry*
- *Intact pavement*
- *Proper temperature*
  - *Pavement > 40°F*
  - *Sealant 400°F*

Crack Treatment Choices?

Pavement Evaluation

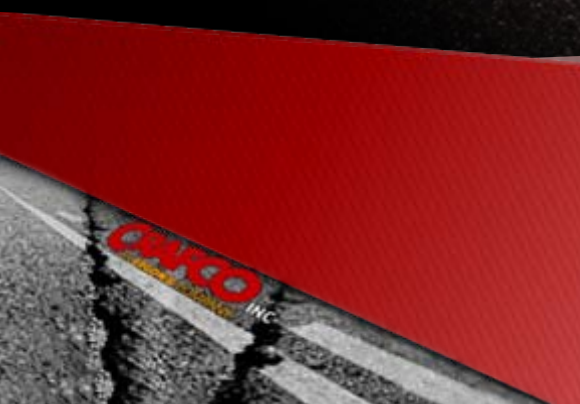
Determine if Crack Sealing or Crack Filling treatment is needed

Select Product

Choose Material for the Treatment, Longevity Desired & Climate

Proper Application

Do the job right the first time



Questions?