

Asphaltic Concrete Pavements “Crack Treatments”

A Pavement Preservation Process

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Crack Treatments

Overview and Objective

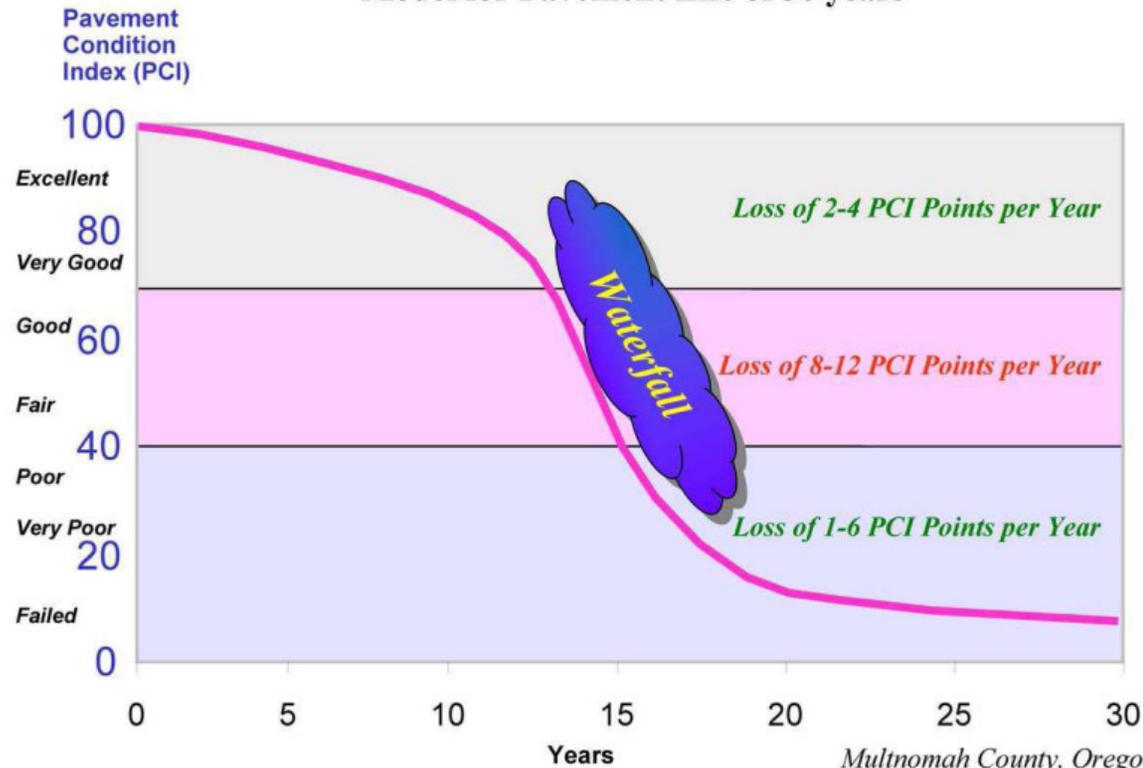
- ❑ Why, when?
- ❑ Pavement evaluation
- ❑ Determine if Crack Sealing (working cracks) or Crack Filling (non-working cracks) treatment is needed
- ❑ Determine pavement temperature (high/low extremes)
- ❑ Select product
- ❑ Proper application/equipment

Why Crack Treatment?

- ❑ Prevents water intrusion into subbase
- ❑ Prevents incompressible intrusion
- ❑ Improves ride quality smoothness
- ❑ Slows down pavement deterioration
- ❑ COST-EFFECTIVE

Cost-effective

PCI Points Lost per Year Model for Pavement Life of 30 years



Cost-effective

An Analogy



Process is continuous
and inevitable

The rate of water flow
increases as condition
decreases

The effort to pump
water increases with
decreasing condition

Why You Should Treat Cracks

- Protects your largest investment
- Pavement failure imminent
- Crack treatments are cost-effective, up to 9 years of (75% effectiveness) performance
- Extends pavement life

Why Crack Treatment?

“Cracks are inevitable, and neglect leads to accelerated cracking and potholing, further reducing pavement serviceability.”
(FHWA-RD-99-147)

Why Crack Treatment?

“With proper and timely application, crack sealing and filling can extend pavement life past the point where the cost-benefit of added pavement life exceeds the cost of conducting the operation.” (FHWA-RD-99-147)

Preservation Philosophy

Pavement preservation offers a ready solution that can put dollars back into the budget.

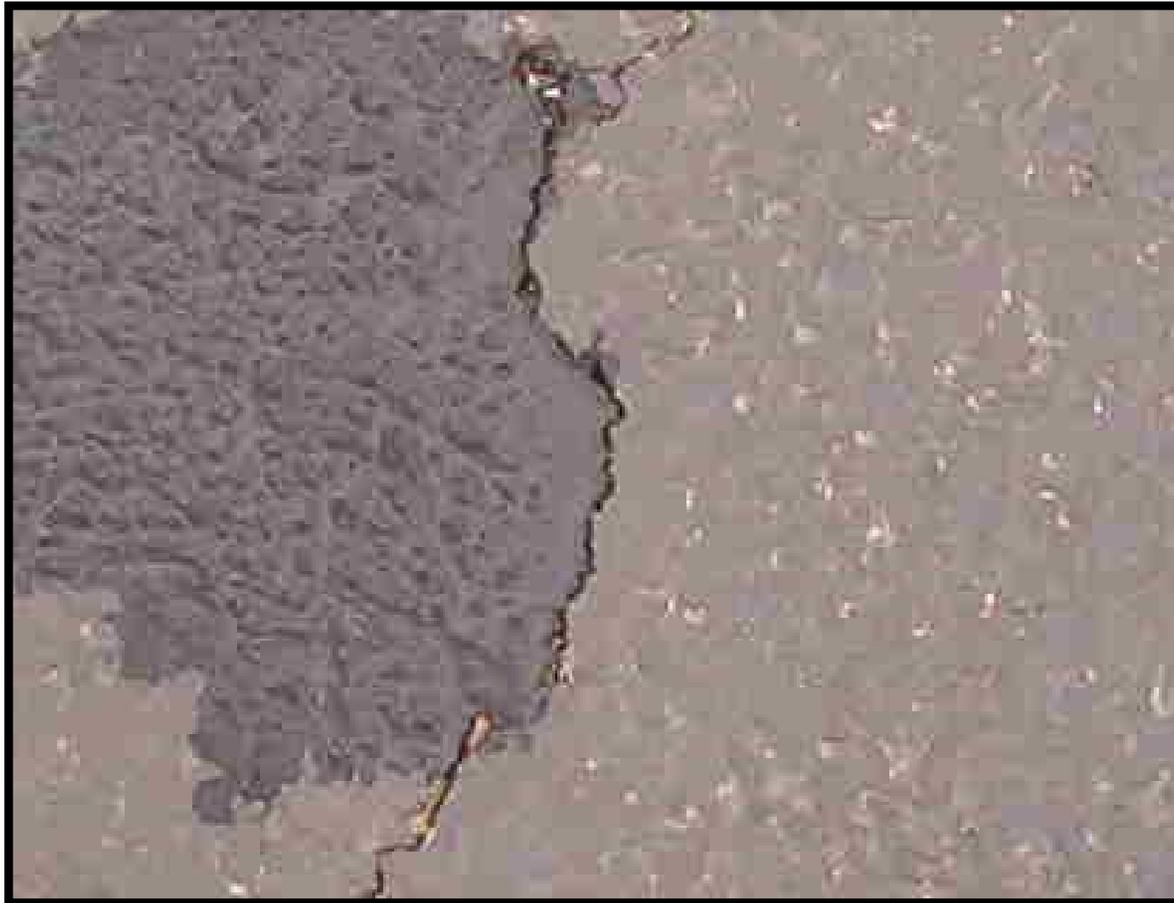
“Preservation teaches us to fix it before it breaks. This philosophy when applied extends the service life and saves dollars.”

Jim Sorensen FHWA

What cracks to treat?

- All cracks soon after they appear... any crack opening will allow moisture penetration into pavement foundation (subbase)
- At minimum all cracks $\geq 1/8''$ ($\geq 3\text{mm}$)

Water intrusion



Water intrusion



Incompressible intrusion



What cracks to treat?

“Don’t forget edge joints”



“Working” vs. “Non-working” cracks

- “Working” (high movement) -
≥ 3mm movement
 - Thermal
- “Non-working” (low or no movement) -
< 3mm movement
 - Longitudinal
 - Block
 - Fatigue

Two different treatments

- 1) “Working” cracks- crack sealing [10% of cracks]- “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)
- 2) “Non-working” cracks- performance crack filling [90% of 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 sealing treatment

Use:

- 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 of 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

Crack type- thermal

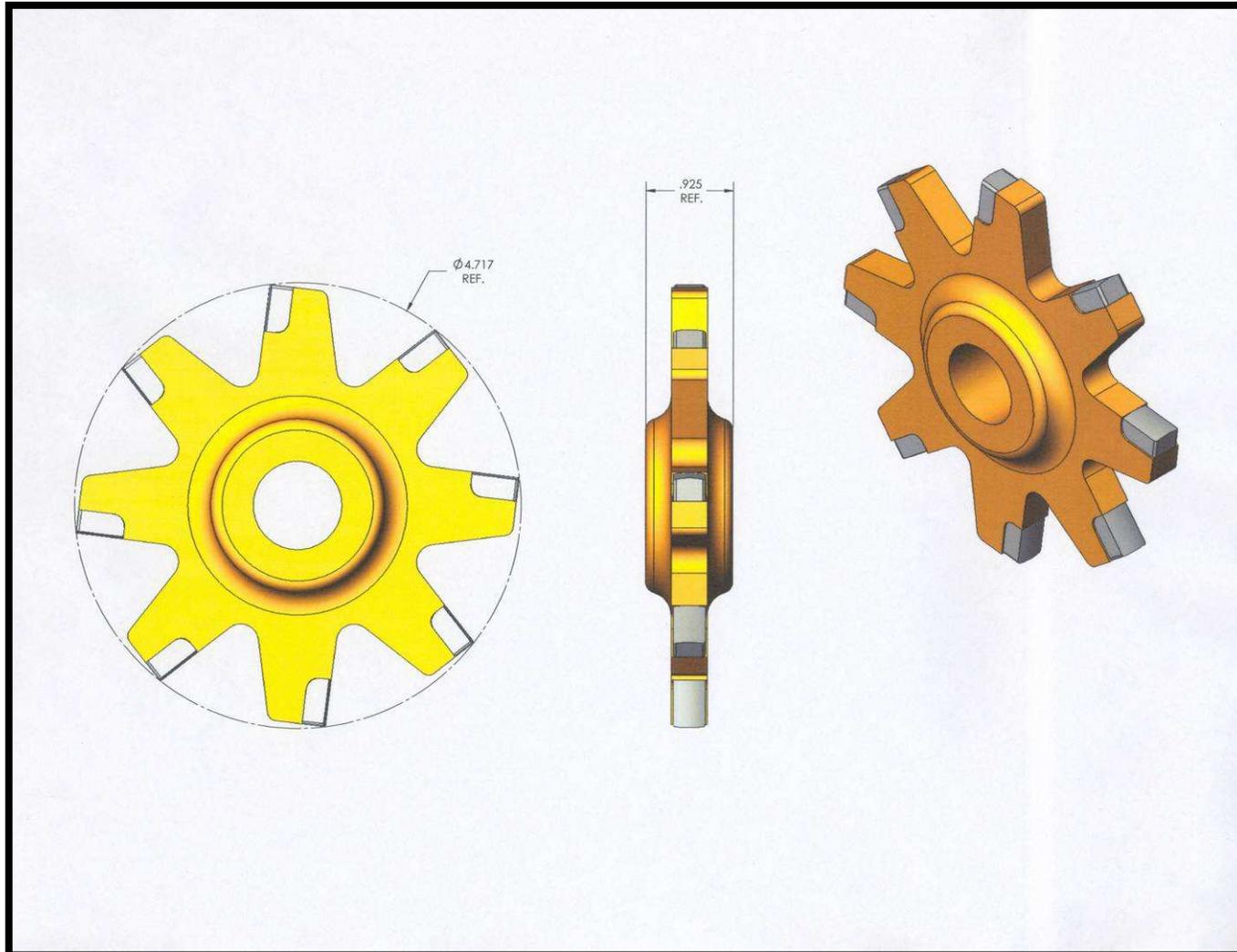


Routing

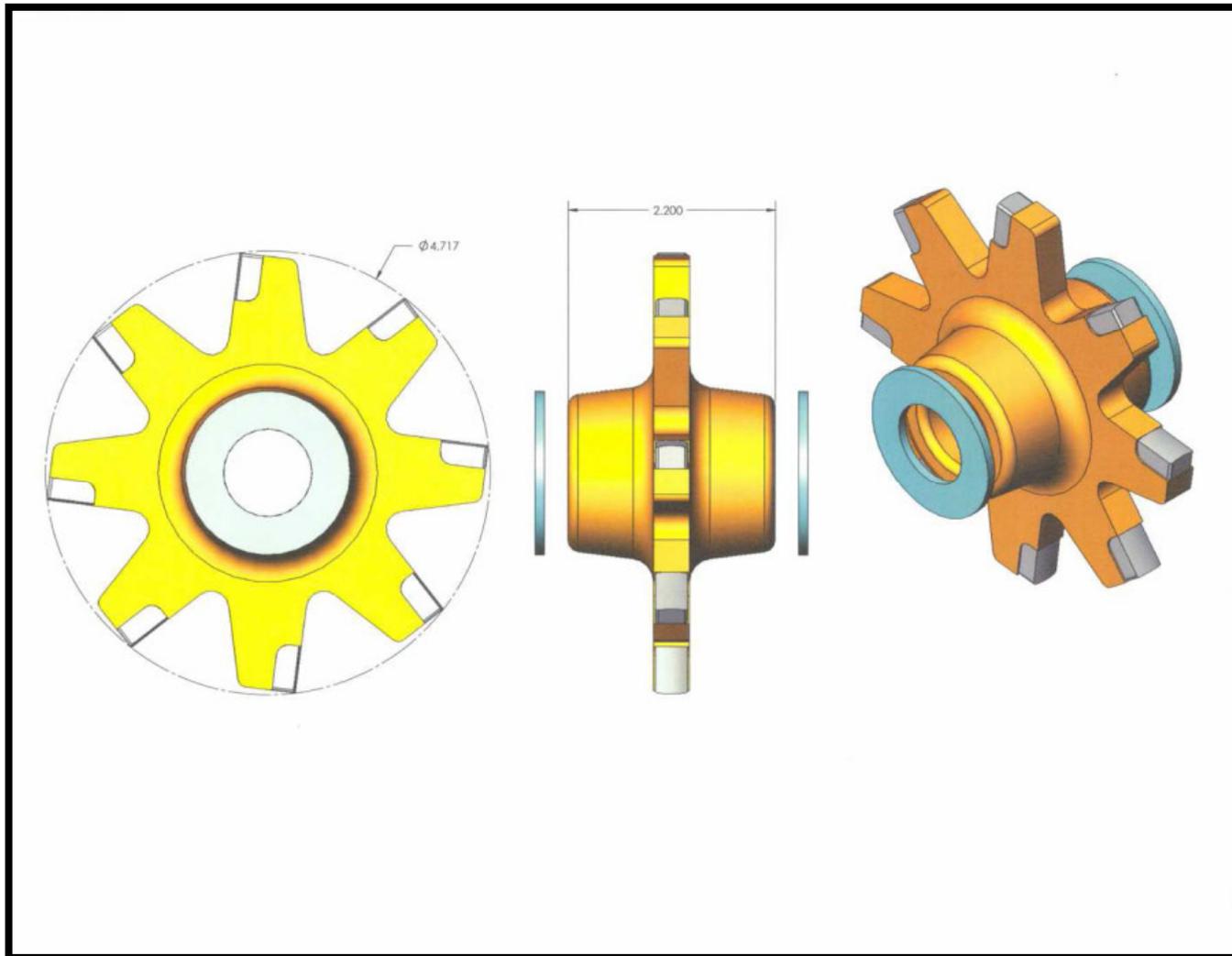


- Rout at least 1/8" (3mm) from each crack face
- Keep centered over crack
- Reduce spalling by using as many cutters as possible

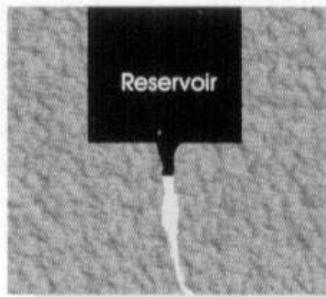
Standard Carbide Cutter



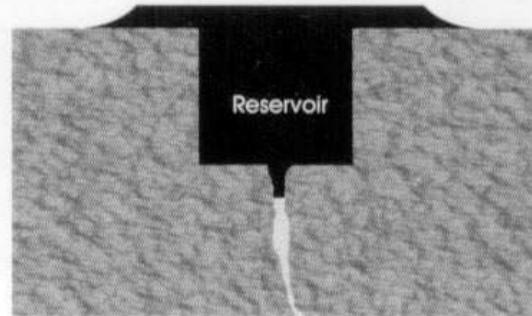
Carbide Cutter, 4 3/4" Wide Hub



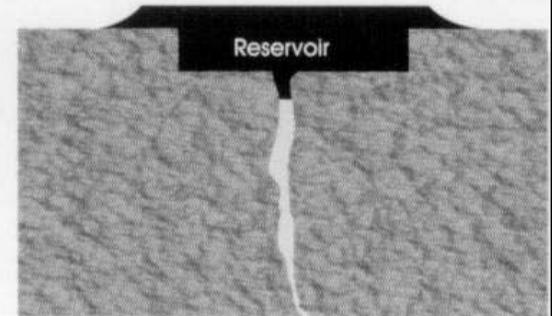
Rout Size Recommendation



Configuration A
Standard Reservoir-and-Flush



Configuration B
Standard Recessed Band-Aid



Configuration C
Shallow Recessed Band-Aid

Crack filling treatment

Use:

- ❑ 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), overband application
- ❑ Pavements in fair to poor condition

Crack type- “longitudinal”

- ❑ 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- longitudinal



Crack type- “fatigue” [alligator]

- ❑ 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

Crack type- fatigue



Same street- slurry seal treatment two years later



Slurry Seal

- Slurry Seal Industry:
- "Crack sealing is absolutely necessary for optimum slurry seal performance"
- All cracks 1/8" (3mm) and larger

Slurry seal

- ❑ Can slurry seal over fresh hot-pour crack sealant the next day when necessary
- ❑ Preferably, when time permits, wait 2-3 months before slurry sealing over crack sealant

Forget it!!



Large Cracks???



Wide Crack [$>1\frac{1}{2}$ "] Treatments

Polymer modified/aggregate materials



Product Selection



Crack sealants and crack fillers need to remain functional over the range of anticipated pavement temperatures.

Determine temperature ranges with
LTPPBind

Cohesive failure:



Adhesive failure:



Types of products: (FHWA-RD-99-147)

- Emulsion and asphalt cement fillers
 - 2 to 4 years performance in unrouted non-working cracks
- Rubber- and fiber-modified asphalt fillers
 - 6 to 8 years performance in unrouted non-working cracks

(performance defined as >75% effectiveness)

Types of products: (FHWA-RD-99-147)

- Rubberized (polymer-modified) asphalt sealants- 5-9 years performance in routed working cracks
 - Rubberized (polymer-modified) asphalt sealants- 2.5-5 years performance in unrouted working cracks
- (performance defined as >75% effectiveness)

Installation Choices

- ❑ Rout or Not
- ❑ Size of rout
- ❑ Cleaning recess
- ❑ Flush
- ❑ Overband

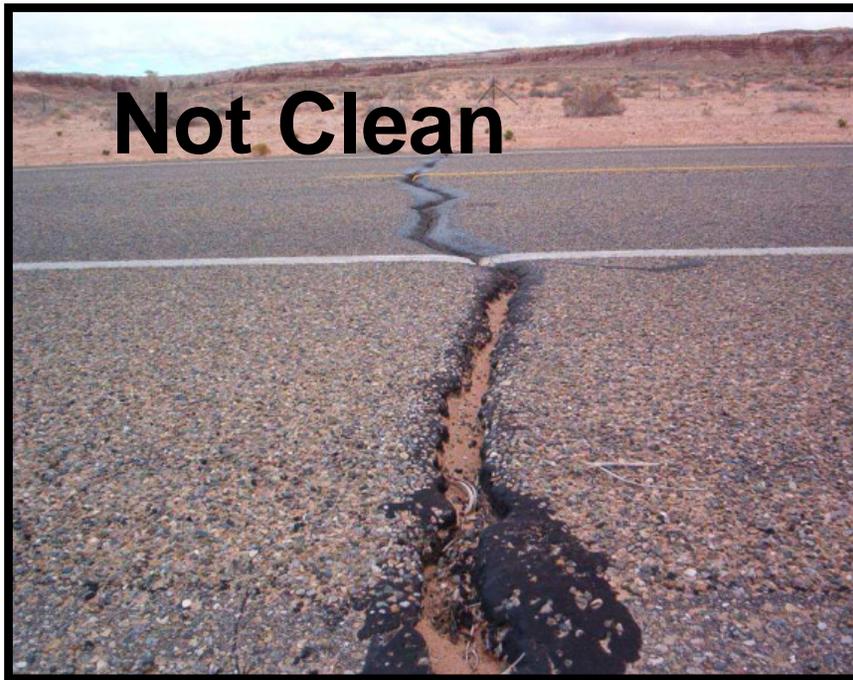
Basic Needs – all installations

- Clean- most important
- Dry
- Intact pavement
- Proper temperature (pavement [40°F] and application [400°F])

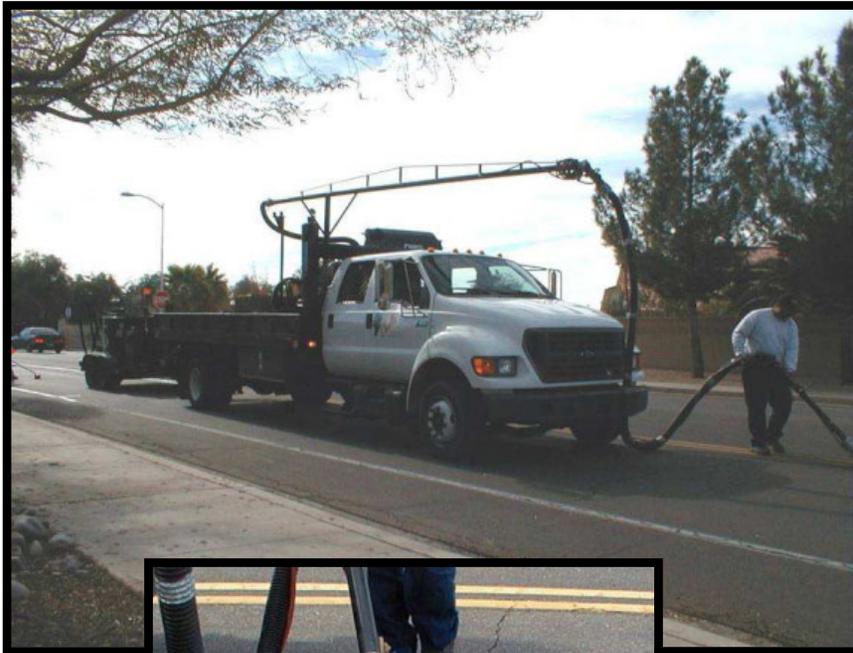
Cleaning Methods

- ❑ Compressed air - sufficient pressure and velocity
- ❑ Vacuum - in combination with compressed air
- ❑ Heat lance - used to warm pavement when needed
- ❑ Routing - cuts new bonding surface

Clean cracks:



Crack Vac



- Reduces dust
- No post job clean up
- Healthier work environment
- Safer work environment
- PM 10 air regulation compliant

Proper Equipment (basics)

- ❑ Oil-jacketed
- ❑ Thermostatic heat controls
- ❑ Continuous agitation
- ❑ Over-heating safety controls
- ❑ Heated hose and wand
- ❑ Right size tank capacity for operation
- ❑ Many commercially versions.....

SuperShot 125DC



EZ Series II, 1000



Sealant Application - Overband

- Maximum 1/8" thick
- Maximum 2" overband on each side of crack
- Overband – best performance (SHRP/FHWA)

Swivel Applicator



Squeegees



Recommend Overband Appearance (Rout/Clean/Fill)



Not recommended



Summary

Crack Treatment Steps

1. Pavement evaluation
2. Proper pavement preparation
3. Determine if Crack Sealing or Crack Filling treatment is needed
4. Determine pavement surface temperature (high/low extremes)
5. Select proper product
6. Proper application

Summary

Why Crack Treatment?

- ❑ Prevents water intrusion into subbase
- ❑ Prevents incompressible intrusion
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- ❑ COST-EFFECTIVE

Questions?



Thank You!



“Bumps” in AC Overlays

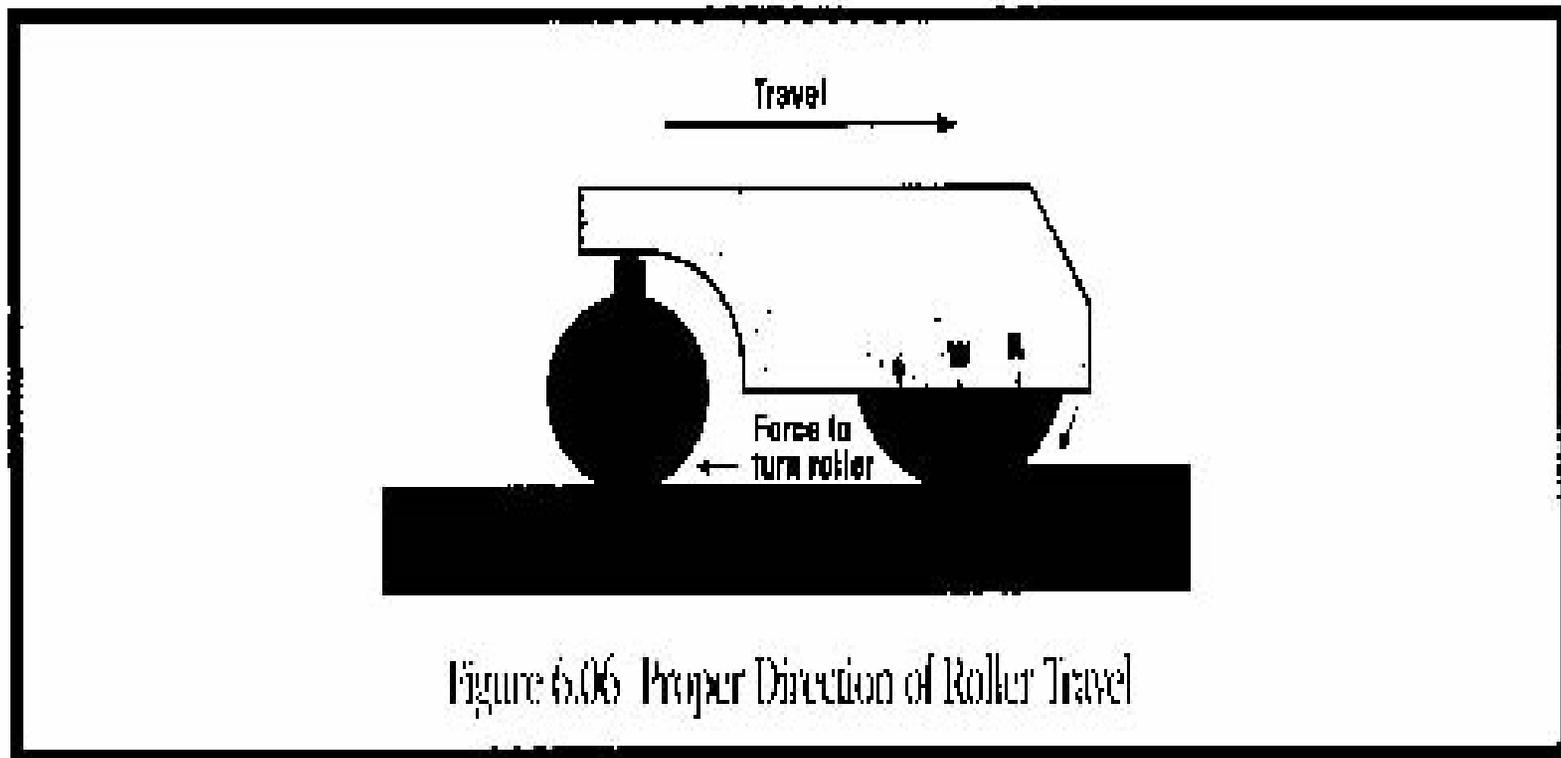


related to
Crack Treatments

Prevent Overlay Bumps

- ❑ Proper crack treatment/product selection
- ❑ Narrow overbands, $\leq 2''$ past crack edge
- ❑ Overband thickness $\leq 1/8''$
- ❑ Minimum 6 months before overlay
- ❑ Reduce horizontal mat movement (shoving/wave):
 - Slower roller speed (3-5 mph maximum)
 - Dual drive rollers or drive wheel leading
 - Polymer modified tack coat, and two lift (scratch course) paving

Dual Drive Rollers

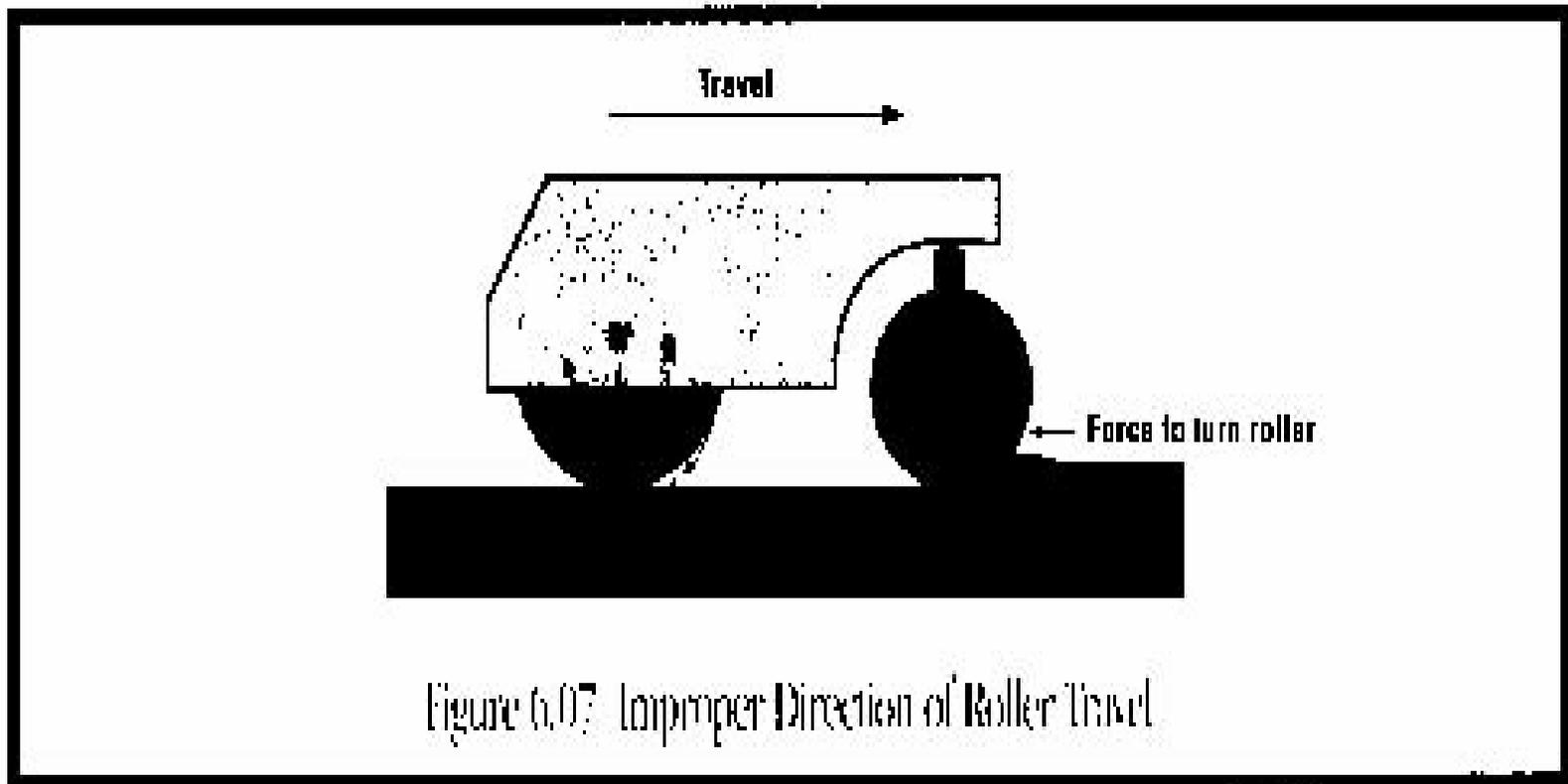


Dual Drive Roller- Advantages

- “For compaction of mix, the desirable movement of all aggregate is vertically downward.”*
- “Drive wheel force tends to move the mixture under the wheel (vertical) rather than push it away (horizontal)”*.
- “Drive wheel larger diameter, flatter contact on mixture surface minimizing horizontal forces”*
- “Drive wheel larger diameter does not sink as deep into mixture, reducing horizontal forces.”*
- Drive wheel heavier...best compaction.”*

* *Construction of HMA Pavements- Asphalt Institute*

Single Drive Roller-tiller (idle) wheel leading



Single Drive Wheel Disadvantages

- “Tiller wheel in front critical mistake, no power has tendency to push (horizontal) mix away causing wave...especially on breakdown pass”*
- “Little or no densification occurs as a result of horizontal movement in mixture... actually can result in reduction of density”*

* *Construction of HMA Pavements- Asphalt Institute*