

Chip Seal Best Practices and New Ideas

Presented by

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Western Emulsions, Inc.

With Special Thanks to The New Mexico
Department of Transportation and The New
Mexico Association of Counties

**Rocky Mountain Pavement Preservation Partnership
Seminar**

October, 28-30 2008
Albuquerque, New Mexico



Purpose of this Presentation

- *Understand the ‘concept’ of chip sealing*
- *Provide some suggested best practices*
- *Cost and Eco efficient alternative practices*
- *Being “in spec” is not enough*



What do I need?

- *Acceptable Weather*
- *Road Selection & Preparation*
- *Asphalt Distributor*
- *Aggregate Spreader*
- *Rolling Operations*
- *Sweeping Operations*
- *Traffic Controls*



What is a Chip Seal?





A Chip Seal is generally defined as a surface treatment in which the pavement is sprayed with asphalt (generally emulsified) and then immediately covered with aggregate and rolled. New Mexico DOT
District Two Chip Seal Crew



Come again?

- *Today's technically advanced chip seals are economical surface treatments designed to protect and prolong the life of pavements. In a single chip seal an asphalt, an asphalt binder is sprayed on the pavement, then immediately covered by a single layer of uniformly sized aggregate. The new chip sealed surface is then rolled to seat the aggregate, broomed, striped and ready for traffic.*



The introduction of polymer-modified asphalt and asphalt emulsions has increased the chip seal's ability to prevent crack reflection and improve stone retention by improving the properties of the asphalt binder. Newer techniques use asphalt emulsion (a mixture of liquid asphalt, surfactant, and water) instead of asphalt. This has been shown to help reduce aggregate loss and reduce cost of installation, but can increase the occurrence of stripping. It reduces emissions of volatile organic compounds (VOCs) due to the lower solvent content

Hidalgo County Road Department Lordsburg, New Mexico



Why Chip Seal?

- *Cost effective surface treatment*
- *Protects underlying pavement*
- *Waterproofs the pavement surface*
- *Seals small cracks and imperfections*
- *Provides a new wearing surface*
- *Restores surface friction*
- *Improves Aesthetics and lane delineation*
- *Extends the service life*
- *Improves Safety*



Equipment Needed to Perform a Chip Seal

- *Asphalt Distributor Truck*
- *Aggregate Distributor*
- *Dump Trucks*
- *Pneumatic Tire Rollers*
- *Brooms*
- *Tags*
- *Traffic Controls*



Asphalt Distributor Truck

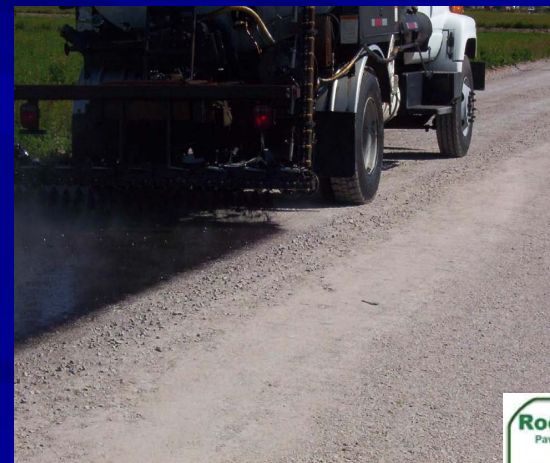
Western Emulsions Tucson, Arizona Terminal



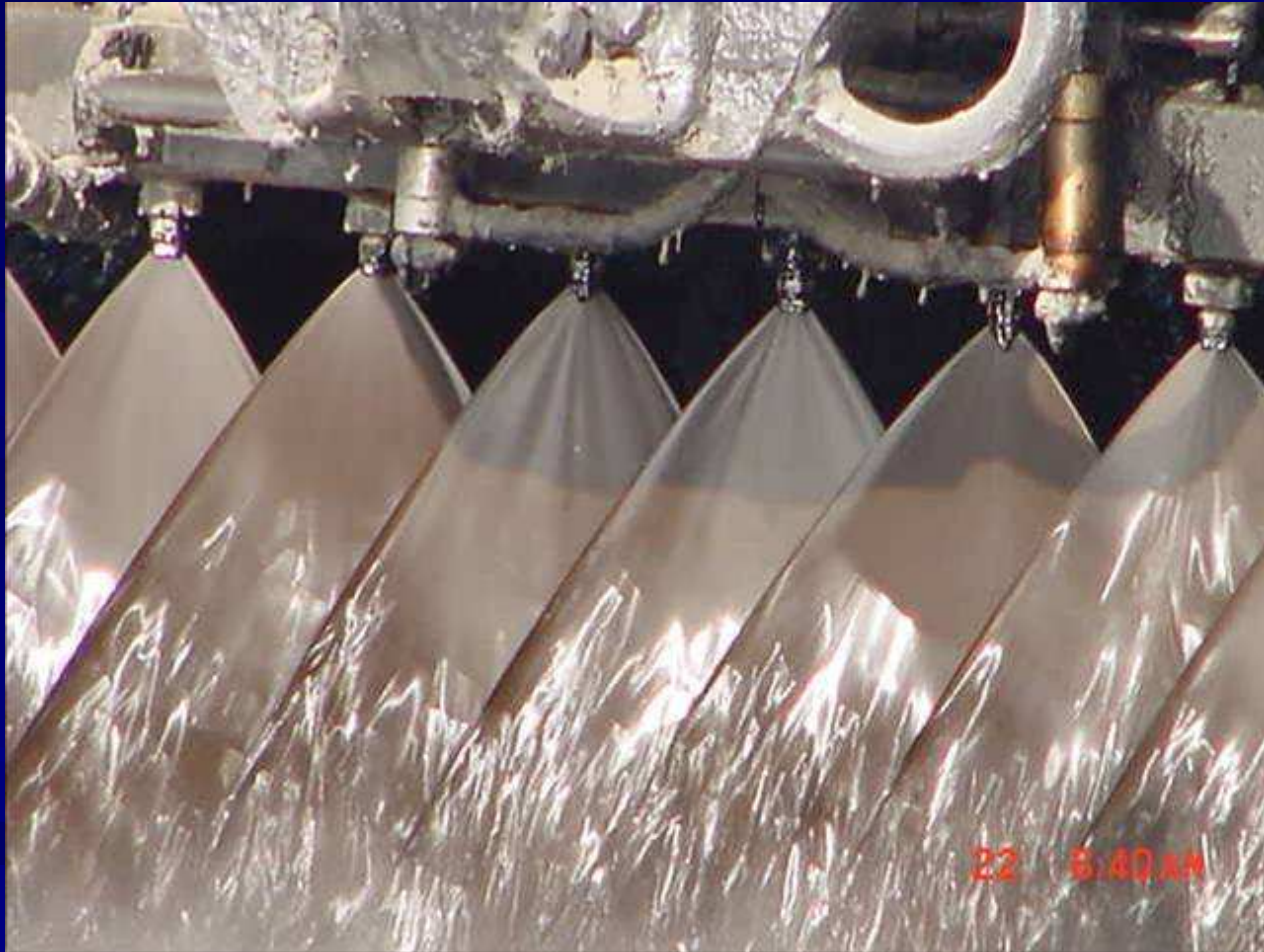
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BearCat CRC spraying emulsion Santa Barbara, California





Proper Tip alignment adjustments and selection is a must



Aggregate Distributor

New Mexico DOT District Two Roswell, New Mexico



Good Coordination between the chip spreader and dump trucks

New Mexico DOT District Two Chip Seal with CHFRS-2P Hondo, New Mexico



Dump Trucks





End Dumps are not necessarily a best practice!

White Sands Missile Range White Sands, New Mexico



Rollers



Kick Brooming a Sand Seal

Bernalillo County Albuquerque, New Mexico



Pick Up Brooms

Artesia, California



Kick Brooming

New Mexico DOT near Carizozo, New Mexico



Ute Lake

Logan, New Mexico





Types of Chip Seals

- Single Course Chip Seal (single pen)
- Double Course Chip Seals (double pen)
- Scrub Seals
- Cape Seals
- Racked-In (sand choke)
- Sandwich Seal
- New Construction



Scrub Seal

PMRE Emulsion Scrub Seal City of Roswell, New Mexico





Fills large cracks



Are Scrub Seals a New Technology?



TEXAS DEPARTMENT OF TRANSPORTATION



Roswell, New Mexico



Specially designed scrub broom fills cracks. The wave of oil is a function of the severity of the distressed pavement.









Who has incorporated Scrub Seals into their preservation tool box?

- *Arizona Department of Transportation*
- *New Mexico Department of Transportation*
- *California Department of Transportation*
- *Nevada Department of Transportation*
- *Missouri Department of Transportation*
- *Tennessee Department of Transportation*
- *Mississippi Department of Transportation*

Arizona Department of Transportation



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ADOT

Casa Grande

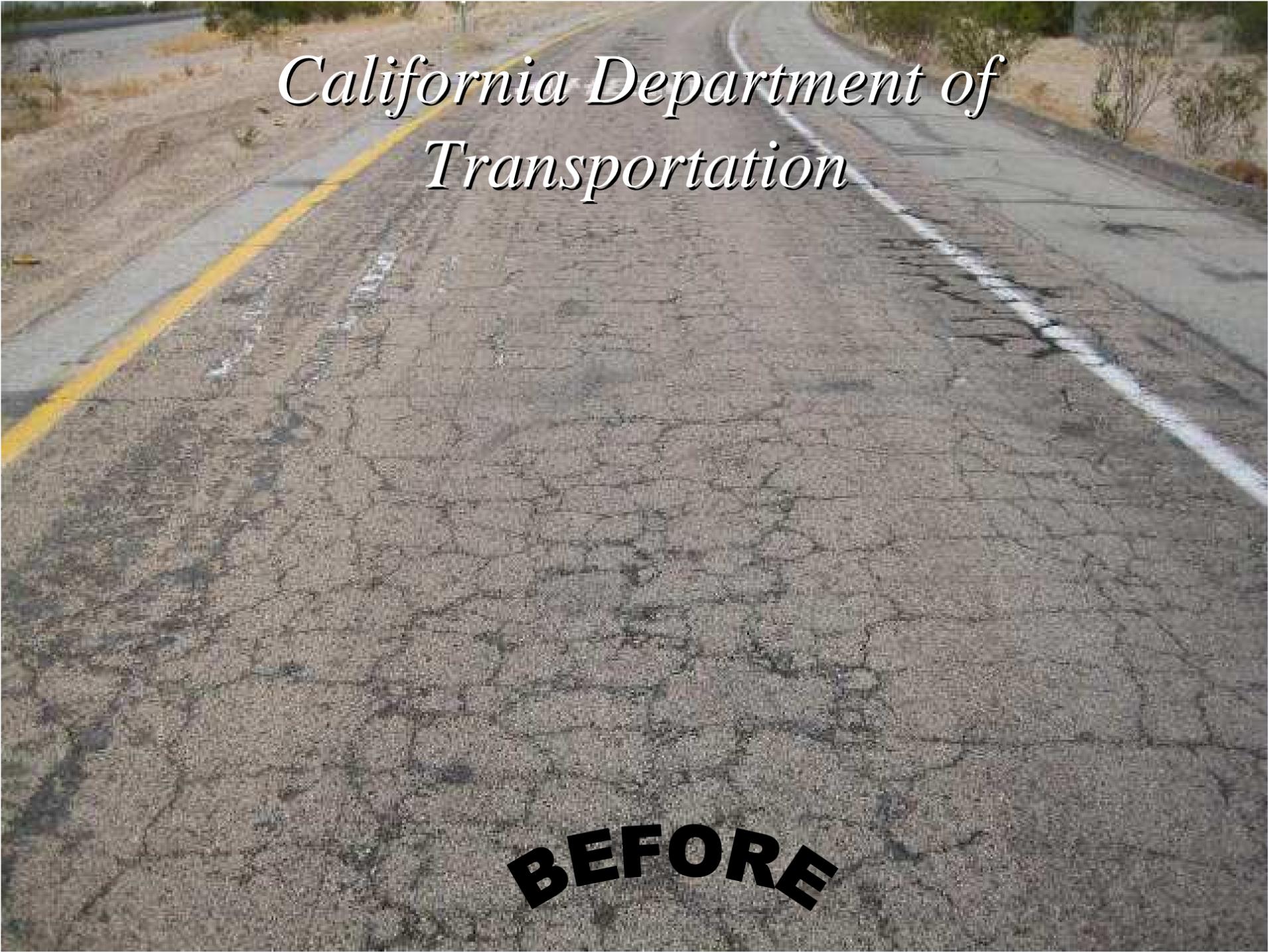


New Mexico DOT



Nevada DOT





*California Department of
Transportation*

BEFORE

*Caltrans performing a Scrub Seal
using PASS emulsion*



**GETTING STARTED
.32 RATE**

Finished Scrub Seal



Mississippi DOT



Tennessee DOT earlier this month



A quick stop at the Jack Daniels distillery was in order..



Cape Seal

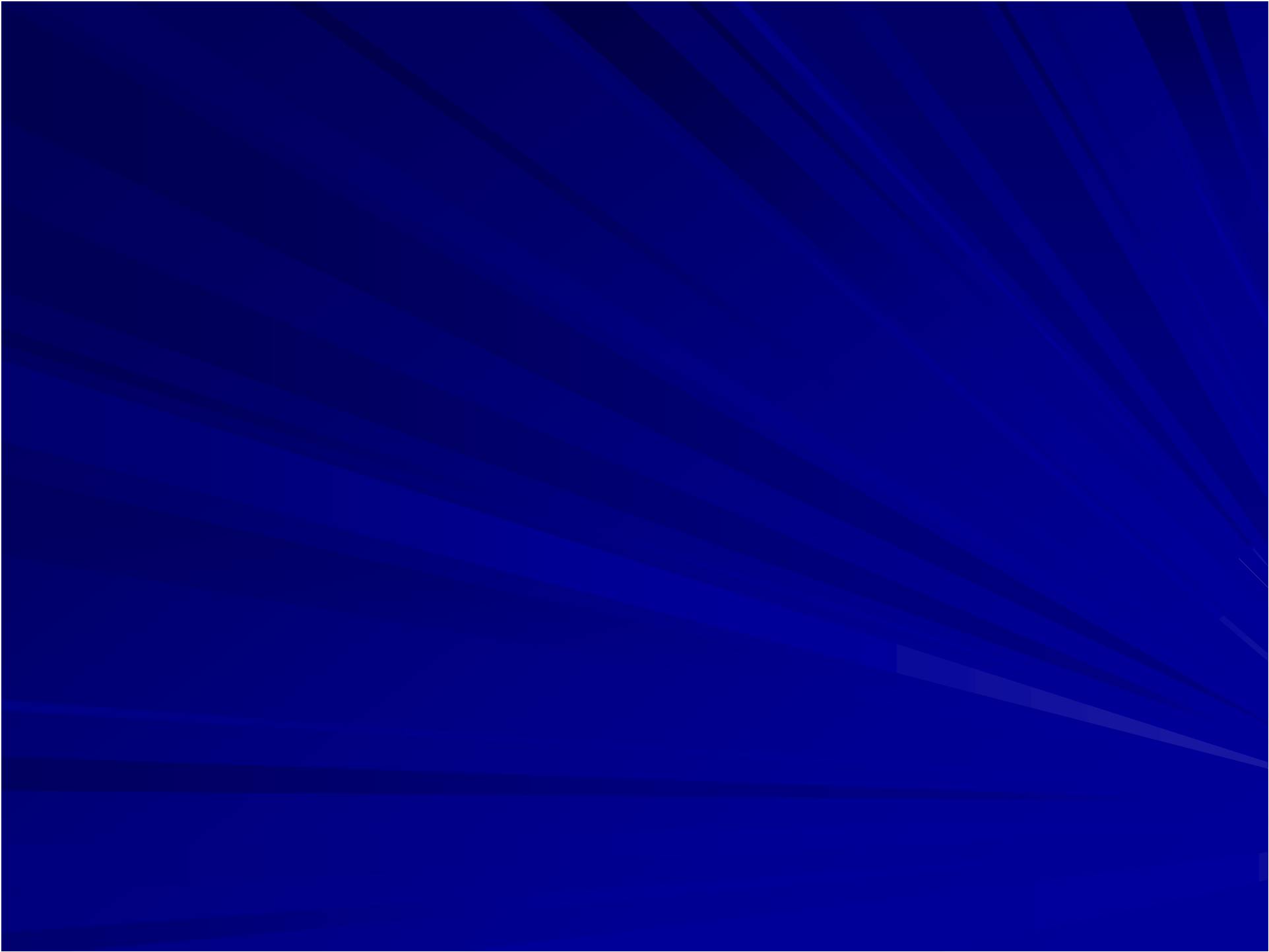


What's a Cape Seal?

- *Made Popular in Cape Town, South Africa*
- *Generally a chip seal or scrub seal is applied to a distressed road immediately followed by a subsequent application of slurry or micro-surfacing.*
- *The chip seal addresses the cracks and acts as a more flexible stress absorbing membrane while the slurry application provides a smooth and black wearing course. With the ever increasing price of reconstruction more agencies are turning to cape seal as cost effective alternatives to full reconstruction.*

Any Service Life Left?





Cape Seal Type 2 PM Slurry applied of PMRE Scrub Seal

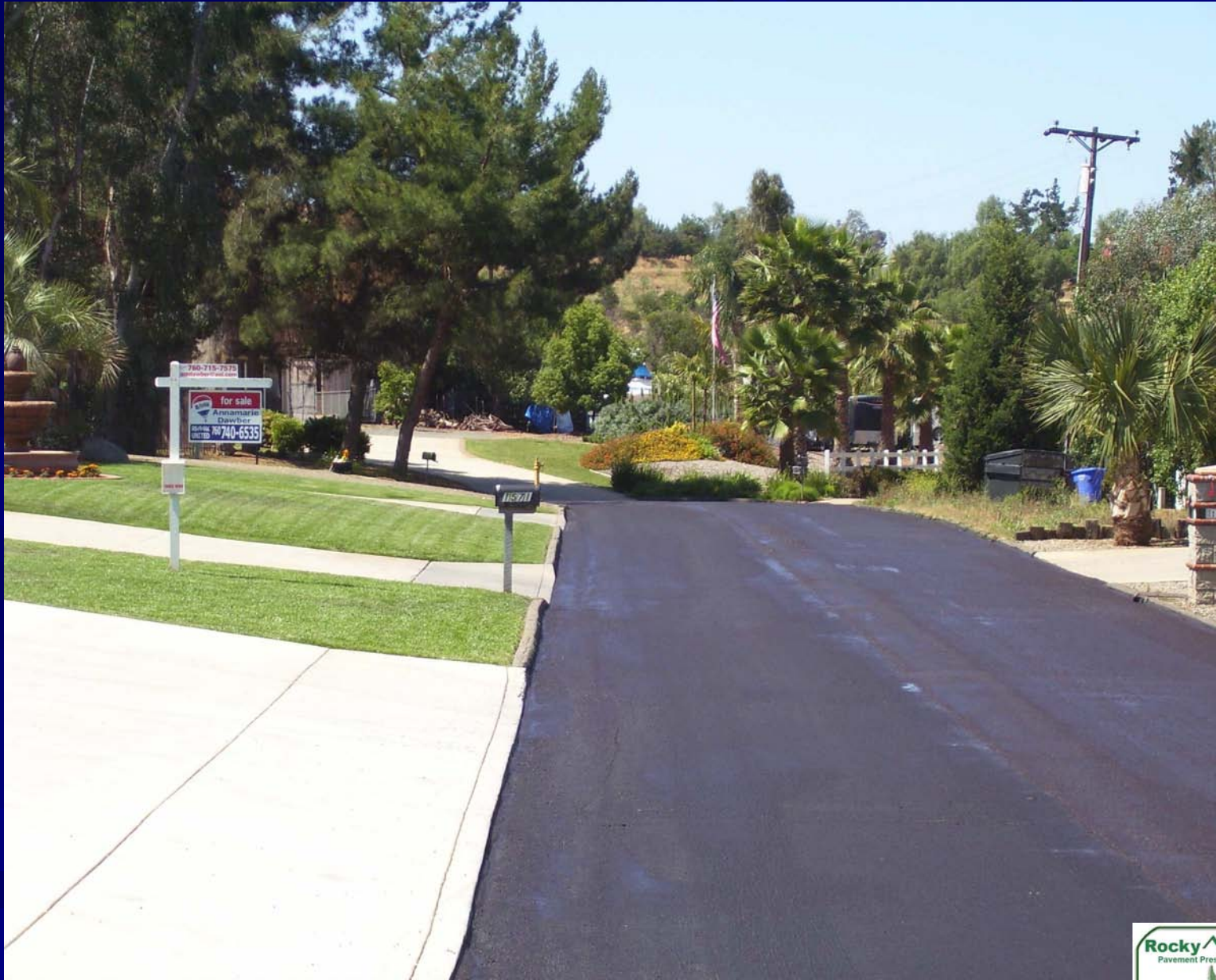
Mcgaffey Blvd. Roswell, New Mexico











New Construction

Base Preparation Chaves County Road Department Roswell, New Mexico



Roosevelt County New Mexico









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New Road Construction
Village of Capitan New Mexico



*Industry driving more and more solvent
Free AEP. DOTs showing trends on eco
sensitivity*

- *Holly Asphalts PEP VOC Free Prime*
- *Blacklidge Emulsions EP-1*
- *Western Emulsions PASS*

Solvent Free Prime Coat

Dona Ana County Las Cruces, New Mexico



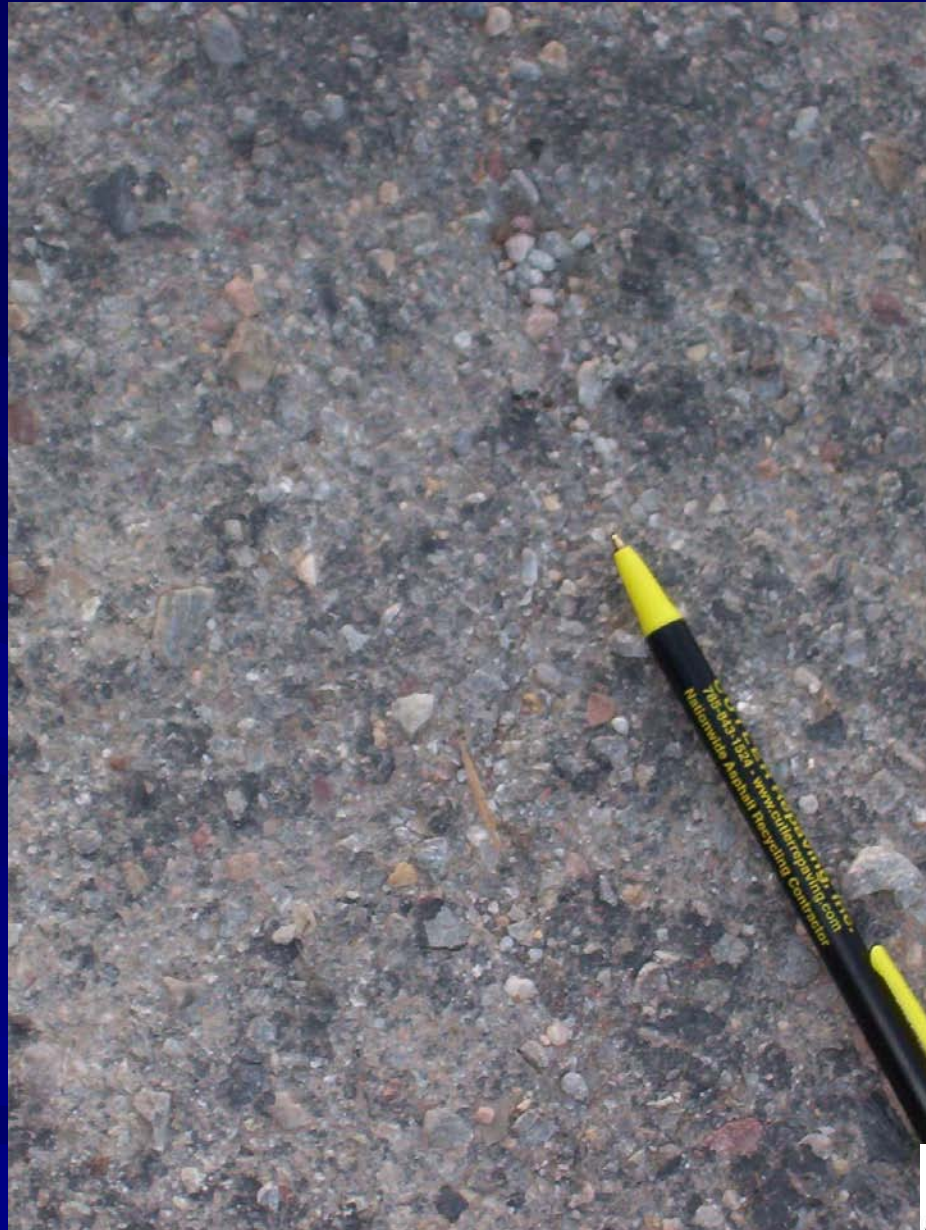
Sand Seals

Bernalillo County Albuquerque, New Mexico



Screening or Crusher Fines





Surface Texture - Medium



McKinley County

Gallup, New Mexico



Western Emulsions, Inc.

McKinley County



Chip Seal - Medium



What are some of the things that can be a “trick” on your project, and cause the end result no treat?...

- *Road Selection/Road Preparation*
- *Materials*
- *Weather*
- *Equipment*
- *Construction Methods*
- *Traffic Control*

*Everything on your project
was “in spec”...*

So what did you get?



Something Good ...



Something Great.....



Or....



Something



or, worse yet.....

A bloody nightmare of a mess



Or Even More Pathetic

University of Arizona Wildcats 28



University of New Mexico Lobos 36



*Road Selection
and
Road Preparation*

Road Selection



*Pick the Right Road for the Right Treatment
at the Right Time*

Road Selection

To get a successful chip seal, select roads that:

- *have a sound structural section*
- *are in no need of repair*

Isolated digouts and crack sealing should be completed before the chip seal is applied (lead time varies depending on prep method).

Road Selection



If you think this road is a good candidate for chip sealing....



..... You just might be a red neck

Road Preparation



*Prevent water from
entering roadway*



Protect utilities

Road Preparation



Repair Pot Holes



*Remove Existing Pavement
Markers and Place
Temporary Pavement
Markers*

Road Preparation



*Sweep Roadway
Prior to Starting
Work.*

*Make Sure it's Clean
and Dry*

Material Selection



- *Materials do not perform the same everywhere*
- *Use/apply materials to fit field conditions*

Out of necessity come innovation

- *5/16" RAP Chips*
- *Cinder Chips*
- *Cinder Fines*
- *Crusher Fines*
- *Slag*
- *Light weight aggregates*

Cinders & RAP





Polymer Modified Emulsions

■ Anionic (- charge)

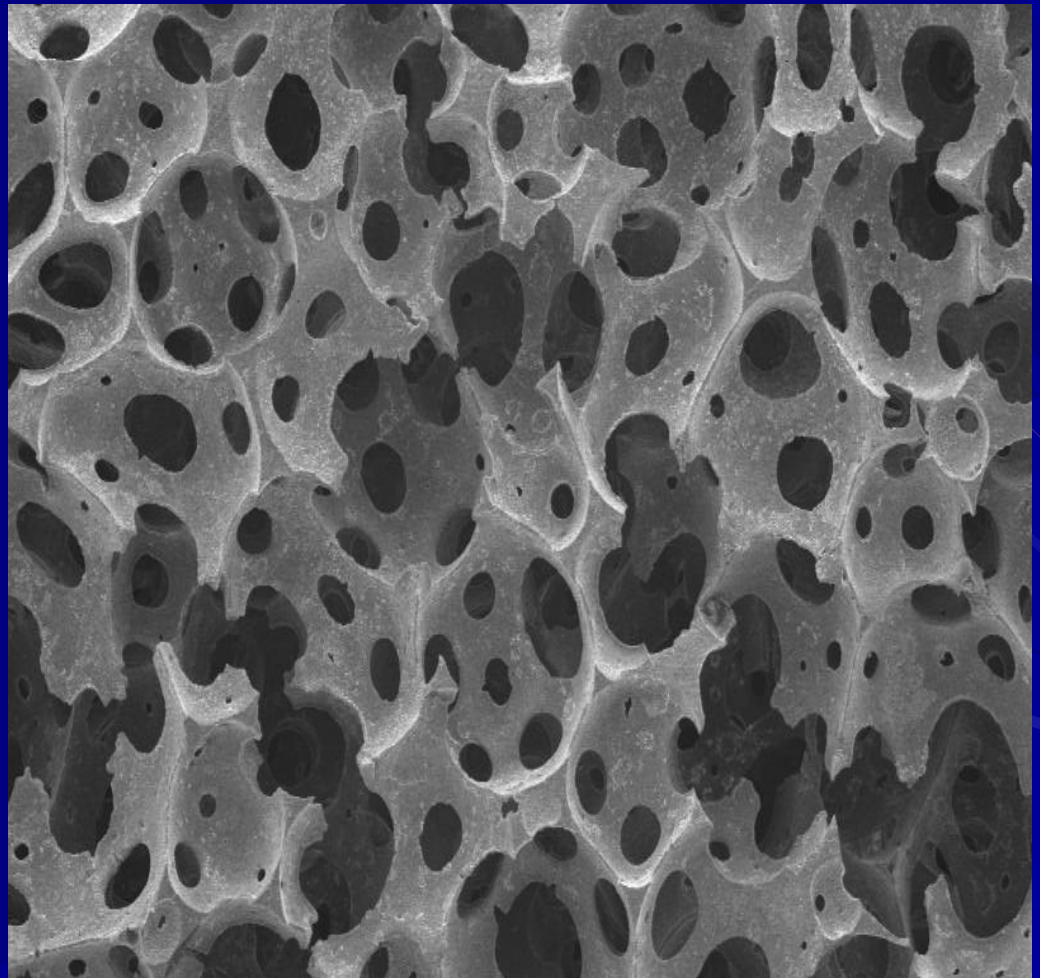
- HFE100p
- HFE90
- PMRS-2
- PMRS-2h
- LMRS-2h
- HFRS-2p

■ Cationic (+ charge)

- CRS-2p
- CHFRS-2p
- PASS
- LMCRS-2h
- CRS-2p

Benefits of Polymers

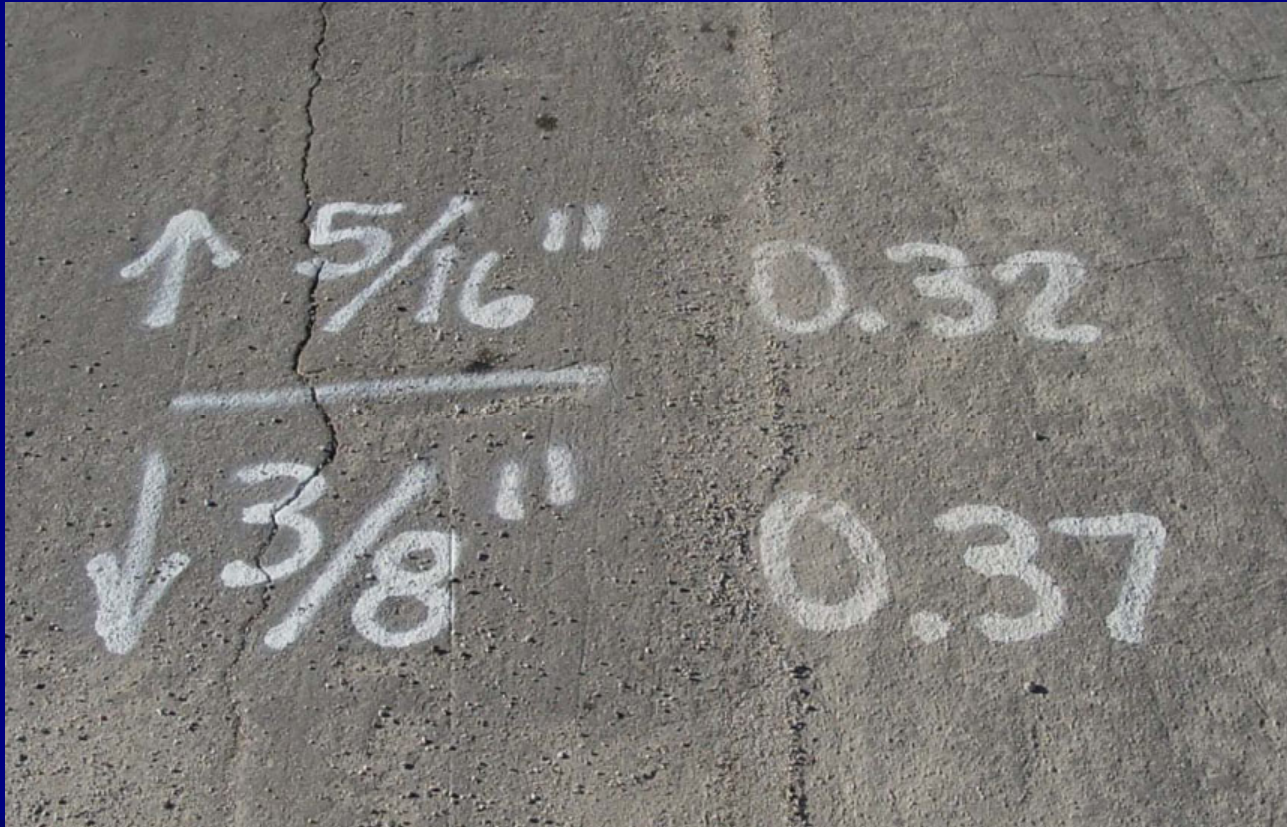
- *Improved adhesion
(less chip loss)*
- *Improved resistance to
flow at high temps*
- *Improved flexibility at
low temps*
- *Longer service life*



Materials - Emulsion

- *Bleeding* – Application not modified as needed
- *Demulsibility* – Breaking too fast or too slow
- *Viscosity* – Viscosity (running or ridging)
- *Temperature* – Emulsion is too cold to apply
- *Penetration* – Too soft or too hard
- *Field Samples* – Sampling and shipping for testing

Spreading Emulsion



*Determine proper application
rate for road surface*

Spreading Emulsion

PMCRS-2H

The sample does pass test requirements for Chip Seal application. The following application rates are recommended:

Emulsion: 0.30 - 0.35 gal./sq.yd.

Aggregate: 20.0 - 25.0 lb./sq.yd.

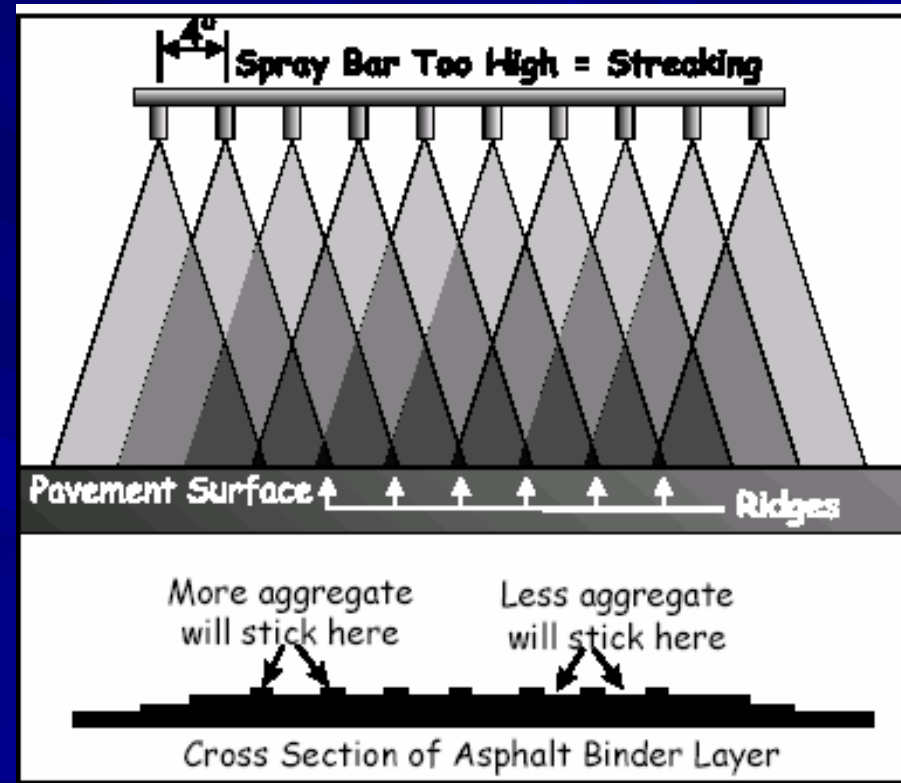
This recommendation is based upon the Asphalt Institute MS-19 6.12, Table VI-3. Adjustments in the field may be necessary and should be implemented using the following table of correction factors:

<u>Surface Texture</u>	<u>Correction (gal/yd²)</u>
Black, flushed asphalt	-0.01 to -0.06
Smooth, non-porous	0.00
Absorbent---slightly porous, oxidized	+0.03
---slightly pocked, porous, oxidized	+0.06
---badly pocked, porous, oxidized	+0.09

Emulsion Spray Bar

*Improper height will
not provide uniform
coverage of emulsion*

*Can cause ridging
or streaking*



Streaking Emulsion



Possible Causes:

- *Incorrect Spray Bar Height*
- *Misalignment of Nozzles*
- *Clogged Nozzles*
- *Emulsion with high viscosity*

Spreading Emulsion



*Application rate
not uniform*

*Inadequate pressure
in spray bar*



Spreading Emulsion

*Over application
of emulsion ---
causes bleeding*



Possible Chip Issues

- *Gradation varies daily or truck-to-truck*
- *Chips not damp enough*
- *Chips too damp*
- *Application not modified to fit traffic pattern*
- *Chips CV is poor +3% passing #200*

Chips

Chips shall be “surface damp”



Too dusty



Too wet

Otero County Alamogordo, New Mexico

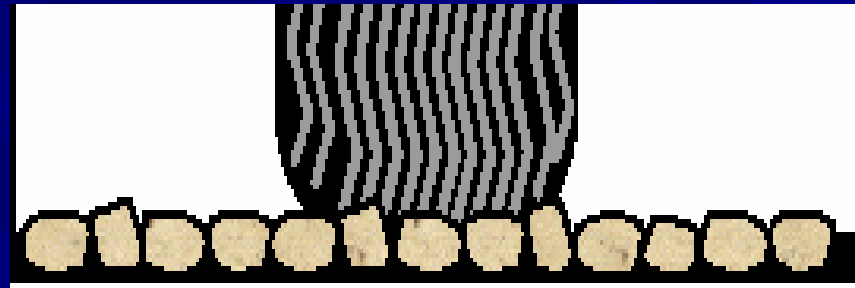


New Mexico DOT District 2 performing excellent stockpile maintenance

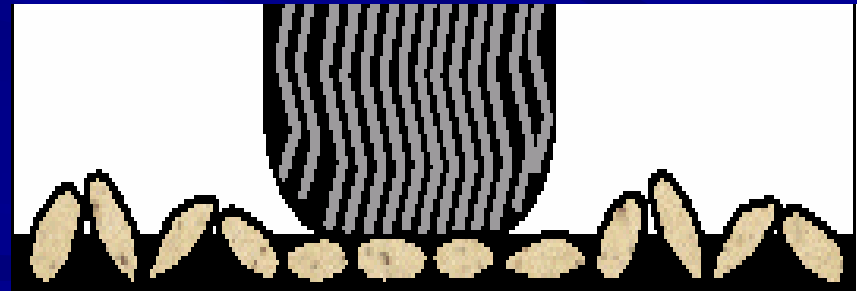


Aggregates

Chips should be crushed and cubical in shape for interlocking

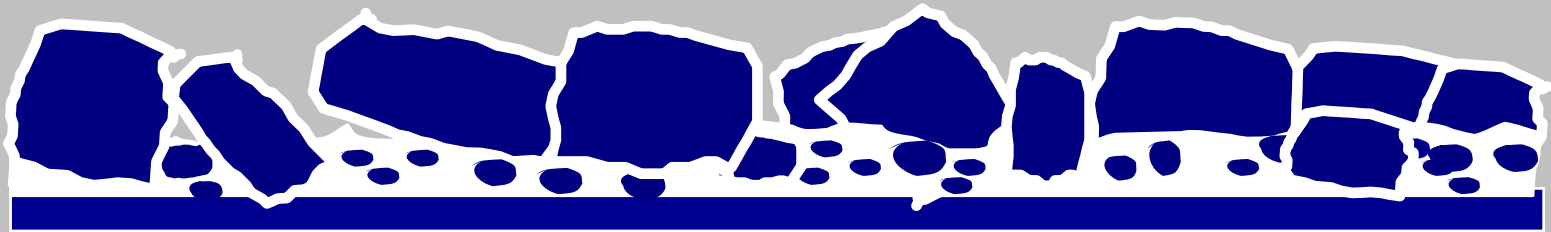


Flat Chips increase the risk of bleeding and reduced friction course

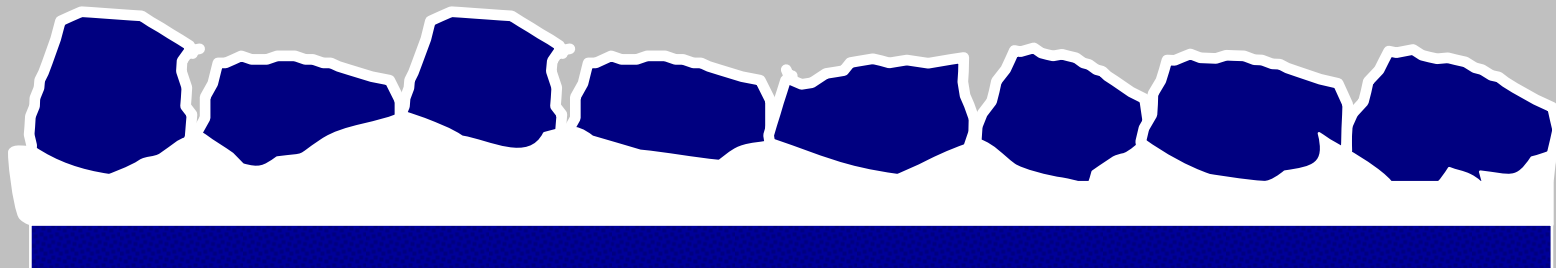


Dense vs. Single Sized

Old Specification



New
Specification



Spreading Chips

*Machine is moving too fast
(rolling chips)*

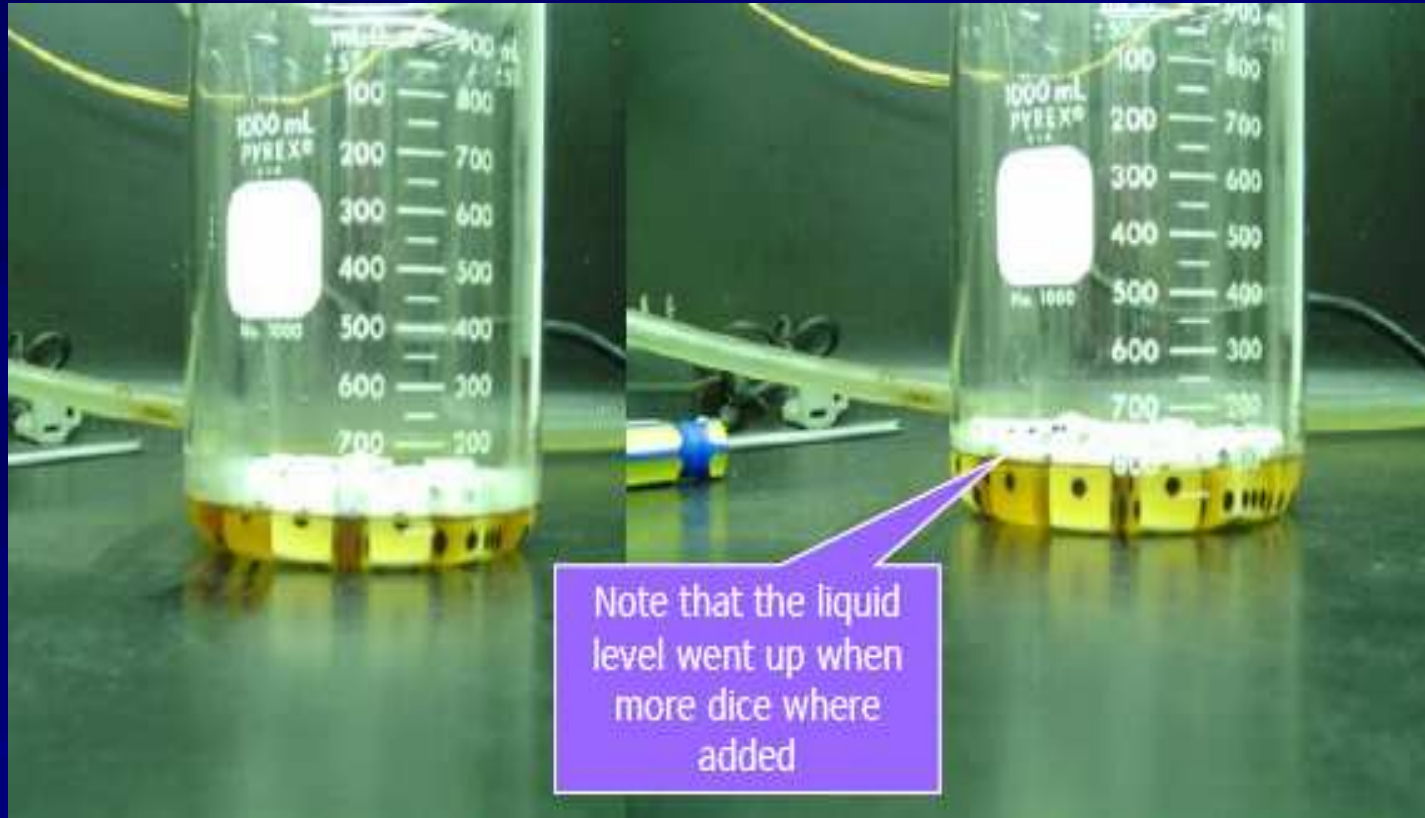
*Mat under spreader is not
getting rolled when waiting
for trucks*



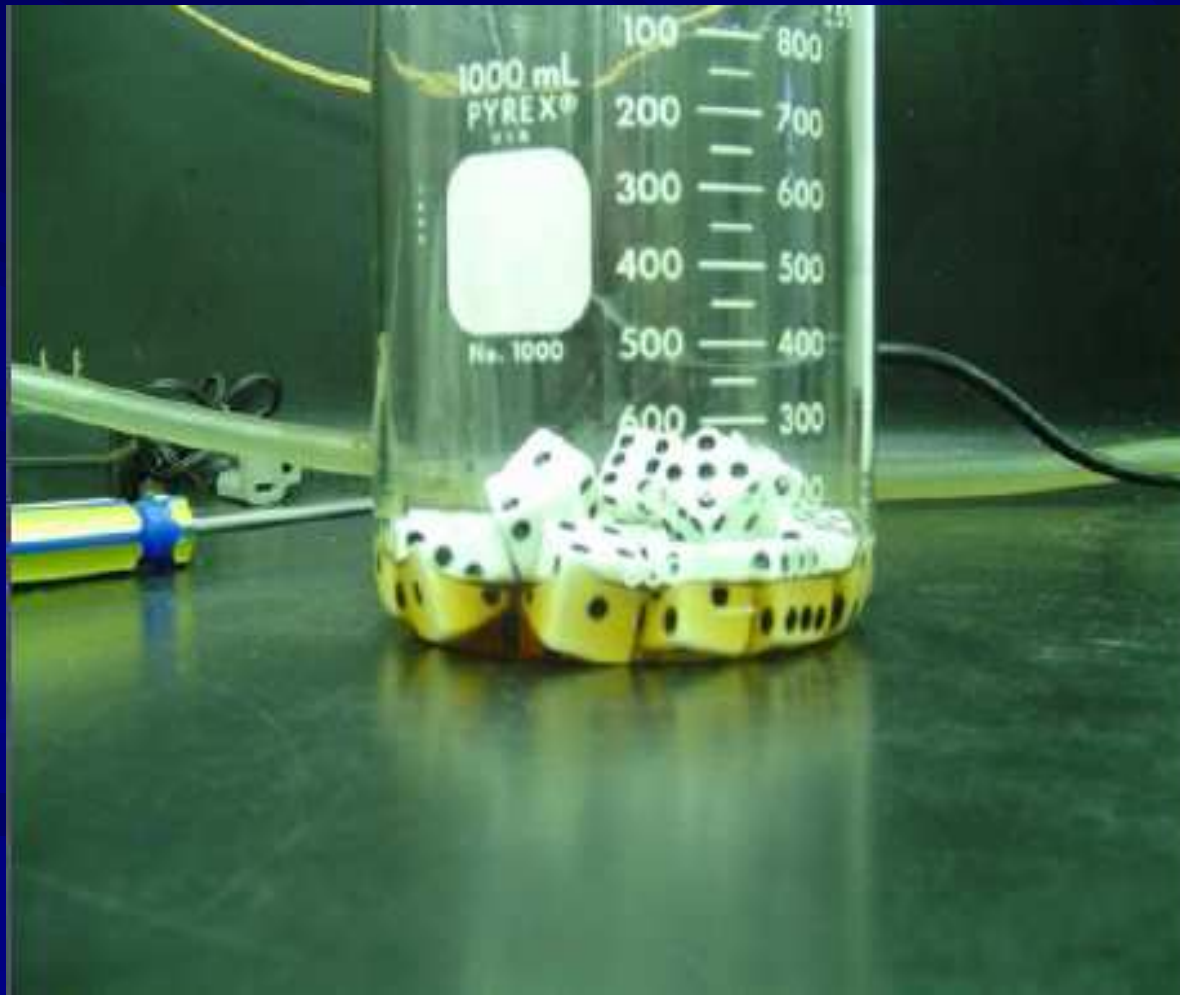
Over application of chips

- *Dislodges embedded aggregates*
- *Breaks windshields*
- *Can cause flushing and bleeding*

An example of over application



Too heavy



Chips

*Chip spreader
and trucks
should connect
properly to
prevent spillage
of screenings*



Rolling Operations

*Rolling too fast
Not enough
rollers on site to
keep up with the
chip seal
operation*



Sweeping Operations

Sweeping too soon

Broom pressure applied too light or too heavy



Maintain “Traffic Control”



Maintain low speeds to prevent damage to windshields and the finished chip seal surface

Maintain “Traffic Control”



Equipment Issues



Calibrate trucks



Check hydraulic lines

Equipment Issues



*Check spray bar nozzles
and bar height*



*Check chip spreader
gate openings*

*A lodged oversized aggregate blocked the gate.
This was caused by improper front loader
techniques loading the dumps.*



Weather Issues... Atmospheric and Pavement Temperatures

- *Too hot during the day ($> 110^{\circ}\text{F}$ atmospheric)*
- *Evenings too cool ($< 50^{\circ}\text{F}$ ambient)*
- *Low pavement temperature in “shaded” areas*
- *Change in weather soon after chip seal is placed*

Weather Issues

*Effects of
rain storm
that
occurred
within hours
after
placement*



Weather Issues...

Pavement Temperature



*Insure pavement temp is
present in sun and shade*



Weather Issues...

Pavement Temperature

Low pavement temperature in the shade, can cause chip loss in the following winter



*30% rule or use rapid setting
emulsions 100%*



Just make sure you move the snow to the shoulders before you chip seal with a PMRE



Caltrans Highway 120
Ambient temp = 40° F

To Fog Seal or Not to Fog Seal



Fog Seal / Flush Coat



Typically slow-set emulsions diluted with water to control application.

Can be used with or without sand blotter.

Bleeding / Flushing



- *Over-application of binder*
- *Dense graded screenings*
- *Pre-existing rutting*
- *Secondary embedment of screenings*

Stripping /Drilling



- *Too little binder applied*
- *Dirty aggregate*
- *Poor weather*
- *Poor rolling*
- *Cold binder or high viscosity*

Delamination



- *Improperly cured patch or digout*
- *Improperly cleaned surface*

Work to Resolve Issues

*On any construction project you will
encounter problems...
that's just the nature of construction*

*How you deal with the issues, is what
will impact your chip seal project and
your preventive maintenance program.*

Work to Resolve Issues

Work together to identify potential problems

When a problem occurs, share ideas to identify a solution

Benefit from each others' experience

It isn't hard when you work together...



Questions ?



Western Emulsions, Inc.

PAVEMENT PRESERVATION THROUGH INNOVATION



INNOVATION



PARTNERSHIP



CONSULTATION



PRESS/MEDIA



RESOURCES



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TODAY IS TUESDAY, JUNE 10 2008

Innovation

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PASS Scrub Sealfyer

PASS Cape Seal

Plastic Seal

Plastic Seal Flyer

Warm Mix

CREAS

CHFRS-2P

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PASS can be utilized for a variety of road maintenance needs. PASS emulsion is a polymer modified asphalt-rejuvenating agent. It has enhanced low and high temperature properties and resists low temperature cracking; as well as maintains and restores asphalt pavements without tracking or bleeding. PASS restorative seals may be applied at ambient temperatures ranging from 45°F to 120°F.

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WE are...



WELCOME TO WESTERN EMULSIONS

Western Emulsions was founded upon a commitment to providing high-quality products, constant innovation and expert service to our customers. An independent, family-owned corporation, Western Emulsions Inc. has produced quality asphalt emulsions since the opening of our first plant in 1977 in Tucson, AZ.

Today, Western Emulsions serves California and Arizona with an emulsion plant in Irwindale, CA, in addition to our original Arizona facility.

What's New: Oklahoma University Study finds Emulsion Chip Seals more effective and less expensive than Hot Asphalt Cement Chip Seals. [Click here to view the study and its results.](#) Our PASS emulsion is extremely effective in cold weather situations. [Click here to read one of our latest success stories on behalf of CalTrans.](#) Western Emulsions Inc. supplies a variety of high-quality asphalt emulsions, technical assistance and pavement maintenance contracting services to a wide range of public agencies and private companies.

NEWSROOM

Vulcan Materials Donates Road Work to Regional Park

Vulcan Materials Company's Western Division, along with partners West MeadVaco and Western Emulsions, conducted a trial project May 14 at Irvine Regional Park that was a win-win for all involved.

Asphalt Contractor

Santa Barbara County opts for emulsions in its pavement preservation efforts.

[View all items >](#)

VIDEOS



2008 LA County Scrub Demo



PASS Red



PASS Blue

[View all videos >](#)

RAISE YOUR PAVEMENT INDEX

The PASS[®] System offers products scientifically formulated to rejuvenate and extend pavement life regardless of its lifecycle stage. PASS[®] is a polymerized asphalt surface sealer, and its patented chemistry provides you the edge. For three decades, we have proudly helped agencies raise the pavement index on their road networks while stretching available transportation funding and reducing the carbon footprint of their maintenance operation.

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Developed for the following applications: Fog Sealing • Crack Filling • Sealing / Rejuvenating • Scrub & Chip seals • Cape Seals • New Wearing Surface Restoration • Stress Absorbing Membrane Interlayer • Hot & Cold Recycling

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Fog Seal



Scrub Seal



Chip Seal



Cold-In-Place Recycling



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Pavement Preservation Through Innovation

Thank You !

