Maintenance Rock / Otta seal & High Float Emulsions
Penetrations, Wedging & Sealing
Lower cost, Reliable and Easy

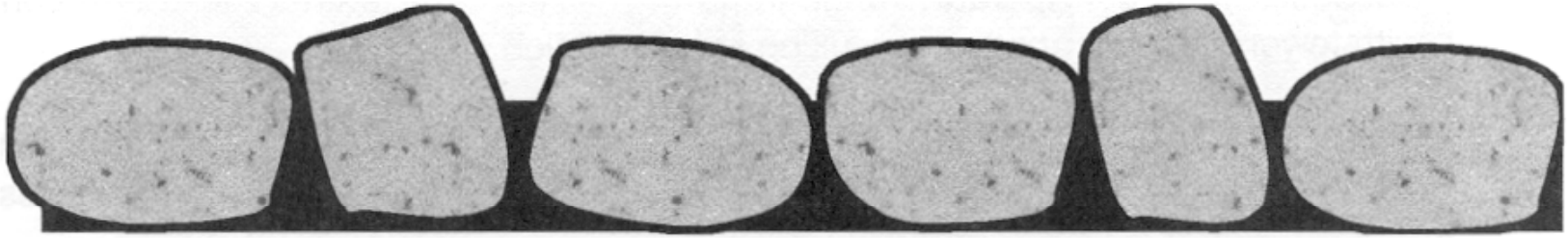
What, Why, How

Topics

- The Basics Explained
- Materials
  - Rock
  - Emulsion
- Processes
  - Maintenance Seal
  - Penetration
  - Penetration Wedging

The Basics

- These are not Chip Seals! Chip Seals are:
  - Single chip size
  - Single chip depth
  - Large voids between stones
- These are more like hot mix in structure
  - Many sizes of aggregate
  - Interlock between individual stones adds strength
  - Voids are small



Single Sized Aggregate
Perfect for the standard chipseal with CRS-2P, CMS-2P

Graded Aggregate / Not good for CRS-2P or CMS-2P
Great for Otta Seal / Maintenance Seal with HF -150

Rock

- Treat the rock like your building a mix not a chipseal:
- Hard
  - Great Wear Characteristics (Strong)
- Fractured
  - High degree of interlock (Stability)
- Fully graded
  - Fill the voids
  - Stability

WSDOT “crushed Cover Stone” 9-03.4(2)

- ¾” square 100 % passing
- 5/8” square 95-100
- U.S. No. 4 20-45
- U.S. No. 200 0-7.5
- % fracture by wt., min. 75
- Sand Equivalent min. 40
- Static Stripping test Pass

- Much dirtier than chips used with cationic emulsions
- **Much lower cost material as we keep many of the agg. Sizes vs. screening them off as waste during chip production.**

Adams County Washington Specs

Aggregate for Bituminous Surface Treatment

- **Grading and Quality**
- *(January 2, 2014 ADCO GSP)*
- Section 9-03.4(2) shall be supplemented with the following:
-
- Coverstone Maintenance shall meet all the requirements of Section 9-03.4(2) except that it shall meet the following specifications for grading, fracture and sand equivalent:
-

Sieve Size	**Percent Passing**	**Tolerance Limits**
3/4" square	100	95-100
5/8" square	95-100	90-100
US No. 4	20-45	16-49
US No. 200	**0-5.0**	0-6.5
% fracture,		
by weight, min	90	85
Sand equivalent min.	40	35

-
- The third paragraph of Section 9-03.4(2) is revised to read:
-
- The fracture requirement shall be at least **two** fractured faces and will apply to the combined aggregate retained on the U.S. No. 4 sieve in accordance with FOP for AASHTO T 335.
-


Adams County Rock

WSDOT Crushed Cover Stone

Binder / Emulsion
HF-150

- 150 Residue Penetration (Min.)
- Slow setting
  - Absorption through the fines
  - Time to penetrate before breaking
  - Time to orient stone matrix for maximum interlock
- Low or no distillate
  - Once broken immediate strength
- Has gel structure
  - Reduced chance of flushing
  - Reduce chance of cracking

High Float 150
Different than CRS-2P and Cat's?

- Slower setting than Cationic emulsions
  - Will allow time for penetration through fines and much work working time during construction to get max rock alignment.
- Easier to handle
  - More stable than the rapid setting Cationics most are used to.
- More forgiving
  - Residue is less temperature susceptible, not as brittle later in the season

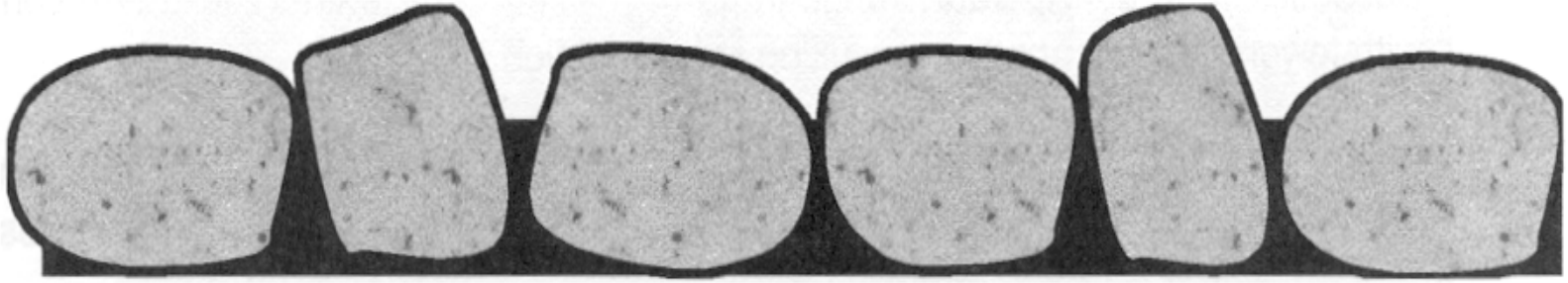
High Float 150
Different than MC's

- Use at much cooler temperatures.
  - HF -150 used around 130 to 175 degree
- Will firm up much quicker –relies on water evap vs. Kerosene evap.
  - Hold rock firmer
- Much less likely to bleed
  - Due to the gelling of the asphalt residue

Known as the Otta seal in Scandinavian Countries

- Different Structure; dense hotmix like structure vs. single chip layer glued down.
  - Less emulsion needed for dense structure Saves $
    - Rock Structure adds to the seal strength / reliability
- Highly reliable
  - Low failure rate
  - Handles cold weather
  - Easy to use
- Scandinavian's have studded tires and feel it holds up well.
- Also used in: Alaska, Canada very successfully

Standard chipseal



- One layer thick
- Asphalt Residue glues the chips down
- CRS-2P needs clean chip to adhere to due to fast break
  - Major cause of Seal failure is dirty chip
- Need enough Glue to hold the chip
  - Major cause of seal failure is not enough glue.

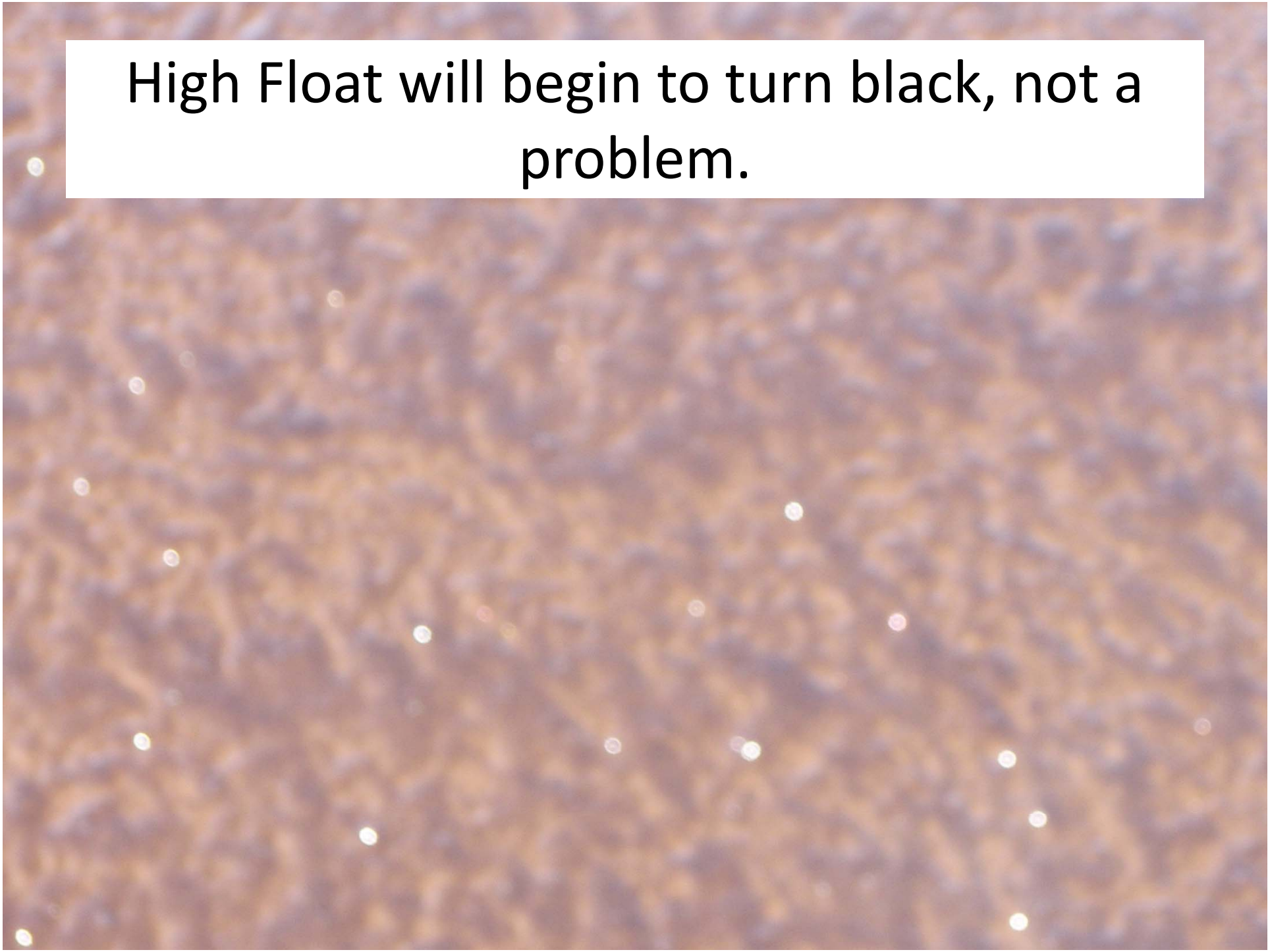
Maintenance / Otta Seal

- Matrix of rock like hotmix
  - Rocks interlock for strength
  - Asphalt Residue fills small voids and surrounds rocks like in hotmix
  - Strength comes from interlock & glue
    - Adds to reliability

- Prep just like any other chipseal.

Apply approx. .40 to .46 Gal / yd^2 (Much less emulsion than CRS-2P for comparable seal and traffic conditions when using HF with Crushed Cover Stone.)

Does not need to be covered immediately unlike cationics.


High Float will begin to turn black, not a problem.

Note the distance of chip spreader behind fresh emulsion. This should not be done with Cationics.

ply 30 to 35 lbs. of Aggregate. Small aggregate will drop first, bu
oat 150 will allow time for rolling and traffic to push larger stone
he seal. This is where you will have problems if you have excess

Stagger your trucks, they do a great job of seating aggregate.


Roll, Roll, Roll
SPEED
LIMIT
50
CATERPILLAR


The fresh seal will look like this after rolling.


Traffic will seat the large stone

Add Steel , Use Vibe if over granular base


Note the smooth Texture
2013/08/08

Lessons on Higher Traffic use

- Otta Seals creat a matrix much like hotmix
  - Treat them like hotmix
  - Higher traffic designs need to be compacted more
- Higher traffic = more compaction, less room for asphalt residue. (Just like Hotmix)

Lessons on Higher Traffic use

- Need to increase compaction while the emulsion is still wet and can grab loose rock.
  - Increased rolling effort means more compaction early, grabs rock before it can sluff off.
    - Increases thickness of seal (holding more rock) at equivalent emulsion rate.
- Otherwise traffic will compact later and force residue to the surface as the rock pushed into voids.

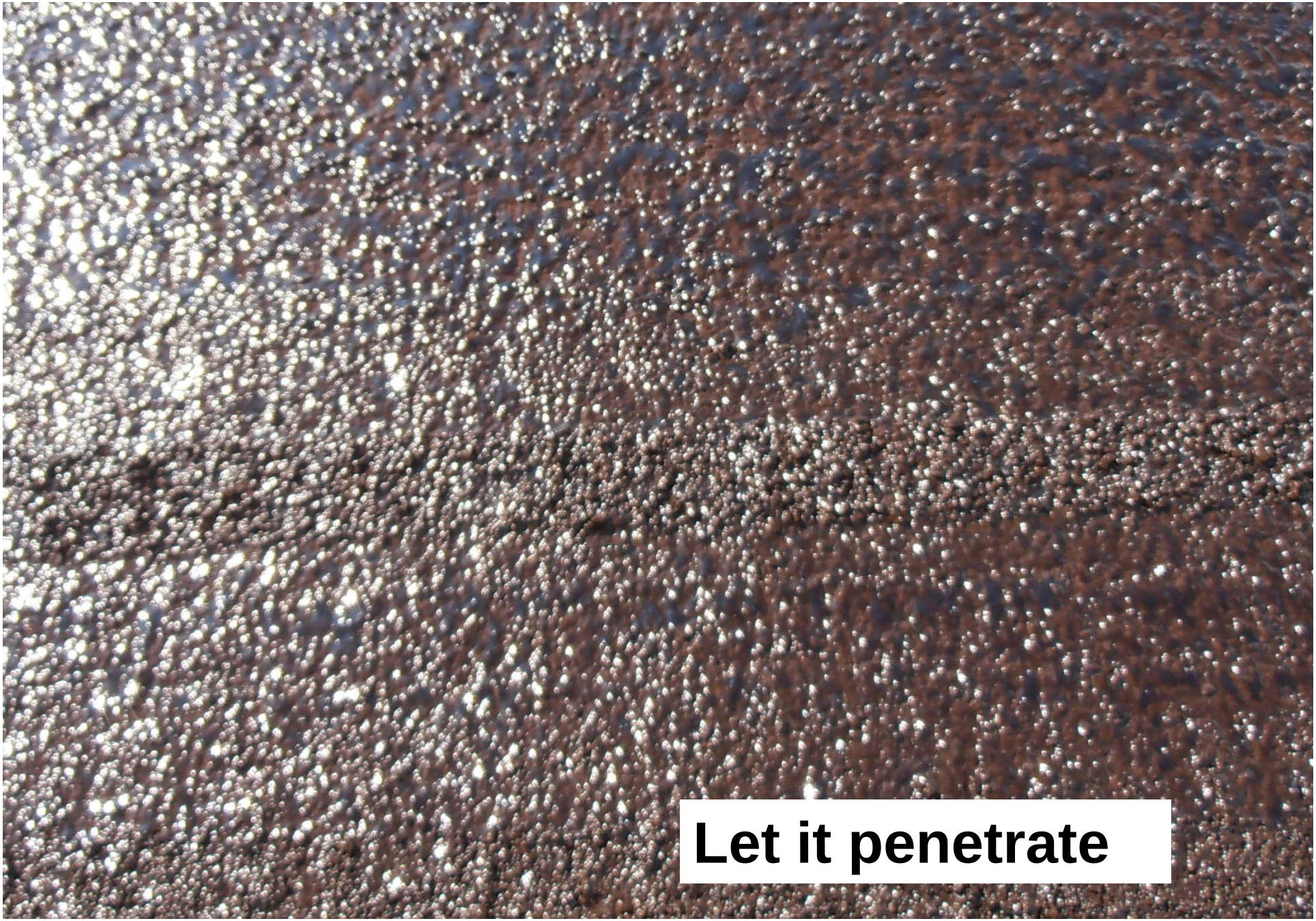
The final product

Using High floats to build a BST road

R Rd NE in Grant County

Spokane County Road

1. **Fluff the surface**
2. **Dampen**
3. **Apply HF-150 @ .5 to .6 Gal/yd^2**


Let it penetrate

Apply crushed cover stone

Roll with steel roller

Building a BST Road with HF

Give the first seal a few days to cure

- Sweep
- Seal again with .4 to .44 gal/yd2 of HF
- Cover with 30 lbs of crushed cover stone
- Roll, roll, roll,
- Sweep

The Final Product

- Strong
- Thick
- Dense

Otta Seals

- Otta Seals save money (15 to 25% less Expensive)
  - Less emulsion and much lower cost rock) vs. CRS-2P and Clean chip.
- With graded aggregate, don't need clean chips
- Particularly great if your working in conditions not conducive to Cationic seals
  - Slow production crews
  - Cooler weather, late season
  - Over granular bases - penetration
  - Low traffic that won't be enough to seat rock soon.
    - CRS-2P requires enough traffic to seat rock well before winter weather. More sensitive than HF-150 and Maintenance Rock!!!

Pre-leveling Roads with a Wedge Penetration

What is it?

- Wedging from the ¼ crown out.
- Using:
  - Maintenance rock for the wedge
  - Oil Rock for choke
  - HF-150 or other suitable penetrating binder
- Chipseal equipment
- Chipseal Crew

What is it (Continued)?

- Fast (Up to 3 centerline miles per day)
- Inexpensive (Around 1 ½ times the cost of a chipseal)
- Strong (Very little post compaction after two years of traffic including grain trucks)

Crew / Equipment List

- Distributor
- Chip Spreader
- Blade (with boot)
- 2 Rubber Tired Rollers (18,000 lb)
- Steel Wheel Roller (28,000 lb Vibratory)
- Broom
- Loader
- Aggregate Trucks
- Flaggers or other Traffic Control
- Foreman

Ideal Project candidate

Another project candidate

Spread Maintenance Rock

- Moving against traffic
- Apply maintenance rock using chip spreader to the inside 4 ft from the fog line.
- Generally gates are wide open.
- Usually have to operate in manual mode.
- Use one man to walk along raking out bumps for smooth grader operation.
- Maintenance rock meets WSDOT Spec 9-03.9(4) hard, fractured.

WSDOT Maintenance Rock

Sieve Size	Percent Passing
5/8"	100
1/2"	90-100
No. 4	45-66
No. 40	10-25
No. 200	7 Max
% Fracture	75 Min.
Sand Equiv.	40 Min.

Shape the wedge

- Ideally use a 2% slope on the blade
- Blade rides the ¼ crown
- Blade needs to stay loaded up.
- If blade runs out of material, need to back up and apply more rock.
- Shapes edge using a boot on the end of the blade
- Use one person to rake out ridges

Seat the rock

- Using a steel roller in vibe mode
- One forward pass starting from the outside.
- When wedge is wider than the roller, another pass is done riding the ¼ crown; not in vibe mode to get all rock seated.


CAT

Clean the inside Edge

- Using a power broom sweep rock from the ¼ crown out
- Creating a clean straight edge for the oil shot.


06/26/2003

Penetrate the wedge

- Apply .60 to .70 gallon per yd^2 MC-250 or HF150 to the full width of rock (1/4 crown out)
- First foot from shoulder should get a double shot
- Lincoln County uses wrap around bar
- Otherwise shoot outside foot first then full width shot right after.


06/26/2003

Let the emulsion sit for at least 15 minutes to soak in


06/26/2003

Apply choke stone

- Using the chip spreader apply approximately 30+ lbs of oil rock to the whole wedge width plus a minimum of 6 inches inside the ¼ crown to ensure full oil coverage.
- Rock meets WSDOT Spec 9-03.4(2) for Crushed Cover Stone


06/26/2003

Roll the choke rock in

- Using one pass with the steel wheel roller in static mode
- Use two passes min. with pneumatic and steel rollers
- Leave the wedge for several days (+) to start curing before any sweeping.


06/26/2003

Chipseal

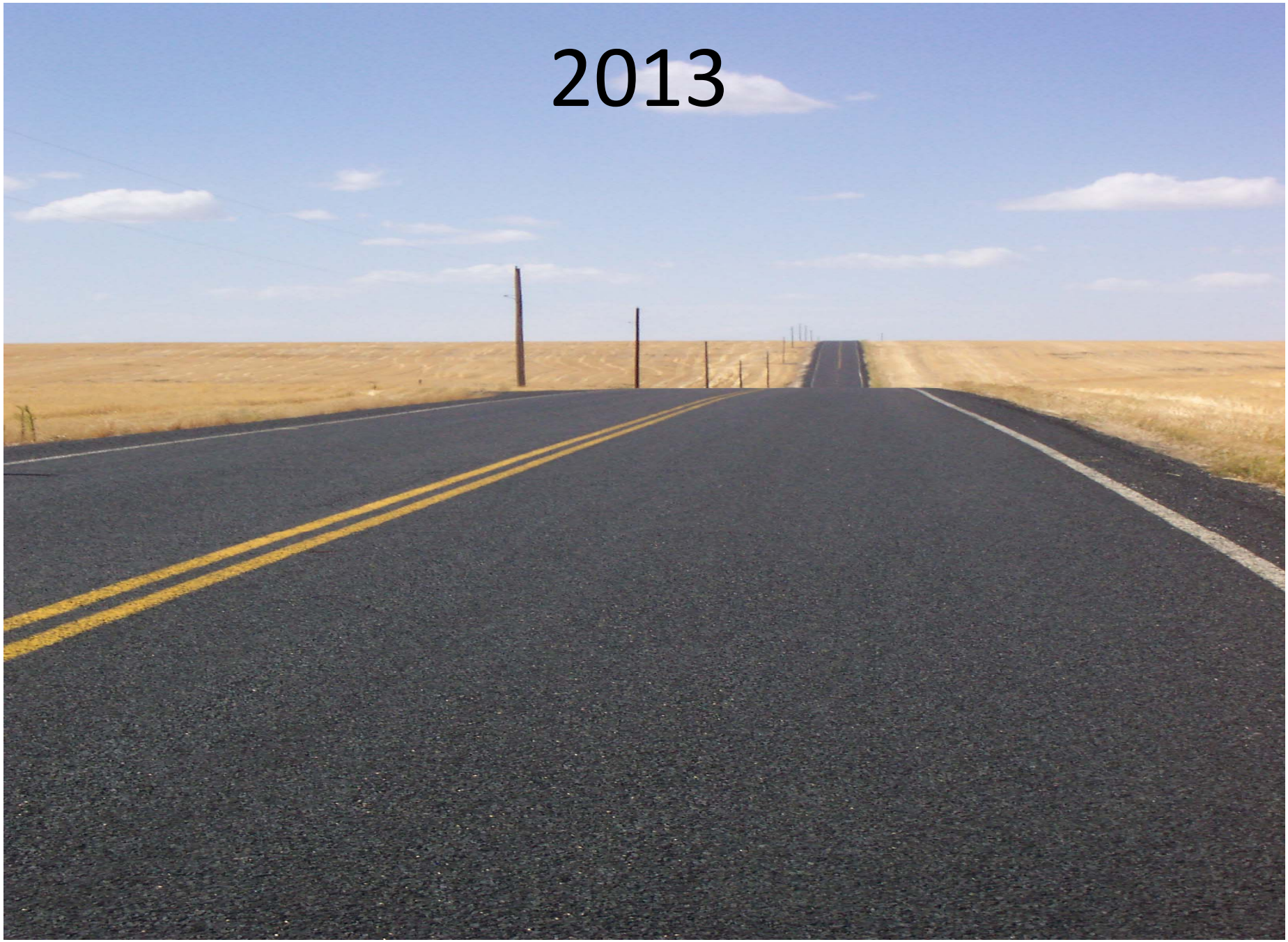
- Chipseal the entire road after at least a few days, preferably at least a week.
- Use your standard chipseal materials and crew

End result

- Sealed road with clean shape and 2% slope.
- Strong pavement (Lincoln county roads over 14 years old show very little post compaction.
- With the double shot on edges they resist edge failure even at farm field entrance points.

First harvest season after construction


After 2 years of traffic 1/4 in. rut


2013


2016 No change in rutting


Interesting!
The cracking stops

Whats New?

WSDOT doing Rut fill with CRS-2P

The Final Word – I promise! Applies to all chipseals!

- Roll, Roll, Roll
- Try a steel roller in your production train
  - It will bring down the high points that get hit by snow plows
  - Great compactive effort
  - Seals look best their second year only because that year of traffic finally gave them the compaction they needed …… So!
- Do it right away and minimize the chance of Seal failure.
- If you can't chipseal, Fog it! Early Fog Seals extend life of pavement

Questions?

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