

Common Sense to Inspecting Slurry & Micro

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What is Micro-Surfacing ?

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- **By design it chemically changes from a semi-liquid material to a dense cold mix material that is able to carry normal traffic within one hour after application.**

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Purpose of Micro-Surfacing

To Restore or renew desirable surface properties such as:

- **Skid resistance**
- **Crack filling**
- **Weather proofing (sealing)**
- **Surface loss of matrix or raveling**
- **Aesthetics & uniformity of surface**
- **Leveling & or rut filling**

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MSE vs Slurry

Differences in:	MICRO-SURFACING	SLURRY SEAL
Asphalt Emulsion	Always polymer modified, quick set	Could be polymer modified
Aggregate Quality Gradation	Stricter spec for SE and durability Use only Type II and III	Can use Type I, II, or III
Additives Break	Chemical break largely independent of weather conditions	Breaking and curing dependent on weather conditions
Mix stiffness Equipment	Stiffer mix, use augers in the spreader box and secondary strike-off	Thinner mix, use texture drag
Applications	Same as slurry, plus rut fill, night work, correction of minor surface profile irregularities	Correct raveling, seal oxidized pavements, restore skid resistance

Aggregate Gradations

Sieve Size	Type II % Passing	Type III % Passing	Stockpile Tolerance
3/8" (9.5mm)	100	100	
#4 (4.75mm)	90 - 100	70 - 90	± 5%
#8 (2.36mm)	65 - 90	45 - 70	± 5%
#16 (1.18mm)	45 - 70	28 - 50	± 5%
#30 (600μm)	30 - 50	19 - 34	± 5%
#50 (330μm)	18 - 30	12 - 25	± 4%
#100 (150μm)	10 - 21	7 - 18	± 3%
#200 (75μm)	5 - 15	5 - 15	± 2%

Mix Design

TEST	ISSA TB No.	SPECIFICATION
Mix Time @ 77 F (25 C)	TB 113	Controllable to 120 seconds minimum
Wet Cohesion at 30 minutes minimum (set) at 60 minutes minimum (traffic)	TB 139	12 kg-cm minimum 20 kg-cm or near spin
Wet Stripping	TB 114	Pass (90% minimum)
Wet Track Abrasion Loss One hour soak Six day soak	TB-100	50 g/ft ² (538 g/m ²) maximum 75 g/ft ² (807 g/m ²) maximum
Lateral Displacement	TB-147	5% maximum
Specific Gravity after 1000 cycles of 125 lb.	TB-147	2.10 maximum
Excess Asphalt by LWT (Sand Adhesion)	TB-109	50 g/ft ² (538 g/m ²) maximum
Classification Compatibility	TB-144	11 grade points minimum (AAA, BAA)

Self-Loading Continuous Micro-Surfacing Paver

Benefits:

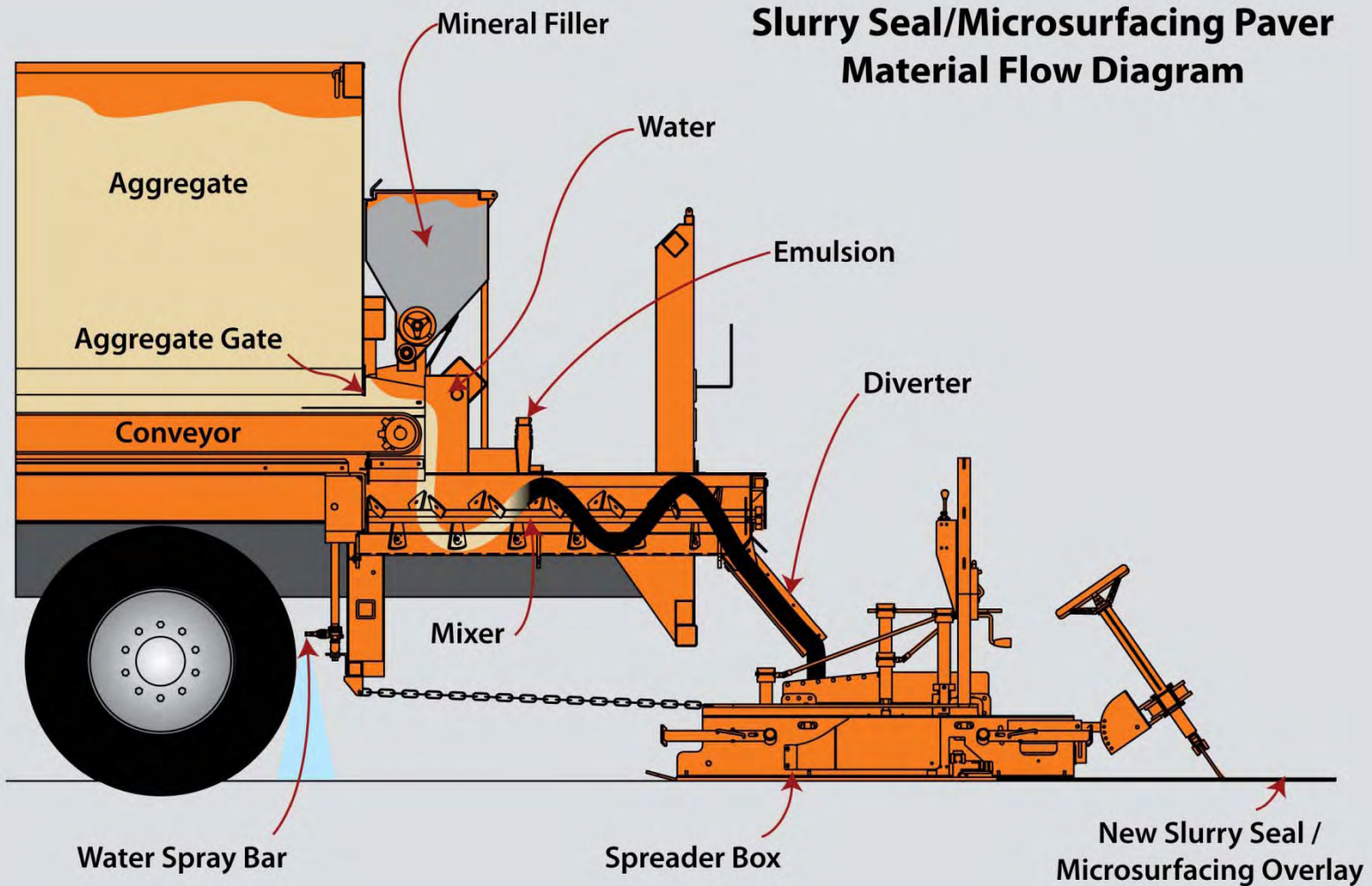
- Consistent Mix
- Less Transverse Joints
- Higher production, fewer lane closures
- Less traffic delays



Truck Mounted Micro-Surfacing Machine



Laydown Equipment



Calibration of Equipment

- Calibrations based on Dry Aggregate
- Calibrations need to be performed with Aggregate source being used for project
- Simple weight and measures process
- Contractor should provide Calibrations sheets

Equipment Calibrations

- Calibrations Based on Jack Shaft Counter
- Contractor will load aggregate and weigh the unit
- Contractor will set aggregate gate on machine, then run material onto stockpile
- Typically this is 100 revolutions
- Unit is reweighed to determine lbs per revolution- this is performed on 3 gate settings

Equipment Calibrations

- Calibrating emulsion is performed in a similar procedure
- Again the Jack shaft counter is used to determine LBS per revolution
- Typically 300 to 400 rev counts to gain accuracy
- Process is repeated 3 times to verify accuracy

Equipment Calibrations

- Once you have emulsion LBS per revolution, you can set aggregate gate for project, and target desired mix design
- Example – 14lbs of emulsion per revolution – mix design calls for 12%,
- = $14\text{lbs} / .12 = 116$ lbs of aggregate per revolution needed to target mix design

Equipment Calibrations

- Calibrations help you determine if mix design is being targeted
- Calibrations help you determine dry aggregate spread rates for project
- Calibrations, along with weight tickets help you track pay items

Project Document Review

- Bid specifications
- Special provisions
- Mix design information
- Bid Items
- Traffic control plan

Pre Seal Inspections

- Surface
- Equipment
- Materials
- Weather
- Traffic Control

Materials Checks

- All material testing procedures and frequencies have been reviewed for all testing before and during construction.
- The emulsion has been sampled and submitted for testing.
- The aggregate source has been sampled and approved

Materials Checks

- Aggregate gradations checked during project
- Aggregate is clean and free of deleterious materials
- Aggregate is not wet
- SE values are checked during production
- Cement, Additives and or retarders have been verified

Surface Preparation

- surface is clean and dry.
- Repair all pavement distresses.
- The existing surface has been inspected for drainage problems.
- Rut Fill areas have been addressed.

Equipment Inspections: Surfacing Equipment

- The Machine/Machines are fully functional
- Rev Counter is operational
- All equipment is inspected for oil leaks
- All paddles in the pugmill are intact
- The spreader box is clean
- Use of proper Micro Surfacing Box
- Strike off rubbers are cleaned

Weather Requirements

- Weather forecasts are checked prior to start up
- Air and surface temperatures meet specifications.
- High temperatures, humidity, and wind will affect how long the emulsion takes to break.
- Application of Surfacing emulsion does not begin if rain is likely.
- Application does not begin if overnight temperatures could be freezing.

Project Inspection Responsibilities

- Surfacing Application
- Truck Operation
- Longitudinal Joints
- Transverse Joints
- Mat Uniformity
- Opening the Micro-surfacing to Traffic

Determining Application Rates

- Spread Rates determined using dry aggregate weight.
- Calibrations used to verify
- Emulsion quantities are being tracked
- Aggregate weigh tickets are being collected
- A full mix design has been done. Note, the mix design does not quantify application rates.

Application Rates

- Aggregate Gradation effects rates
- Surface texture of roadway effects rates
- Less material is applied to smooth, nonporous, and asphalt-rich surfaces
- Spreader Box set up effects application rates
- Speed of application effects application rates
- Moisture content of aggregate needs to be considered

Surfacing Application

- Has a test strip been done—is it satisfactory?
- Are field tests carried out—are they in specification?
- Enough trucks are on hand to keep a steady supply of material.
- The application starts and stops with neat, straight edges. Should they be papered?
- A rut box is used for ruts deeper than 12 mm (1/2 in).

Surfacing Application

- A leveling course is used with a steel strike-off or equivalent strike off rubber for ruts less than 12 mm (1/2 in).
- Two courses are used where rut filling or leveling is employed.
- No drag marks are present due to oversize aggregate or dirty rubbers.

Crew demonstrates the experience to apply product.



Surfacing Application

- Rubbers are cleaned regularly and at the end of each day.
- The machine takes a straight even line with minimal number of passes to cover the pavement.
- Mix is even and consistent.
- Mix does not float fines.

Surfacing Application

- The application is stopped as soon as any problems are detected.
- The application appears uniform.
- The surface has an even and uniform texture.
- Check application rate based on amounts of aggregate and emulsion used.

Truck Operation

- Trucks are staggered across the fresh seal coat to avoid driving over the same area.
- Trucks travel slowly on the fresh seal.
- Stops and turns are made gradually.
- Truck operators avoid driving over micro-surfacing.
- All trucks involved in the Micro-surfacing application process should stagger their wheel paths when exiting and returning to the application site.



Longitudinal Joints

- The meet lines are not made in the wheel paths.
- The meet lines are made at the center of the road, center of a lane, or edge of a lane.
- The meet line is overlapped only 75 mm (3 in) maximum.
- The slurry unit spreader box runners do not run on fresh mat.

Transverse Joints

- All emulsion applications begin and end on building paper.
- Mixture is not overly wet at start-up.
- Building paper is disposed of properly.



Brooming

- Brooming does not begin until sufficient bond has formed between the emulsion and the aggregate.
- Brooming begins after the microsurfacing is available for traffic.
- Brooming should not dislodge the microsurfacing.
- Follow-up brooming should be done if ravel is high or if traffic is high.

Project Cleanup Responsibilities

- All loose aggregate from brooming is removed from travel way and has been properly disposed
- Excess emulsion and spills are removed
- Stockpile has been returned to original condition
- Temporary delineation be it temporary markers or temporary striping is in place and will be maintained until permanent striping is complete

Common Problems and Solutions

- **Drag marks:**

- Clean rubbers, check aggregate grading.

- **Flush surface:**

- Reduce asphalt content of mix.
- Reduce water content and increase additive. Increase cement.
- Allow longer time before traffic.
- Reduce total fluids.

Common Problems and Solutions

● **Uneven surface—wash boarding:**

- Spreader box is incorrectly set up.
- Viscosity of the mix is too high.
- Forward speed is excessive
- Add extra additive or water.
- Mix is breaking too fast.
- Ambient temperature is too high.
- Use water sprays on front of spreader.

Common Problems and Solutions

- **Poor joints:**
 - Too much water at start-up.
 - Runners of spreader box running on fresh micro surfacing— use water spray.
 - Excessive hand work

Common Problems and Solutions

- **Excessive ravel:**

- Mix is breaking and curing too slowly.
- Make mix faster; add cement.
- Control traffic. Wait until cured to trafficking level.
- Traffic or equipment speeds too high.
- Brooming or trafficking before the emulsion is properly set.
- Improper secondary strike-off angle/pressure can cause a raveling issue if texture is boney or rough.

Micro-Surfacing aggregate and shedding is very common during the first 24 hours. Post Sweeping times should be discussed.

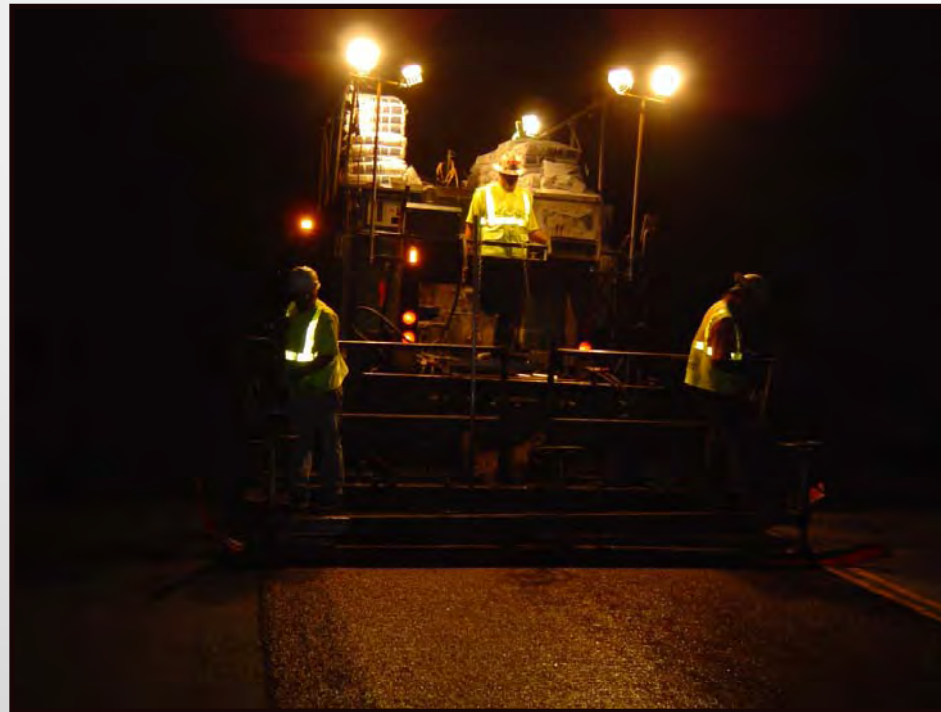


Application of Micro-Surfacing. Good Texture



Night application of Micro-Surfacing Caltrans Highway District

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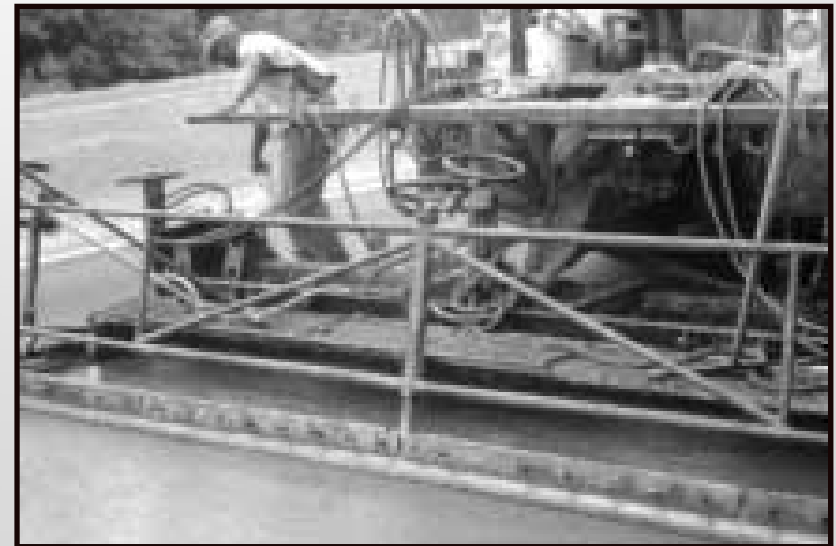
Two Layer Micro- Surfacing system I-80 Utah D.O.T.

As a rule
when micro-
surfacing is
being placed
over 30#per
P.S.Y. Multiple
applications
should be
considered



Texture and secondary strike off's

- Heavier materials such as Micro Surfacing, a second rubber strike off may be used in place of other type drags for beneficial mat texture.
- A drag used improperly can cause large stones to roll where they are not properly imbedded in the mat.



Micro-Surfacing texture and secondary Strike-Off's



Improper Surface Texture



Proper joint construction

- Longitudinal joints: Joints should be on tangent sections and uniformly follow the traffic lane. They may be constructed as an overlap or butt joint. If overlapped they should not exceed (3in) in width.
- Transverse joints: Transition at these joints must be smooth to avoid creating a bump. Starting transverse joints on roofing paper can eliminate these problems.

Proper Joint Construction



Unacceptable Transverse Joint



Unacceptable Joint Overlap



Unacceptable Longitudinal Joint

Joints are not neat and aligned in a uniform manner



Poor Transverse Joint, along with drag marks



Slow traffic time



Opening to Traffic

- Problem: The weather conditions can cause the micro surfacing not to break and cure quickly for traffic times.
- Cause: low ambient and pavement temperatures, field additives can slow the break times, emulsion not formulated correctly.
- Prevention: Placement within recommended temperatures. Increase or decrease Portland cement, reformulate emulsion.

Wash Boarding Effect



Smoothness and ride quality

- When using stiffer mixes the spreader box may, if incorrectly set up, chatter or bump as the material is spread and produce a washboard effect.
- The chatter may be reduced by making the mix slower to set, adjusting the strike off rubber.
- Make sure forward speed is not excessive

Greasy Intersections- use of sand blotter

As a general rule micro-surfacing can carry traffic when it is expelling clear water.



Damage from Early Traffic



Surface De-Bonding

Lack of cleaning or overspill of micro-surfacing aggregate.



Results of Fast Uncontrolled Breaks

Micro-surfacing placement machines should allow the operator to control the mixture by adding additives to help slow the break time if required.



Unacceptable Edge lines: If proper alignment is not met. The contractor should stop work and not be re-started until the contractor demonstrates can be constructed.



Poor Mix and Workmanship



Improper Rut-Filling

Contractor should have basic knowledge along with proper pavement selection so ruts do not reappear



Unacceptable Hand Work

As a general rule less is more when it come to hand work, especially with micro-surfacing systems.



Recognizing Problem Areas

Streaking



Chattering

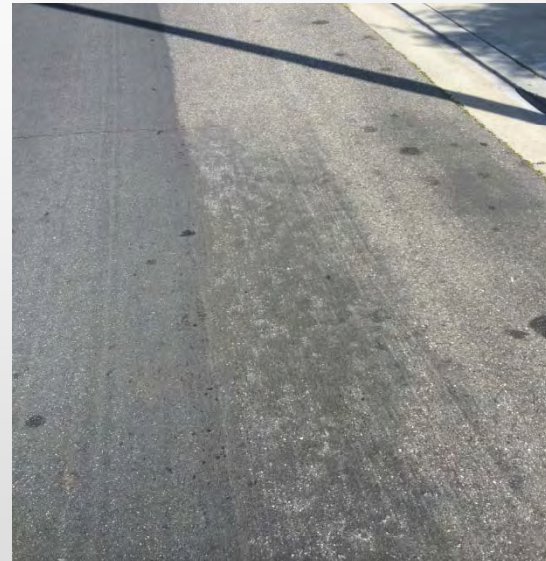


Recognizing Problem Areas

Bleeding



Raveling

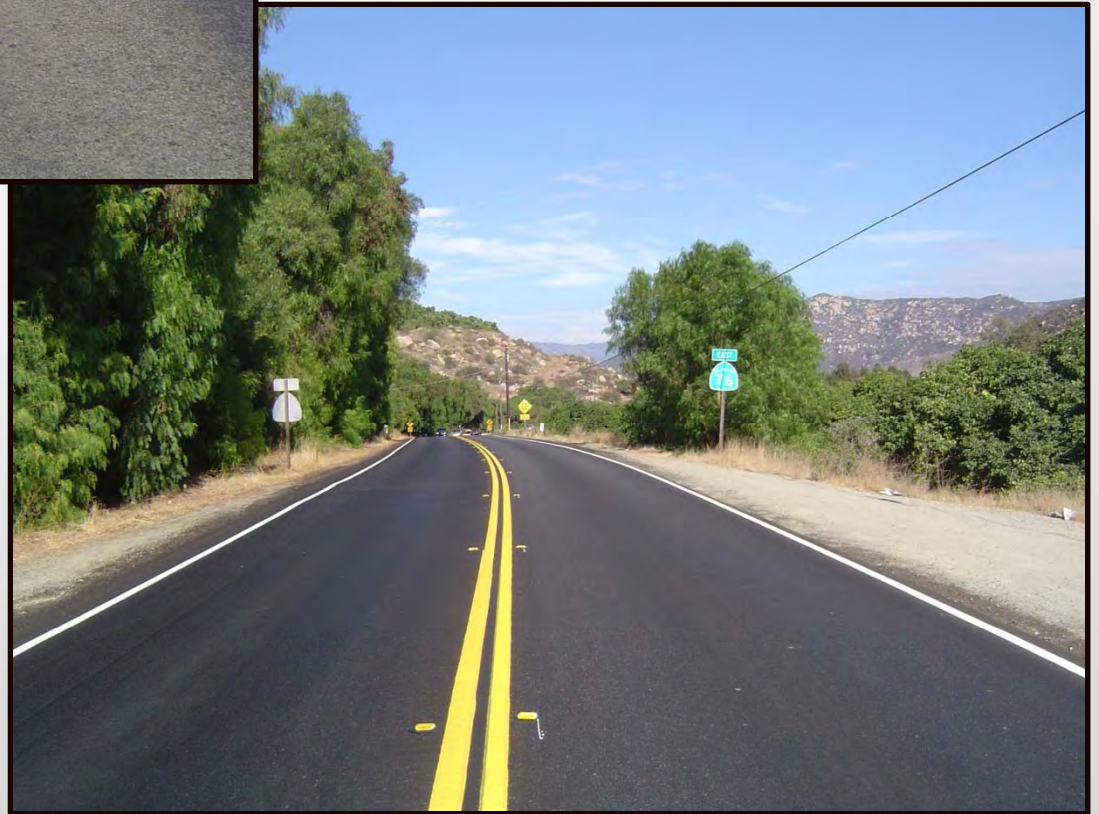




Your jobs
should look
like this



Or
this....



Thank You for your Time!

