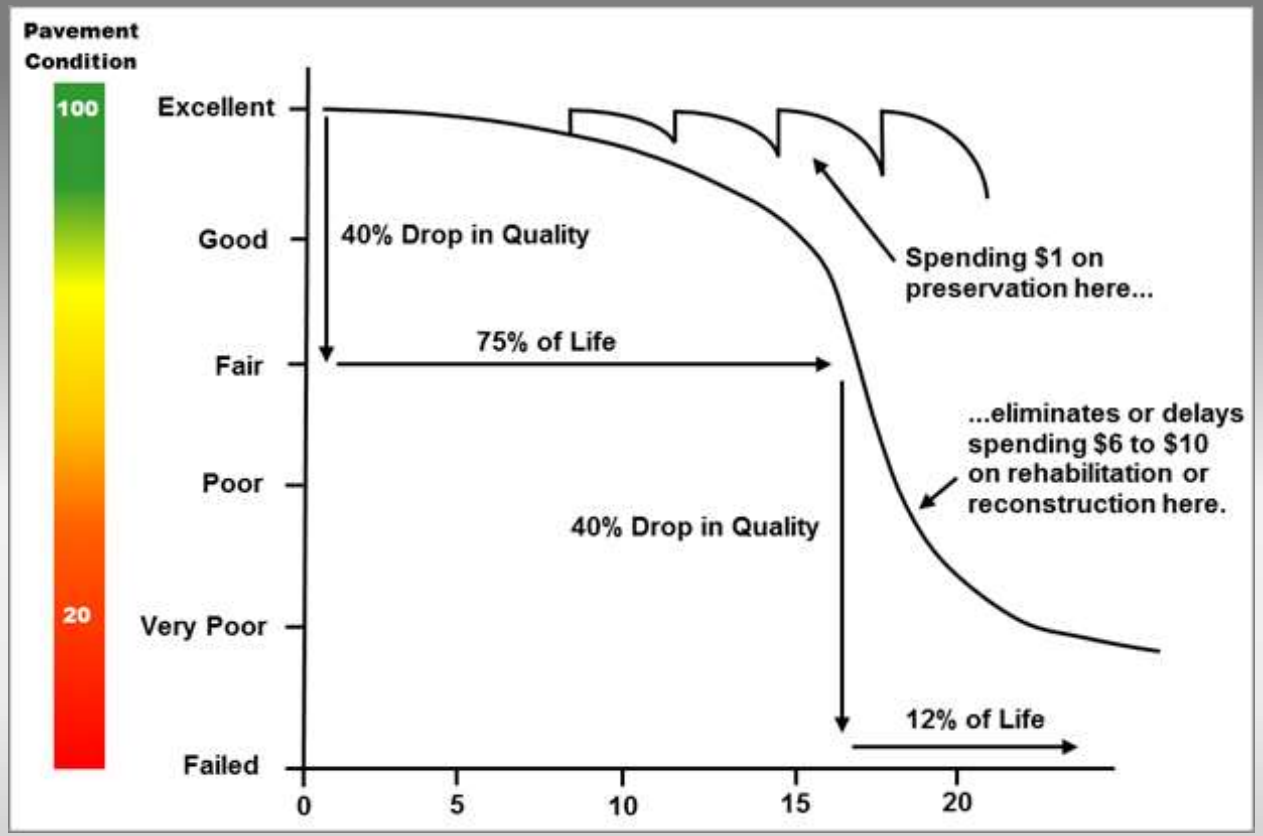
| Pavement Preservation |
| Tool Kit |


GARMIN 07/25/2018 02:13:15 PM 37.61628 -83.41235 42 MPH

Why Preventive Maintenance?

- Cost effective treatments that extends the life of the existing pavement.
- Limited Funding
- Rising Cost
- Decline in quality
- Increased miles and traffic



Understanding Emulsions & Terminology

Cationic

- Positive Charge
- Chemical Break

Examples

- CSS-1H
- CRS-2

Anionic

- Negative Charge
- Evaporation Break

- SS-1H
- RS-2

Emulsions

Rapid Set = RS

- Least stable
- Breaks fast in contact with aggregate
- Polymer may be added
  - increase adhesion
  - shorten return time to traffic
- KYTC Common Uses
  - Chip Seal applications
  - Asphalt Seal Coats

Medium Set = MS

- Designed to stay workable longer than RS
- KYTC common uses
- Chip Seal

Slow Set = SS

- Most stable of emulsions
- Breaks primarily by evaporation
- KYTC Common Uses
- Tack

Quick Set = QS

- Works with finer aggregates with a fast break
- Includes polymers and other additives
- KYTC Common Uses
  - Microsurfacing

Lower Viscosity = 1

- More Fluid

High Viscosity = 2

- Thicker

Designed to cling to rock

Harder Base = H

- Thicker
- Performs well in hotter climates
- Less likely to run when heated

Softer Base = S

- Thinner
- Preforms well in colder climates
- More resistant to cracking

Emulsions

Polymer = P

- Improve physical properties
  - Performance
  - Durability

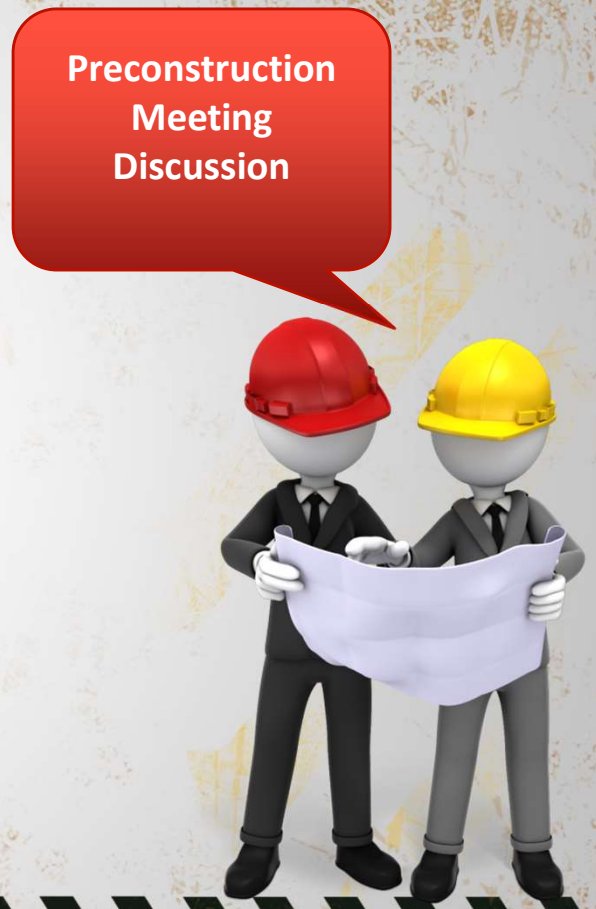
Latex Polymer = L

- Improves physical properties
  - Performance
  - Durability
  - Less Common

Construction - Chip Seal

Preconstruction Meeting

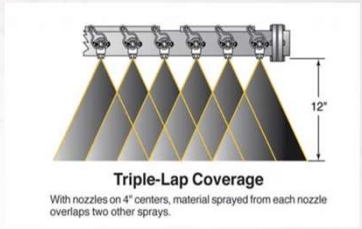
- Preconstruction Meeting
  - Mix Design/Compatibility test
  - PR Information Discussed
  - Proper Signs
    - Loose Gravel
    - Reduce Speed
  - Equipment Calibration
    - Distributor
    - Chip Spreader
  - Staging Lot/Stockpile
  - Proper Emulsion
    - Crack seal on existing pavement use CRS-2P
  - Sampling Materials
    - Aggregate (Pretest Material)
    - Emulsion (Lot Number)
  - Traffic Control & Phasing
    - Pilot Truck
    - Sweeping operation (entrances and approach roads)

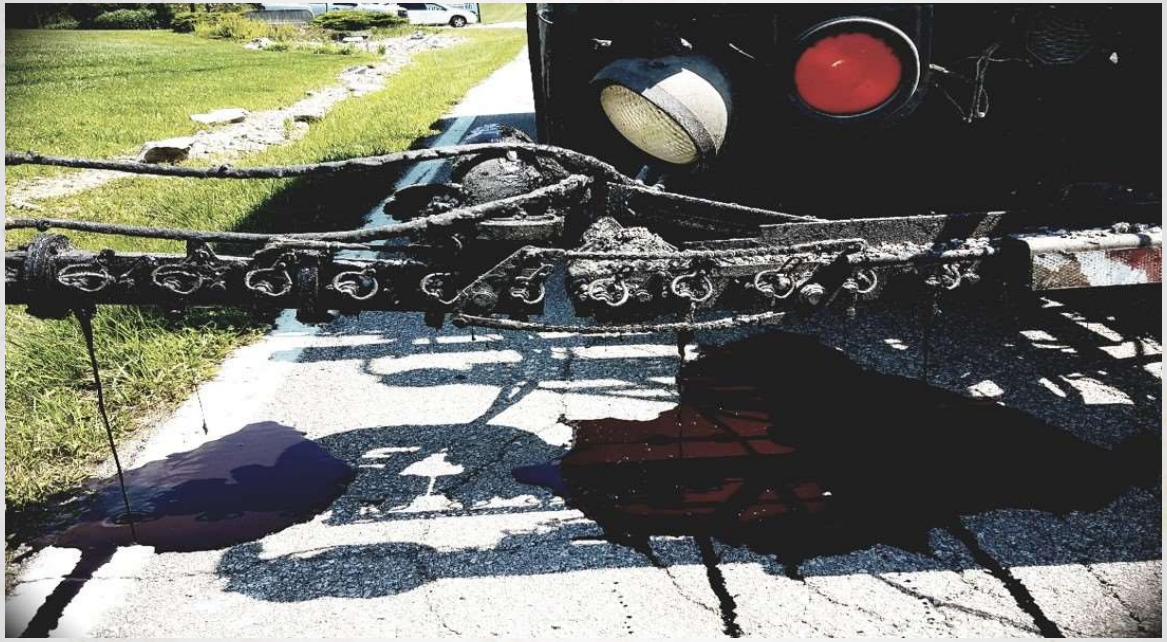


Construction – Chip Seal

Calibration & Walk Around

- Distributor
  - ensure proper size, angle of nozzles and height of bar
  - Look for leaks
  - check screen if calibration is off
  - temperature of material
  - application rate is usually .33 to .34 gallons per sq yard
- Chip Spreader
  - Check for screen in hopper to stop oversize aggregate
  - Chipper must be variable width
  - Computer rate control
  - Locking device for dump trucks
  - Look for leaks on equipment
  - Aggregate is usually between 16 to 18 lbs. (ideal to set chipper at 17 lbs.)
- Rollers
  - 2 Pneumatic tire rollers
  - 1 Double Steel drum roller 5 to 8 tons
  - Check weight of steel drum roller
  - ensure no hydraulic leaks

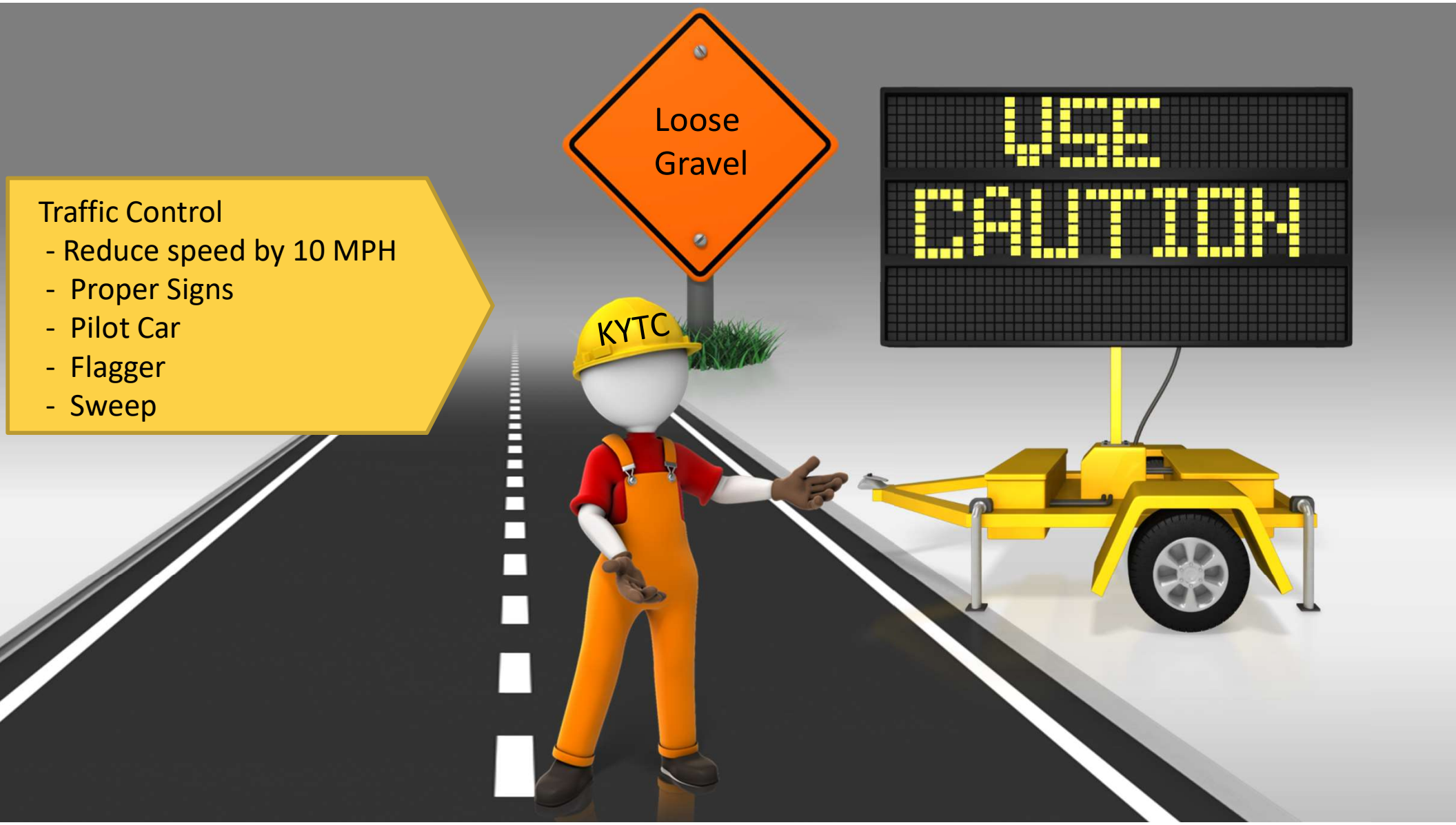




Construction – Chip Seal

Surface Preparation

- Remove all thermoplastic and raised pavement markers
- Prior to chip seal operation, clean and fill holes where raised pavement markers were removed
- Clean any vegetation, loose material and dirt off roadway
- Clean edges of pavement to remove any over growth of grass, weeds and brush
- If you crack seal on existing pavement use a CRS-2P
- Surface preparation is incidental


Traffic Control
- Reduce speed by 10 MPH
- Proper Signs
- Pilot Car
- Flagger
- Sweep
Loose
Gravel
KYTC
USE
CAUTION

Weather

- Air Temperature 50 and rising
- Surface Temperature 70 degrees
- Ambient not 35 degrees within 24 hours
- Stop operation if rain within next 4 hours
- Pop up shower stop distributor immediately and cover with aggregate

Materials

- Green Sheet (Bill of Lading) should have lot # and weight per gallon
- Sample Emulsion: 2 – 1 gallon containers per project unless you have any issues.
- Emulsion should be heated between 120 to 180 degrees.
- Aggregate should be sampled every 50,000 square yards (about 450 tons)
- Is aggregate too dusty?
- Aggregate should be damp but NOT too wet
- If any material is questionable, SAMPLE!
- Selection of Emulsions
  - Crack Seal on existing pavement use CRS-2P

Stockpile

- Limit the amount of movement of rock from source to application
- Ensure there is no foreign material caused by the loader operator
- Be sure the source material is properly separated
- Check stockpile for any oversized aggregate.
- Clean truck beds are also important for stockpile and eliminating oversized material at chip spreader.

Chip Seal

- Sweep roadway before starting production each day.
- Use tar paper or other materials that create professional joint and to cover manhole lids.
- Keep distributor within 150’ of Chip Spreader.
- Keep communication between chip spreader and distributor operators.
- When constructing one lane at a time ensure that you sweep edge of chip seal or do not place aggregate to the edge of emulsion.
- Roll aggregate with 5 minutes to ensure it is embedded.
  - 2 complete passes with pneumatic rollers
  - 1 pass with steel drum roller
- Roller speed is not greater than 5mph
  - Aggregate will not be properly embedded

Chip Seal

- Always sweep, blow back or don't chip to the edge of emulsion on longitudinal and transverse joints to ensure you get proper contact of emulsion to pavement.
- Proper cure time to allow traffic and sweeping operation to begin.
- Sweeping is REQUIRED at the end of each day of production.
  - This includes side roads and approaches
  - Curb and gutter use a pickup broom
  - Ensure broom head is not worn down
  - May need to sweep more than once.
- Do not stripe unless sweeping has been done.

Chip Seal

Troubleshooting Chip Seal

- Inconsistent aggregate coverage
  - Machine calibration is off (left to right side of chip spreader)
  - Oversized aggregate lodged in gate
  - Dusty/dirty aggregate
  - New asphalt (Will absorb emulsion and not enough left to retain aggregate)
- Emulsion running off roadway or into adjacent lane
  - Application rate too high
  - Calibration is off
  - Temperature too high (rage between 120 to 180) (I use 150)
  - Viscosity too low
- Crushed aggregate or poor aggregate retention due to rolling procedures
  - Crushed Aggregate:
    - Ensure proper weight of double steel drum roller
    - Excessive rolling with double steel drum roller
- Retention:
  - Delayed rolling time. Add additional pneumatic rollers or slow down production.
    - Pneumatic rollers may be moving too fast.
    - Traffic allowed on before proper cure time

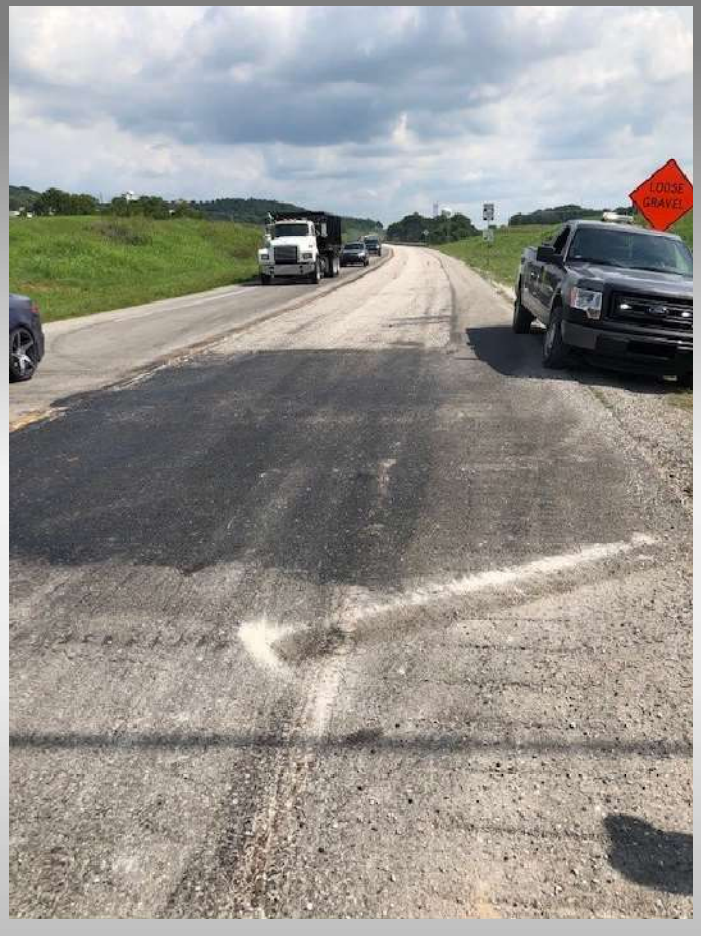
Fog Seal for Chip Seal

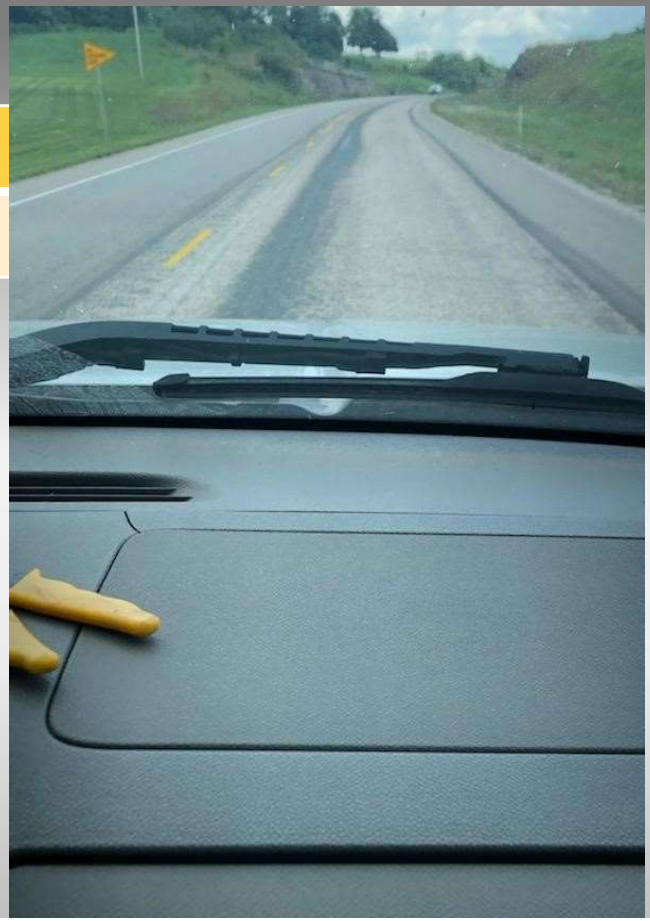
- Fog Seal for Chip Seal
  - Diluted between 28 – 32%
  - Wait 5 to 10 days after completion of chip seal.
  - Rate of application 0.05 to 0.08 gallons per sq yard
  - Chip Seal should be thoroughly swept prior to fog seal
  - Take precautionary measures for fog seal in curb & gutter, concrete driveways, etc..
  - Use proper nozzle size for fog seal application
  - No samples for diluted fog seal material

Fog Seal for Shoulders

- Fog Seal for Shoulders
  - UNDILUTED
  - Sweep shoulder before application of fog seal.
  - Rate at 0.10 gallons per sq yard
  - Use proper nozzle size on distributor
  - You can sample this material because it is undiluted
  - Great way to treat shoulders with minimum cost.

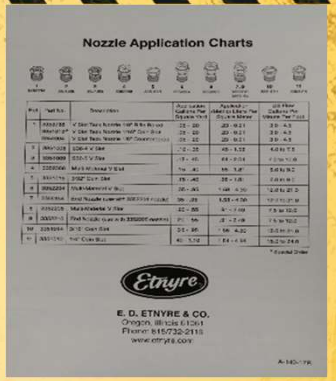
Meade County KY 313

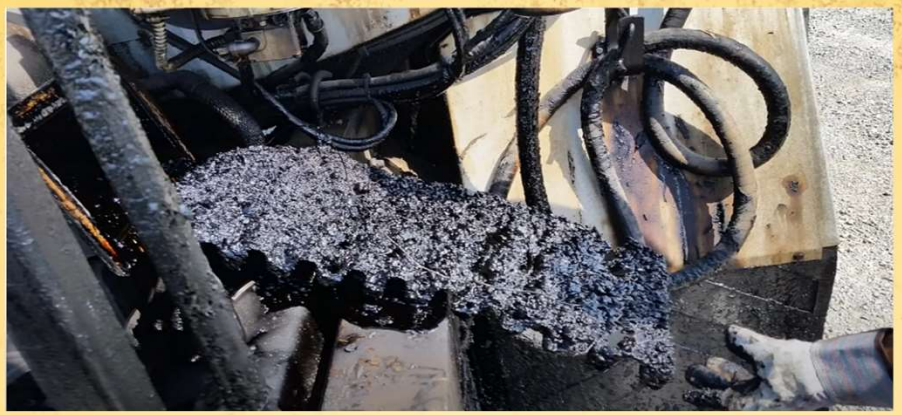


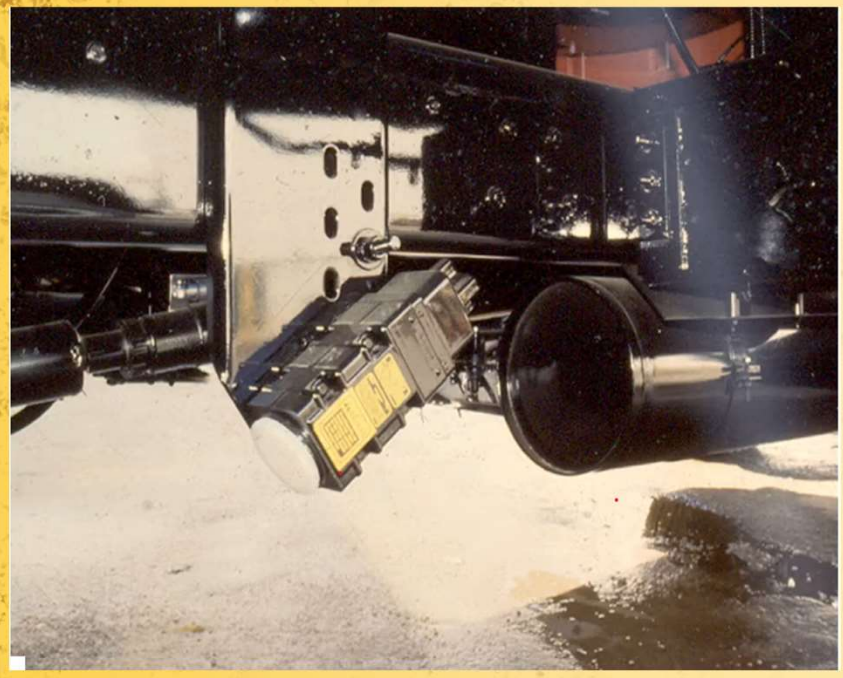


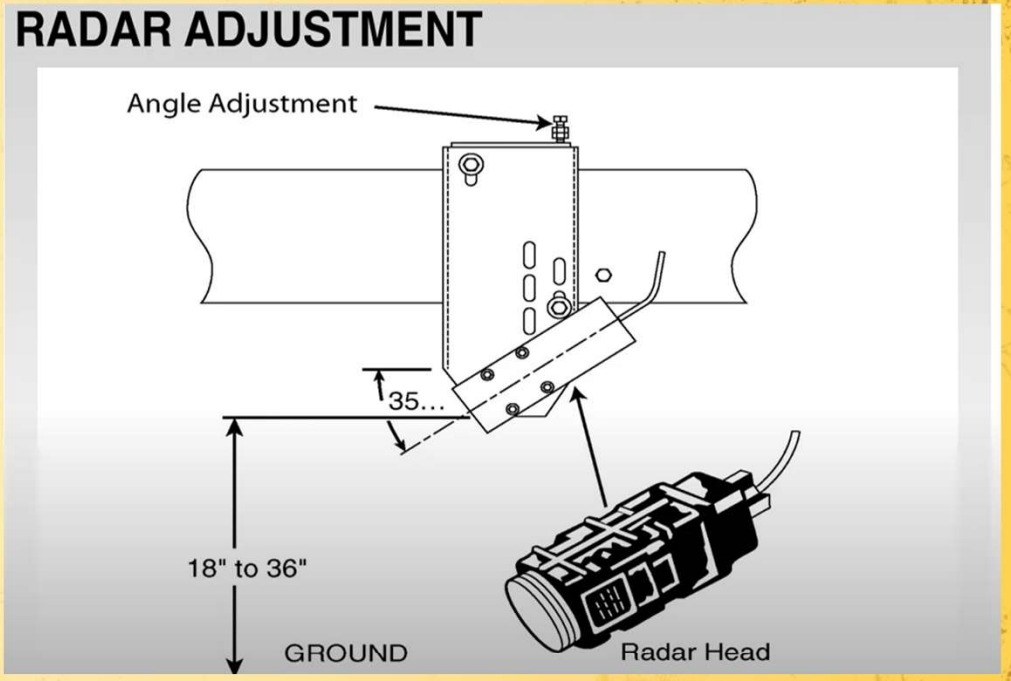
Distributor What You Need to Know

- Some of the Major Components
  - Circulating & Pumping System
    - Hydraulic Pump
    - Hydraulic Motor
    - Asphalt Pump
      Sensor in motor counts revolutions of asphalt pump
  - Radar Unit
    - Senses ground speed
    - Angle of radar 35 degrees off horizontal
    - 18” to 36”” from ground for accuracy.
    - Lens of radar should be clean, free of cracks and no water behind lens
  - Spray Bar & Nozzles
    - Circulate emulsion in bar
    - Spray bar 12” height from ground
    - Proper nozzle size for application
    - All nozzles are at 30-degree angle in same direction
  - Distributor Controls & Gages
    - Set application in gallons per sq yard








RADAR ADJUSTMENT
Angle Adjustment
35...
18" to 36"
GROUND
Radar Head

Calibration of Distributor

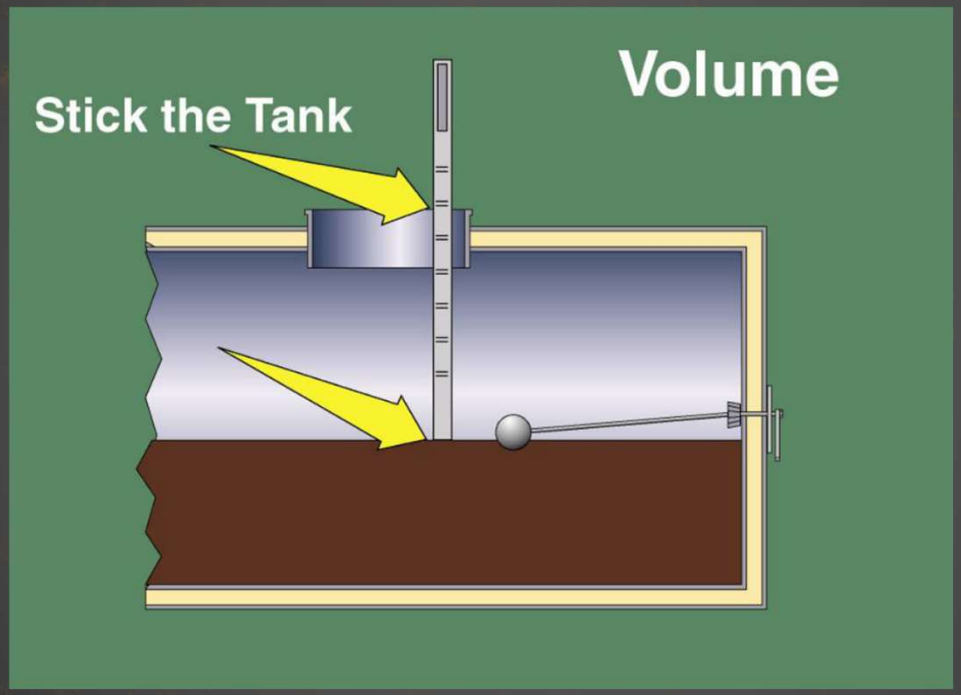
Why???? & How

- What to check
  - Nozzle size, angle of nozzles & bar height
  - Temperature of material
  - Application rate
- Now What
  - Get absorbent pads, carpet padding or geotextile fabric
  - Gorilla tape
  - Refrigerant scale
  - Bucket
  - Garbage bags
  - Gloves
  - Covers for boots

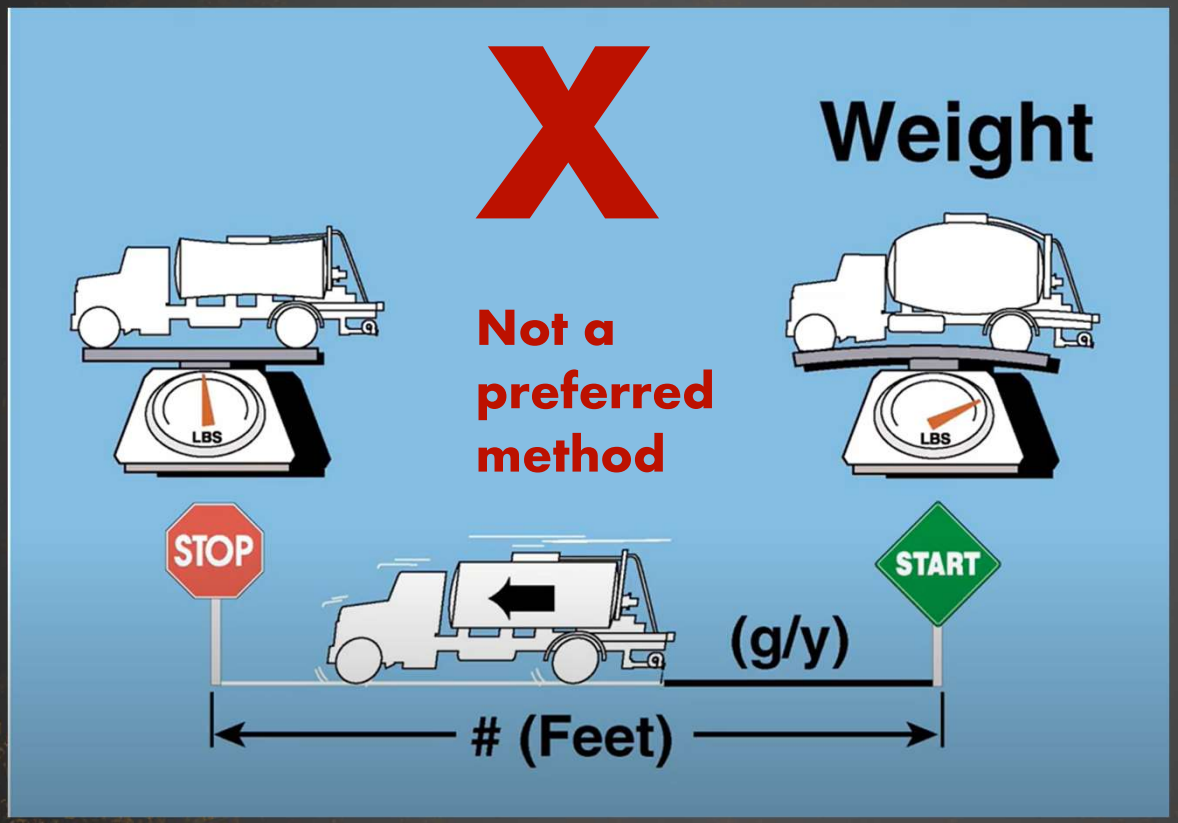
Calibration of Distributor

X

Not a preferred method



Calibration of Distributor



Calibration of Distributor

Figure 19. ASTM D 2995 Pads Used to Evaluate Transverse Application Uniformity

Figure 20. Placing Pads for ASTM D 2995

Field Verification of Application Rate of Distributor

Spreadsheet & Quick Reference Guides

available on website

Calibration of Distributor

- Have the Bill of Lading (Green sheet)
  - Need pounds per gallon off sheet
  - Enter the pounds per gallon onto spreadsheet
  - Also enter the application rate in gallons per square into the spreadsheet
- Tare weight
  - Weight of bucket with garbage bag, gloves and whatever pad you use dry
  - Enter weight into spreadsheet
- Measure Sample pad
  - Enter that measurement in inches into spreadsheet
- Lay down and secure pad
- Have distributor spray over pad
  - Pickup pad and place it and your gloves in the bucket
  - Enter the weight

This will calculate the actual application rate

Verify Application Rate of Distributor

Fill in only the grey cells.

Theorectical Application Rate

	LBS. per gallon(found on "green sheet" Bill of Lading
	Rate of Application in gallons per square yard
0.00	LBS. per square yard

Sample Pad Dimensions

	Length (inches)
	Width (inches
0.00	Square Yards of Sample Pad

Calculated Emlusion Sample Weight

	Tare weight of Pad(LBS.)(Before Emulsion is applied)
	Total weight of sample (LBS) (Pad & Emulsion)
0	Weight of Emulsion minus Tare weight(LBS.)

Actual Sample Weight of Emulsion per Square Yard

0.00	LBS. per Square Yard
0.00	Square Yards of Sample
0.00	LBS. per Sample Pad

Comfirmed Actual Application Rate

#DIV/0!	Gallons per square Yard

| Pavement Preservation |
| Tool Kit |

Microsurfacing

Preconstruction Meeting

- Approved Mix Design
- PR Information Discussion
- Is there crack seal on roadway or is it part of project
- Equipment Calibration
  - Distributor
  - Microsurfacing machine (Mechanical or Electronic)
- Staging Area/Stockpile
  - If using 2 types of aggregate proper separation
- Material Sampling
  - Aggregate (Pretest Material)(Use Gradation from Supplemental Spec. 804.04.05)
  - Emulsion (1 Sample per lot)
- Traffic Control/Phasing
  - Cones, Pilot Truck, flaggers
  - Sand for heavy traffic areas
- What areas are you paving (approaches and crossovers)
  - Single or double course

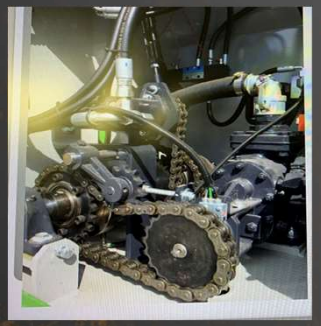
Weather & Seasonal Limitations Microsurface

- Ambient temperature 50 degrees and rising
- Existing pavement temperature 50 degrees
- No imminent rain in the forecast
- DO NOT place material between September 30 and May 1

Microsurface

Mechanical Microsurfacing Machine

- Runs on a jackshaft
  - Jackshaft keeps aggregate & emulsion pump in the same ratio
- Adjustable gates
  - Achieve proper mix design
  - Lower gate increases % of emulsion
  - Raise gate decrease % of emulsion
- Use proper calibration sheet



Electronic Microsurfacing Machine

- Uses a computer controlled hydraulic motor to separately control aggregate belt and emulsion pump.
- Computer maintains ratios of aggregate and emulsion.
- Radar keeps machine applying proper application
- Calibrate radar
- Use proper calibration sheet.

Calibration of Mechanical Paver

Emulsion

- 3 Readings
  - Start weight & Ending Weight
  - Start counts & Ending counts
  - Aggregate count
- All 3 readings within 2%

Microsurfacing Calibration Work Sheets

Unit No. _____ Date _____

RPM _____

I. Emulsion Calibration

Minimum of 50 Aggregate Counts

Trial	A Starting Weight	B Ending Emulsion Weight	C Net Emulsion Weight (B - A)	D Starting Emulsion Count	E Ending Emulsion Count	F Net Emulsion Count (E - D)	G Aggregate Count	H Emulsion lbs per Emul Count (C ÷ F)	I Emulsion lbs per Agg Count (C ÷ G)	J Within 2% Error Count for Emulsion $((H-H_1)\div H_1)\times 100$
1	0	106	106	0	3074	3074	690	0.034482759	0.034482759	0.1
2	0	104	104	0	3017	3017	680	0.034471329	0.034471329	0
3	0	107	107	0	3108	3108	700	0.034427284	0.034427284	0.1
			Average Emulsion			Average (S)	Average Ag Count	Average (H_1)	Average (I)	
			105.666667			3066.33333	690	0.034460457	0.153140097	

Calibration of Mechanical Paver

Aggregate

- Put in % Moisture
- 3” Gate Setting 3 Readings
  - Start weight & Ending Weight
  - Start counts & Ending counts
  - All 3 readings with 2%
- 4” Gate Setting 3 Readings
  - Start weight & End weight
  - Start counts & End counts
  - All 3 reading within 2%
- 5” Gate Setting 3 Readings
  - Start weight & Ending Weight
  - Start counts & Ending counts
  - All 3 reading within 2%

II. Aggregate Calibration

% Moisture in Agg. in Decimal: 0.04 + 1.00 = Moisture Factor[1]: 1.04

Agg. Gate Setting inches	A Starting Weight	B Ending Weight	C Net Weight	D Starting Aggregate Counts	E Ending Aggregate Counts	F Number of Aggregate Counts	G Aggregate Lbs per Agg Count	H Within 2% Error count
3			(B - A)			(E - D)	(C÷F)	((C-G_1)÷G_1)×100
1	0	272	272	0	310	310	0.877419355	0.8
2	0	275	275	0	314	314	0.875796178	0.6
3	0	255	255	0	297	297	0.858585859	1.4
							Average (G_1)	
							0.870600464	

Average Agg. Wt. per Agg. Count (G_1) _____ ÷ Moisture Factor[1] _____ = Dry Agg. Wt./Agg. Count (Y_1) 0.837115831

Page 1

Agg. Gate Setting inches	A Starting Weight	B Ending Weight	C Net Weight	D Starting Aggregate Counts	E Ending Aggregate Counts	F Number of Aggregate Counts	G Aggregate Lbs per Agg Count	H Within 2% Error count
4			(B - A)			(E - D)	(C÷F)	((C-G_2)÷G_2)×100
1	0	352	352	0	311	311	1.131832797	1.5
2	0	352	352	0	305	305	1.154098361	0.5
3	0	354	354	0	305	305	1.160655738	1
							Average (G_2)	
							1.148862299	

Average Agg. Wt. per Agg. Count (G_2) 1.148862299 ÷ Moisture Factor[1] _____ = Dry Agg. Wt./Agg. Count (Y_2) 1.104675287

Agg. Gate Setting inches	A Starting Weight	B Ending Weight	C Net Weight	D Starting Aggregate Counts	E Ending Aggregate Counts	F Number of Aggregate Counts	G Aggregate Lbs per Agg Count	H Within 2% Error count
5			(B - A)			(E - D)	(C÷F)	((C-G_3)÷G_3)×100
1	0	430	430	0	301	301	1.428571429	0.2
2	0	430	430	0	303	303	1.419141914	0.4
3	0	440	440	0	308	308	1.428571429	0.2
							Average (G_3)	
							1.425428257	

Calibration of Mechanical Paver

Cement

- 3 Readings
  - Start weight & Ending Weight
  - Start counts & Ending counts
- All 3 readings within 2%

Page 2

III. Cement Calibration

	A	B	C	D	E	F	G	H
Cement	Starting Weight	Ending Weight	Net Weight	Start Cement Count	End Cement Count	Number of Cement Counts	Cement Lbs per Cem. Count	Within 2% Error count
			(B - A)			(E - D)	(C÷F)	((C-G_1)÷G_1)×100
1	0	9.9	9.9	0	706	706	0.014022663	1
2	0	10.1	10.1	0	714	714	0.014145658	0.1
3	0	10.2	10.2	0	713	713	0.01430575	1
							Average (G_1)	
							0.014158024	

Calibration of Mechanical Paver

Water

- 3 Readings
  - Start weight & Ending Weight
  - Start counts & Ending counts
- All 3 readings within 2%

IV. Water Calibration

	A	B	C	D	E	F	G	H
Water	Starting Weight	Ending Weight	Net Weight	Start Water Reading	End Water Reading	Number of Gallons	Water Gal per Gal Count	Within 2% Error count
			(B - A)			(E - D)	(C÷F)	((C-G_1)÷G_1)×100
1	0	35	35	0	412	412	0.084951456	1.3
2	0	33	33	0	395	395	0.083544304	0.4
3	0	32	32	0	385	385	0.083116883	0.9
							Average (G_1)	
							0.083870881	

Calibration of Mechanical Paver

Now what do I need a mix design for?

Put in the % Emulsion per Mix Design.

Where you Say !

Determine the gate setting that will be used by plotting a graph. The vertical axis will be scaled and labeled as the Dry Aggregate Weight per Aggregate Count and the horizontal axis is the gate setting. Plot three points on the graph by using the different gate settings that was used during calibration along with the corresponding dry aggregate weight per aggregate count. Draw a straight line to connect the three points.

From the mix design obtain the percent of emulsion that will be used for the mixture. On the vertical axis draw a horizontal line from the value calculated from the average weight of emulsion per emulsion count that was determined during the emulsion calibration and is labeled as Average (S) divided by the emulsion percentage from the mix design in decimal form.

Emulsion P.C.	0.153140097	(I)	%Emulsionper design	0.117	(P)	I/P	1.308889715

Once the horizontal line touches the straight line, draw a vertical line down to determine the aggregate gate setting that will be used.

Calibration of Mechanical Paver

NOW WHAT the *@**

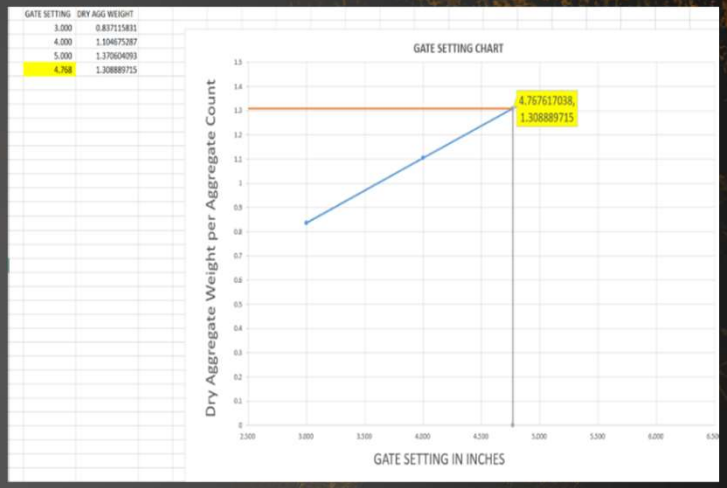
Go to the Graph tab at the bottom

Now the spreadsheet has graphed your Calibration information!

BAM!!! Now you know your gate setting!

Thanks Greg!

GATE SETTING	DRY AGG WEIGHT
3.000	0.837115831
4.000	1.104675287
5.000	1.370604093
4.768	1.308889715



Calibration of Mechanical Paver

When Calibrated drop a pile of mix.

MICRO SURFACING / SLURRY SEAL DESIGN

TERRY ASPHALT MATERIALS INC

Job Identifiers: Campbell County
KYTC 222025

Project No. / Contract ID:

Customer Strawser Construction

Job Mix Formula

Component	Amount
Aggregate	100%
Cement	1.0% ± 0.5%
Tot. water (exc. agg moist. 3%)	9.0% ± 1.0%
Emulsion	11.7% ± 0.5%
Residual	7.8% ± 0.3%
Additive	0% ± 0.04%

Aggregate data

Supplier: Hanson Plum Run
Type: Type II

Sieve	% Passing	Spec
3/8 in.	100%	100
No. 4	97%	90-100
No. 8	72%	60-90
No. 16	47%	40-75
No. 30	31%	25-50
No. 50	21%	15-30
No. 100	15%	10-21
No. 200	11.1%	5-15

Quant eff of moist.
6%-98.3 lbs/cu. ft.
5%-95.3 lbs/cu. ft.
4%-91.1 lbs/cu. ft.
3%-88.0 lbs/cu. ft.
4%-85.7 lbs/cu. ft.
5%-85.1 lbs/cu. ft.
6%-83.9 lbs/cu. ft.

Soundness	LA Abrasion	Sand Equ
1.9	28	75

Moisture%
3%

Emulsion data

Supplier: Terry Asphalt
Type: CQS-1HP

Test on emulsion	Result	Spec
Residual solids, pct.	66.7	62.0 min.
Storage stability, pct.	0.8	1 max
Particle charge	Positive	Positive
Viscosity, Saybolt, 25°C, sec.	40	20 - 100
Sieve, pct.	0.00	0.10 max

Test on residue	Result	Spec
Penetration, 25°C, dmm	53	40-90
Ductility, 25°C, cm	82	40 min
Elastic recovery, 10°C, pct.	60	45 min
Solubility in TCE, pct.	99.8	97.5
Softening point, °C	63	60°C min.

Mixture performance data

Test	Result @ 7.8%	Spec
Mix time @ 77F (25C), TB113	160 seconds	Ctrl to 120 Sec. Min.
Mix time @ 104F (40C), TB113	45 seconds	Ctrl to 35 Sec. Min.
Cohesion @ 30min, TB139	14 N kg-cm	12 kg-cm Min.
Cohesion @ 60min, TB139	21 N kg-cm	20 kg-cm or NS Min.
Wet stripping test, TB114	99%	Pass (90% Minimum)
WTAT 1 hour, TB100	130 g/m2	538 g/m2 Max
WTAT 6 day, TB100	395 g/m2	807 g/m2 Max
Lateral displacement, TB147	0.92%	5% Maximum
Excess asphalt/sand adhesion, TB109	21 g/ft2	50 g/ft2 Maximum
Schulze-Breuer and Ruck, TB144	1.1 g	2.0 g max

Designed by: B. Behrens
QA Technician

5/31/2022

Calibration of Electronic Paver

Emulsion

- 3 Readings
  - Start weight & Ending Weight
  - Start counts & Ending counts
- All 3 readings within 2%

Microsurfacing Calibration Work Sheets

Unit No. _____ Date _____

RPM _____

Emulsion Calibartion _____ _____

Agg. Gate Setting inches	A Starting Weight	B Ending Weight	C Net Weight	D Starting Emulsion Counts	E Ending Emulsion Counts	F Number of Emulsion Counts	G Emulsion Lbs per Count	H Within 2% Error count
			(B - A)			(E - D)	(C÷F)	$((C-G_t)\div G_t)\times 100$
1			0			0	0	#DIV/0!
2			0			0	0	#DIV/0!
3			0			0	0	#DIV/0!
							Average (G_t)	
							0	

Calibration of Electronic Paver

Aggregate

- % Moisture
- 3 Readings
  - Start weight & Ending Weight
  - Start counts & Ending counts
- All 3 readings within 2%

II. Aggregate Calibration

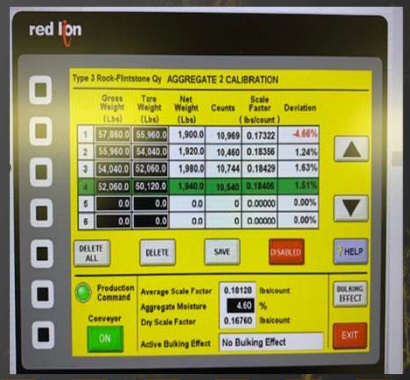
% Moisture in Agg. in Decimal _____ +1.00=Moistue Factor _____1

Agg. Gate Setting inches	A Starting Weight	B Ending Weight	C Net Weight (B - A)	D Starting Aggregate Counts	E Ending Aggregate Counts	F Number of Aggregate Counts (E - D)	G Aggregate Lbs per Agg Count (C÷F)	H Within 2% Error count ((C-G_2)÷G_2)×100
1			0			0	#DIV/0!	#DIV/0!
2			0			0	#DIV/0!	#DIV/0!
3			0			0	#DIV/0!	#DIV/0!
							Average (G_2)	
							#DIV/0!	

Average Agg. Wt. per Agg. Count (G_3) #DIV/0! ÷ Moisture Factor[1] _____ 1 Dry Agg.Wt./Agg.Count(Y3) #DIV/0!

Agg. Gate Setting inches	A Starting Weight	B Ending Weight	C Net Weight (B - A)	D Starting Aggregate Counts	E Ending Aggregate Counts	F Number of Aggregate Counts (E - D)	G Aggregate Lbs per Agg Count (C÷F)	H Within 2% Error count ((C-G_3)÷G_3)×100
1			0			0	#DIV/0!	#DIV/0!
2			0			0	#DIV/0!	#DIV/0!
3			0			0	#DIV/0!	#DIV/0!
							Average (G_3)	
							#DIV/0!	

Average Agg. Wt. per Agg. Count(G_3) #DIV/0! ÷ Moisture Factor[1] _____ 1 Dry Agg.Wt./Agg.Count(Y3) #DIV/0!



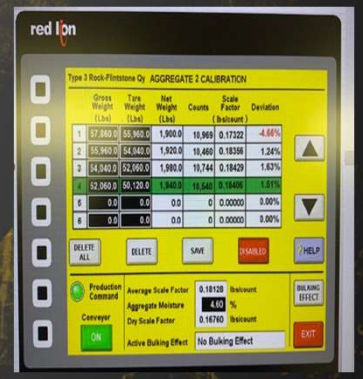
Calibration of Electronic Paver

Cement

- 3 Readings
  - Start weight & Ending Weight
  - Start counts & Ending counts
- All 3 readings within 2%

III. Cement Calibration

Cement	A Starting Weight	B Ending Weight	C Net Weight	D Start Cement Count	E End Cement Count	F Number of Cement Counts	G Cement Lbs per Cem. Count	H Within 2% Error count
			(B - A)			(E - D)	(C÷F)	$((C-G_1)\div G_1)\times 100$
1			0			0	#DIV/0!	#DIV/0!
2			0			0	#DIV/0!	#DIV/0!
3			0			0	#DIV/0!	#DIV/0!
							Average (G_1)	
							#DIV/0!	



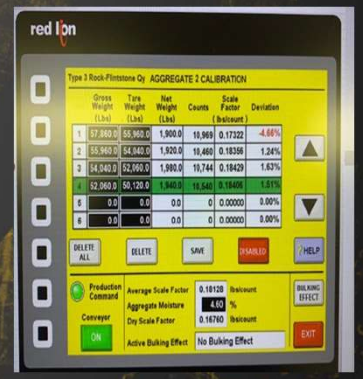
Calibration of Electronic Paver

Water

- 3 Readings
  - Start weight & Ending Weight
  - Start counts & Ending counts
- All 3 readings within 2%

IV. Water Calibration

	A	B	C	D	E	F	G	H
Water	Starting Weight	Ending Weight	Net Weight	Start Water Reading	End Water Reading	Number of Gallons	Water Gal per Gal Count	Within 2% Error count
			(B - A)			(E - D)	(C÷F)	$((C-G_1)\div G_1)\times 100$
1			0			0	#DIV/0!	#DIV/0!
2			0			0	#DIV/0!	#DIV/0!
3			0			0	#DIV/0!	#DIV/0!
							Average (G_1)	
							#DIV/0!	



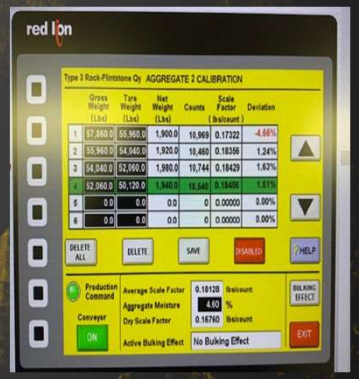
Calibration of Electronic Paver

Distance (That's Different)

- 3 Readings
  - Measured Distance
  - Counts
- All 3 readings within 2%

Why Micro Machine runs on Radar

Distance Calibration				
	Minimum of 500' perferred 1000'			
	Distance			
	Measured Feet	**Counts**	**Inches /Count**	**Deviation**
1			#DIV/0!	#DIV/0!
2			#DIV/0!	#DIV/0!
3			#DIV/0!	#DIV/0!
4				
5				
6				
			Average	
			#DIV/0!	



When Should You Recalibrate

- Replace emulsion pump
- Replace water pump
- Additive pump
- Replace aggregate belt or skirting
- Replace tips to pug mill
- Change mix design

Microsurface

- Calibration & Walk Around
  - Copy of approved mix design
  - Know if you are using a Electronic or Mechanical paver
    - Calibrations are different for each machine
      - One machine has one jack shaft and other computer controlled hydraulic motors
  - Calibrate Paver to Mix Design
    - Calibrate for Type II & Type III aggregate
    - Ensure that aggregate has been run through screener
    - Know moisture of aggregate (contractor will do speedy moisture)
    - Always drop a pile in staging lot before test strip
  - Walk Around machine & Support Trucks
    - look for hydraulic or any other fluid leaks
    - worn out skirts
    - Inspect spreader box that it is clean and in good working order
  - When to recalibrate
    - Replacement of Emulsion Pump
    - Water pump
    - Additive Pump
    - Replace aggregate belt or skirting
    - Tips on pug mill
    - Change in a mix design

Look for loose aggregate

Microsurfacing Spreader Box

- Components of the Spreader Box
  - Front Seal
    - Contains material inside box
  - Runners (Inboard & Outboard)
    - Inboard runner carries weight of box for placing microsurface for longitudinal joint
    - Outboard runner maintains side seal of box
  - Primary Strike Off
    - Determines your application rate.
    - Rigid (can restore pavement profile) (Use on Leveling Course)
  - Secondary Strike Off
    - Provides finish surface
    - More flexible rubber
  - Augers
    - Rear augers bring material to outside of box
    - Front augers bring excess material back to center of box
  - Controls
    - Modifies width, height & shape of material being placed

Microsurface

- Surface Preparation
  - Is incidental
  - Clean roadway of vegetation, loose material, dirt and any other questionable material
  - Sweep roadway
  - Remove raised pavement markers and any thermoplastic
    - Fill in holes from raised pavement markers
      - Micro, hot mix or other material approved by engineer
  - Was crack seal completed before project or is it part of project?
  - Apply Tack
    - diluted rate of 2 to 1 ratio
    - application rate of 0.03 to 0.06 gal/sq yd
    - Never apply tack on microsurface material (Minor leveling or Leveling course)
    - No sample required because it is diluted

Microsurface

- Test Strip
  - Prior to production
  - 1000’ long lane width wide
  - Time of day of normal contract production
    - Daytime or night time
  - Should be able to hold traffic in 60 minutes
    - Or less if engineer is comfortable with cure time
    - If test strip doesn’t cure in 60 minutes another test strip is required
  - Look for any problems in mix
    - Do you see chevron pattern in mat
      - No cement in mix
      - box needs to be adjusted
    - Too slick looking (should have oatmeal texture)
      - Use a stick and draw a line in mat if fills with water
  - Towel Test

Microsurface

- Microsurface Production
  - Leveling Course
    - 18lbs
    - Type III aggregate
    - always D aggregate
    - Used only in double Micro
    - Paid by the square yard
    - Meet joint no overlap
  - Surface Course
    - Type II aggregate
    - Aggregate could be A,B or D
    - Used in single micro
      - 24lbs
      - Paid by square yard
    - Also, in Double micro
      - No tack on Leveling Course
      - 18 lbs.
      - Paid by the square yard

Microsurface

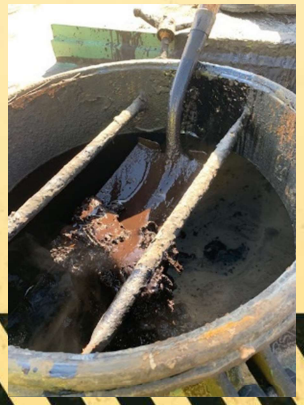
- What to watch for
  - Fluids leaking from equipment
  - Clean professional construction joints
  - Sand falling in front of spreader box
  - Side Rubbers on spreader box
  - Keeping mix only halfway or less up on augers
  - Not dragging material out
  - Putting roofing paper or plastic down on bridges
  - Sanding high traffic areas like approaches and side roads
    - Ensure this material is swept after project completion
  - Get 3 random yield reading from contractor
    - Yield is based on dry aggregate weight
  - Maximum 2” overlap on longitudinal joints
  - Drags marks in mat
    - Buildup on rubbers
    - Oversized aggregate, etc...
      - If over sized aggregate is excessive check that material is being screened or that there are not holes in screen
    - Contamination in stockpile
  - Blending Type II & Type III aggregates

Sampling for Microsurface

- Materials
  - Approved mix design
  - CQS-1hP or CQS-1hL (Emulsion)
    - 1 sample (2 jugs) per lot number
      - lot number is on Bill of Lading (Green Ticket)
  - Aggregate (Sand)
    - 1 per day per type of aggregate Type III & Type II
      - Gradations from Supplemental Specifications 804.04.05 Microsurface
      - Sand equivalent
  - Tack
    - No sample required diluted 2 to 1
  - Mineral Filler (Cement)
    - On Approved Material List for Portland Cement Type 1

Emulsion CQS-1hP or CQS-1hL

- Temperatures are best at 80 degrees to 110 degrees
  - Emulsion dropping below 75 degrees will likely cause to separate or shear.
  - Emulsion over 125 degrees can cause material to break quickly and be out of control
- Separation of Emulsion
  - If material has sat in storage tank for multiple days without production especially in early spring and late fall
  - If you see strings of latex in the material coming out behind the secondary rubber you should go check storage tank for material breaking down. Continue to monitor material closely
  - This is most likely to happen in the early spring and late fall.



Troubleshooting Microsurface

Debonding

- Any petroleum fluids on pavement
- Dirt on roadway
- Vegetation growing in roadway
- Aggregate falling in front of box under paver
- No tack used on asphalt surface
- Traffic on microsurface too soon

Raveling

- Slight amount is common
  Leveling Course will ravel
  more than Surface Course
- Cooler Temperatures
- Microsurface not being placed at proper thickness (too thin)
- Traffic allowed on mat too soon

Troubleshooting Microsurface

- Washboard Texture
  - Paving too fast
  - Rubber strike off need's adjustment
- Cure Time Too Fast
  - Excessive cement
  - No enough additive
  - High ambient/pavement temperatures
  - Emulsion Temperature too hot
  - Too little water
  - Not Fogging pavement with water in front of spreader box
  - Too many fines in Microsurfacing sand

Troubleshooting Microsurface

- Cure Time Too Slow
  - Insufficient Mineral Filler(Cement)
  - Too much additive
  - Too much water
  - Emulsion formulated for different temperature range
- Surface Mat Inconsistencies
  - Paving too fast
  - Running material to light
  - Aggregate rolling over crack seal
  - Oversize Material
  - Excessive liquids floating emulsion to top
  - Chevron Pattern
    - No Cement
    - Spreader box too low

Troubleshooting Microsurface

- Microsurface Completed 8/15/2018
- Picture Taken March 16, 2023

- Cost of repair
  - 17,556’ x 4’ = 70,224 sq’
  - 70,224 sq’ / 9 = 7803 sq yards
  - 7803 x 110 = 430 tons Asphalt
  - 430 tons of Millings
  - Striping
  - Now 2 joints
  - Public Complaints

Asphalt Thin Lay

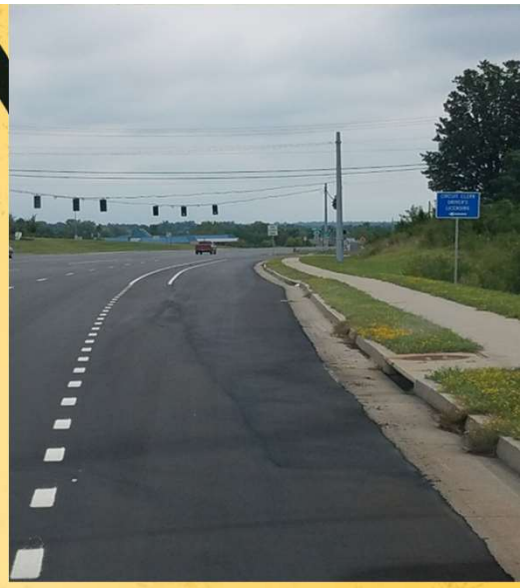
- Rollers
  - Compaction (Spec. Book 403.03.10)
    - Option B
      - Break down roller weight 10 tons
      - 40” Diameter or more
- Temperature
  - Surface & Air 50 degrees
- Paver
  - Screed is hot
  - Take paver to truck
  - Minimize stops
  - Steady Speed

Asphalt Thin Lay

- Remove
  - Raised pavement markers
  - Thermoplastic
- Milling
  - Edge Keys
  - Curb Cuts
  - Full width
  - Fine milling
- Tack
  - Clean surface
  - Application Rate!
  - Vertical faces
  - Uniform coverage

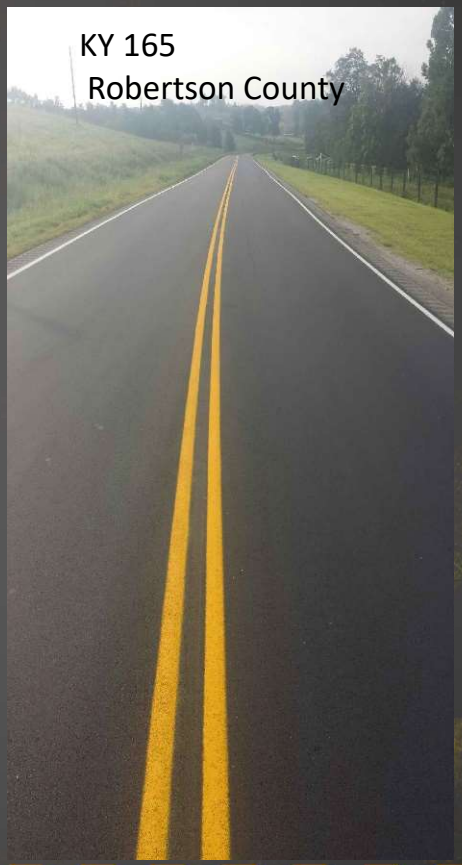
Asphalt Thin Lay

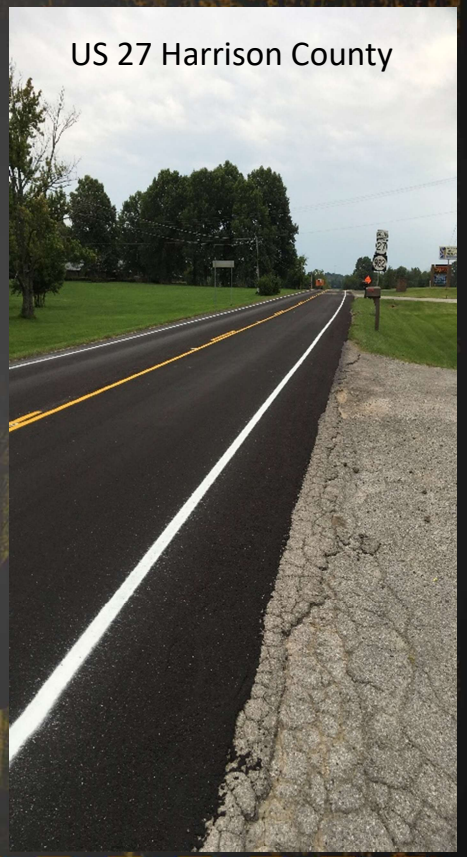
- Oversized material
- Handwork
- Static rolling
- Crack Seal
- Tack Application



Cape Seal

- Chip Seal followed by Thin Lay/Micro
  - Cure time
    - No less than 72 hours
    - Final treatment start within 10 days
  - Sweep
  - Tack as usual
  - Flexible interlayer
  - Seals entire roadway





Liquidated Damages

- Paving completed by September 30
  - Microsurfacing
  - Chip Seals
  - Asphalt Surface No.4 mixes
  - Fog Seal
- LD's assessed
  - All paving items not completed
  - September 30th to November 30th of completion year
  - May 1st to completion of work the following year
- Written Approval from Engineer will allow contractors to work
  - October 1st to October 15th and /or May 1st to May 15th

Crack Seal

- Crack seal can either be on existing pavement or part of the micro contract.
  - If part of the contract, place at least 30 days prior to micro
- Ensure to follow manufactures' heating instructions
  - Contractors have operating external thermostats on crack seal buggy
- Ensure area is properly cleaned and dried prior to sealing
- Overband is typical application when let with Microsurfacing contract
  - Overband no more than 1/8" thickness
  - Ensure sealer has cooled down or use a detacking product (Lime water) before traffic is allowed on it.

Non- Tracking Tack & Tack

- What is the difference
  - Regular tack (SS-1 or SS-1h)
    - Temperature range for application 70-160 degrees per spec. book
    - Undiluted application rate of 0.1 gallons per sq. yd.
  - Non-tacking Tack
    - Special Notes/Special Provisions on Construction website
    - Temperature range for application 165 – 180 degrees
    - Undiluted application rate of 0.08 gallons per sq. yard
    - Season limitations October 1 to May 15th
    - Roadway temperature minimum of 40 degrees and rising
- Sampling of Tack & Non-tracking Tack
  - 1 – Sample (2- 1 gallon jugs) per 115 tons of tack
  - Check on Bill of Lading (Green Sheet) for date of manufactured
    - 28 days before retesting is required

Pavement Bonding Issues

What are some of the major causes of debonding???

- Dirty surface
- Not enough tack or uneven tack
- Not waiting for tack to break
- Tack applied to wet surface
- TOO much cut back (adding of water SS-1 or SS-1h)
  - No water to be added by contractor
- Non-Tracking Tack pavement temperatures too cold
- Traffic on tack before breaking and tracking off
- Not tacking between layers of asphalt

Question???