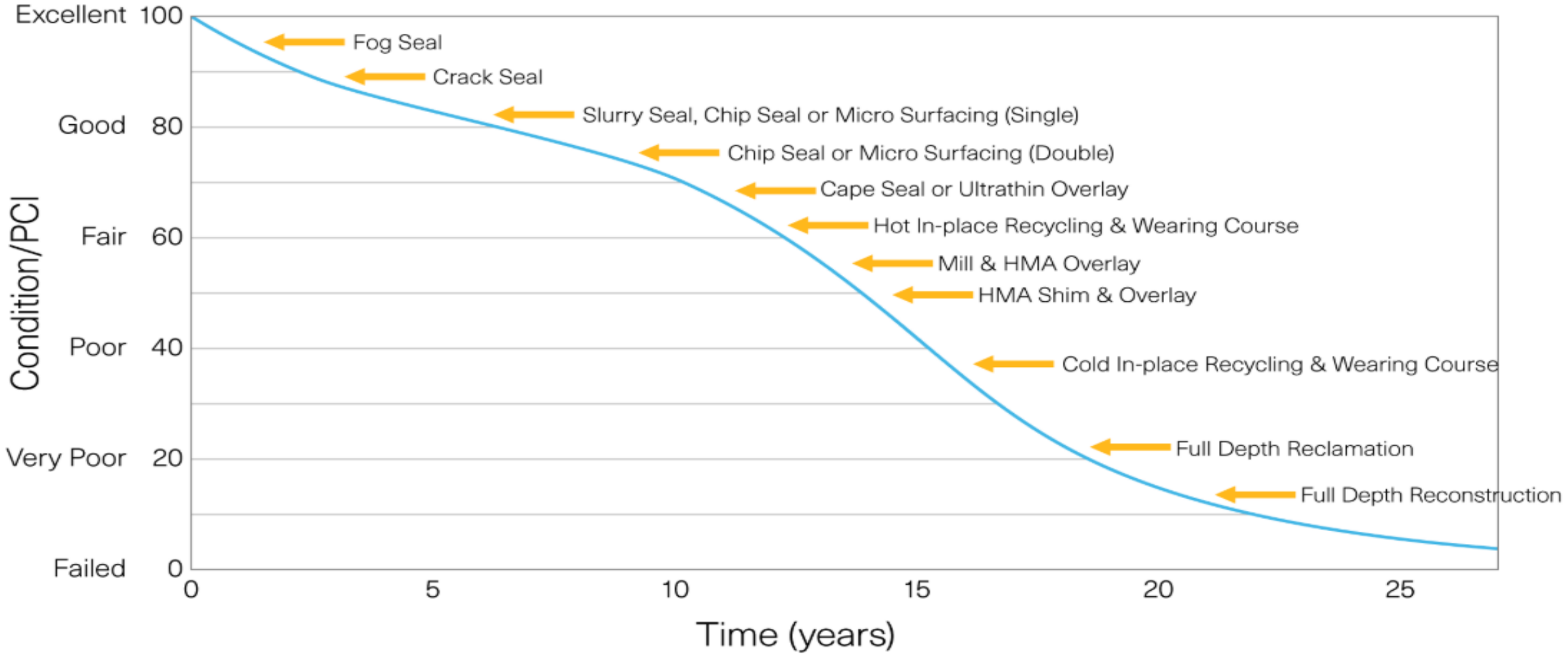
North Dakota Pavement Preservation Training
Overview of Preservation Treatments

Rex Eberly
National Center Pavement Preservation

MICHIGAN STATE
UNIVERSITY

Deterioration Curve



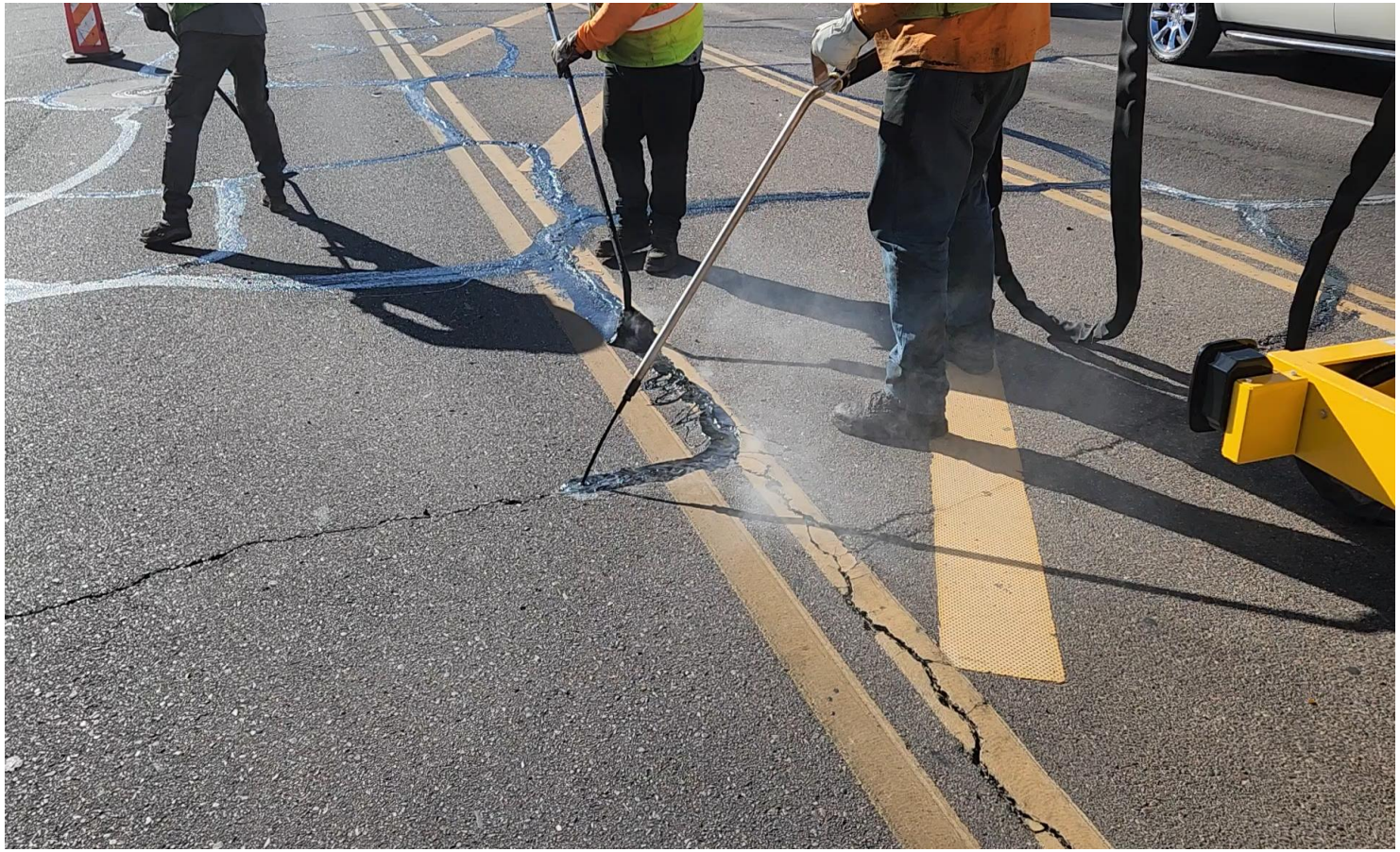
Indus Inc.

Crack Treatments

- Crack Treatments are broken into 3 categories:
  - Crack Sealing – Working Cracks
  - Crack Filling – Non-Working Cracks
  - Mastics – Over 1 ½" in width
- They reduce water penetration into underlying pavement layers, thus maintaining base strength near the crack
- Reduce incompressible intrusion, thus reducing crack growth and raveling

Benefits of Crack Treatments

- Slows pavement deterioration
- Prevents future roughness increase
- Slows crack spalling
- Reduces potholes
- Extends pavement life from 1 to 7+ years



Crack Movement

- Horizontal Thermal Movement
  - Temperature Changes

- Vertical Movement
  - Up and down movement
  - Caused by traffic loads

Cracks can open up to 100% of original width as the pavement temperature changes from summer to winter extremes

Rate	0 - 0.004 mm/min
Daily	0 - 2 mm
Seasonal	0 - 25 mm

Proof That Crack Treatments Work – NCAT Study

Life-Extending Benefit of Crack Sealing for Pavement Preservation

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Abstract

Crack sealing and filling is used as a pavement preservation treatment to prevent water infiltration and loss of load-carrying capacity, hence extending the life of the pavement. This study used field performance data of test sections from the Pavement Preservation Group (PG) Study being conducted in part by the National Center for Asphalt Technology (NCAT). Data from test sections located in a low traffic volume road with a hot, wet, no-freeze climate collected over a period of more than 6 years were used to evaluate the effect of crack sealing and filling, either as a stand-alone treatment or in combination with other surface treatments. A semi-parametric survival analysis was performed to determine the difference in median time to failure (MTTF) for sections with and without crack sealing. The results showed that when used as a stand-alone treatment on a pavement in "good" condition, the life-extending benefit from crack sealing/filling could not be calculated for the selected analysis period because the MTTF would not be reached within 10 years. The estimated benefit for pavements in "fair" and "poor" condition ranged from 1.1 to 7.3 years, depending on pretreatment condition and travel lane. If used in combination with a chip seal, the additional life-extending benefit for a pavement in "good" condition is approximately 2 years, and is slightly decreased to approximately 1.5 years if the pavement is in "fair" to "poor" category. Test sections continue to be monitored as part of a broader long-term study.

Findings from NCAT Crack Treatment Study

- Pavements in Good Condition stayed in Good Condition and did not return to Pre-Existing Condition (% of Cracking) during the study (+ 10 Years).
  - Life Extension of + 10 Years.
- Pavements in Fair to Poor Condition saw Life Extension values of 1.1 to 7.3 years.
- A Crack Seal placed before a Chip Seal or Micro surface added at least 2 years of Life Extension over the Chip or Micro alone.

When Should you Treat Cracks?

- All cracks soon after they appear… any crack opening will allow moisture penetration into pavement foundation (subbase)
- At a minimum, all cracks >1/8” (≥ 3mm)

Chip Seal

- Bituminous Seal Coat is essentially a single layer of asphalt binder that is covered by embedded aggregate (one stone thick) whose primary purpose is to seal the fine cracks in an underlying pavement's surface and prevent water intrusion into the base and subgrade.

Chip Seal

The main advantages of chip seals include:

- **Improved Skid Resistance**: Chip seals provide good skid resistance,
- **Cost Effective Treatments**: Chip seals are typically cost effective when properly placed on the right type of pavement,
- **Good Durability**: By using durable aggregates, chip seals wear well and can have long service lives,
- **Ease of Construction**: Chip seals are typically constructed rapidly and cause less disruption to the traveling public.

Chip Seal

- Chip Seals help preserve the pavement by:
  - Protecting the surface asphalt from oxidation.
    - Oxidation, caused by sun and chemicals make the asphalt cement brittle and more prone to cracking and raveling.
  - Protecting the surface and base from moisture intrusion.
    - Moisture causes:
      - Stripping of base layers
      - Potholes
      - Base Failures
  - Repairing light raveling
    - As asphalt ages, top layer gets brittle
    - Small aggregate begins to wear away
    - Seal coat adds new binder to halt this
  - Provides a skid resistant, sacrificial wearing surface that protects the underlying surface from traffic wear and damage.


Bear Cat
CRC Computerized Rate Control
INTERNATIONAL

Chip Seal Selection

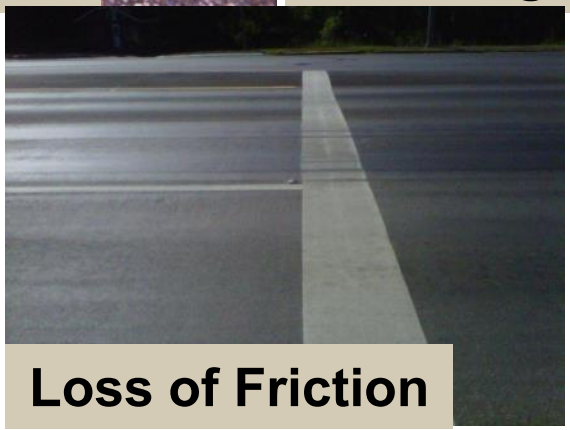
Good Candidates

Minor Cracking

Loss of Fines

Flushing

Oxidation



Loss of Friction

Chip Seal Selection

Unacceptable Candidates

Rutted Pavement

Poor Ride

Chip Seal Selection

Unacceptable Candidates

Cracks >3/4”

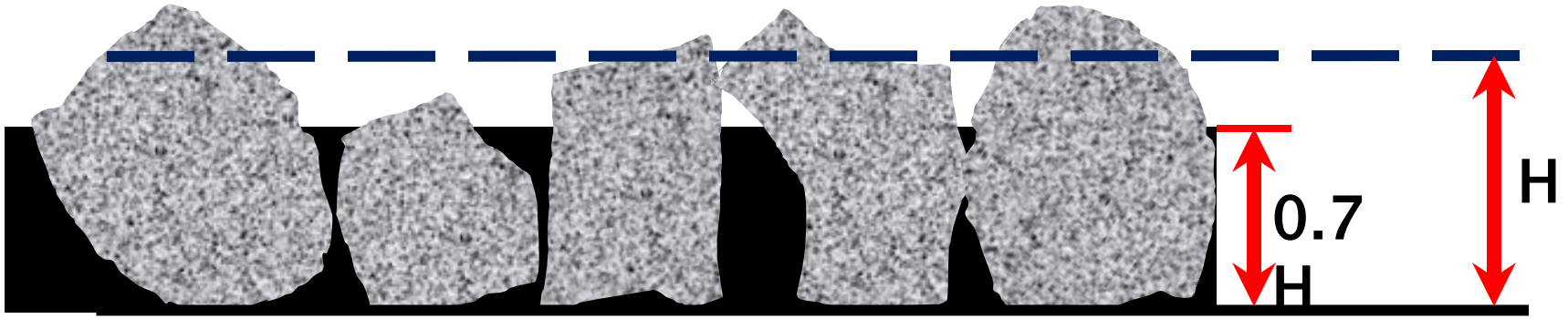
Structural Issues

Chip Seal Selection

Unacceptable Candidate
Low Severity Fatigue Cracking

Embedment

Average Least Dimension (H)



Embedment (0.7 H)

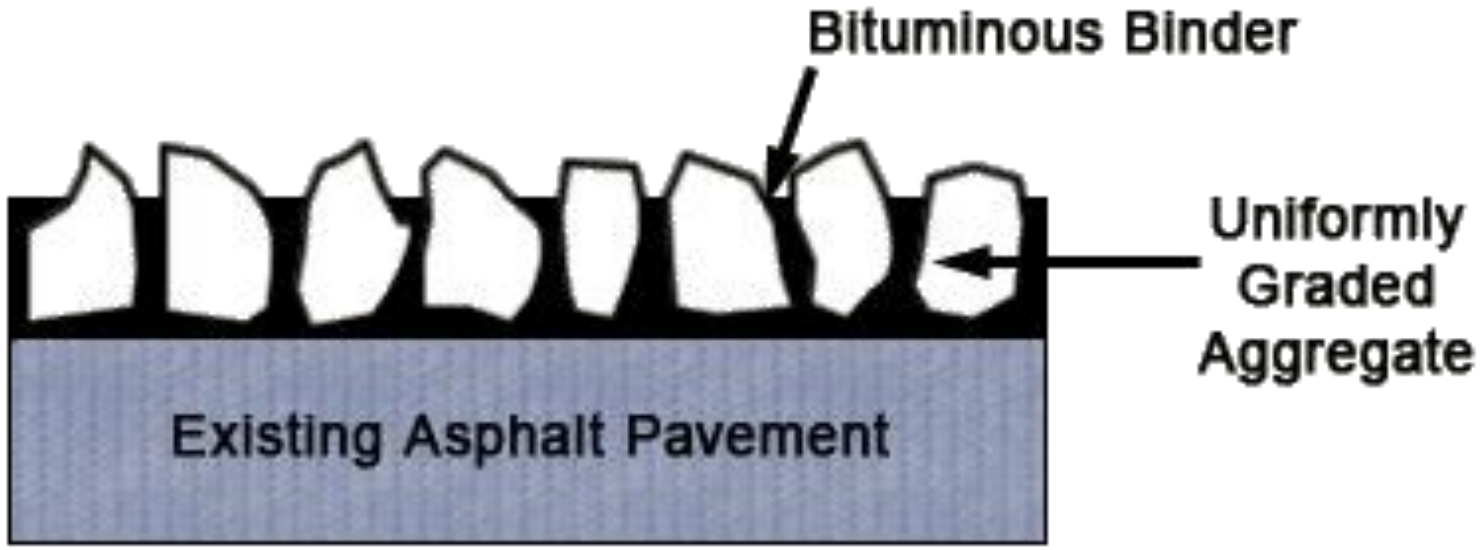
Inputs that affect Embedment

- Materials
  - Emulsions
  - Aggregates
- Equipment
  - Asphalt Distributor
  - Chip Spreader
  - Rollers
  - Brooms
- Application
- Existing Pavement

CHIP SEAL EMULSION

- CRS-2P
  - C = Cationic or Positive Charge
  - RS = Rapid Set
  - 2 = Higher Viscosity
  - P = Polymer Modified.

Materials

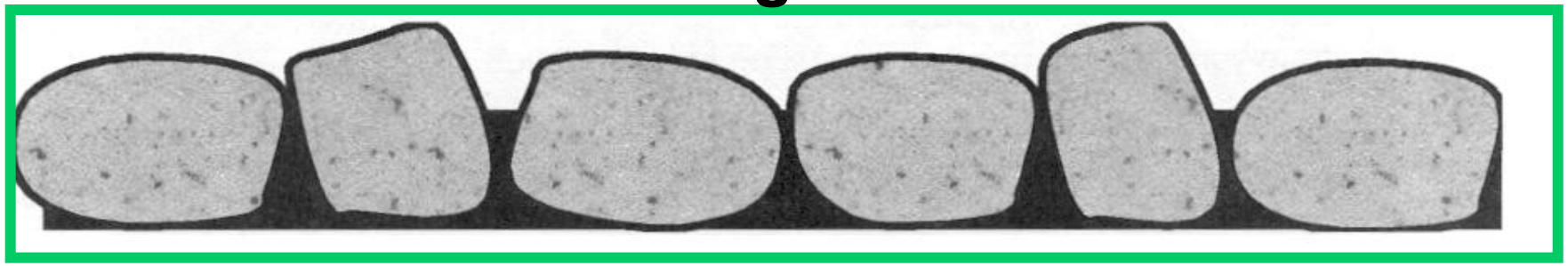


Single Chip Seal

Materials

Dense Graded

Single Size



Materials

Best Aggregate Performance when:

- Single sized
- Minimum fines
- Clean
- Free of clay
- Cubical
- Crushed faces
- Abrasion < 30%
- Binder compatible
- Damp for emulsions
- Dry for hot binders

Application Rates

- Emulsion –
  - Gal / S.Y.
- Aggregate –
  - Lbs. / S.Y.

Application Rates

- Emulsion –
  - Gal / S.Y.
- Aggregate –
  - Lbs. / S.Y.

Asphalt Distributor Checklist

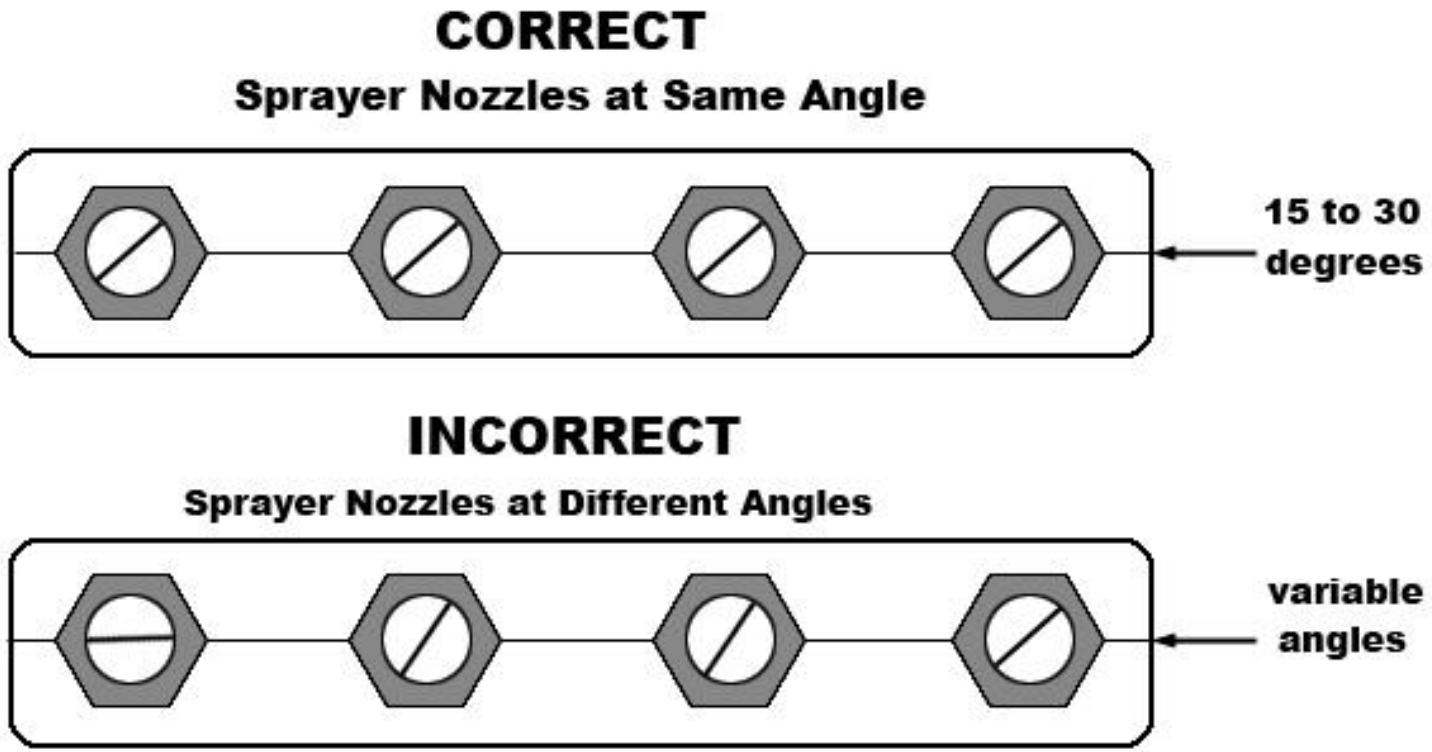
Distributor Check List

- Computerized
- Able to Circulate between tank and Bar
- Working radar
- Working Thermometer for measuring temperatures in the tank.
- Heating when required
- Gallon Gauge / Calibrated dip stick
- Correct tips (nozzles) for application
- Strainers are cleaned. No clogs

Why Should You Check Your Distributor's Calibration?

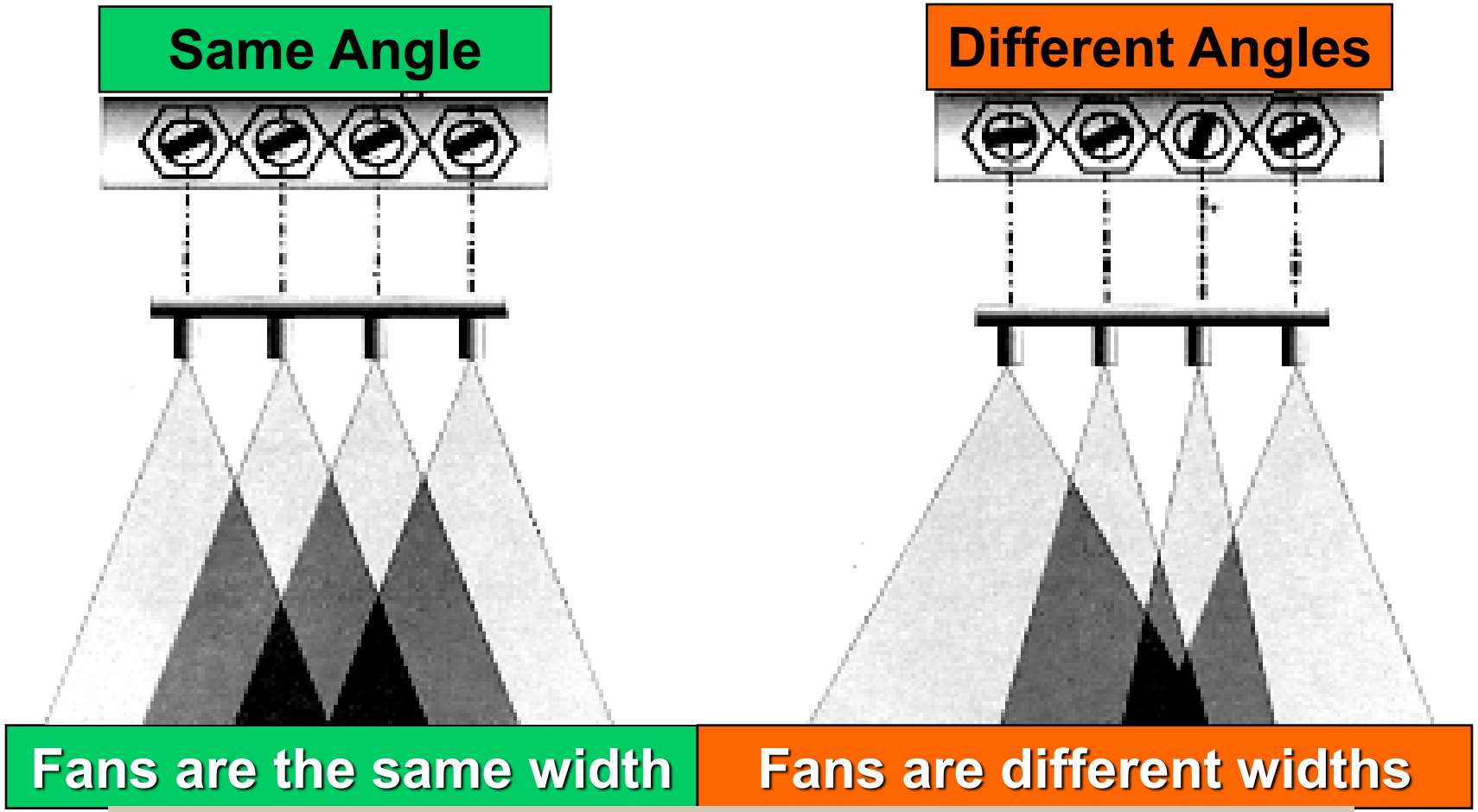
- To make sure the computer rate matches what's going on The ground
- To avoid bleeding or flooding of material
- To make sure there is enough material to retain the chip, or assure a good bond for paving surface
- To avoid increased cost of material, due to over application

Distributor Checklist



Spray Bar Nozzle Alignment

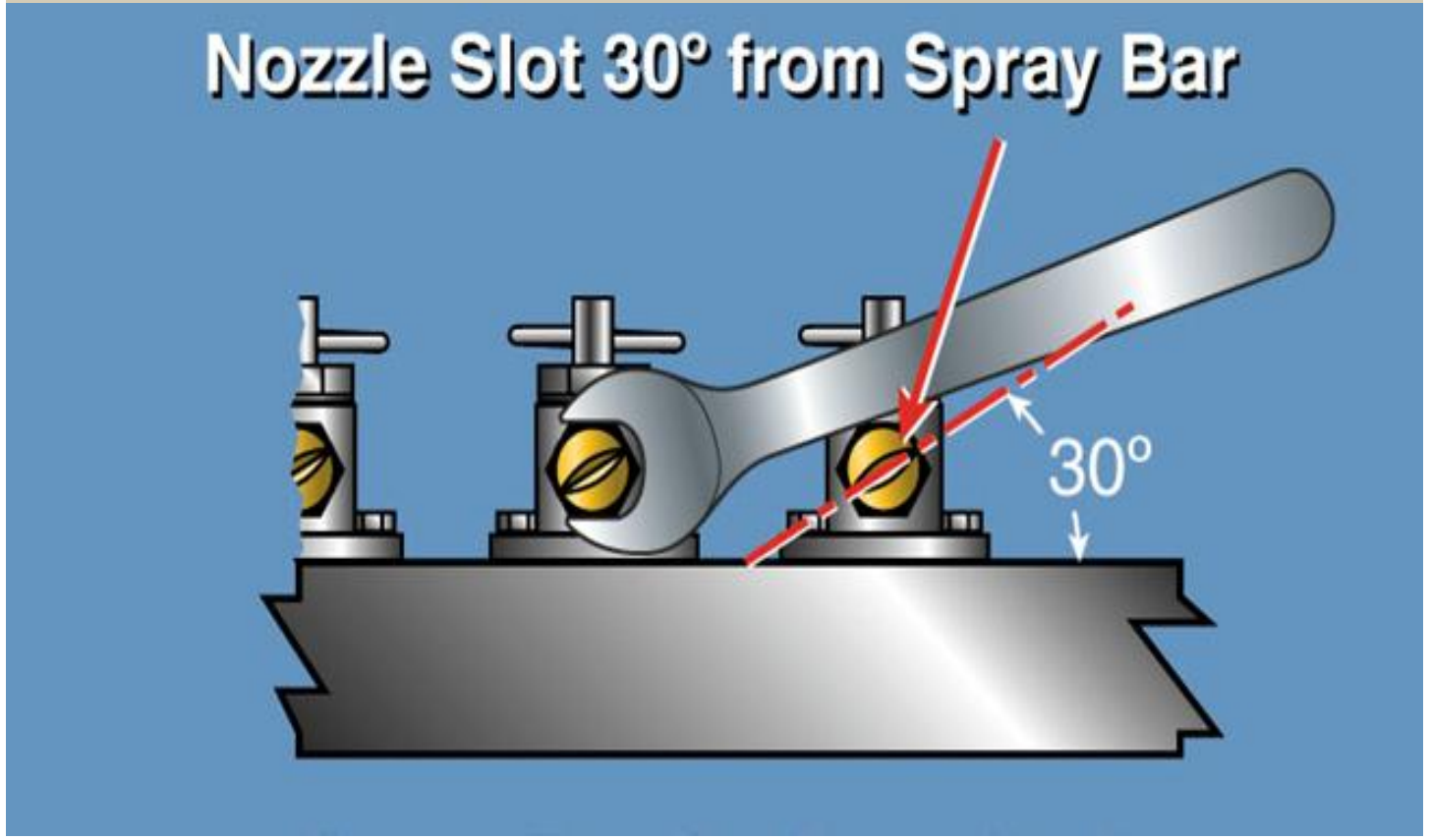
Distributor Checklist



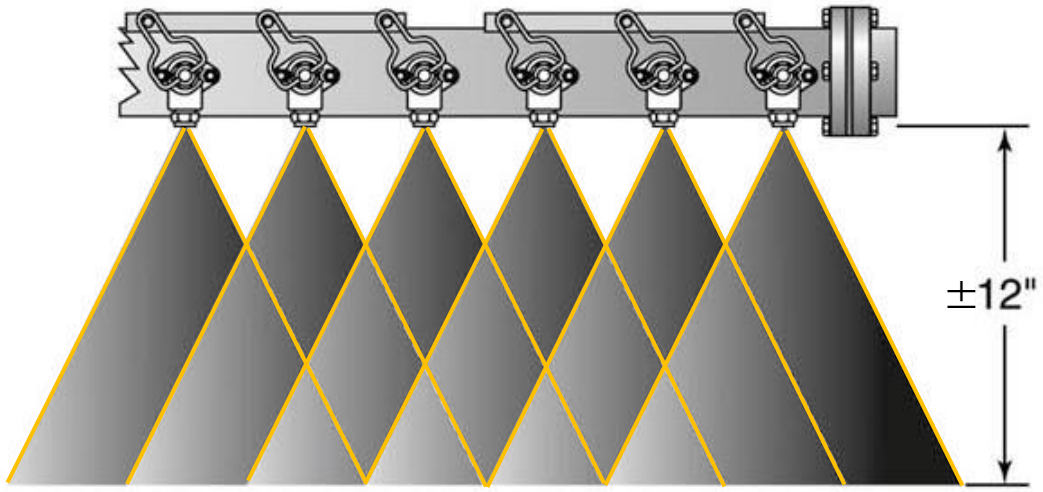
Spray Bar Nozzle Alignment

Distributor Checklist

Spray Bar Nozzle Alignment



Distributor Checklist

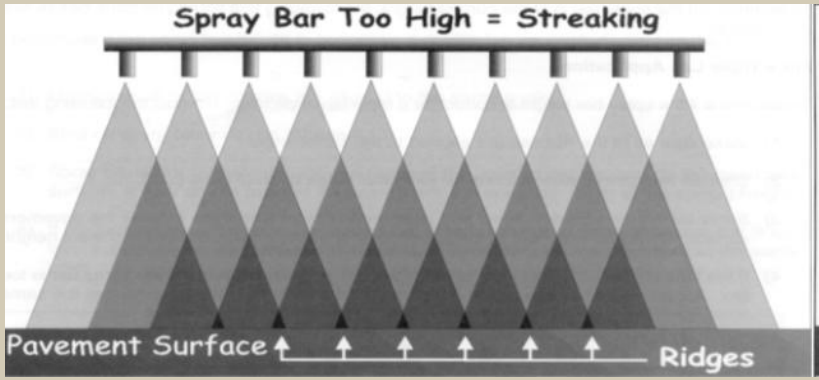


Triple-Lap Coverage

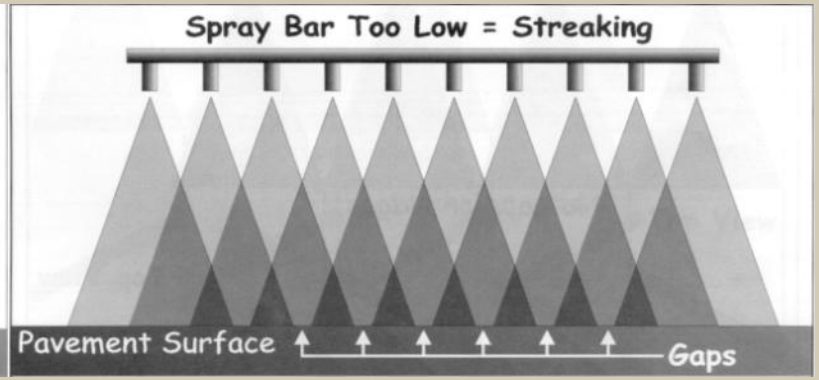
With nozzles on 4" centers, material sprayed from each nozzle overlaps two other sprays.

Calibration

Adjusting Spray Bar Height



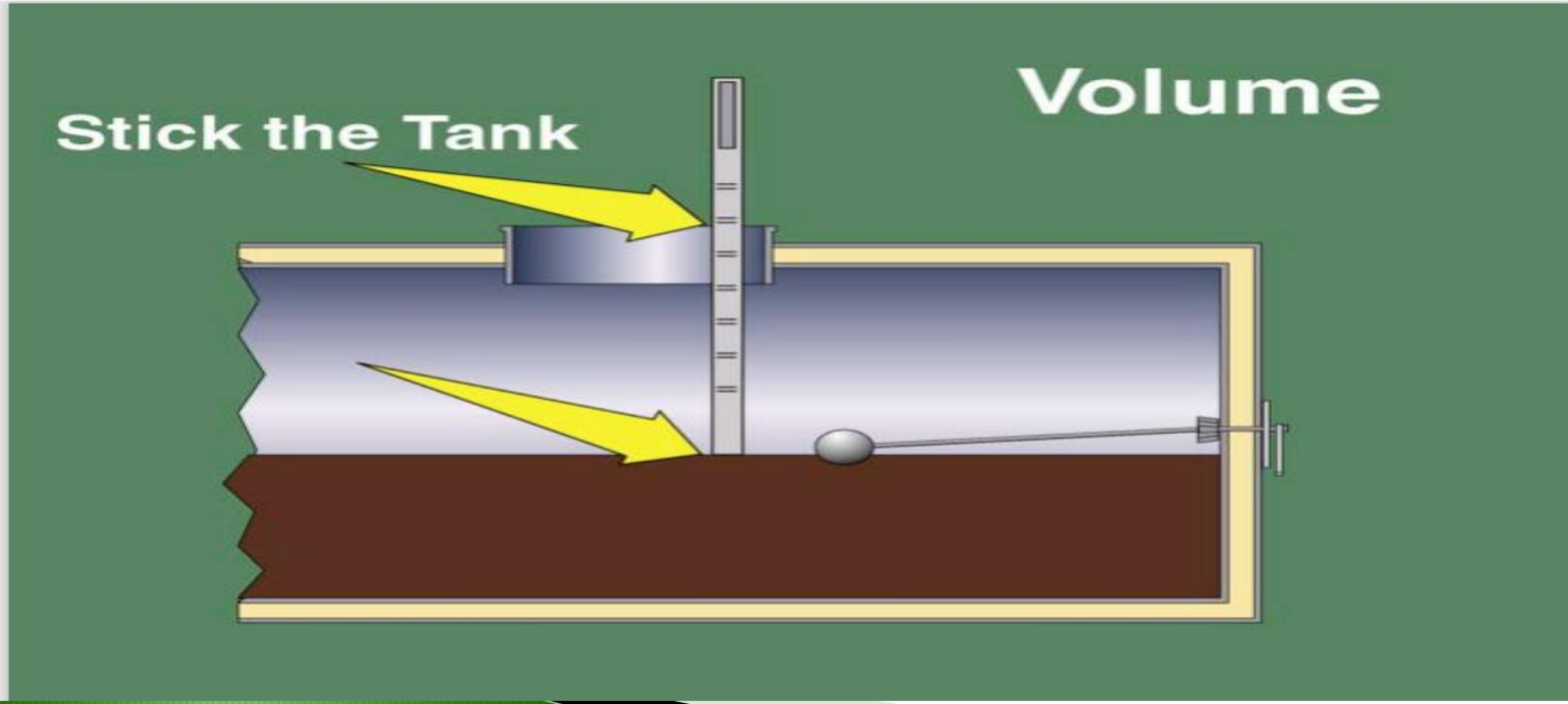
Too High = Ridges



Too Low = Gaps

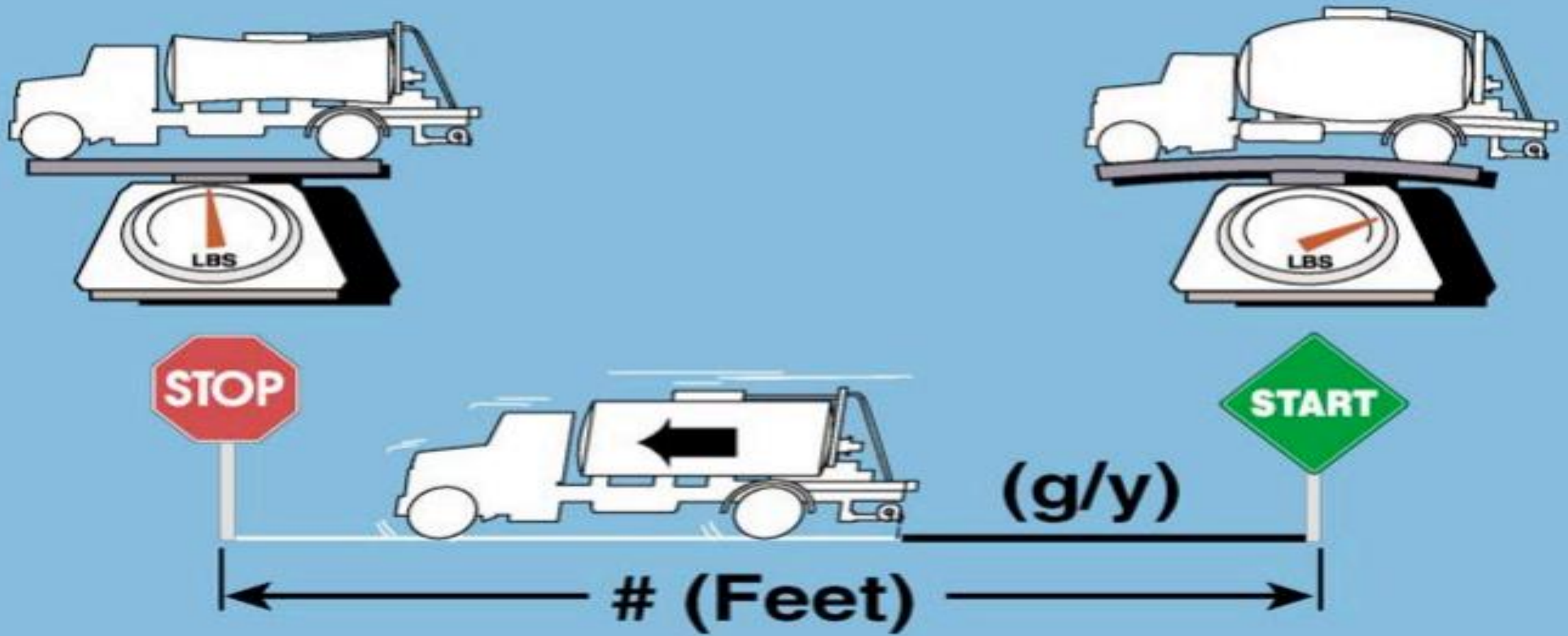
Distributor Checklist

Improper Spray Bar Height

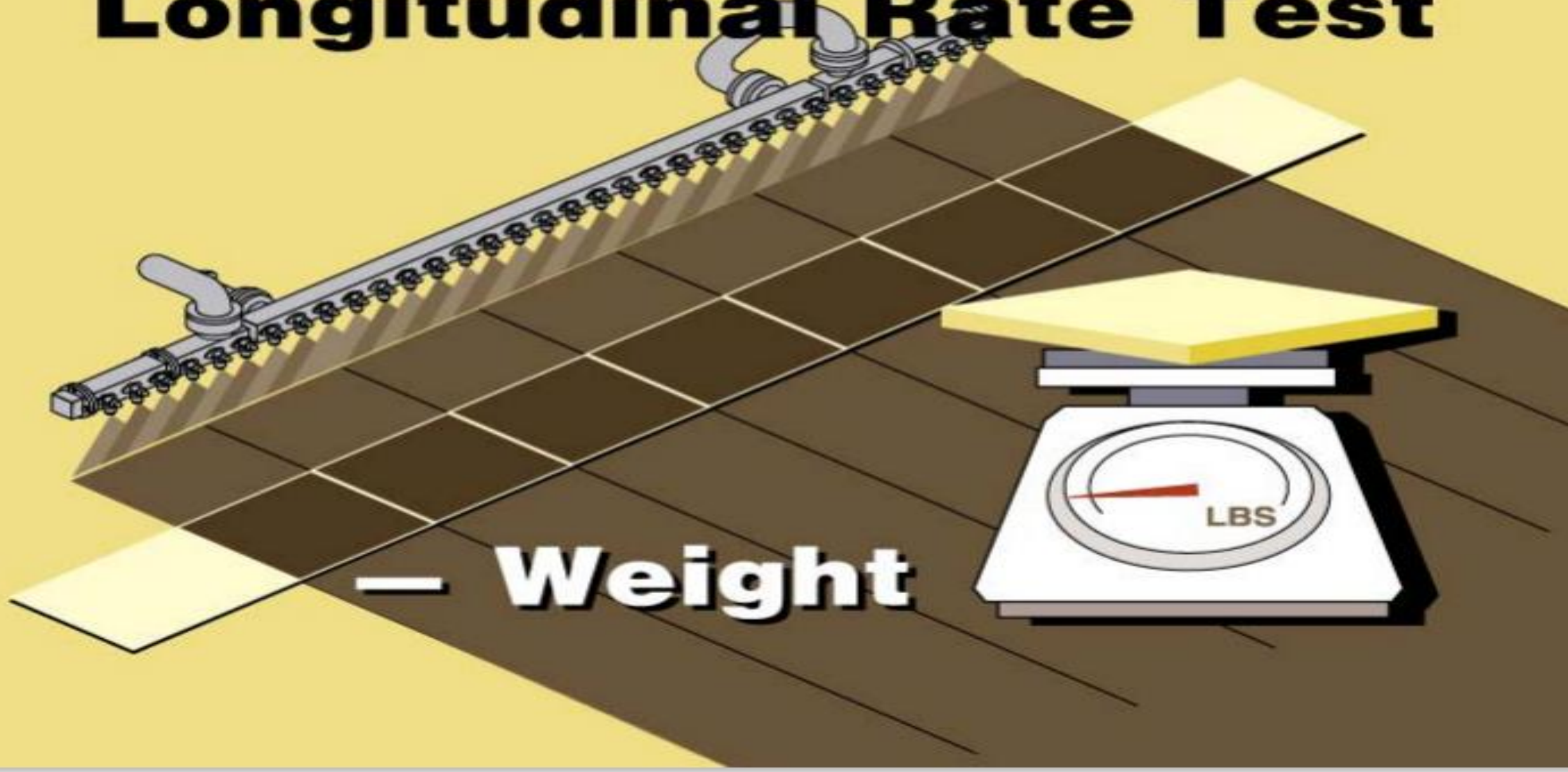

Volume
Stick the Tank

Before checking your volume by sticking the tank, make sure Distributor is level

Weight

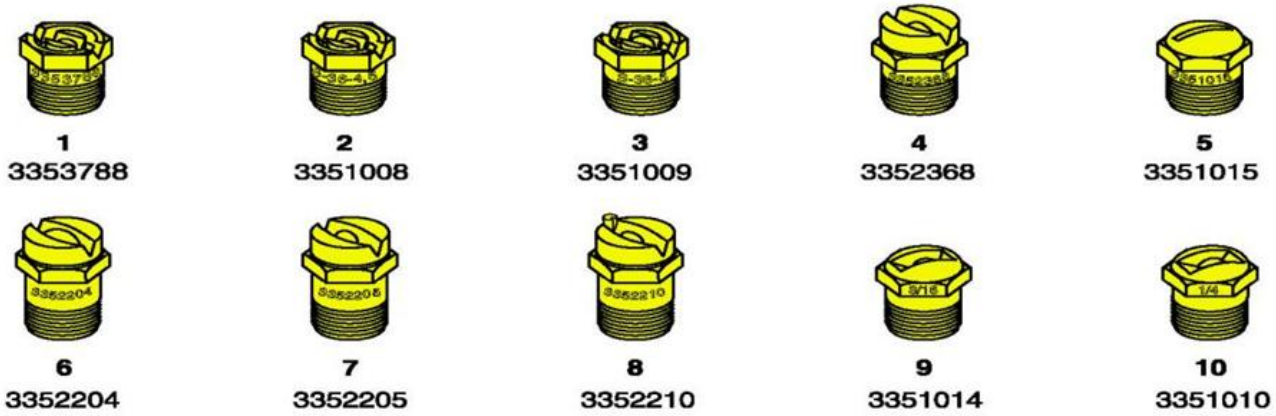


Longitudinal Rate Test



— Weight

Distributor Checklist



Ref.	Part No.	Description	Application Per Square Yard	Application (Metric) Liters Per Square Meter	Flow Gallons Per Minute Per Foot
1	3353788	V Slot Tack Nozzle	.05 - .20	.19 - .75	3.0 to 4.5
2	3351008	S36-4 V Slot	.10 - .35	.38 - 1.30	4.0 to 7.5
3	3351009	S36-5 V Slot	.18 - .45		7.0 to 10.0
4	3352368	Multi-Material V Slot	.15 - .40	.57 - 1.50	6.0 to 9.0
5	3351015	3/32" Coin Slot	.15 - .40	.57 - 1.50	6.0 to 9.0
6	3352204	Multi-Material V Slot	.35 - .95	1.30 - 3.60	12.0 to 21.0
7	3352205	Multi-Material V Slot	.20 - .55	.75 - 2.08	7.5 to 12.0
8	3352210	End Nozzle (3352205)	.20 - .55	.75 - 2.08	7.5 to 12.0
9	3351014	3/16" Coin Slot	.35 - .95	1.30 - 3.60	12.0 to 21.0
10	3351010	1/4" Coin Slot	.40 - 1.10	1.50 - 4.16	15.0 to 24.0

#6 Recommended for Chip Seals

Match Nozzles to Application

Spreader Checklist

Chip Spreader Checklist

- Uniform aggregate application is a must
- Calibrated to ensure consistent discharge across width
- Hopper clean and clear of debris and clogs.
- Spread Hopper Gates are set correctly.
- Well Maintained, no hydraulic leaks.
- Correct Tire Pressure
  - Unit will bounce if pressure is too high.

Haul Trucks Checklist

- Compatibility
- Dirty Tires cause “ pick ups”
- No sharp turns
- Enough trucks to do the job
- No Leaks
- Stagger wheel paths
- Chip Bar and Tailgate latch required.
- Watch the Air Tank Bleed Valve. Can damage seal if directed straight down.

Check each truck for hitch acceptance!

Stockpile and Loader Checklist

- Loader must be leak free
- Stockpile must be clean and stable to avoid contamination of aggregate.
- Stockpiles free draining avoid water entrapment
- Minimal handling will help reduce degradation.

Roller Checklist

- Nine Wheel Pneumatic Rollers
- Minimum two rollers, three is best
- Orients aggregate on flattest side.
- Embeds aggregate in binder
- Achieves mechanical lock of aggregate particles
- 8 ton minimum
- Tire Pressure
  - 85 psi
  - No variance of more than 5 psi between all tires

Broom Checklist

- Self propelled
- Four Wheels
- Watch Speed – Do No Harm
- Plastic Bristles (Not Wire)
- Cleans existing road surface and joints
- Used to remove excess aggregate when binder is fully cured.
- Water may be used for dust.
- Rotary / Vacuum / Pick up

Application Strategies

Road Preparation Checklist

- Weed Removal Complete?
- Thermo-Plastic striping removed?
- Pre-Sweep Complete?
- Utilities Protected?
- Temporary Markings in Place?

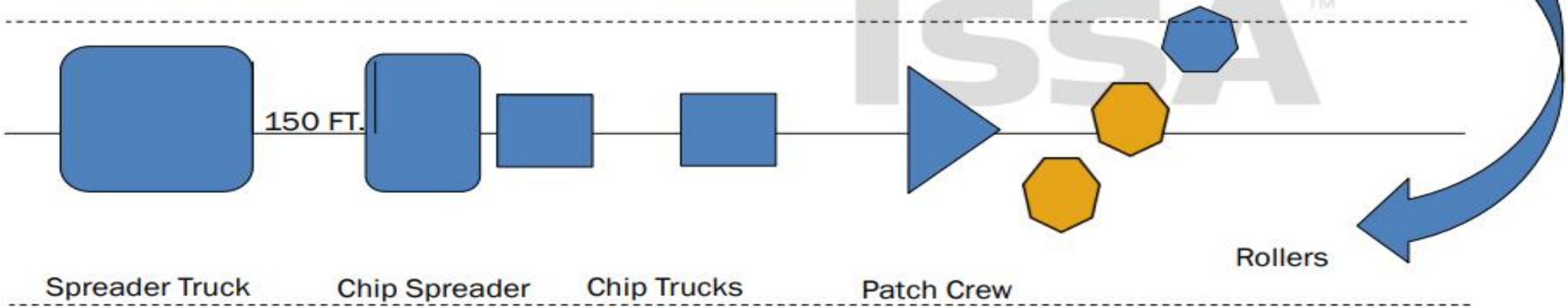
Traffic Considerations

- Ideally, keep traffic off until emulsion cures sufficiently to hold the aggregate.

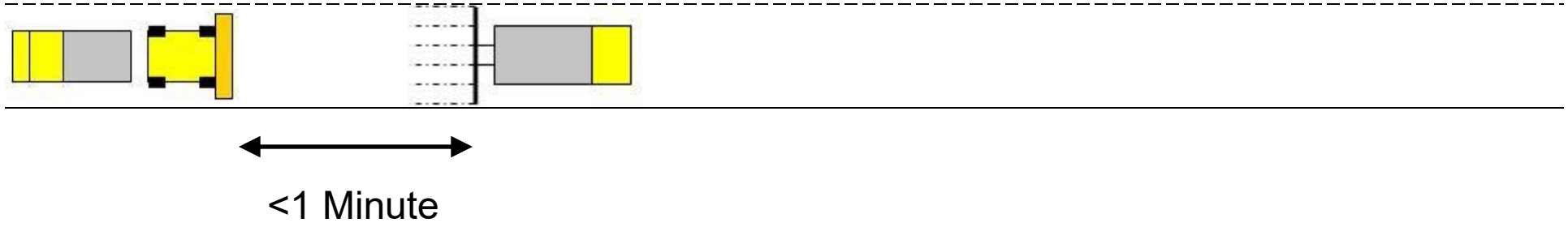
Traffic Considerations

- Control traffic by:
  - Use of pilot vehicles
    - Pilot vehicle is the lead through the workzone
  - Close road
  - Advance notice signage, alternate route
  - Multilane roads – keep lane closed

Equipment Placement



Emulsion/Agg Spreading



This way…

Distributor and Agg Spreader Virtually Joined Together

Emulsion/Agg Spreading

NOT this way…

Causes too many joints, and may cause uneven chip retention

Application Checklist

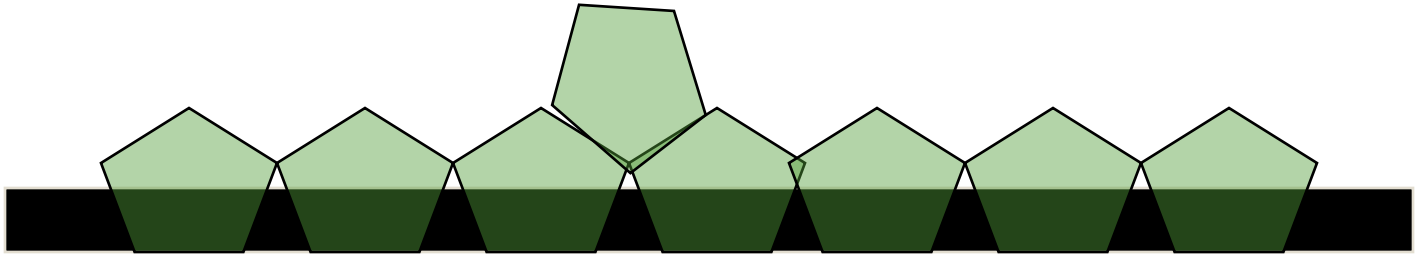
- Air and Ambient Temperature above 55F*. Above 40F overnight
- Dry pavement, no rain forecast for 24 hours.
- Emulsion heated to manufacturers requirements (145 – 185F)
- Aggregate damp but not wet
- Tar Paper set at beginning and end of emulsion shot.
- Chip Spreader width set to leave a narrow strip of uncoated emulsion.

Application Checklist

- Chip Spreader stays within 150 ft. of Asphalt Distributor.
- Adjust speed so that Chip Spreader doesn't bounce.
- Stop after first 1,000 ft. Check for:
  - Emulsion Application Rate
    - Too Little Emulsion is much worse than Too Much!
  - Aggregate Application Rate
    - Salt and Pepper
    - Embedment
  - Quality of Mat
    - No streaks, ridges, pickups

Aggregate Application

- Don’t over apply
  - Ideally, 1 stone thick
  - Too much is as bad as not enough
  - “Salt and Pepper” appearance

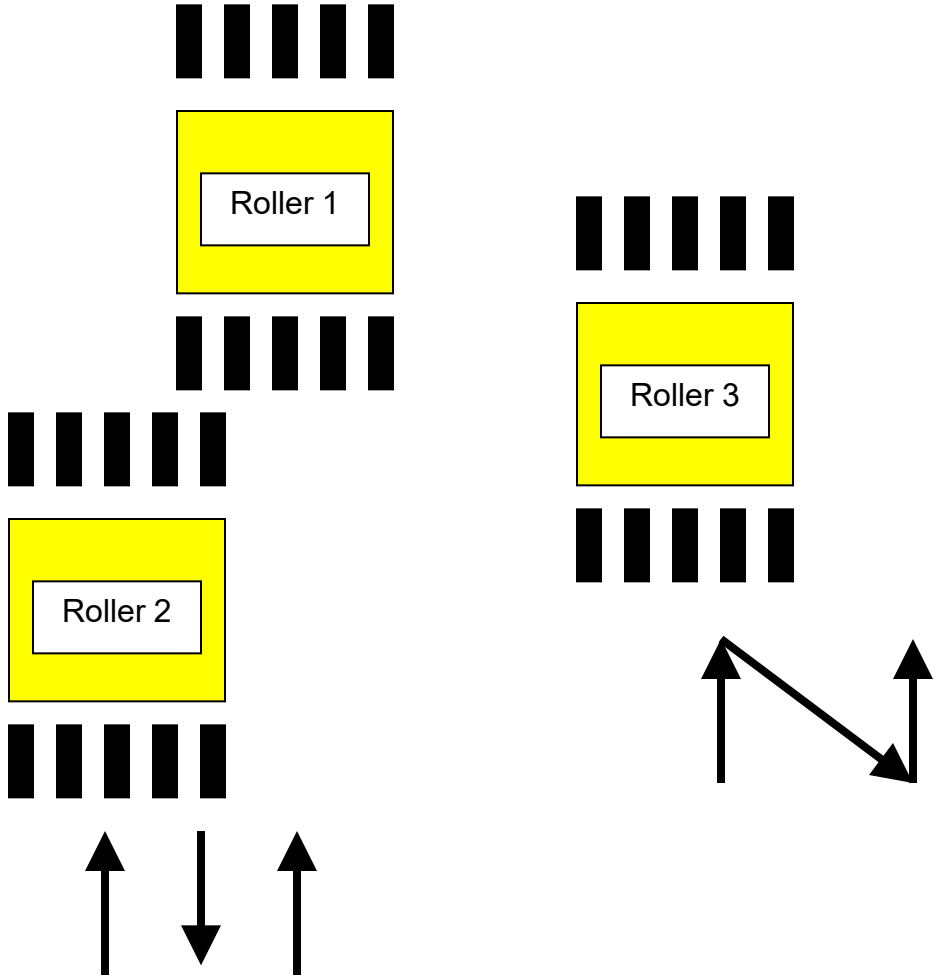


Application Checklist

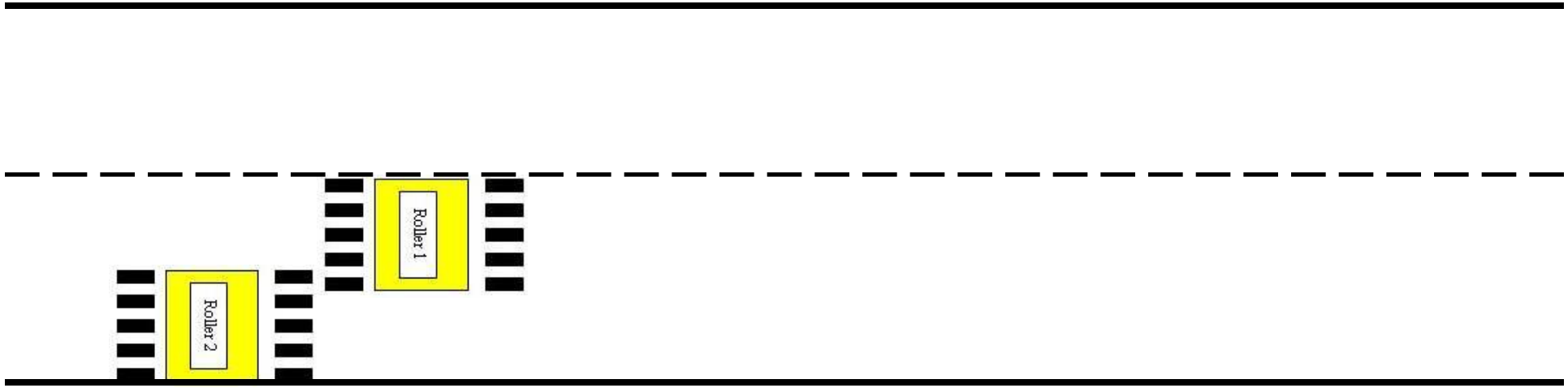
- Enough rollers available to make three passes while keeping up with the Chip Spreader without exceeding 3 – mph.
- Watch for rooster tails of dislodged aggregate for fast rolling.
- Rollers limit turning and stopping on fresh seal.
- Keep tires clear of emulsion.

Construction

- Rollers
  - At least 3 passes (“Applications”)
  - 2 Roller Pattern
  - 3 Roller Pattern

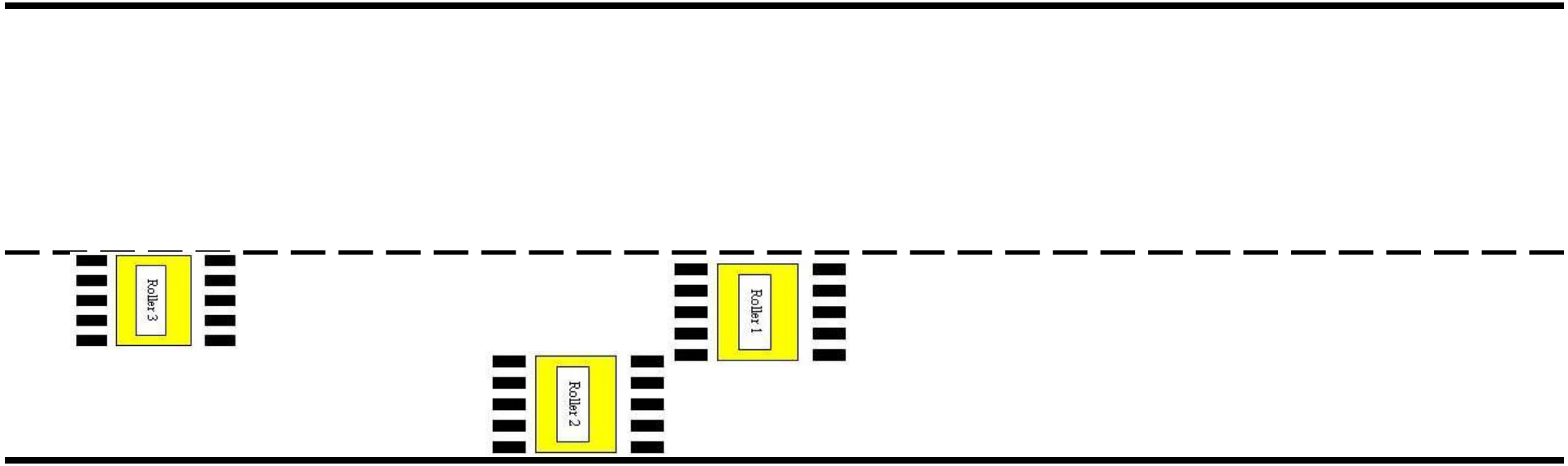


2 Roller Preferred Pattern



Both rollers stay in line

3 Roller Preferred Pattern



Rollers 1 and 2 stay in line (same as 2 roller pattern),

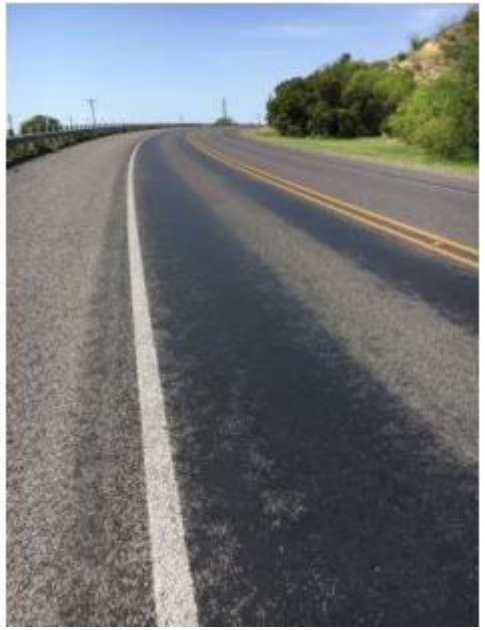
Roller 3 zigzags

Application Checklist

- Brooming should start when emulsion is cured; usually between one and two hours after rolling.
- Light brooming only. Heavy brooming removes excess chips. Excess chips remove other chips. Embedment is lost.
- Broom centerline joint if necessary.
- Open to controlled rolling traffic as soon as safely possible

Existing Pavement

Cracks
Texture
Structural Issues



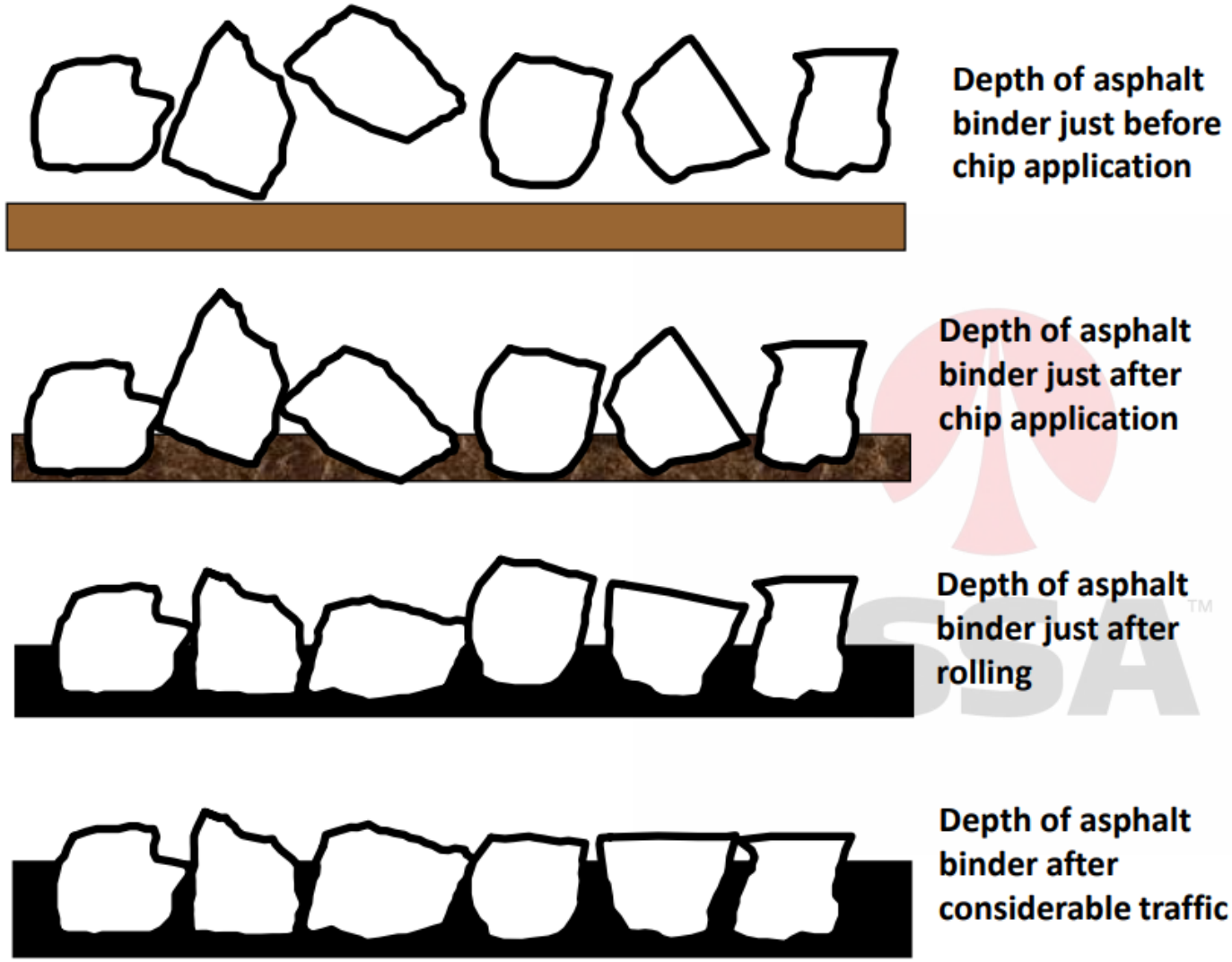
ncpp
National Center for Pavement Preservation

Shot Rate Adjustments

Pavement Condition	Factor	Adjustment
Flushed asphalt surface	0.70	-0.03 gal/yd^2
Smooth, non-porous surface	0.90	0.00 gal/yd^2
Slightly porous, oxidized surface	0.94	+0.02 gal/yd^2
Slightly pocked, porous surface	0.90	+0.04 gal/yd^2
Badly pocked, porous, oxidized surface	0.90	+0.06 gal/yd^2

Final Thoughts

- Remember, Embedment of the stone is key!
- Everything you do should be aimed at achieving proper embedment and minimum stone loss.



Scrub Seal

- Scrub Seal is a higher end Chip Seal that uses a broom trailer, pulled behind the distributor to spread and broom the asphalt emulsion into the fine (< ¼”) surface cracks.
- Scrub Seal often uses PMRE, Polymer Modified Rejuvenating Emulsion to add life back into the surface and slow oxidation and crack growth.

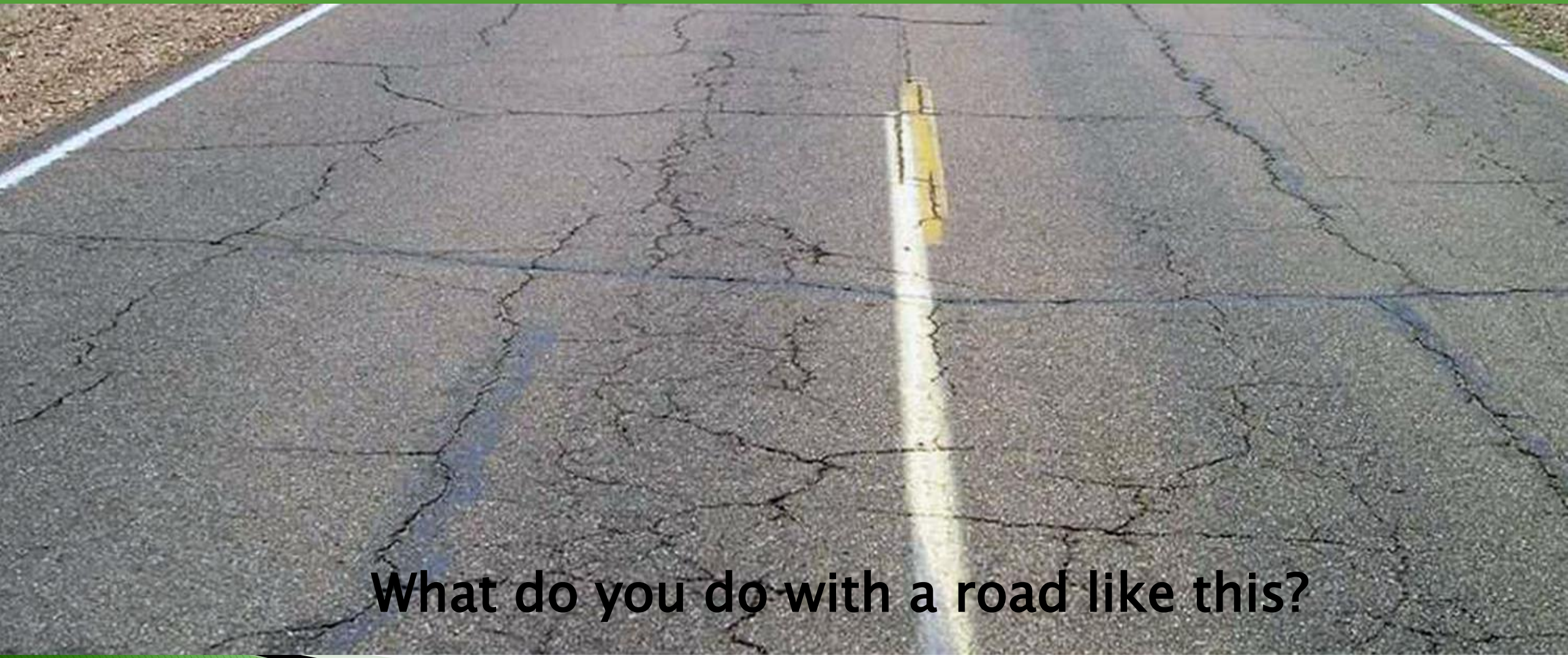
SCRUB SEAL WHEN?

RoadResource.org
Provided By: PPRA

PCI Range 55-70

Scrub seals are designed for application on pavements that are moderately to highly cracked but have adequate structural capacity. If a pavement is displaying structural distress, a different treatment should be selected. If a pavement is experiencing active rutting and/or shoving, it is not a candidate for scrub sealing.

SCRUB SEAL



What do you do with a road like this?

CRACK SEAL?

SCRUB SEAL

SCRUB SEAL

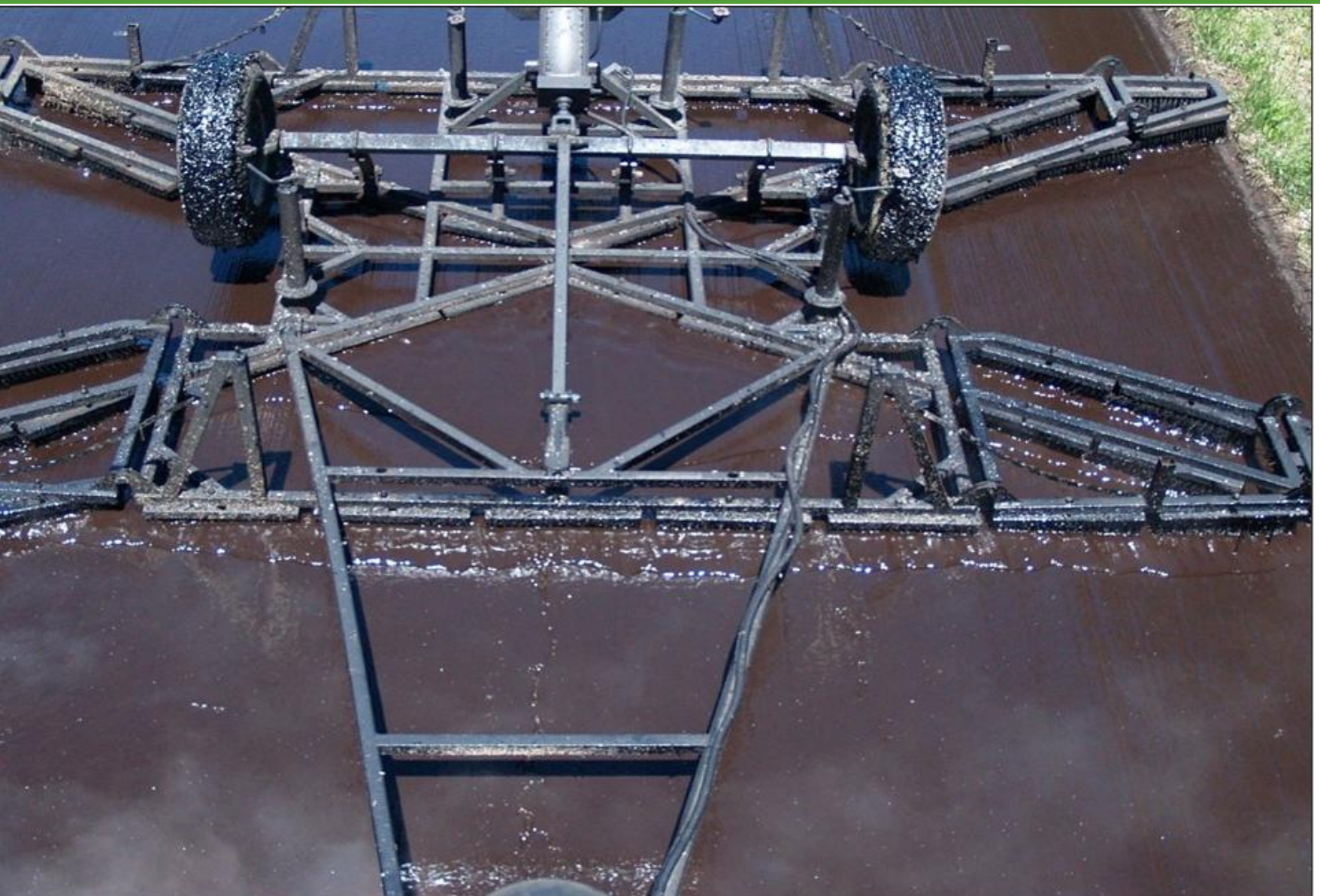
ETNYRE BROOM BOX

- Mounted Fixed to the back of the distributer
- Hydrolic remote adjustable on the fly
- Width limit 8-14 feet
- Emulsion containment

ETNYRE BROOM BOX

GREENSBROOM BROOM TRAILER

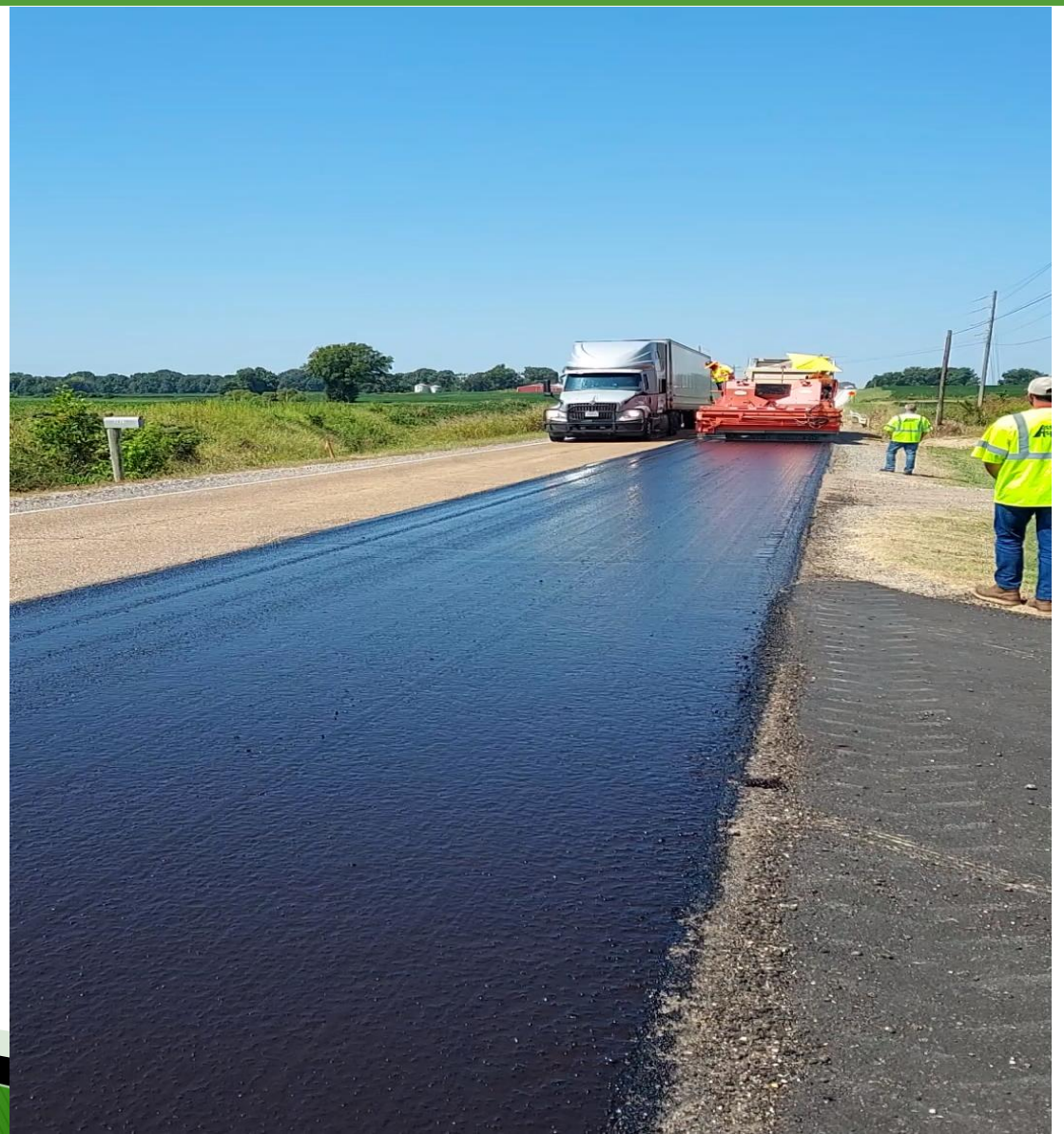
SHOP BUILT BROOM TRAILER



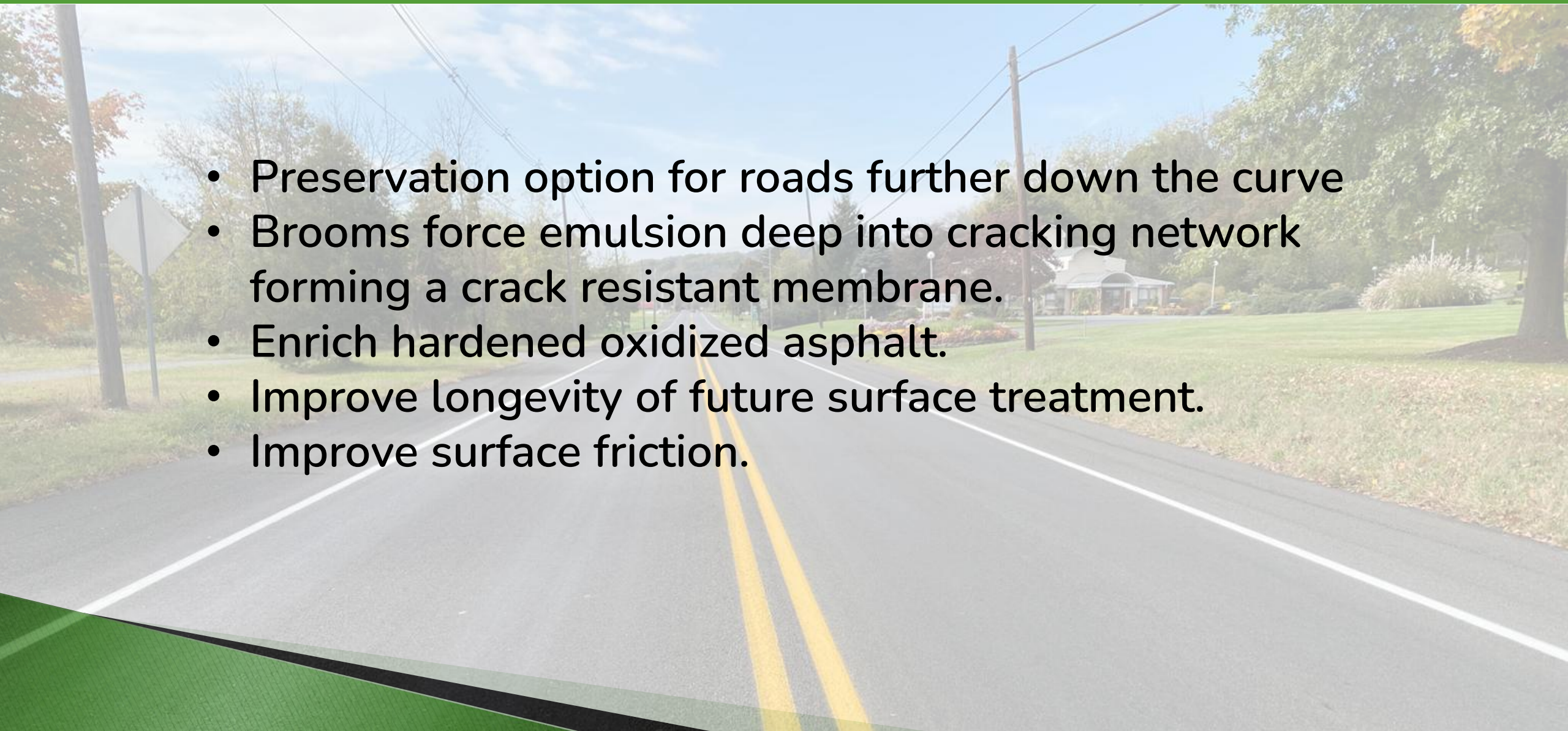
- Trailer mounted, towed by the distributer
- Expandable “wings”
- Operational widths 14-22 feet
- No Containment

SCRUB SEAL

SCRUB SEAL



SCRUB SEAL BENEFITS



- Preservation option for roads further down the curve
- Brooms force emulsion deep into cracking network forming a crack resistant membrane.
- Enrich hardened oxidized asphalt.
- Improve longevity of future surface treatment.
- Improve surface friction.

SCRUB SEAL APPLICATIONS

Stand Alone

- Single application

Combination applications

- Scrub Seal + Fog Seal
- Scrub Seal + Seal Coat
- Scrub Seal + Slurry Seal or Microsurfacing (Cape Seal)
- Scrub Seal + HMA (SAMI Intermediate Layer)

SCRUB SEAL CONSIDERATIONS

Materials

- CMS-2P (Medium Set)
  - Slightly slower break to allow brooms to carry “wave”
- Polymer Modified asphalt Rejuvenation Emulsion (PMRE)
  - Maltines penetrate surface
  - Bonds to crack wall

SCRUB SEAL CONSIDERATIONS

Prep Work

- Fog seal any patching performed less than 60 days prior
- Remove heavy thermoplastic or epoxy paint
- Remove vegetation from edge lines and cracking
- Ensure surface is clean and dry

Scrub seals are designed for application on pavements that are moderately to highly cracked but have adequate structural capacity.

Micro surfacing

Benefits of Micro surfacing

- Provides a tough, skid resistant wearing surface
- Able to fill ruts and transversely level the road profile. (Micro-surfacing)
- Repairs Deteriorated Centerline Joints
- Performs well as a combination treatment with other treatments.
  - Crack Seal
  - Bituminous Seal Coat (Cape Seal)
  - Profile or Micro-Milling

Slurry Surfacing is a homogenous mixture of emulsified asphalt, water, well-graded fine aggregate and mineral filler that has a creamy fluid-like appearance when applied. Slurry Surfacing is used to fill existing pavement surface defects as either a preparatory treatment for other maintenance treatments or as a Preservation wearing course.


Micro-Surfacing
Emulsion
Water
Additive
Mineral Filler
Aggregate

Slurry Surfacing Components

SLURRY

Aggregate
- Virgin
  - Type I, II and III
- RAP
  - Type II and III

Emulsion
- CSS, SS
- CQS
- PMCQS / LMCQS

Mineral Filler
- Cement is optional depending on Mix Design

Break Control Additive
- Emulsifier (Optional)

MICRO SURFACING

Aggregate
- Virgin
  - Type II and III
- RAP
  - Type II and III

Emulsion
- MSE, CSS-1HP,
- Minimum 3% Polymer

Mineral Filler
- Cement .

Break Control Additive
- Aluminum Sulfate*
- Emulsifier

Three Types of Slurry Surfacing

Slurry Seal

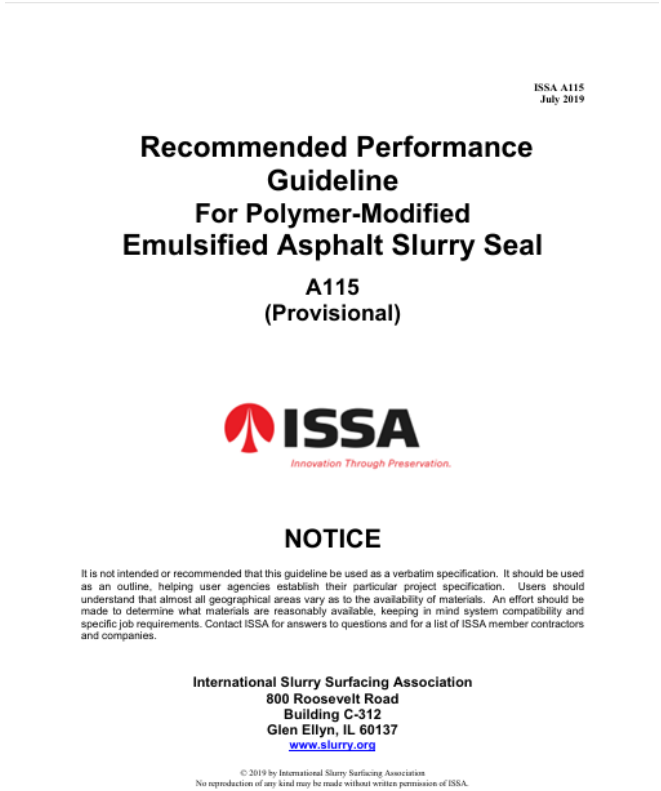
- ISSA A-105 Specification Guide

Polymer Modified Slurry Seal

- ISSA A-115 Specification Guide

Micro surfacing

- ISSA A-143 Specification Guide



ISSA A115
July 2019

Recommended Performance Guideline For Polymer-Modified Emulsified Asphalt Slurry Seal

A115
(Provisional)

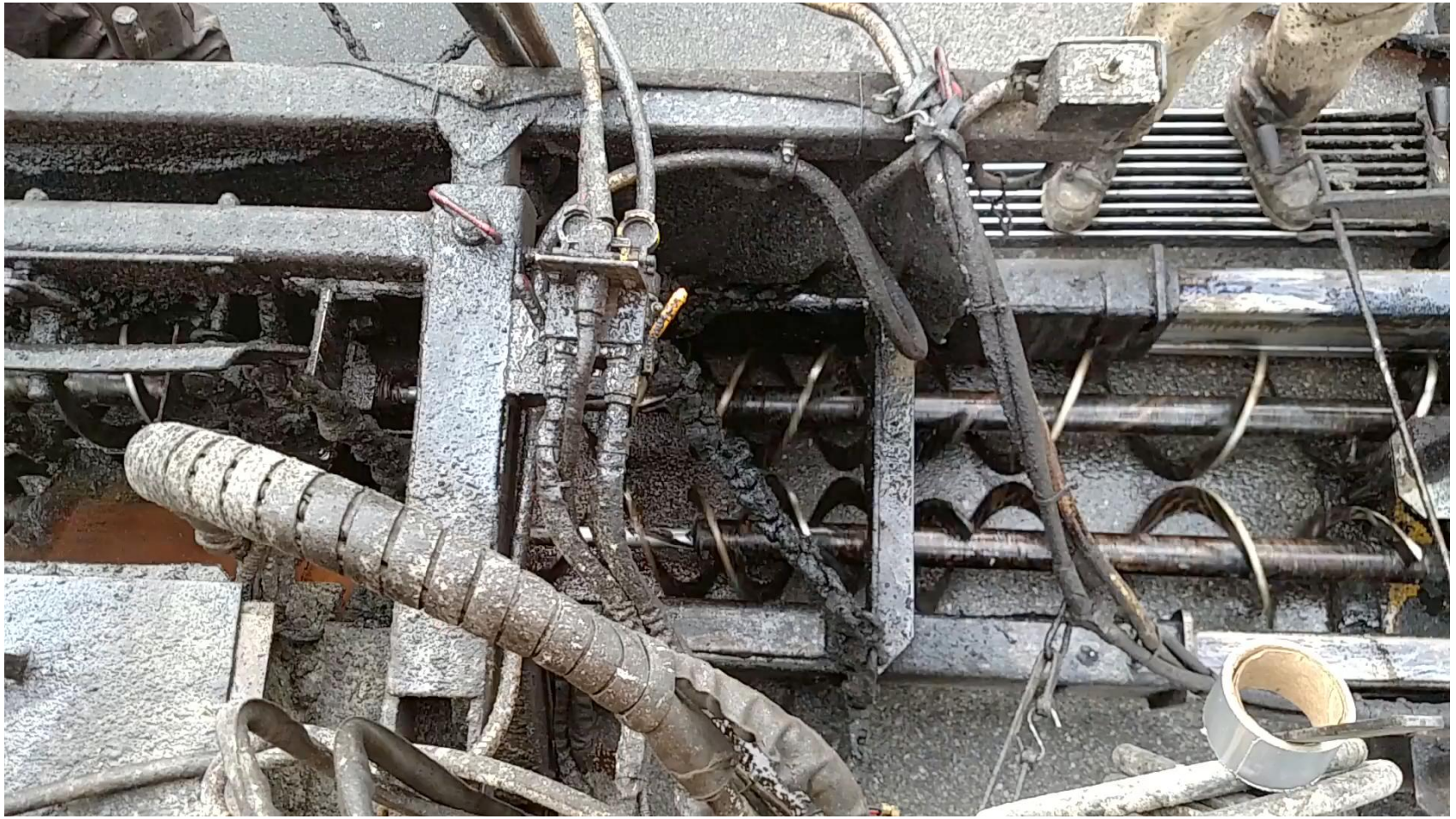
ISSA
Innovation Through Preservation.

NOTICE

It is not intended or recommended that this guideline be used as a verbatim specification. It should be used as an outline, helping user agencies establish their particular project specification. Users should understand that almost all geographical areas vary as to the availability of materials. An effort should be made to determine what materials are reasonably available, keeping in mind system compatibility and specific job requirements. Contact ISSA for answers to questions and for a list of ISSA member contractors and companies.

International Slurry Surfacing Association
800 Roosevelt Road
Building C-312
Glen Ellyn, IL 60137
www.slurry.org

Spreader Box Operation



Variable Width Spreader Box

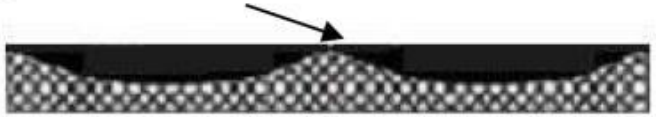
Rut Box

Rut Filling

Re-profiling Wheel Ruts
with
Micro surfacing

For each inch of applied micro-surface rut fill mix add 1/8" to 1/4" crown to compensate for return traffic compaction.

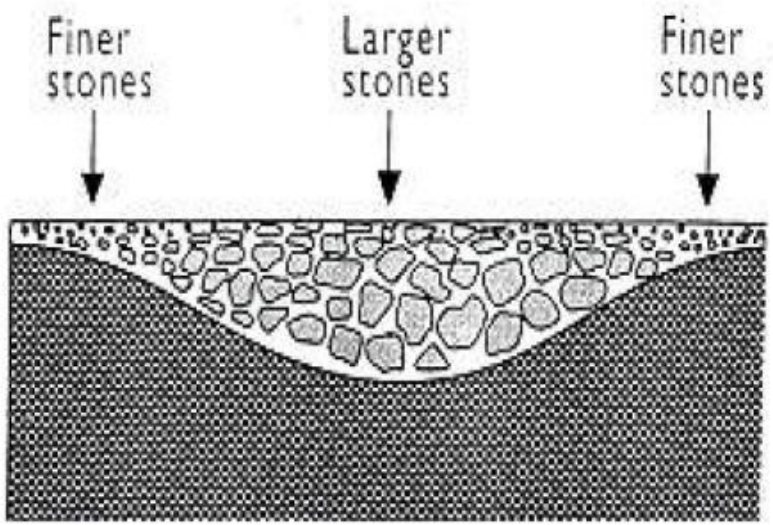
Original Pavement Cross Section



Ruts in Wheelpaths

Ruts ½" & Over
Must Use the Rut Box

Cross Section of a Rut



Spreader Box Adjustments

Equipment Inspection Items

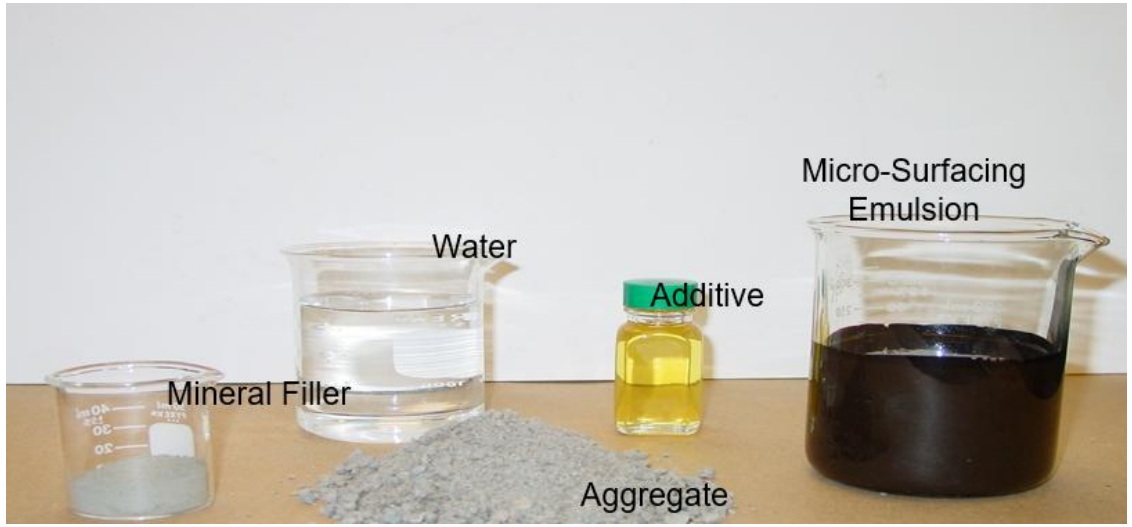
- Cleanliness
  - Mixer cleaned nightly
  - Spreader Box cleaned at every stop (micro) and nightly.
- Aggregate Spillage
  - Under Feed Belt
  - Under Mixer
  - Front Hopper Rubber
- Liquid Leakage
  - Hydraulic Oil or Fuel
  - Emulsion

Equipment Inspection Items

- Spreader Box
  - Clean
  - Augers within ½ inch of roadway or as low as possible.
  - Augers not foaming or splashing mix
  - Front Rubber in Place
  - Side Rubbers in Place and tight.
  - Side Runners are level and not rocking.
  - Box Urethane is Tight with No Wrinkles

Materials and Calibration

- Micro surfacing is a chemical system. Each component has an important function in the system and when any component fails to meet the design parameters the system breaks down.
- Components Include:
  - Aggregate
  - Emulsion
  - Cement
  - Additives
  - Paver Calibration



Aggregate

- Gradation
  - Small deviations in the middle of the sieves (#16,#30,#50) are not a major issue.
  - Watch for the #8 and #4 going coarse. This may cause raveling and or a noisy ride.
  - The #200 is very important. The amount passing the #200 must stay within the JMF.
    - Not enough passing the Lbs.200 can cause the system to flush. Too much can cause the system to be too fast.
- Cleanliness
  - Watch that the loader operator stays out of the bottom of the pile, especially at the end of the job.
  - Low Sand Equivalent and High Methylene Blue Results can cause the mix to break too quickly.
    - Dirt or Base Rock can be a killer.

Emulsion

- Temperature
  - Micro surfacing works best when the temperature of the emulsion is between 80 and 110 F.
    - Emulsion under 75 F may separate or shear. It may separate during storage.
    - Emulsion over 125 F will probably cause the system to break quickly and be “out of control”.
- Separation
  - Small amounts of separated latex are ok but watch for large strings in the tanker.
  - Also watch for large strings of separated latex in the spreader box. In this case, contractor should shut down and ship the load back.

Cement

- Cement promotes a thicker/creamier mix and keeps the water from separating in the spreader box.
- Cement also starts the breaking process of Micro surfacing by causing a PH shift that makes the aggregate more attractive to the emulsion.
- The contractor may adjust his cement percentage (within the JMF) throughout the day. This changes can increase or decrease the break time.

What is calibration?

- **Calibration is the process of measuring by weight the:**
  - Aggregate
  - Emulsion
  - Mineral Filler

  Then correlating the weight to revolutions of the aggregate conveyor recorded by a counter. The goal is to obtain a weight per count.

Why do we calibrate?

- Calibration sets the paver, so the ratios of material stay match the mix design
- Calibration will ensure quality control of the Micro surfacing system for the contractor and buying agency
- Calibration serves as a basis for recording the amount of materials used.

When Do We Calibrate?

- Slurry/Micro Pavers must be calibrated to make sure the mix matches the Mix Design.
- Must be calibrated using the aggregate and emulsion type to be used on the project.
- Must be re-calibrated if:
  - Material Change
  - Pump Repair or Change
  - Replacement of Conveyor Skirt Rubbers.
- Emulsion should be calibrated every job* or at least once per month.

Converting Mix Design to Paver Mix

Aggregate

+

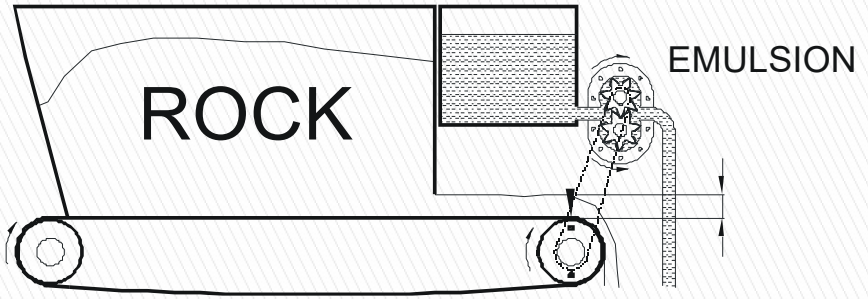
% Emulsion

+

% Water

+

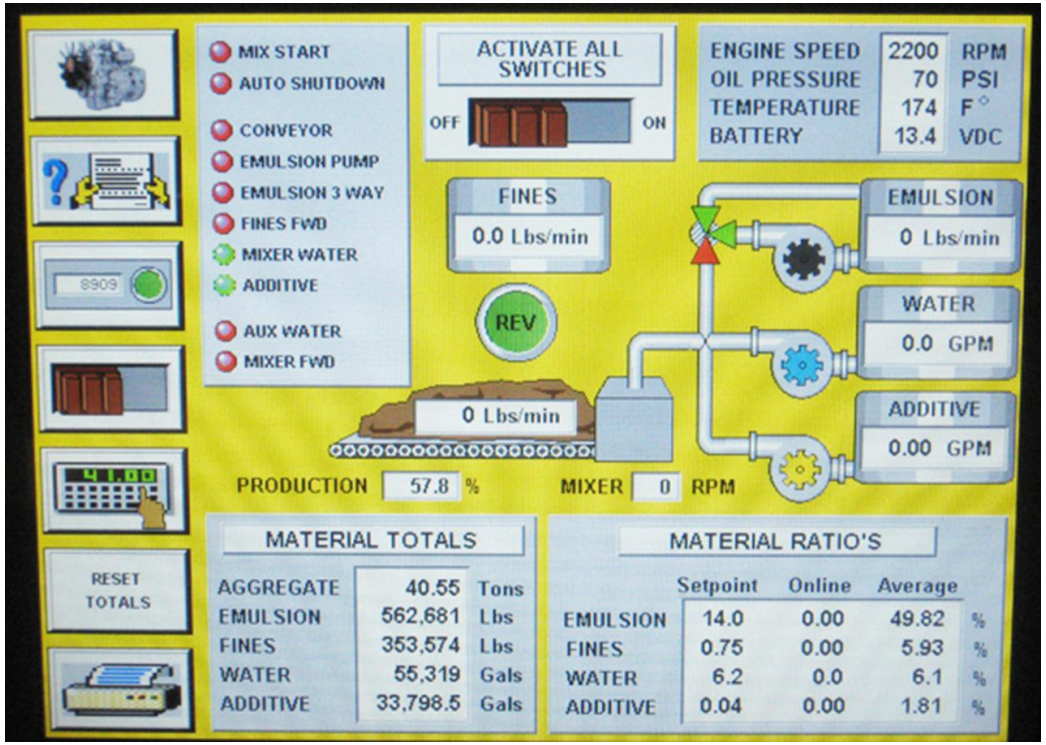
% Additives



Batch Mix Design VS. Continuous Flow Mixing

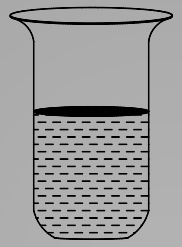
Paver Calibration

- Calibration converts Volumetric Batch Mix Design into a Continuous Feed Process.
- Aggregate and Emulsion are mechanically or electronically connected to maintain Mix Design Ratios.
- In most pavers the emulsion rate is fixed and the aggregate is adjustable by raising or lowering a rock gate.

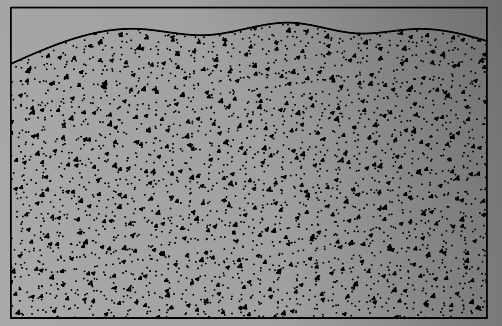


If we mixed in a batch:

10%

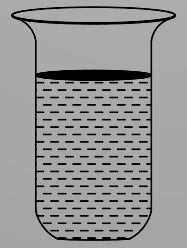


Emulsion – 10 lbs

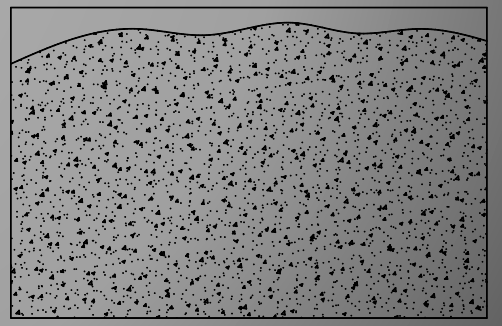


Rock – 100 lbs

12%

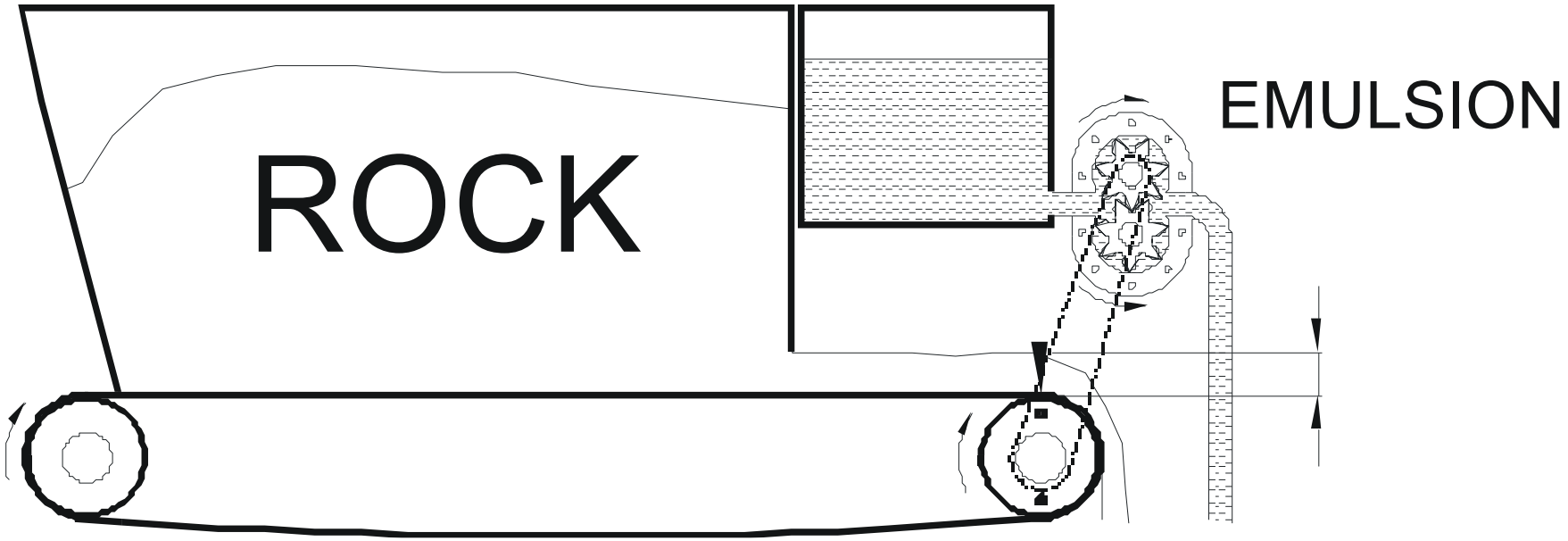


Emulsion – 12 lbs



Rock – 100 lbs

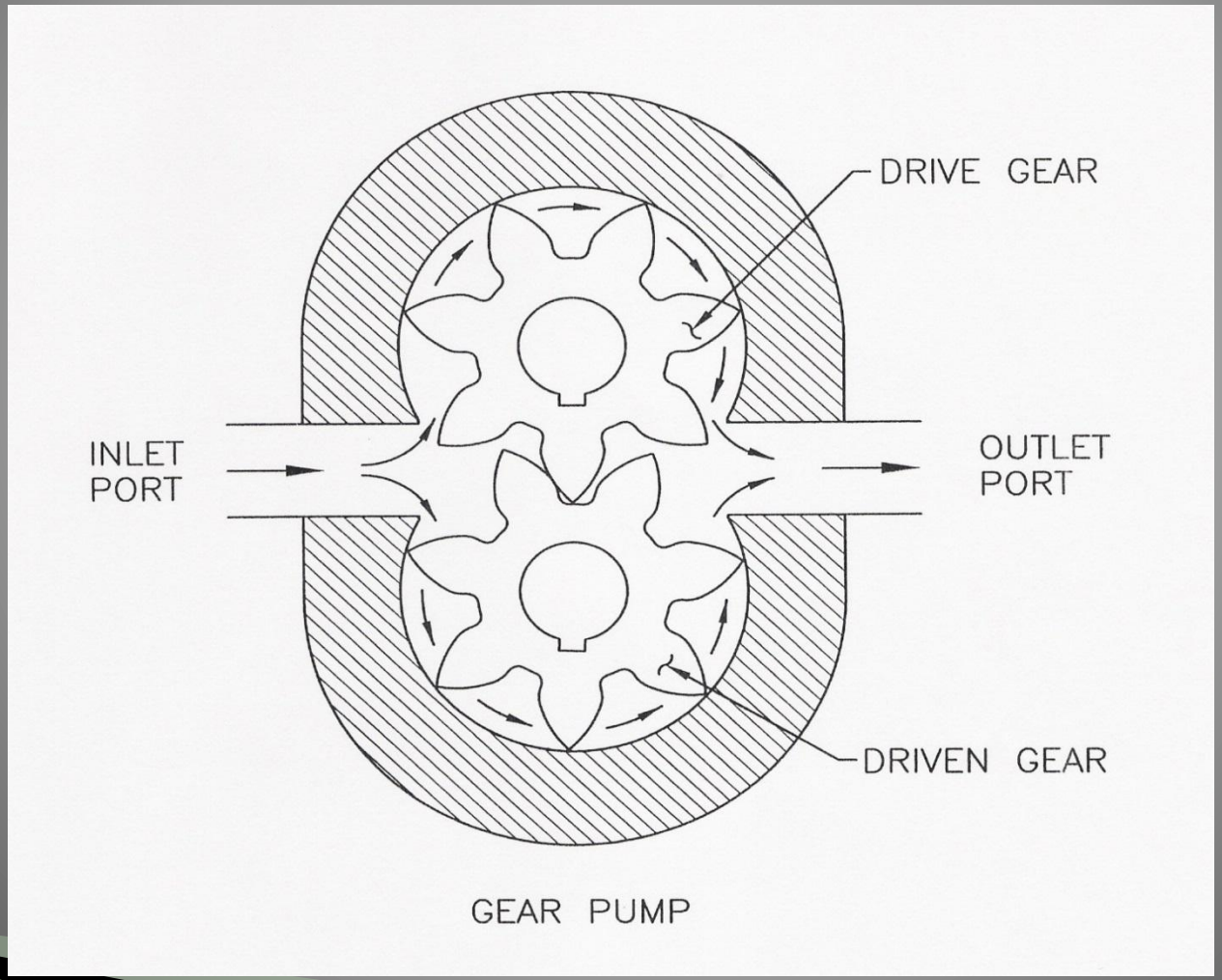
Aggregate Conveyor



The aggregate is delivered by a conveyor, delivering a consistent amount of aggregate (at a given gate setting) from the hopper into the pugmill.

Emulsion Pump

Gear Pump (Positive Displacement)

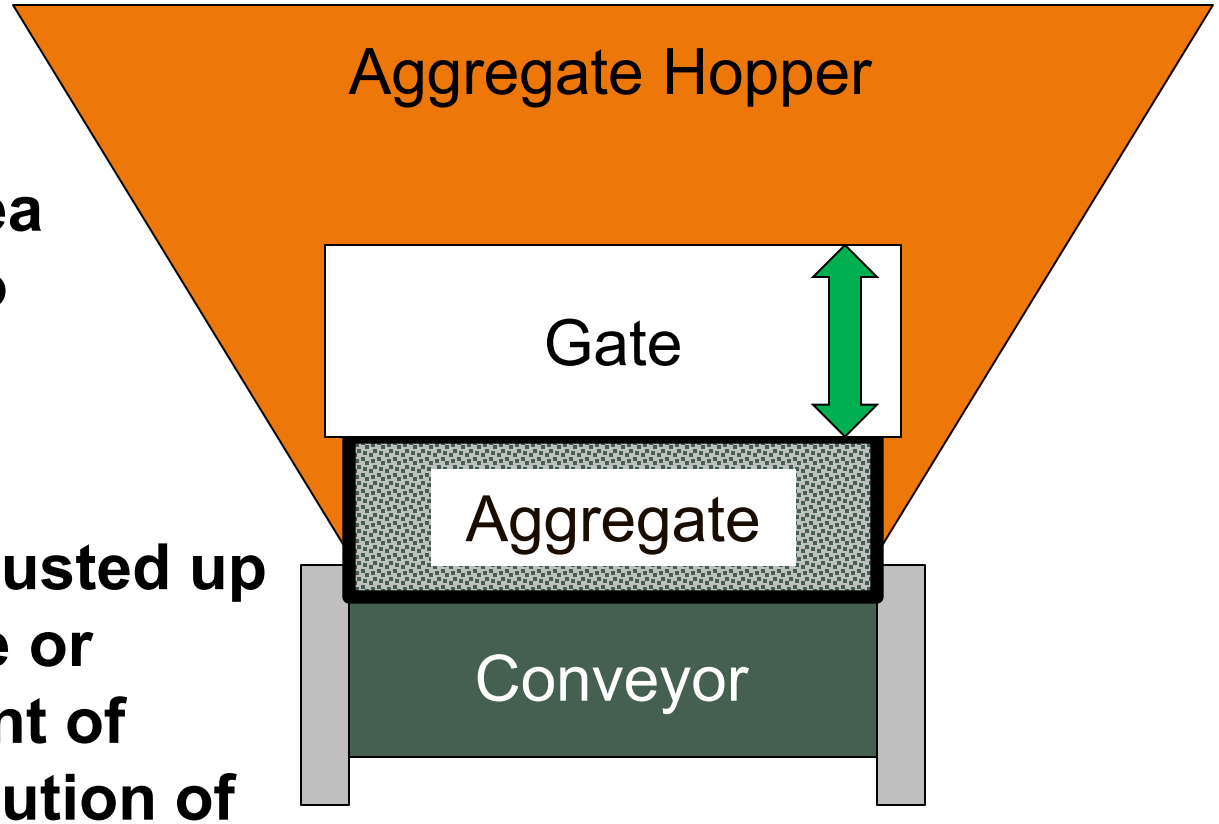


Aggregate Gate

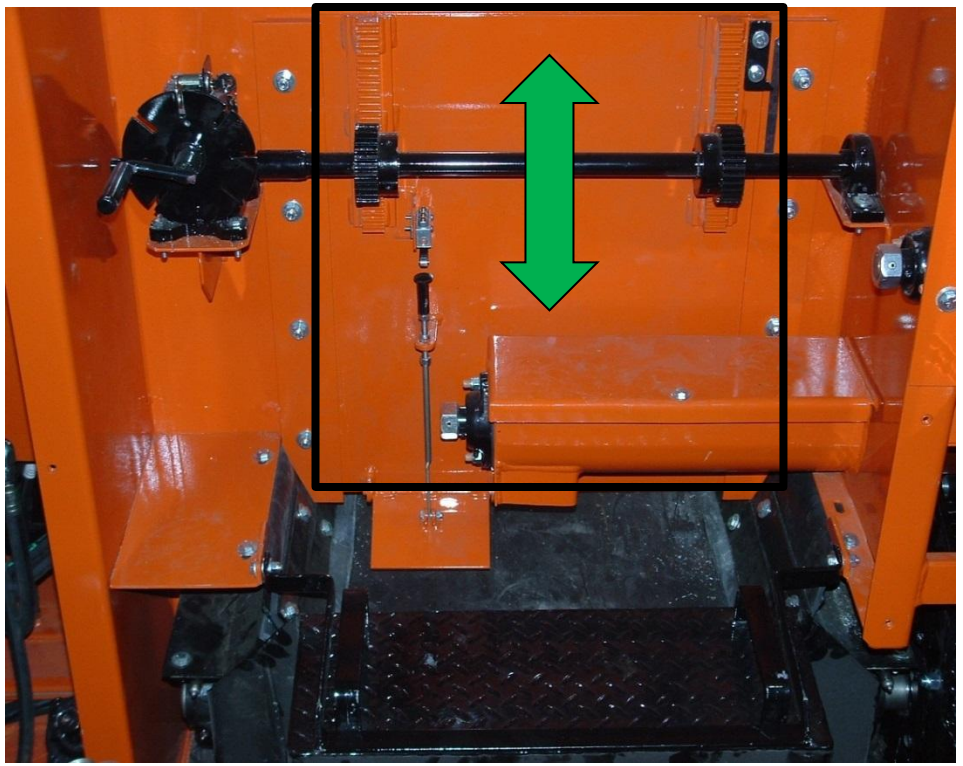
The outlet of the aggregate hopper provides a fixed area for the aggregate to flow through

The gate can be adjusted up or down to increase or decrease the amount of aggregate per revolution of the conveyor pulley

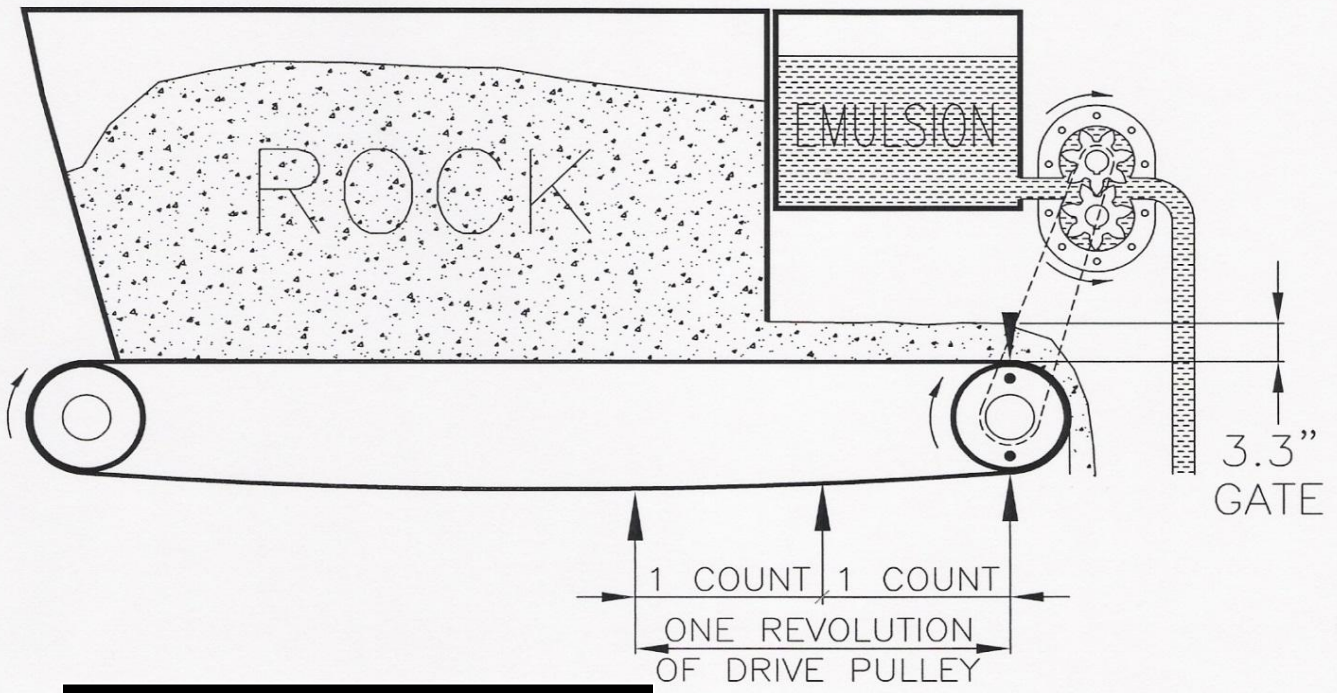
End View of Paver



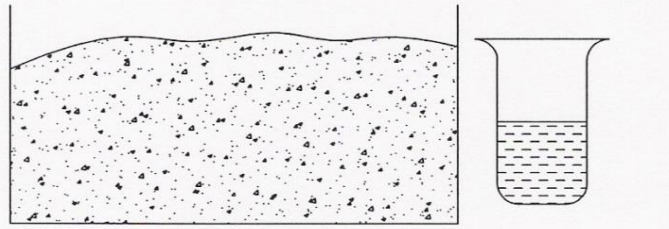
Gate setting of the hopper is varied to achieve different emulsion/aggregate ratios.



Lower gate to increase emulsion %
Raise gate to decrease emulsion %

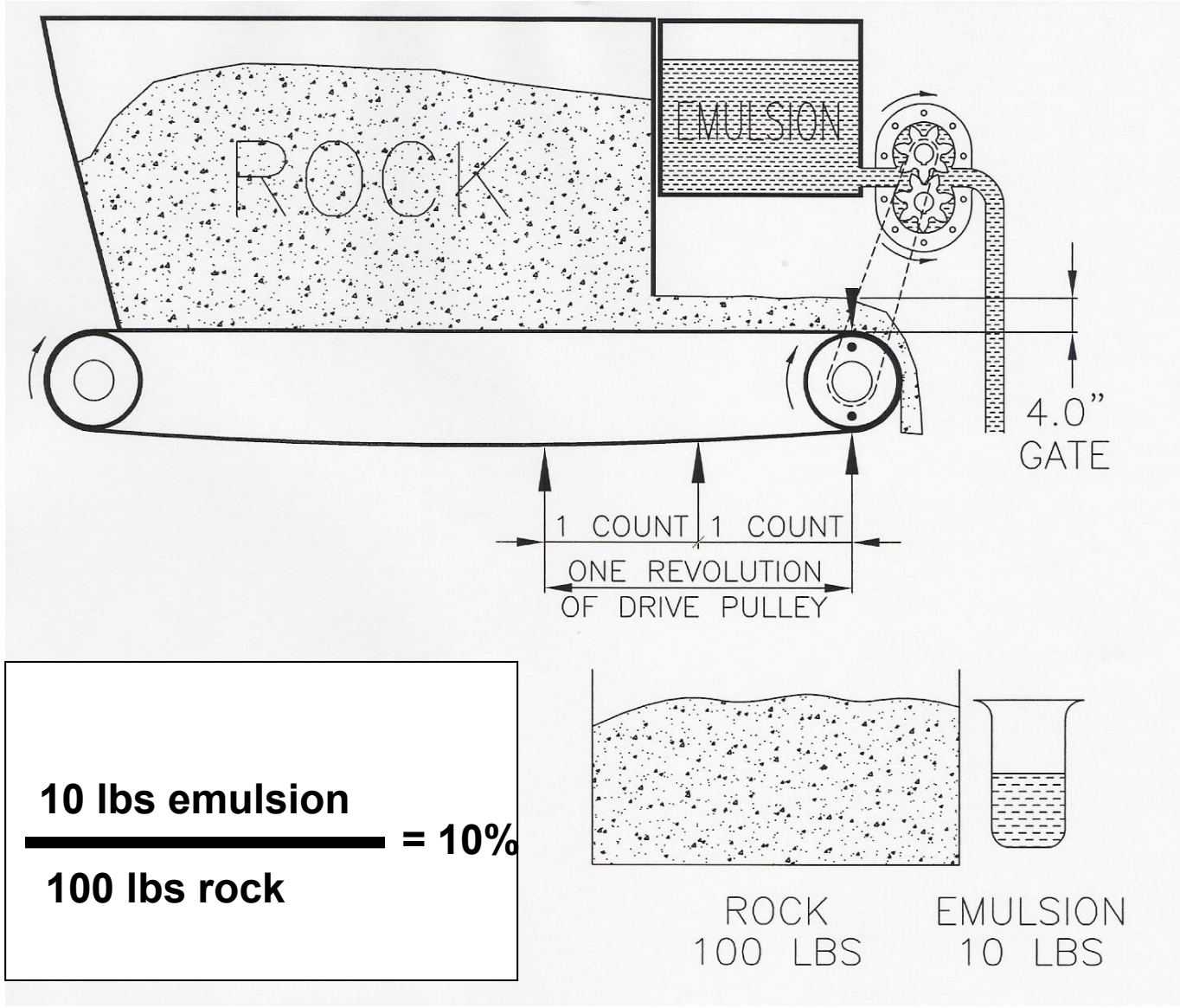


10 lbs emulsion / 83.3 lbs rock = 12%



ROCK 83.3 LBS

EMULSION 10 LBS



$$\frac{\text{10 lbs emulsion}}{\text{100 lbs rock}} = 10\%$$

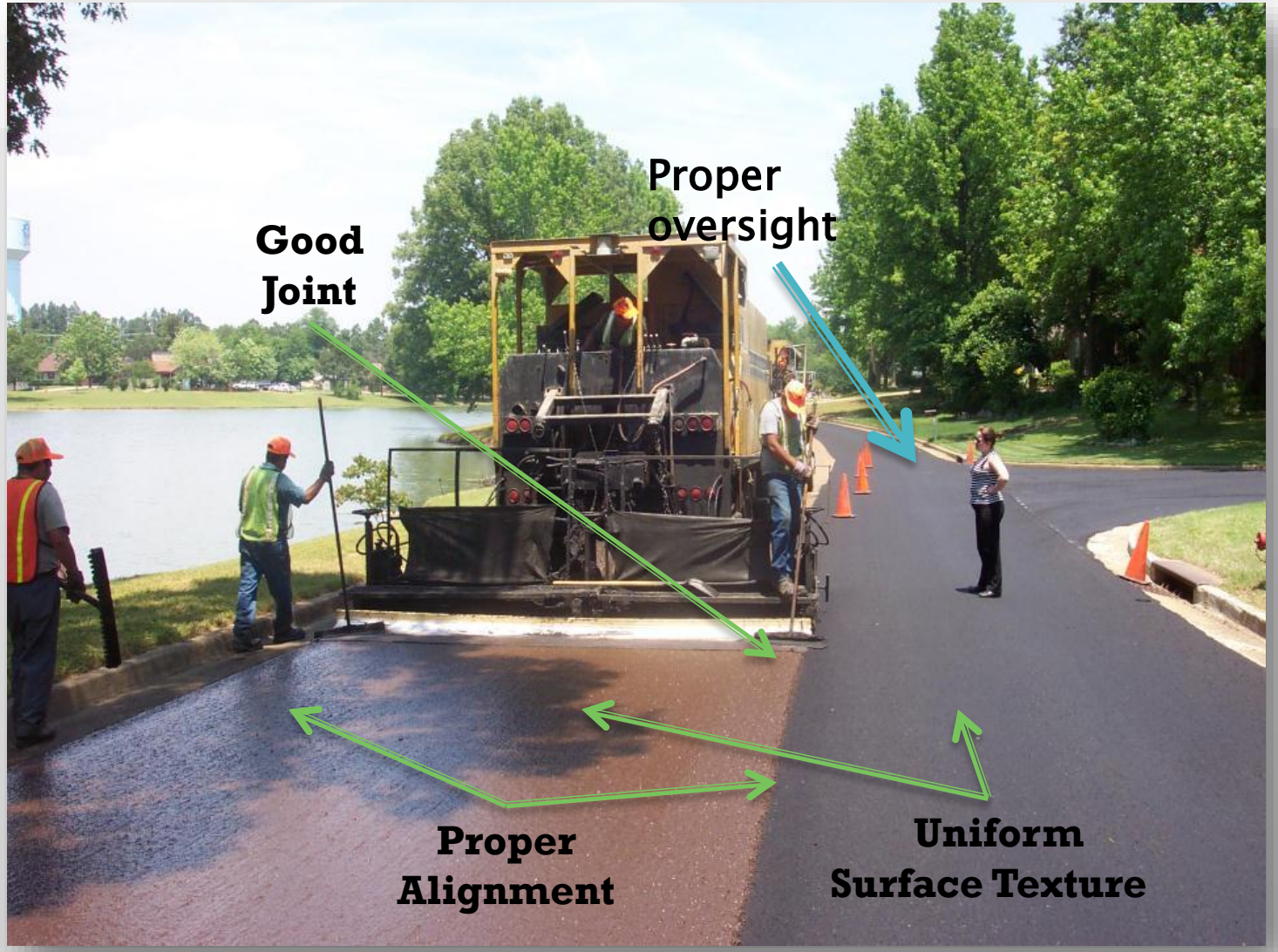
of rock.

Surface Preparation

- Cleaning
  - Slurry Surfacing will not stick to ANY loose rock, mix, dust, vegetation.
  - Vacuum, Sweep, Wash as necessary.
- Pavement Marking Removal
  - All Thermoplastic and Heavy Paint lane lines and symbols should be removed
- Crack Sealing
  - Sealant should be kept flush with minimal over banding. Thick over bands will get caught by the box runners.
  - It is best to seal at least 30 days prior to surfacing.
- Patching
  - Make sure patches are kept at or below the road surface. Remember – Micro surfacing does a great job of filling low areas. Bumps will be Bumps.
  - Cold Mix patches should “cure” at least 30 days prior to Micro surfacing.

Paving Techniques

Performing A Great Job



Longitudinal Joints

- Should be straight on tangent lines
- Uniformly follow the traffic lane
- Should be constructed as an overlap or butt joint
- If the overlap method is used it should be kept to a minimum
  (3” maximum)
- Should be smooth and neat in appearance
- Excessive buildup or uncovered areas should not be permitted

Longitudinal Joints

Acceptable Joints

Unacceptable Joints

Unacceptable Joints

Transverse Joints

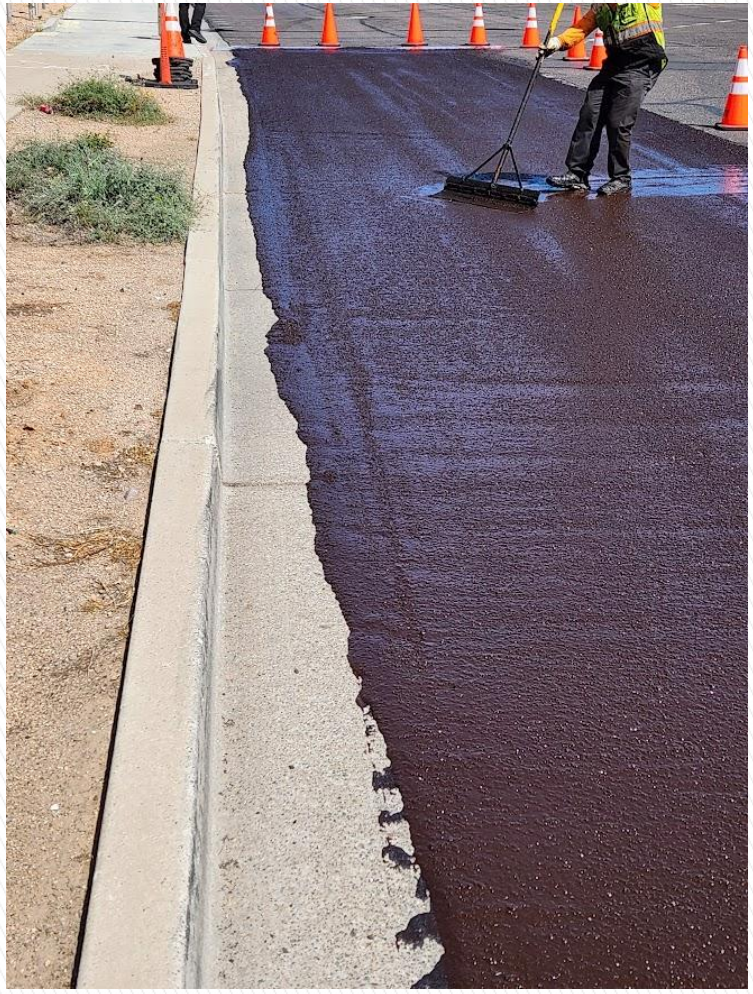
- Should be smooth and neat in appearance
- Hand work should be kept to a minimum
- Excessive buildup or uncovered areas should not be permitted
- Should be constructed as a butt joint
- Use of roofing felt may assist contractor in construction of acceptable transverse joints

Edge Lines

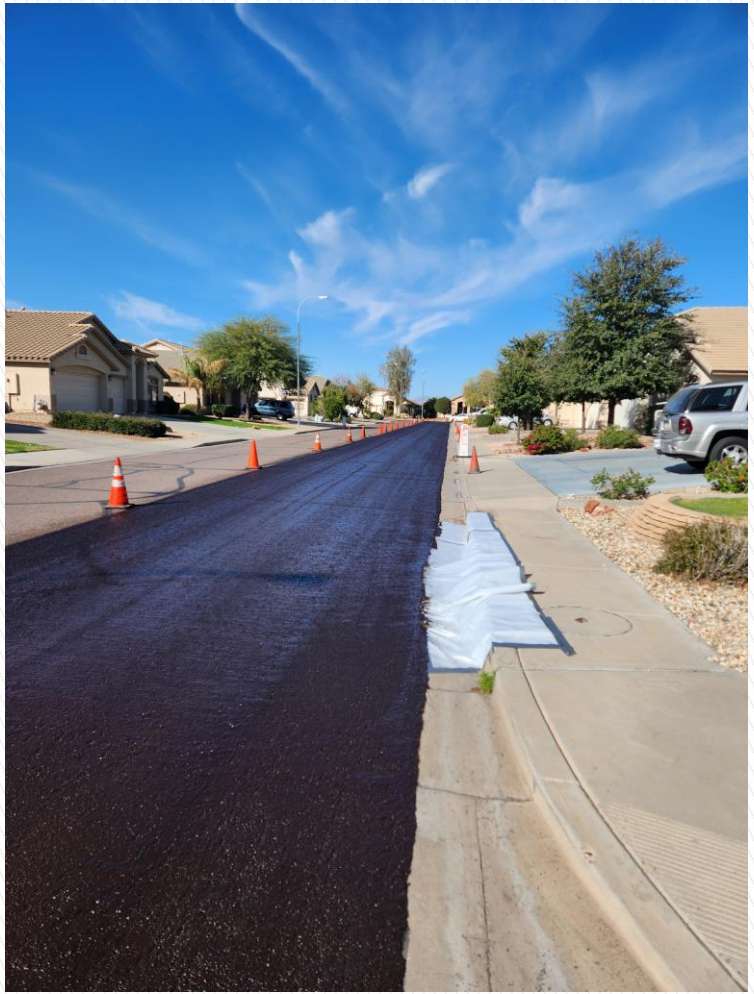
- Should be parallel to curb or centerline.
  - May require a paint or stringline.
- Edge line should be even and match existing edge.
- Should have consistent color and texture

Edge Lines

Unacceptable



Acceptable



Surface Texture

- Factors that influence final surface texture are:
  - Existing pavement surface texture
  - Mix consistency (accurate calibration)
  - Adherence to JMF
  - Type of screed rubber used
  - Spreader box maintenance
  - Use of drags or secondary strike off
  - Application rate
  - Speed of application machine (too fast may cause wash boarding)
  - Opening to traffic too early
  - Rolling (if required)

Surface Texture Uniformity

- Slurry systems have an aggressive surface texture and when applied properly can maintain a high friction surface for the duration of their useful life.

Surface Texture

Unacceptable

Acceptable

Possible Quality Issues

- Flushing / Slick Surface
  - Excess asphalt binder that creates a shiny tacky surface.
- Surface Loss – Debonding
  - Due to traffic wear, debonding or delamination.
- Raveling
  - Loose Aggregate
- Rutting
  - ¼” Rutting

Bleeding

- Bleeding can be caused by:
  - Excess asphalt in mix
    - Check Calibration against Mix Design
    - Paver Issue
  - Lack of fines in mix
    - If aggregate is too clean their may not be enough surface area for the amount of emulsion in the mix.
  - Application rate too high for gradation
    - Aggregate can settle to bottom leaving asphalt and fines on the surface
  - Incorrect emulsion supplied to project
    - Lack of Polymer Modification

Surface Loss

- Debonding or Delamination is usually caused by:
  - Poor Surface Preparation
  - Contamination from Paving Process
  - Mixture that is Breaking and Curing too Quickly
  - Debonding or Deterioration of Original Surface

Raveling

- A slight amount of raveling is normal within the first day or two.
  - You should NOT hear loose rock when driving over the surface.
  - The shoulders should not be black
- A Level Up or Scratch Course will be ravel more than a Surface Course.
- Raveling is more common in cooler temperatures.

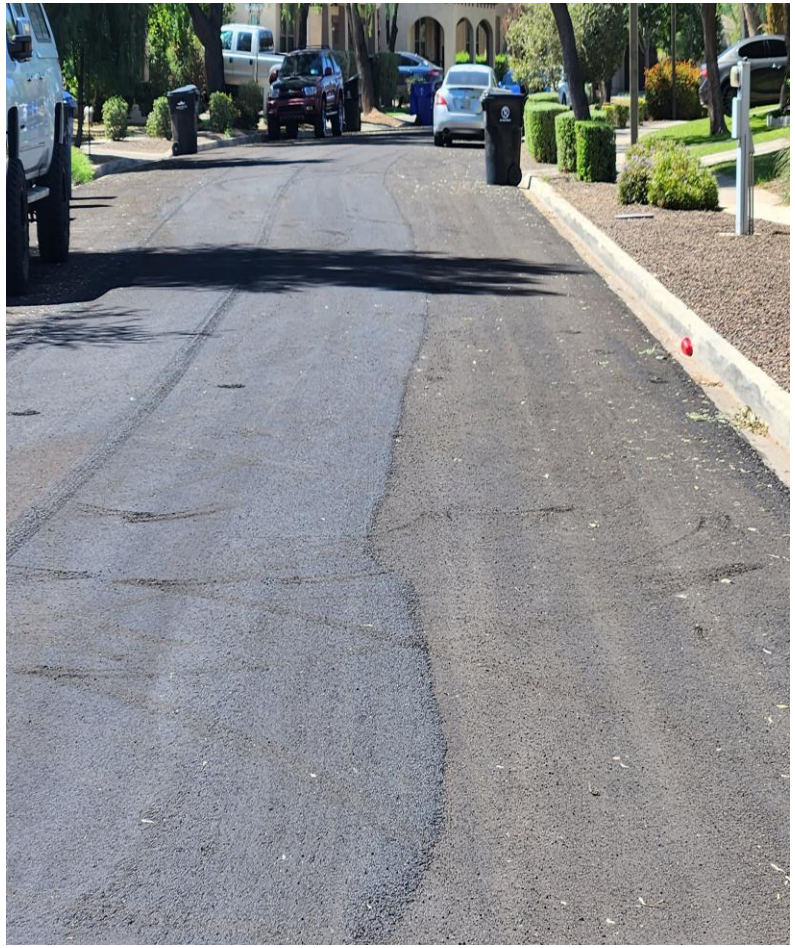
Causes of Raveling

- The aggregate lacks sufficient embedment in the matrix caused from insufficient asphalt quantity to hold the larger aggregate;
- Poor quality aggregates may debond from the matrix;
- The application rate was too thin to hold larger aggregates;
- The matrix has a lack of fines to fill voids between larger aggregates;
- Cooler temperatures may result in slowing of the cure necessary for traffic;
- Premature opening to traffic; and
- Slurry system was exposed to rain before final cure was achieved.

Rutting

- True Rutting of a Micro surfacing is Rare.
  - Was Slurry Seal used to fill ruts instead of Micro-surfacing.
  - Was the Micro surfacing level at completion?
    - Should the road have been leveled?
    - Did the contractor put the rut into the mat?
  - Is the underlying surface continuing to rut?
  - Did the Micro surfacing not meet the JMF?
  - Did the Aggregate and Emulsion Match the Mix Design.

Patching



- Traffic Marks or poor workmanship should be patched by placing a full width pass of slurry over the area.
- Patches should:
  - Match the existing texture
  - Edges should be square and parallel to edge of road.
  - Cover the entire lane.

Quality Is The Goal

- 5 Keys
  - Materials and Calibration
  - Surface Preparation
  - Equipment
  - Paving Techniques
  - Problem Solving

Cape Seal

- Cape Seal is a combination of a Chip Seal followed by a Micro surfacing.
- This combination utilizes the best of both treatments to provide a 1 + 1 = 3 solution to Pavement Preservation

Why Use Combination Treatments?

- Extends pavement service life significantly
- Targets multiple pavement distresses
- Expands treatment options for roadways in poorer condition
- Offers substantial cost savings compared to hot mix applications
- Improves public perception of preservation and enables use in areas previously considered unviable
- Suitable for higher ADT, urban, and residential roadways

When To Use a Cape Seal

PCI = B (70 – 84)

Fatigue Cracking - Low

Oxidation and Raveling – Moderate

Longitudinal & Transverse Cracking - Low

PCI = C (55-69)

Fatigue, Longitudinal & Transverse Cracking

Oxidation and Raveling – High

Longitudinal & Transverse Cracking

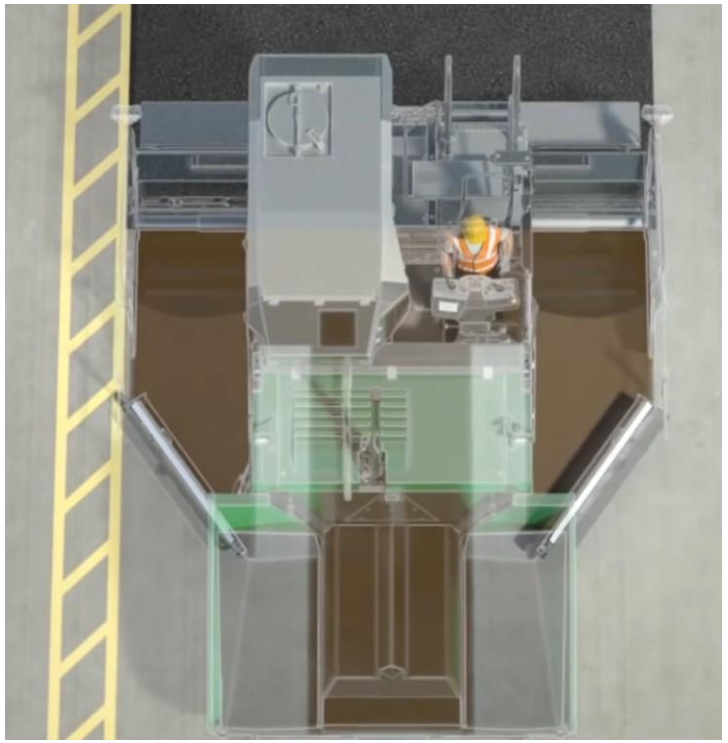
Ultra Thin Bonded Wearing Course – UTBWC

- Ultra-Thin Bonded Wearing Course (UTBWC) is designed for use as a high-performance ultra-thin overlay which seals the existing road surface and provides a skid-resistant, smooth, and thin (¾ inch) gap graded hot mix asphalt wearing course in a single operation.

What is Ultra-Thin Bonded Wearing Course?

- UTBWC is a high performance sealing and ultra-thin paving system placed on structurally sound asphalt or concrete pavements.
- UTBWC provides a durable, gap graded, skid resistant HMA wearing surface which improves ride quality
- A specialized paver applies a heavy application of a polymer modified emulsion to waterproof the surface directly in front of the paving screed immediately followed by an asphalt rich, gap graded HMA placed at ⅝” to ¾” depth
- A 10 Ton steel roller compacts/seats the mix allowing for a quick return of traffic, typically within 15 minutes

Specialized Equipment



- Specialized Spray Paver with Integrated Spray System and High Quality Screed
  - Applies the heavy application of polymer modified emulsion
  - Emulsion remains undisturbed prior to the immediate placement of the ultra-thin gap graded HMA

UTBWC Materials – Asphalt Emulsion

- Polymer Modified Emulsion Membrane
  - UTFCEM –
    - Similar properties as CRS-2P with following main differences:
      - Lower Viscosity Allows for a uniform application of this high asphalt residue material (63% minimum)
      - Lower Penetration
      - Higher Elastic Recovery Highly Polymer Modified which provides superior bonding of the gap graded HMA

Polymer Modified Emulsion Membrane

completely fills the voids bottom ⅜" which provides superior sealing of existing surface

Pavement Condition Index B (70 – 84)

Fatigue Cracking
Low

Oxidation and Raveling
Moderate

Longitudinal & Transverse
Cracking Low

TREATMENT OPTION

Ultra-Thin Bonded Wearing Course

Pavement Condition Index C (55 – 69)

Fatigue, Longitudinal & Transverse Cracking – Moderate

Polished Concrete

Block Cracking

TREATMENT OPTION

Ultra-Thin Bonded Wearing Course

Project Selection – Where to use UTBWC

- Suitable for all types of settings and traffic volume including cul-de-sac, residential and collector streets, industrial parks, state and interstate highways.
- Ideal for structurally sound asphalt or concrete pavements which are showing signs of surface oxidation, raveling, cracking or minor rutting and are in Good or Fair condition.
- Uniquely suited for heavy traffic and high speed settings which have difficult traffic control, where other Pavement Preservation processes or Two Step Combination Treatments are difficult to construct.
- Pavements which require reprofiling but not to the point where a Structural Overlay are required.

UTBWC Gradation B Residential Development

Project Selection – Where to use UTBWC

UTBWC used to Seal and Level Concrete followed by a Structural 2 inch SMA Overlay

I-78, Lehigh County

UTBWC used as final surface over Concrete

I-78 Lehigh County

Project Selection – Where to use UTBWC

Ultra Thin Bonded Wearing Course – UTBWC

- This Pavement Preservation treatment is ideal for structurally sound asphalt or concrete pavements which are exhibiting signs of surface oxidation, raveling, cracking, or minor rutting.
- High Polymer emulsion is sprayed on the surface prior to the application of the HMA.

Thin Lift Hot-Mix Overlay

Thin Lift Hot-Mix Overlay

There are several types of thin lift hot mix asphalt:

- Dense-Graded Mixes: These are versatile and economical, suitable for general use, and fill voids to improve durability.
- Stone Matrix Asphalt (SMA): Ideal for rut resistance, often used in wheel paths.
- Open-Graded Friction Course (OGFC): Designed to improve friction and reduce splash and noise.
- Performance-Specified Superpave: Offers enhanced performance tailored to climate and traffic conditions.
- Thin Hot Mix Asphalt Overlays: These overlays are placed over existing surfaces and can be placed in lifts as thin as 3/4 inches, requiring smaller aggregates for optimal compaction.

Thin Lift Hot-Mix Overlay

Successful Thin-HMA overlays require:

- A Smooth Initial Surface
  - Consider Fine or Micro Milling
  - Take care when prepping the roadway (Patching, Crack Treatments, Cleaning)
- Quality Materials
  - Thin is not the time to skimp on aggregates or asphalt.
  - Consider Polymer modification.
- Attention to Tack (Bond Coat)
  - Correct materials, correct application, correct cure time.
- Attention to Compaction
  - Don’t break the rock!

Questions?

?