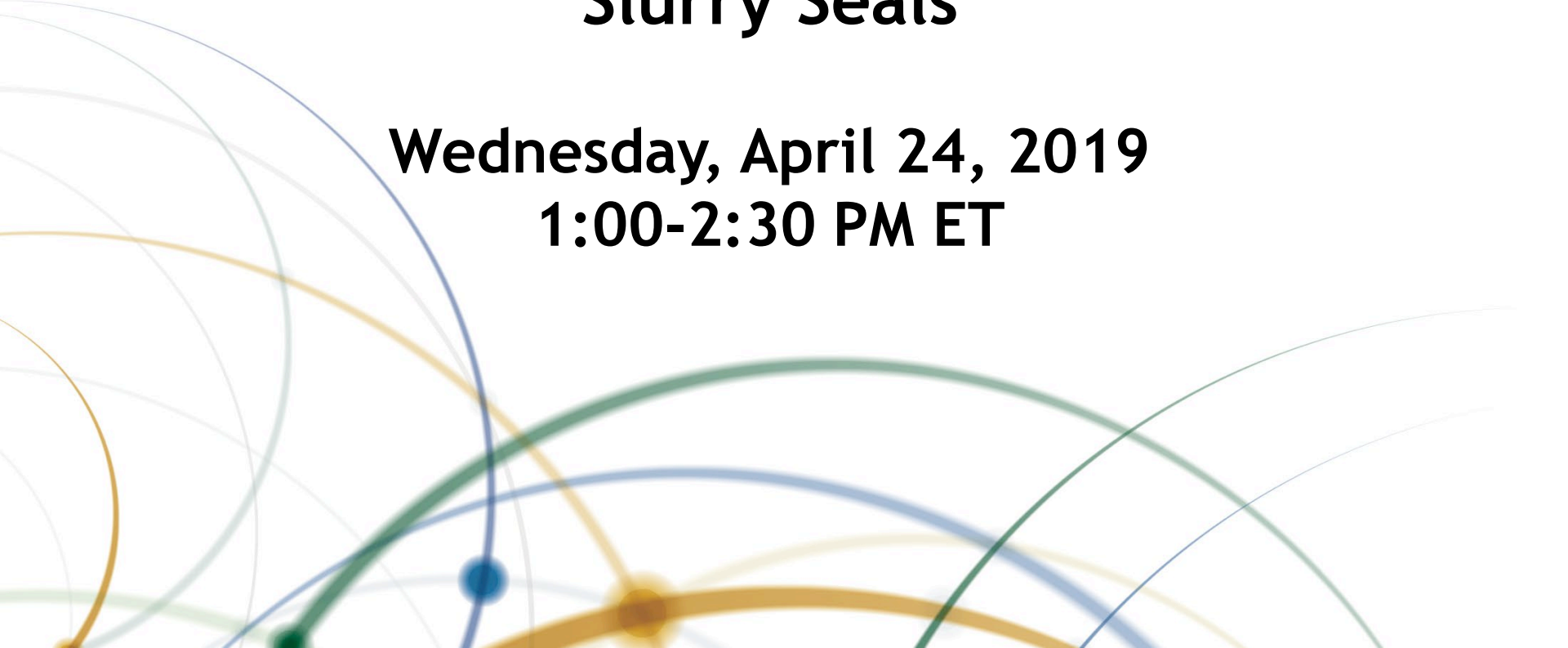


TRANSPORTATION RESEARCH BOARD

# **Building Better Micro Surfacing and Slurry Seals**

**Wednesday, April 24, 2019  
1:00-2:30 PM ET**



***The Transportation Research Board has met the standards and requirements of the Registered Continuing Education Providers Program. Credit earned on completion of this program will be reported to RCEP. A certificate of completion will be issued to participants that have registered and attended the entire session. As such, it does not include content that may be deemed or construed to be an approval or endorsement by RCEP.***



**REGISTERED CONTINUING EDUCATION PROGRAM**




## Purpose

To describe micro surfacing and slurry seals and discuss their use and construction.

## Learning Objectives

At the end of this webinar, you will be able to:

- Define micro surfacing and slurry seals
  - Identify causes of early failure of these treatments and identify methods to avoid them
  - Describe what is required in construction process to meet goals
- 

The background features abstract, overlapping green geometric shapes in various shades of green, creating a modern and dynamic visual effect. The shapes are primarily located on the left and right sides of the slide, framing the central text area.

# Building Better Micro Surfacing

Moderated by: Judith Corley-Lay

Chairman of AHD18



# Goal of this webinar

- ▶ That every micro surfacing project constructed this year would use the processes that we will describe this afternoon to insure a successful application.
- ▶ When things go wrong, project personnel know what to do to bring the project back on track.

# Agenda

- ▶ Dr. Andrew Braham, from University of Arkansas, will introduce micro surfacing as a pavement preservation treatment.
- ▶ Tim Harrawood, with Vance Brothers Construction, will highlight the key aspects of a quality micro surfacing project.
- ▶ Greg Garner, Pavement Preservation Engineer with the Kentucky Transportation Cabinet, will describe the response to a micro surfacing failure and continuing improvement process being used in Kentucky.
- ▶ Questions from the chat box.

# Sponsor

- ▶ AHD18, the committee on Pavement Preservation, developed this webinar.

*You are invited to attend our committee at the January annual meeting. To become a friend of AHD18, create a profile on myTRB and list AHD18 as a friend.*

# TRB Webinar: Building Better Micro Surfacing and Slurry Seals

## An Introduction to Micro Surfacing and Slurry Seals

Andrew Braham, P.E.  
Associate Professor  
University of Arkansas

April 24, 2019



(An auger on slurry paver)

# What is a pavement's purpose?

- Pavements must provide:
  - A safe traveling surface
  - Structural capacity for the loads applied
  - Drainage of water
  - Enough surface friction to prevent vehicle slippage
  - Smoothness



(Traffic on I-40 in Arkansas)

## Why are roads important to our economy?

# Importance of roads

- United States highway system worth ~\$1.75 trillion
  - ~2.6M miles paved roads (~95% asphalt concrete surface)
- Losses because of poor infrastructure:
  - Traffic congestion: \$160 billion, wasted time and fuel
  - Deficient pavement: \$112 billion, repairs & operating costs
- \$420 billion needed to raise roads from a grade “D” (ASCE report card)
  - Currently we spend ~\$92 billion USD

Potential solution?

Use pavement preservation and maintenance



# Maintenance treatments

- Fog seal
- Rejuvenating fog seal
- Chip seal
- Slurry seal
- Micro surfacing
- Ultra-thin lift overlay
- Cape seal
- Crack seal
- Scrub seal



Slurry seal (roadresource.org)



Micro surfacing (roadresource.org)

More information on [RoadResource.org](http://RoadResource.org)

# An introduction to slurry seals and micro surfacing

1. Proper usage
2. Material selection
3. Design considerations
4. Construction
5. “Lane-mile-year” potential gain



(roadresource.org)

We'll go through each of these briefly



# Slurry seal/micro surfacing proper usage

- Flushing
- Polished aggregate
- Raveling
- Oxidation
- Light/moderate cracking
- Rutting
  - Micro surfacing only



(roadresource.org)

Raveling and  
oxidation

# Proper usage: additional notes

- Slurry seals
  - Generally seal pavement surface
  - Fill small top down cracking
  - Restore surface friction
  - No loose aggregate
  - ~One stone thickness
- Micro surfacing
  - Same as slurry seals
  - Can also fill rill
  - Retard cracks from growing wider
  - Multiple stone thickness



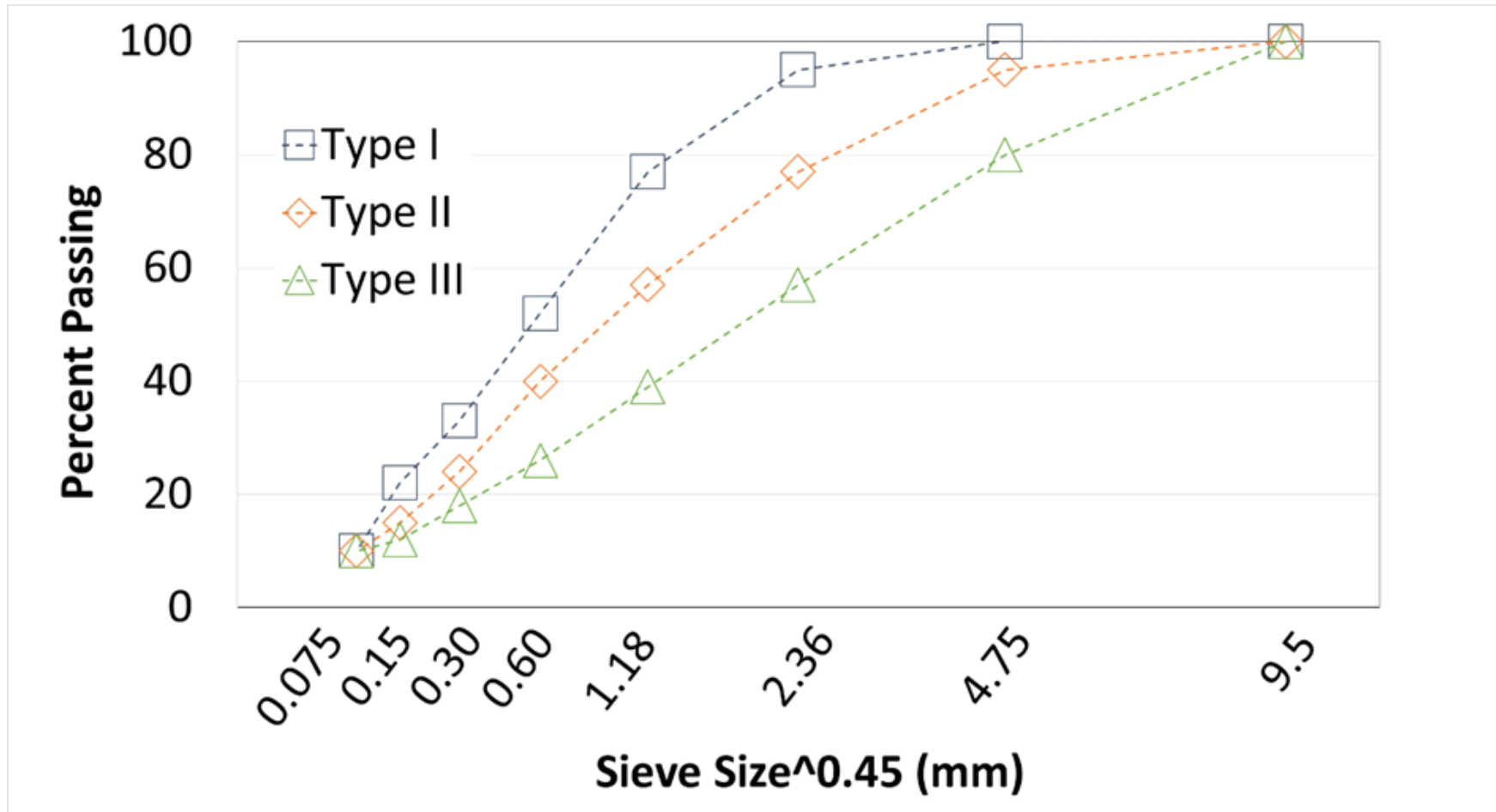
Micro surfacing  
rut fill  
(roadresource.org)

Do not prevent cracks from returning

# Slurry seal materials

- Five primary materials
  - Asphalt emulsion, aggregate, mineral filler, additives, water
- Asphalt emulsion
  - Anionic or cationic
  - Slow set or quick set
  - May be latex modified
- Mineral filler
  - Portland cement
  - Hydrated lime
  - Limestone dust
- Aggregate
  - Fractured faces
  - Minimal dust, clay
  - High soundness, abrasion
  - Three gradations
- Additives
  - Set control
- Water
  - No harmful salts or contaminants

# Slurry seal gradations



Seal and fill voids, Type III maximum skid resistance

# Micro surfacing materials

- Very similar to slurry seals, only differences shown
- Asphalt emulsion
  - CQS-1hP, CSS-1hP, CSS-1hLM (all meet same spec)
- Aggregate
  - Tighter limits
  - Only Type II and III gradation
  - Type III rut fill
- Additives – the same
- Water – the same
- Mineral filler – the same

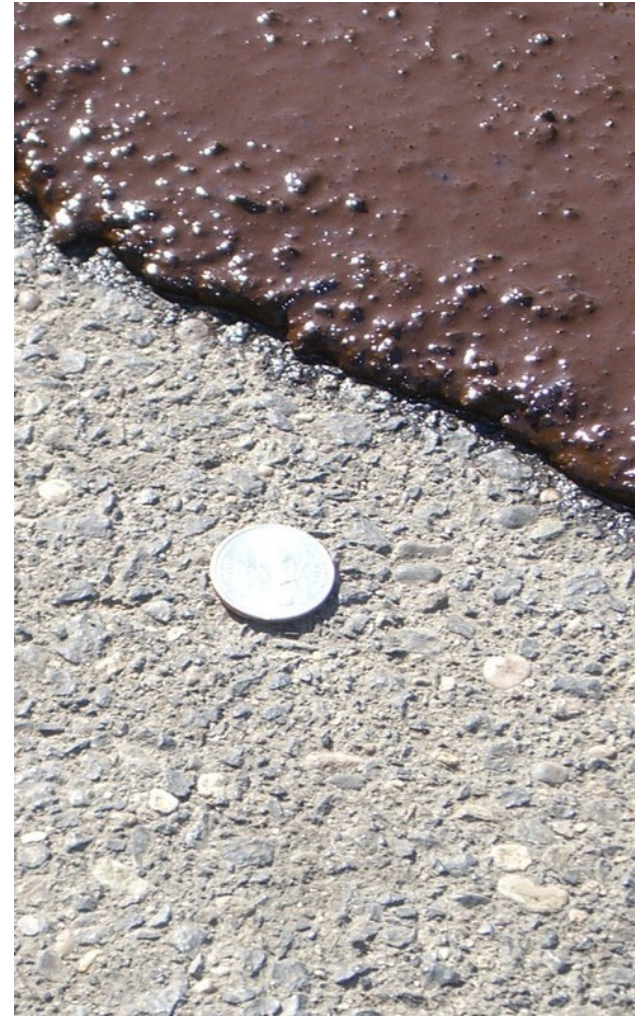


(An aggregate stockpile)



# Slurry seal/micro surfacing design

- ISSA A105: Slurry seal
  - Mix time test (TB113)
  - Slurry seal consistency (TB106)
  - Wet cohesion test (TB139)
  - Wet stripping test (TB114)
  - Wet track abrasion loss (TB100)
  - Loaded Wheel Tester (TB109)
- ISSA A143: Micro surfacing
  - TB113, 139, 114, 100, 109
  - Stability (TB147)
  - Compatibility (TB144)



Slurry seal (roadresource.org)

# Slurry seal/micro surfacing construction

- Unless rut fill, no visual difference
- Three key considerations
  - Weather, surface preparation, application
- Weather
  - Yes: 50°F (10°C) temperature, rising
  - No: freezing within 24 hours
  - No: rain is imminent
- Surface preparation
  - Remove loose material and plant matter
  - Cracks dry
  - Cover utilities with paper
  - Tack coat if existing surface dry/raveled (must cure)



(Brooming and paper)



# Slurry seal/micro surfacing application

- Single truck delivers aggregate, asphalt emulsion, water to paver (nurse truck)
- Paver mixes with additives in pugmill
- Treatment placed uniformly across surface
- Drag provides textured surface
- Application rate
  - 8-30 lb/yd<sup>2</sup> (4.3-16.3 kg/m<sup>2</sup>)

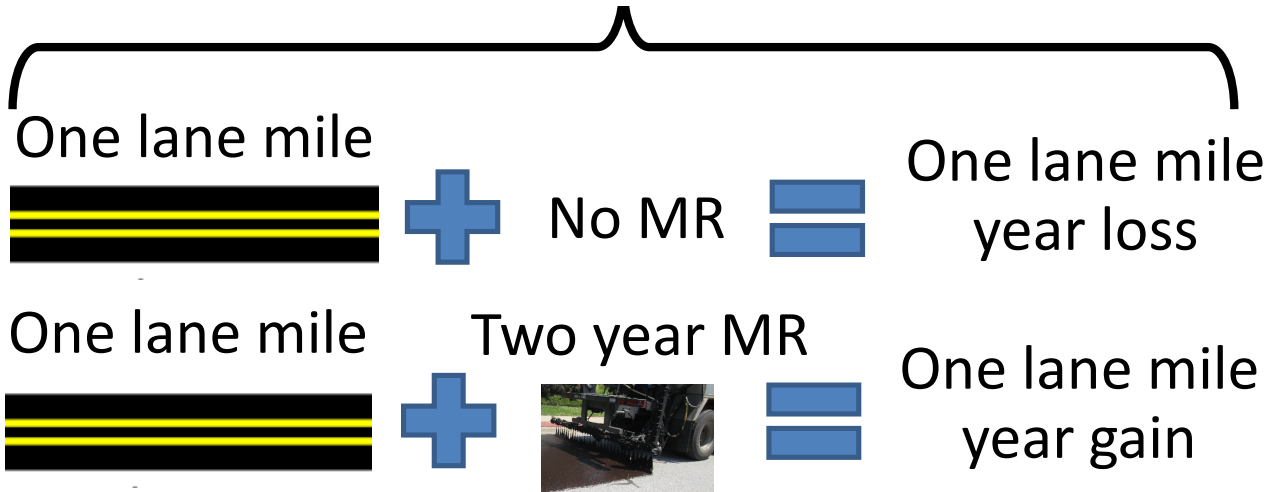


Can also have a single unit



# Slurry seal/micro surfacing “lane-mile-year” potential gain: RoadResource.org

Remaining Service Life → lane mile years



An actual DOT budget, monthly treatments

	Slurry seal	Crack seal	Mill & Fill	Reconstruct	Lane-mile-year
Current (approx.)	\$3 M	\$2 M	\$10 M	\$52 M	-3,041
Possible?	\$12 M	\$6 M	\$10 M	\$39 M	+1,700

# Electronic resources

- Pavement Preservation and Recycling Alliance
  - <https://roadresource.org/>
- FHWA pavement distress manual
  - <https://www.fhwa.dot.gov/publications/research/infrastructure/pavements/ltpa/reports/03031/03031.pdf>
- University of Arkansas Asphalt Emulsion Training
  - Three certificates have been developed
  - Google “asphalt emulsion uark”

# Conclusions

1. Proper usage
2. Material selection
3. Design considerations
4. Construction
5. “Lane-mile-year” potential gain



(roadresource.org)

Thank you!

# UNIVERSITY OF ARKANSAS<sup>®</sup>

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# Building Better Micro Surfacing & Slurry Seals



Transportation Research Board

4-24-2019

# Disclaimer

It is not intended or recommended that this training be used as a verbatim specification. It should be only be used as a abbreviated guide to assist contractors and user agencies with the information necessary to construct a high quality project.

Sources for more complete information will be given at the end of this presentation

# Presentation Assumptions

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Proper site selection

---

Project has been bid

---

Project has been awarded

---

Early phase of surface preparation has been completed (examples to follow)

---

Mix design has been submitted and approved

---

Preconstruction meeting has been held

---

Materials are on site (tested or certified) and approved for use



# Surface Preparation early phase

**Crack treatments** – ¼" and larger, blow & seal or rout & seal, compatible materials with minimal amount of sealant on the surface

**Structural leveling** – Areas in need of repair or leveling need addressed prior to resurfacing

**Full depth repairs** – repair pavement and base failures according to best practices

**Tree trimming** - Trim trees to provide the equipment access to the pavement receiving treatment. (not necessary on all projects)

**Herbicide treatment** -Treat vegetation intruding into the pavement with an approved herbicide well in advance of treatment application





# Sequence of Construction Activities

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Mobilization of equipment, materials and personnel

---

Stockpile set up

---

Final surface preparation

---

Calibration of application equipment (with agency present)

---

Machine set up (based upon calibration factors)

---

Application of test strip

---

Test strip evaluation and approval/disapproval

---

Full production

# Calibration

- Required prior to product installation
- Performed with agency oversight
- Verifies component material output (Aggregate, emulsion, cement)
- Ensures compliance with approved mix design/job mix formula
- Factors determined through the calibration process aid in application rate verification and overall materials usage
- Generally performed one time per project (some agencies allow the transfer of calibrations)



# Calibration

- Can be performed on truck scales or platform scales
- All scales used for calibration should be certified
- Follow industry standards for calibration or use equipment manufacturers guidelines
- Seasoned crews can perform calibration in less than two hours

Aggregate calibration



Asphalt emulsion calibration



# Surface Preparation final phase

- Prior to applying the slurry seal or micro surfacing, the pavement to be resurfaced should be swept and all loose materials should be removed

Treatment success is 100% reliant on the ability to bond to the existing surface





# Surface Preparation final phase

- Structure & casting protection
  - Protecting utility structures, such as bridge decks, manhole covers, catch basins and valve boxes is extremely important

Sweat the little things!





1



4



**Protecting the limits of the  
project  
BOP,EOP and bridge decks**

2



3



**Surface Preparation  
final phase**

---

# Surface Preparation final phase

---

Pavement marking removal – painted pavement marking removal generally not required

---

Raised pavement markers – All raised pavement markers should be removed prior to application

---

Snow plowable markers – Should be removed and then patched with suitable asphaltic materials  
(high performance cold mix)

---

Thermoplastic pavement markings – Marking in excess of 4" should be removed. (Stop bars, cross walks, arrows, words etc. Grind or water blast

**80-85% removal is adequate to ensure bond**



# Snow plowable markers

- Creating a problem





# Thermo Plastic removal

80-85% removal is  
adequate



# Tack Coat

Generally not required unless you are treating concrete, brick or extremely oxidized pavement

---

- Tack coat preceding slurry system treatment
  - May improve uniformity of the absorptive nature of a road surface
  - May improve application success
  - Tack coat is normally not required
  - If required dilute 3 parts water to 1 part emulsion and apply at 0.05 to 0.10 per square yard
  - Allow to dry before slurry system treatment application

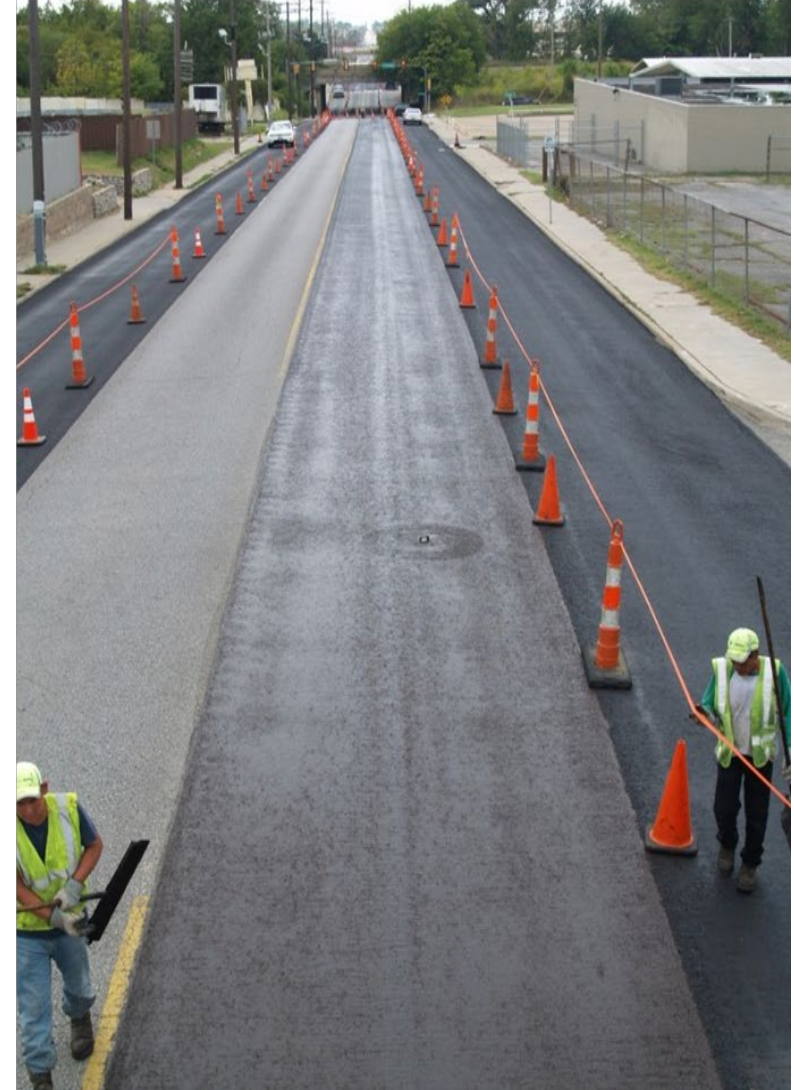




# Traffic Control Micro/Slurry require a robust traffic control effort

Notification of affected parties is  
a benefit

- Safety of the traveling public
- Safety of the employees performing the work
- Product protection
- Traffic control devices
  - needs vary depending on the situation
- Consider certifying employees through ATSSA



# Screening of aggregate

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# Test strips

- Test strips:
  - Assure adequate workmanship, aesthetics, and cure time of the mixture is achievable when applied with the personnel, equipment, and materials intended for use during execution of the project
  - Should be performed in similar conditions as those expected during actual application. Day time project = test strip performed during the day. Night time project = Test strip performed at night
  - If hand work is performed during the test strip, it should have a uniform application rate and surface texture that sufficiently matches that applied by the spreader box





# Test strip evaluation

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Proportion optimization

---

Application rate verification

---

Uniformity of surface texture

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Equipment in good condition

---

Adequate workforce/well trained

---

Cure time (not a performance indicator)

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Workmanship

---

Proper alignment

# 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.



# Final 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
  - Rolling (if required)





# Non uniform surface texture

- Non uniform surface texture as seen here can be caused by, poor spreader box maintenance or a slurry system that is setting too quickly



# Keys to success

- Proper site selection
- Good specifications (enforced)
- Proper roadway preparation (early and final)
- Proper equipment (match equipment to project)
- Accurate mix design
- Accurate equipment calibration
- Material consistency (use materials with history of past performance)
- Contractor performance (use seasoned, well-trained workforce)
- Quality project inspection
- Agency – industry relationship (working together for a common goal)
- Information





# Sources of information

## ISSA/FHWA Web Based Training

International Slurry Surfacing Association  
[www.slurry.org](http://www.slurry.org)

Pavement Preservation & Recycling  
Alliance [roadresource.org/](http://roadresource.org/)

National Center for Pavement Preservation  
[www.pavementpreservation.org/](http://www.pavementpreservation.org/)

Fp2 Formerly the Foundation for  
Pavement Preservation <https://fp2.org/>

# Thank you!



## Vance Brothers, Inc.

*Bringing Integrity to the Surface.*

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Conway, Arkansas

email: [tharrawood@vancebrothers.com](mailto:tharrawood@vancebrothers.com) 72032

**Tim Harrawood**

Manager Southern Contracting Division

# BUILDING BETTER MICRO SURFACING

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2019

KENTUCKY MICROSURFACING

# EARLY MICROSURFACING

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- 2012 Microsurface Pikeville US 23
  - Contaminated Aggregate
  - “Gully Washer”
  - Car Wash
- Back in Pikeville 2018
  - \$400k Spent On RS Routes
  - 12 Lane Miles of Microsurface MP





# MICROSURFACING AFTER 2012

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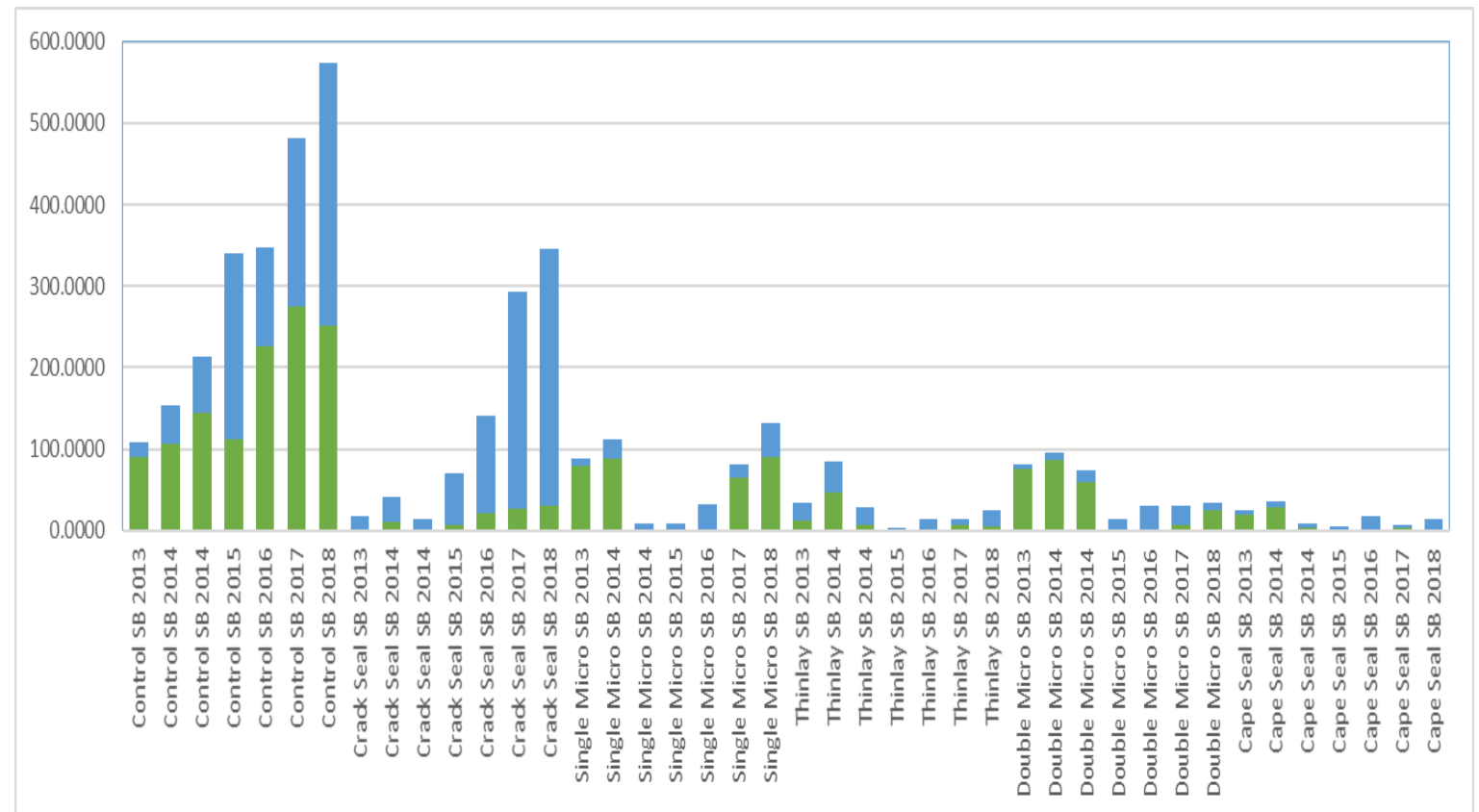
- Improvements Since 2012
  - US 127 Test Site
  - Created PMA
  - Created PMA Specifications Subcommittee
  - Spring Training
  - Fall Project Review
  - Maintenance Presence On The Job
  - Created KY Gradation
  - Incorporated Micro In Spec Book
  - Increased Projects
  - More Competition and Contractors





# KYTC RESEARCH SECTION-US 127

- 1500' Sections of Current Preservation Treatments
  - Single Microsurface
  - Double Microsurface
  - Cape Seal (Microsurface)
  - 5/8" 4.75mm Thinlay
  - Crack Seal
  - Control



# PREVENTIVE MAINTENANCE ALLIANCE

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- **PMA**
  - Maintain Data Driven Process
  - Ensure Quality Applications
  - Track Performance
  - Increase Treatment Options
  - Guide Research
- **PMA Specifications Subcommittee**
  - Improve and Create Application and Material Specifications
  - CO and District
- **CO Responsibilities**
  - Provide Training
  - Evaluate and Analyze Performance
  - Maintain Data and Provide Candidates
  - Perform Final Selection When Necessary
- **District Responsibilities**
  - Submit Projects
  - Attend Training
  - Provide Qualified Personnel
  - Attend Annual Meeting
  - Provide Project Peer Reviews

# PMA MEETINGS

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- Spring Training
  - Project Selection
  - Treatment Options
  - Inspector Training
- Annual PMA Conference
  - Project Review
  - Project Submittal
  - New Products and Research Opportunities
  - Business Meeting



# IMPROVING MICROSURFACING

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- Steps for a Better Micro
  - Introduced to the Spec Book
  - Presence on the Job
  - Created Gradation for Kentucky
  - Certification?





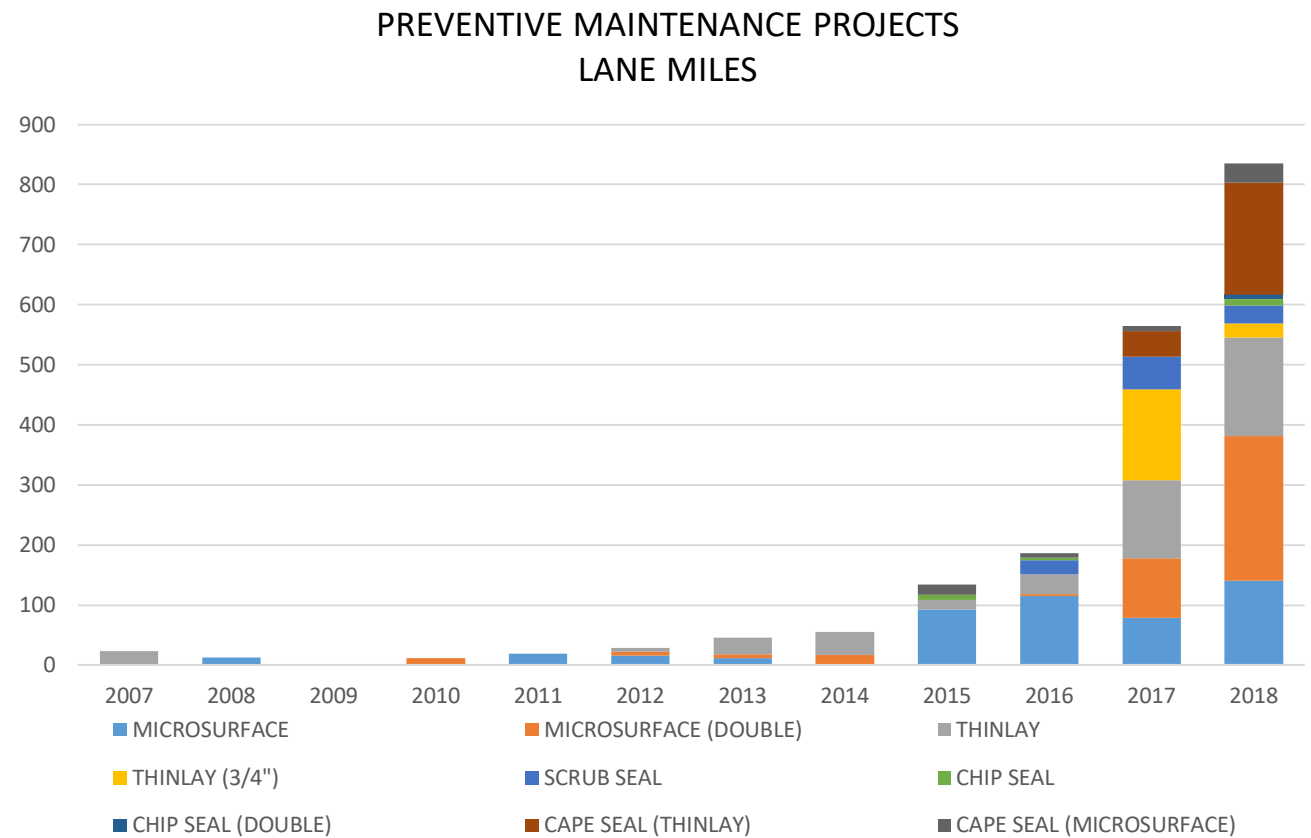
# PROJECT INFORMATION

- Project Information Since 2012

- 830 Lane Miles Of Micro
- \$27 Million
- 74 Projects

- Contractors Since 2012

- 6 Contractors Awarded
- In State Contractors



# ZERO TO HERO

---

- Why We Are Successful
  - “No Dollar Is More Carefully Spent”
  - “Give Us The Opportunity To Fail”
  - “Find People To Do Your Job”
  - “Give A Damn”



# Today's Speakers

- Judith Corley-Lay, *National Center for Pavement Preservation*, [jcorleylay314@gmail.com](mailto:jcorleylay314@gmail.com)
- Andrew Braham, *University of Arkansas*, [afbraham@uark.edu](mailto:afbraham@uark.edu)
- Greg Garner, *Kentucky Transportation Cabinet*, [greg.garner@ky.gov](mailto:greg.garner@ky.gov)
- Tim Harrawood, *Vance Brothers, Inc.*, [tharrawood@vancebrothers.com](mailto:tharrawood@vancebrothers.com)



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- Become a Friend of a Committee (<http://bit.ly/TRBcommittees>)
  - Networking opportunities
  - May provide a path to become a Standing Committee member
- ***Sponsoring Committee: AHD18***
- For more information: [www.mytrb.org](http://www.mytrb.org)
  - Create your account
  - Update your profile



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