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This innovation focuses on promoting the practice of applying the right treatment on the right roadway at the right time with quality construction and materials. Pavement Preservation “How” focuses upon quality construction and materials practices of pavement preservation treatments.

Pavements deteriorate as a result of many different forces, but the predominant factors affecting pavement performance are the vehicle loads and environmental elements they are exposed to over their lifetime. Today, most highway agencies accept that an effective pavement preservation program will slow down the rate of pavement deterioration while also providing a safer, smoother ride to the traveling public.

One obstacle to successful pavement preservation is the impact that treatment failures can have on an entire program. Whether it is a failed patch, stone flying off a chip seal, or a microsurfacing that peels off because it did not set, even a single failure and the associated damages can set back an agency’s program for many years. However, most early failures can be attributed to a breakdown in some part of the construction process, such as the materials, site preparation, or placement practices, and as such are avoidable.

This EDC effort promotes quality construction and materials practices that apply to both flexible and rigid pavements. For flexible pavements these include asphalt surfacings such as chip seals, scrub seals, slurry seals, microsurfacing, and ultrathin bonded wearing courses; rigid pavement strategies addressed in this innovation include dowel bar retrofits, partial- and full-depth patching, cross-stitching, and diamond grinding.

By following best practices for materials selection and construction practices, pavement preservation will be less disruptive and safer. Improved construction practices and the associated reduction in construction-related failures allow agencies to continue to use treatments that are proven to be effective, enabling them to realize the benefits of these techniques.
BENEFITS

· **Safety.** The treatments are typically installed in shorter work zones and during off-peak hours, reducing the likelihood of work zone incidents. Improved skid resistance is a key functional benefit of preservation.

· **Performance.** Successful construction practices contribute to improved pavement performance, providing smoother and safer roads and delaying the need for time-consuming and costly rehabilitation.

· **Flexibility.** Retaining a mix of successful treatments in the preservation toolbox provides agencies greater flexibility in placing the right treatment on the right pavement at the right time.

· **Savings.** Improved performance and fewer failures keep a pavement network in a state of good repair at a lower cost.

STATE OF THE PRACTICE

The past 20 years have seen significant advancements in the quality of the materials used in preservation, as well as technological advancements in equipment and construction methods. A focus on improved construction of pavement preservation highlights innovations in treatment materials, construction practices, improved specifications, better equipment, and a greater emphasis on construction quality, all of which lead to longer lasting preservation treatments. FHWA has invested in training to promote implementation of these innovations and thereby enhance the success of pavement preservation treatments.

Properly constructed pavement preservation projects on flexible pavements using chip seals, microsurfacing and slurry seals, and ultrathin bonded wearing courses have allowed agencies to cover more miles of pavements more rapidly and with greater assurance of success. Similarly, successful preservation projects on rigid pavements, using techniques such as dowel bar retrofits, patching, and diamond grinding, have been demonstrated to add years of service life to pavements.

Highway agencies, industry and the Federal Highway Administration (FHWA) have partnered in deploying the materials and methods needed to advance the how aspect of pavement preservation. They have identified effective approaches that are implementation-ready and have been used in all regions of the United States. Some of these include:

- North Carolina Department of Transportation’s chip seal specifications and construction practices
- The Kentucky Transportation Cabinet’s slurry and microsurfacing specifications and construction practices
- Clinton County, Iowa’s portland cement concrete full panel replacement specifications and construction practices

RESOURCES

FHWA EDC-4 [https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/]

FHWA EDC-4 Pavement Preservation When and Where [http://www.fhwa.dot.gov/asset/]

FHWA EDC-4 Pavement Preservation How [https://www.fhwa.dot.gov/preservation/]

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**Every Day Counts (EDC)**, a State-based initiative of FHWA’s Center for Accelerating Innovation, works with State, local and private sector partners to encourage the adoption of proven technologies and innovations aimed at shortening and enhancing project delivery.

U.S. Department of Transportation  
Federal Highway Administration  
www.fhwa.dot.gov/everydaycounts
Pavement Preservation: How
Technical Working Group (TWG) Members

The TWG is providing professional expertise to inform the implementation plan for this innovation. The members of the TWG reflect a diverse group of stakeholders from Federal, State, and local governments, and industry organizations.

1. Jerry Auge, Ramsey County, Minnesota
2. Scott Capps, North Carolina DOT
3. Bryan Cawley, FHWA
4. James Gray, FHWA
5. Todd Kinney, Clinton County, Iowa
6. Laura Lawndy, FHWA
7. Mike McGee, FHWA
8. Jim Moulthrop, FP2, Inc.
9. Tracy Nowaczyk, Kentucky Transportation Cabinet
10. Rusty Price, International Slurry Surfacing Association (ISSA)
12. Michael Sheehan, Olmsted County, Minnesota
13. Leif Wathne, American Concrete Pavement Association (ACPA)
Purpose of the Workbook

The purpose of this workbook is to share information about this innovation. The remaining pages of the workbook provide the presentations given by FHWA, public sector, and pavement industry presenters during the Pavement Preservation: How sessions at the seven regional summits held between October and December 2016 in: Baltimore, MD; Minneapolis, MN; Albany, NY; Portland, OR; Sacramento, CA; Austin, TX; and Orlando, FL; as well as the presentations from the two Pavement Preservation: How virtual summits held in September 2016.
Presenter Biographies

FHWA Representatives

Bryan Cawley, PE, currently serves as the Construction Management Team Leader in the FHWA Office of Infrastructure. Since joining FHWA in 1997, Bryan has held a variety of positions in the Utah Division Office, Nebraska Division Office, Chicago Resource Center, and North Dakota Division Office. Prior to working for FHWA, Bryan worked for Staker Paving and Construction and the Utah Department of Transportation. Bryan holds a Master's in Business Administration from the University of Nebraska, Master’s Degree in Civil Engineering from Iowa State University, and a Bachelor’s Degree in Civil Engineering from the University of Utah. Bryan is also a licensed Professional Engineer in the State of North Dakota.

Presented at Regional Summits in: Baltimore, MD and Minneapolis, MN

Presentation on page: 12

James Gray, PE, currently serves as Preservation and Maintenance Engineer on the Construction Management Team in the FHWA Office of Infrastructure. Since joining FHWA in 2006, James has held positions as a Project Engineer and a Construction Operations Engineer with the Eastern Federal Lands Division. Prior to working for FHWA, James worked for the Michigan Department of Transportation, Michigan State University, and the City of Warren, Michigan. James holds a Master’s Degree in Business Administration from Pennsylvania State University and a Bachelor’s Degree in Civil Engineering from Michigan State University. James is also a licensed Professional Engineer in the State of Michigan.

Presented at Regional Summits in: Portland, OR; Sacramento, CA; and Austin, TX

Presentation on page: 12
Laura Lawndy is a Senior Program Analyst in the FHWA Office of Infrastructure. In this role, she serves as the financial manager for the Office of Infrastructures RD&T budgets and is the co-leader for the Pavement Preservation Expert Task Group. Prior to her current role, Laura was a program support contractor in the FHWA Office of Asset Management, supporting the preservation, maintenance, and construction program. Laura holds a Bachelor of Arts Degree in International Business from Grace College.

Presented at Regional Summit in: Albany, NY

Presentation on page: 12

Mike McGee, PE, currently serves as a Pavement and Materials Engineer in the FHWA Missouri Division Office. Since joining FHWA in 2005, Mike has held a variety of positions in the Missouri Division Office. Mike holds a Bachelor’s Degree in Civil Engineering from the University of Missouri. Mike is also a licensed Professional Engineer in the State of Missouri.

Presented at Regional Summit in: Orlando, FL

Presentation on page: 12

Public Sector Representatives

Tracy Nowaczky, PE, is the Branch Manager for the Operations and Pavement Management Branch for the Kentucky Transportation Cabinet (KYTC). The branch is charged with managing programs that collect data to measure condition of KYTC assets, report system performance, and analyze budgetary needs. Tracy has over 12 years of experience in pavement management and has led the effort to grow the pavement preservation program in Kentucky. Prior to working with KYTC, Tracy designed bridges for the Minnesota DOT. She graduated with a Bachelor’s Degree in Civil Engineering from the University of Wisconsin-Madison.

Presented at Regional Summits in: Minneapolis, MN and Orlando, FL

Presentation on page: 16

Gerald “Jerry” Auge, Jr., PE, currently serves as the Construction and Maintenance Engineer for the Ramsey County, Minnesota Public Works Department. Since joining Ramsey County in 2006, Jerry has held positions as a Project Manager and as the Construction Engineer in the Engineering Division of Public Works Department. Prior to working at Ramsey County, Jerry worked for the City of Shoreview, MN, Qwest (now TPG).
Century Link), a communications company, the City of Farmington and MSA Consulting/H.R. Green Company. For the past two years, Jerry has been working with the Minnesota DOT as a member of a Technical Working Group for Concrete Specifications and Collaboration. Jerry holds a Master’s of Science in Infrastructure Systems Engineering from the University of Minnesota and a Bachelor’s Degree in Civil Engineering from the University of Minnesota. Jerry is also a licensed Professional Engineer in the State of Minnesota.

Presented at Regional Summits in: Albany, NY and Austin, TX

Presentation on page: 21

Scott Capps, PE, CEM, is the State Maintenance and Equipment Engineer for the North Carolina DOT. Scott has over 25 years of experience in the maintenance and repair of asphalt and concrete pavements and has been actively involved in the agency’s pavement preservation activities. He is currently the Vice Chair of the Pavement Technical Working Group of the AASHTO Subcommittee on Maintenance. Scott graduated from North Carolina State University in 1990 with a Bachelor of Science degree in Civil Engineering Construction. He is a registered Professional Engineer in North Carolina and is also a Certified Equipment Manager.

Presented at Regional Summits in: Portland, OR and Sacramento, CA

Presentation on page: 27

Industry Representatives

David Peshkin, PE, is the Chief Engineer of Applied Pavement Technology, Inc., where he has worked since 1996. He has over 30 years experience as a pavement engineer, working on a wide variety of projects in pavement evaluation, performance, design, and maintenance. For the past 25 years, his work has been focused on pavement maintenance and preservation through research, training, and application. David holds Bachelor’s and Master’s degrees in Civil Engineering from the University of Illinois and a Bachelor of Arts in History from Swarthmore College. He is a licensed Professional Engineer in Illinois and 13 other States.

Presented at Regional Summits in: Baltimore, MD; Albany, NY; Sacramento, CA; Austin, TX; and Orlando, FL
Gregory Duncan, PE, is a Senior Engineer at Applied Pavement Technologies, Inc. (APTech) with 21 years of pavement materials, construction, and roadway maintenance engineering experience. His work at APTech has focused on highway maintenance, pavement preservation, and evaluation for both highways and airfields. Prior to joining APTech, Mr. Duncan was the Assistant Chief Engineer of Operations for the Tennessee DOT, where he was responsible for coordination of construction projects and maintenance and operations of the highway system. Since beginning his career with the Department in 1994, he served as State Bituminous Engineer, Assistant Director of Construction, Regional Director for Western Tennessee Region 4, and Director of the Maintenance Division. Mr. Duncan was an active member of the AASHTO Subcommittee on Maintenance, Subcommittee on Transportation Systems Management and Operations, and the Special Committee on Transportation Security and Emergency Management. In October 2014, he was appointed the chairman of the AASHTO Winter Maintenance Technical Services Program. Mr. Duncan is a licensed professional engineer, and earned a Bachelor’s Degree in Civil Engineering from Tennessee Technological University and a Master’s Degree in Civil Engineering from Auburn University.

Presented at Regional Summits in: Minneapolis, MN and Portland, OR

Chuck Ingram is the Sales Manager at Slurry Pavers, where he has worked for 40 years. He began his career as a laborer, and has also worked as a foreman, and superintendent. He has been a part of the firm’s evolution into a multi-faceted company with many disciplines of Pavement Preservation, including slurry seal, micro surfacing, chip sealing, crack sealing, pavement milling, full depth reclamation, and asphalt emulsion manufacturing. For the past 25 years, Chuck has been in charge of Business Development for the company in the Mid-Atlantic region. He has also been involved with the International Slurry Surfacing Association (ISSA) for over 20 years, serving on the Industry Relations Committee and the Quality/Education and Training Committee. In addition, he serves as SME on ISSA’s web-based training modules for Slurry Seal and Micro Surfacing and is currently co-chair of ISSA’s Slurry Systems Workshop. Chuck also serves as an instructor for the Slurry Systems Certification.
Presented at Regional Summit in: Baltimore, MD

Presentation on page: 36

Dan Patenaude, PE, is a licensed professional engineer with a Bachelor’s degree in Civil Engineering from the University of Vermont and a Master’s degree in Business Administration from Curry College. After spending the first 11 years of his career in construction management and commercial real estate development, Dan joined the public sector and became the Public Works Director for the Town of Wallkill in New York, where he gained his passion for pavement management. In 10 years of service with the Town, Dan and his team were able to raise the community’s network pavement condition index (PCI) from 76 to 83, a very noticeable improvement for local road users. Dan rejoined the private sector in 2002, and since that time has enjoyed working with multiple road owner agencies along the east coast, helping them optimize their limited roadway funding. Dan is currently the Sales & Marketing Manager for Sealcoating, Inc. based in Braintree, MA. He and his team promote innovative pavement preservation solutions throughout New England and downstate New York.

Presented at Regional Summit in: Albany, NY

Presentation on page: 41

Robert Seghetti is the President of ACME Concrete Paving, Inc. He has been involved at ACME since receiving his BS in Civil Engineering in 1985 from Gonzaga University. Since that time he has constructed many new concrete pavements for streets, highways and airports along with many Concrete Pavement Restoration (CPR) Projects throughout the Western US. During his time at ACME, the company has evolved from being a strictly concrete paving contractor to a full service concrete pavement rehabilitation contractor completing panel replacements, dowel bar retrofit, and concrete grinding and grooving. He is currently on the board of the CP Tech Center and is a member of ACPA and IGGA.

Presented at Regional Summits in: Portland, OR and Sacramento, CA

Presentation on page: 49
Billy Miller is a graduate of Northeastern University with extensive experience in civil construction. Since 2015, Miller has served as Vice President of Highway/Contract Services and Risk Management at Penhall Company, a construction company specializing in concrete cutting, breaking, excavation, and grinding services.

**Presented at Regional Summit in:** Orlando, FL

**Presentation on page:** 49

Rusty Price started working in the industry for Intermountain Slurry Seal in 1984. Since that time, he has held the following positions with the company: foreman, superintendent, estimator, project manager, operations manager and general manager. Intermountain performs various pavement preservation techniques for Federal, State, and local municipalities in 17 States from Texas to the west coast. He is a member of the International Slurry Surfacing Association (ISSA), a nonprofit association dedicated to the interests, education, and success of slurry surfacing professionals and corporations around the world. He has been on their Board of Directors since 2006 and currently serves as the ISSA President. He also served as the Slurry and Micro surfacing committee chairman from 2009 to 2014. In 2010, he was a topic panel member of an NCHRP Synthesis Project 411, Micro surfacing Highway Practice. From 2013 to the present, he has served as a member of the FHWA Emulsion Task Force and he is also a member of the FHWA Pavement Preservation Expert Task Group.

**Presented at Regional Summit in:** Austin, TX

**Presentation on page:** 55
Federal Highway Administration Presentation
Pavement Preservation: “How”

Applying the right treatment on the right roadway at the right time with quality construction and materials. Pavement Preservation “How” focuses upon quality construction and materials practices of pavement preservation treatments.
Where did Pavement Preservation: How come from?

- Flexible-surfaced preservation initiatives:
  - Chip seal
  - Microsurfacing
  - Slurry seal/scrub seal
  - Ultrathin bonded wearing course

- Rigid-surfaced preservation initiatives
  - Partial-depth repair
  - Full-depth repair
  - Dowel bar retrofit/cross stitching
  - Diamond grinding

What can we expect from FHWA EDC-4 Pavement Preservation How?

- 1 of 11 EDC-4 technologies
- 4-months
  - 7 EDC Summits
    - Explanation of technology
      - Owner Subject Matter Expert presenting how and why they adopted best quality practices
      - Contractor Subject Matter Expert presenting how and why they adopted best quality practices
  - Development of Implementation Plan
- 2017 and 2018
  - Delivery of Implementation Plan activities
Tools under development to accelerate deployment

- **Best Practice Guide**
  - Flexible-surfaced: Nevada DOT
  - Rigid-surfaced: Missouri DOT
- **Web based training for constructing rigid-surfaced pavement preservation**
- **Under contract**
  - Web based training for constructing flexible-surfaced pavement preservation.
- **Researching the use of RAP in Pavement Preservation Treatments**

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Implementation Team

<table>
<thead>
<tr>
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<th>Phone Number</th>
<th>Email Address</th>
</tr>
</thead>
<tbody>
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</table>

For Additional Information

[https://www.fhwa.dot.gov/preservation/](https://www.fhwa.dot.gov/preservation/)
[https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/](https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/)

Photo sources: (1) American Concrete Pavement Association; (2) Utah DOT; (3) Applied Pavement Technology, Inc.; (4) National Park Service; (5) Washington State DOT
Public Sector Representative Presentations
Kentucky Transportation Cabinet
Microsurface Best Practices

Tracy Nowaczyk, P.E.
Operations and Pavement Management

**Preservation Need**
- 95% of system asphalt
- Requires annual investment of over $250 million to sustain conditions
- Traditional resurfacing cost $146,000 per centerline mile
- Microsurface $58,000 per centerline mile

**Kentucky’s System Mileage**
- 800 Interstate
- 520 Parkway
- 11,674 Primary and Secondary routes
- 12,742 Rural Secondary
- 1,749 Supplemental routes
- 27,465 centerline miles

**Microsurface Growth**
- 2008-2011: demo projects
- 2012: began letting as alternate bid
- 2015: let first geographic package
Microsurface Introduction

- Mixture of polymer-modified asphalt emulsion and mineral aggregate
- Chemical reaction causes set
- Cures quickly
- Can be used to treat rutting and skid
- Addresses minor surface distresses

Microsurface Applications

- Type III used for rut fill
- Type II for leveling and surface

Types of Slurry Seal

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<th>Type</th>
<th>Size (mm)</th>
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<tr>
<td>1</td>
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<tr>
<td>2</td>
<td>200 x 1/4&quot;</td>
</tr>
<tr>
<td>3</td>
<td>200 x 3/8&quot;</td>
</tr>
</tbody>
</table>

Microsurface Applications

- Leveling/Scratch Course
- Rut Fill

Weather

- Pavement temp 50 degrees and rising
- Air temp 45 degrees and rising
- May be applied at night
- No imminent rain
- No imminent freezing
Materials
• Approved quality materials
• Screened aggregate
  • Polish resistant
  • No porous
• Portland cement
• Emulsion
  • CSS-1H polymer modified

Microsurface Equipment
• Approved
• Calibrated
• Continuous, self-propelled or truck-mounted paver
• Spreader box
• Screening equipment
  • Aggregate is screened directly into trucks to prevent oversized materials

Preparation
• Patching
• Crack sealing
• Remove thermoplastic markings
• Cover raised pavement markers, utility inlets, and manholes
• Removal of loose materials
• Notify residents

Test Strip
• Required in the specification
• Approves
  o Cure time
  o Application rates
  o Time to traffic
• 1000-ft long, one lane-width
• Same day under similar conditions
**Hand Work**

- Coverage in areas that can't be reached by the paver
- Lightly dampened pavement
- Uniform texture and thickness

**Joints**

- Clean and straight
- Non-overlapping transverse
- No excessive longitudinal overlap
- Feathered edge lines
- Done on roofing felt

**Curing Time**

- Premature opening to traffic creates loss of material
- Sanding can be used for intersections
- Extend curing time if possible

**Keys to Success**

- Proper site selection
- Current specifications
- Site preparation
- Equipment calibration
- Quality materials
- Knowledgeable contractors
- Knowledgeable inspectors
- Partnerships
Contact for More Information
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Kentucky Transportation Cabinet
Operations and Pavement Management
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502-782-5595
Concrete Preservation in a Urban Setting
 Ramsey County MN
 Jerry Auge, PE
 Maintenance and Construction Engineer

Ramsey County Demographics

Capitol is St. Paul
Population ~540,000
- Suburbs of St. Paul (County Staff)
- St. Paul (City Maintains 55 Miles, County 15 Miles)
- 109 5/8 Public Works Employees
AADT150-25,000 per day
Most urbanized County in the State
Smallest County in the State (by area)
131 different languages spoken in St. Paul Schools

Ramsey County 291-Mile Roadway System

Bituminous Pavements – 234 Miles
Concrete Pavements – 30 Miles
- Concrete Pavement – Higher AADT
Bituminous over Concrete – 27 Miles
- Mostly State turnback routes
- County system in St. Paul
No Gravel Roads

Funding Sources- Bond Funds, County Board Allocation, Wheelage Tax, CSAH, Fed STP

Past Approaches to Concrete Pavement Preservation

St. Paul –
- No Concrete Preservation
- Overlay with Bituminous
- Utility Holes
  - Bituminous Patches
  - Concrete Patches
Stakeholders’ Needs on Roadways

City Utilities
- Watermain
- Sanitary Sewer
- Signal Systems
- Storm Sewer

Private Utilities
- Gas
- Commun.
- Electric

Watershed

Preservation Project Field Work

Mobile Temporary Traffic Control
Measure the Distresses
- Sample areas
- Entire project limits
Core Joints - Deterioration limits
Partial Depth Repairs
Mid Panel Cracks (tight/wide)
Panel Faulting
Deterioration of Structures/Rings

Cost Benefit
Determine Preservation Project Costs
New Concrete Pavement Costs
- Cost benefit
Bituminous Overlay or Ultra Thin
- Rapid concrete deterioration
- Have a future plan
Do Nothing

Keep in Mind There is more Hidden to New Construction Costs
Water Treatment Requirements
- Treat water - watershed requirements
- Very costly in an urbanized community
- Don’t touch the base or the dirt!!!
Storm Sewer Design Requirements
- Add more storm sewer inlets
- Limited capacity in mainline storm
Right of Way Impacts are costly
- Permanent
- Temporary
- Damages and loss of business claims
Anticipated Concrete Preservation Cycle

15-20 Years (Minor Repairs)
- Partial-depth repairs
- Full-depth cracked panel repairs

30-50 Years (Major Repairs)
- Partial-depth repairs
- More full-depth repairs
  - Joints/dowels
  - Full Panels
- Diamond grinding
- Storm structures
- Signal system

Why? Benefits to Concrete Preservation

Older Concrete Pavements have Quality Aggregates
- Durability
- Size of rock (1”)

Ability to Repair Utilities Internally
- Water main
- Sanitary sewer
- Storm sewer

Less Impact to Motoring Public
Improve Structural Integrity and Ride
Preservation Costs Vs. New Construction

B Repairs – $21-32/LF
CX Repairs – $73.85-$91/SY
CD-LV Repairs – $50.50 – $60.50/LF

Concrete Paving Costs
$5.42-$8.47/SY/In

Opening Times

B Repairs 24 Hours
CX Repairs 24-36 hours
CX-LV Repairs Timeline 36 hours

Break beams for full depth repairs
- Rock Angularity
- Rock Size ¾” and 1”

Photos Prior to Preservation Project
Saw and Seal Repairs

Completed Project

Questions

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North Carolina Department of Transportation: Chip Sealing Best Practices
Scott Capps, P.E.
North Carolina Department of Transportation

Why is Preservation Important in NC?

Why are Chip Seals Important to North Carolina?

What Does North Carolina’s System Look Like?

- Approximately 60,000 miles on Secondary Paved System
- 54% have Plant Mix (32,000 miles)
- 44% have Chip Seal Treatment (26,300)
- 2% “other” – composites, slurry

- System size second only to Texas
- 50,000 miles with an ADT less than 2000
- Chip Seal costs approximately $25,000/mile
- Plant Mix costs approximately $100,000/mile

Photo sources: (1) American Concrete Pavement Association; (2) Utah DOT; (3) Applied Pavement Technology, Inc.; (4) National Park Service; (5) Washington State DOT
Best Practices to Ensure A Great Chip Seal

- Dedicated Funding
- Equipment
- Materials
- Operator/Supervisor Training
- Research
  - Began research initiative in 2003
  - 9 projects with NC State

Introduction to Chip Seals
Keep Good Roads Good

Also known as:
- Road Oil
- Tar and Gravel
- Bituminous Surface Treatment (BST)
- Asphalt Surface Treatment (AST)
- Chip Seal
- Chip Seal – Layer of Emulsion, followed by a Layer of Aggregate

Annual Chip Seal Use

NC Chip Seals: Centerline miles by year

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Equipment

- Aggregate spreaders
- Distributors
- Rubber tire or combo rollers
- Broom/vacuum
Primary Key to Success: Calibration

**Distributor**
- Height of spray bar for single, double, and triple coverage
- Cut off one or two nozzles so that the tips touch
- Uniform spray
- New/clean nozzles

**Spreader**
- Application rate (lbs/sy)
- Uniform coverage
- Operating speed

---

What Materials Are We Using?

**Clean Washed Stone:**
- 78 M – Granite Material (mostly 3/8”)
- 5/16 LW – Lightweight Expanded Slate

**Emulsions:**
- CRS 2P
- CRS 2L

Materials – Aggregate

- Lightweight 5/16” Slate
- 78 M 3/8” Granite
Aggregates – Know Your Rock

- Coordination with Materials and Test
- Coordination with Quarries
- Compatible – anionic
- Shape – cubical
  - Flat tends to bleed
- Hardness – granite or slate
  - Doesn’t fracture from rolling
- Cleanliness – minimum fines
  - Dust tends to bleed and ravel
- Uniform size – single or gap graded
- Surface properties – crushed face

Reminders:
- Keep stockpiles clean and dry
- Keep aggregate separated
- Keep base material out of aggregate pile

Materials – Emulsion

- Emulsions are mixture of liquid asphalt, emulsifying agent, and water, with additives for stability
- Durable, long lasting, rapid setting, good aggregate retention
- Specifications require cationic rapid set emulsion
- CRS-2L or CRS-2P – proven reduction in loose aggregate
- Emulsion will have a slightly positive charge
- Do not mix emulsion grades
- Application temperature 160-170°F

New Table 660-1: Design

<table>
<thead>
<tr>
<th>Type of Coat</th>
<th>Layer</th>
<th>Aggregate Type</th>
<th>Aggregate Target Rate (Lbs / SY)</th>
<th>Emulsion Target Rate (Gal / SY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGLE SEAL</td>
<td>TOP</td>
<td>#78M(3/8&quot;)</td>
<td>18</td>
<td>0.35</td>
</tr>
<tr>
<td>DOUBLE SEAL</td>
<td>TOP</td>
<td>5/16&quot; LW</td>
<td>9</td>
<td>0.25</td>
</tr>
<tr>
<td>DOUBLE SEAL</td>
<td>BOTTOM</td>
<td>#78M(3/8&quot;)</td>
<td>18</td>
<td>0.30</td>
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<tr>
<td>TRIPLE SEAL</td>
<td>TOP</td>
<td>#14(1/4&quot;)</td>
<td>7</td>
<td>0.20</td>
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<tr>
<td>TRIPLE SEAL</td>
<td>MIDDLE</td>
<td>#5/16 LW</td>
<td>9</td>
<td>0.25</td>
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<tr>
<td>TRIPLE SEAL</td>
<td>BOTTOM</td>
<td>#67(5/8&quot;)</td>
<td>30</td>
<td>0.32</td>
</tr>
</tbody>
</table>

Chip Seal Weather Considerations

Moisture and Temperature
- Goldilocks and the Three Bears
  - Moisture
    - Too much water has the tendency to bleed
    - Too little water has the tendency to ravel
    - A little water on surface aggregate – just right
  - Temperature
    - Extremely high temperatures have the tendency to bleed
    - Extremely low temperatures have the tendency to ravel
    - Between 70°F and 80°F degrees – just right
  - Wind
Additional Weather Consideration

Do not place AST from Oct. 15th to April 1st

12-month Chip Seal Warranty

- Performance and Payment Bond
- Loss of aggregate
- Emulsion bleeding
- Small distresses over a Lot (200-ft length)

Questions?
Pavement Preservation: How Implementation

Today's Objective
- Highlight the innovations
- Discuss the Draft Implementation Plan
- Solicit feedback on implementation
- Identify implementation needs

Draft Implementation Plan: Your Input
The State of (Your) Practice: Written Responses
Do you construct quality pavement preservation treatments?
• Which treatments?
• What practices contribute to quality?
• Will you share your practices?

Challenges: Written Responses
• What are your challenges in incorporating quality practices in pavement preservation construction?
• Is it difficult to obtain quality materials?
• Are quality contractors bidding on your projects?

Measuring and Tracking Progress: Written Responses
• What are good deployment targets?
• What are appropriate measures of deployment success?
• How will you track progress?

Adopting Improved Construction Practices
• What information would support adoption of these innovations?
• What implementation help do you need?
• What do you need to address your challenges?
**Awareness and Dissemination**

- How can we get needed resources into practitioners’ hands?
- Which methods or channels of communication are particularly effective for reaching you?

Ideas could include: Newsletters, e-mail blasts, websites, webinars, peer exchanges, visitor presentations, a clearinghouse... are there others?

---

**Accelerating Change**

- Where should efforts be focused nationally?
- What would help your organization?
We Have Built a Lot of Stuff... letting it crumble is not an option...

Some Effective “Top of the Curve” Treatments

- **Slurry Seal** (change gradations, polymer modified, etc.)
- **Micro Surfacing** (double apps., change gradation of aggregate, rut fill, fiberized, etc.)
- **Chip Seal** (single seal, split seal, latex modified binder, etc.)
- **Crack Treatment** (least expensive first line of defense)
- **Combination Treatments** (cape seal, fog seal, etc.)
Chip Sealing

HIP Surface Recycling

Slurry Seal/Cape Seal Curb & Gutter

Cape Seal Primary Route
Micro Surfacing

Double Application Micro Surfacing

Combinations

Actual County Budget ~$25M

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Budget Dollars (% of Total)</th>
<th>Completed Miles (% of Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reconstruction</td>
<td>16</td>
<td>6</td>
</tr>
<tr>
<td>Resurfacing</td>
<td>59</td>
<td>30</td>
</tr>
<tr>
<td>Surface Treatments &amp; Patching</td>
<td>18</td>
<td>58</td>
</tr>
<tr>
<td>Masonry</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
PERFORMANCE GUIDELINES

Communication / Education / Training

- ISSA Slurry Systems Workshop
- Web-Based Training (WBT)
  - How to Construct High Quality Slurry Seal and Micro Surfacing Treatments — Part 1 and Part 2
  - How to Construct High Quality Chip Seal Treatments
  - Best Construction Practices for Operating a Spreader Box used with Slurry/Micro Surfacing Materials
  - Best Construction Practices for Crack Sealing and Joint Filling of Asphalt and Concrete Pavements
- NCPP Training Courses
  - For Training Course Details: www.pavementpreservation.org

Accreditation and Certification
- AASHTO Material Reference Laboratory (AMRL) ... Pavement Preservation Laboratory Accreditation Program
  - ISSA recognized need to qualify labs doing mix designs
  - Certified 10 of 21 labs requesting certification this year
- Agency/Contractor Certification

There’s No “How” Without a “Who”
- Agencies need a CHAMPION (sometimes, a “Renegade”)
- Be able to answer the challenges
- Get away from another “W”...Worst First
- Dedicate portion of budget to PP (10 – 15%)
- Not a one time shot
- Better community outreach
Some Final thoughts... New to Some

- Multi-Year Contracts
  - Don’t forget the Asphalt Index
- Purchase Order Contracts
  - NCDOT...$2.5 M Division Administered Contracts
- Piggyback Contracting
  - Peer-to-peer communication
  - Take advantage of small budget/minimize mobilization

Photo sources: (1) American Concrete Pavement Association; (2) Utah DOT; (3) Applied Pavement Technology, Inc.; (4) National Park Service; (5) Washington State DOT

Thank You!
Questions?

Chuck Ingram
Slurry Pavers, Inc.
cingram@slurrypavers.com
Pavement Preservation
Industry Innovations to Raise the Bar

Dan Patenaude, P.E.
Sealcoating, Inc. / ISSA
International Slurry Surfacing Association
FHWA EDC 4 Summit
Albany, NY
November 1, 2016

Presentation Overview

• **WHY** Pavement Preservation is important
• **HOW** Pavement Preservation is currently being done in this region
• **HOW** Pavement Preservation will be done **BETTER** going forward

We’ve built a lot of stuff in this country... letting it crumble is not an option!
Asphalt Deterioration Curve
(An Unfortunate Fact of Life)

Applying the Right Treatment, to the Right Road, at the Right Time...

Excellant
Good
Fair
Poor
Very Poor
Failed

1. Crack Sealing*, Fog Seal/Rejuvenator
2. Slurry Seal, Chip Seal or Micro Surfacing (Single)
3. Chip Seal or Micro Surfacing (Double)
4. Cape Seal
5. HMA Overlay
6. In-Place Recycling & Overlay
7. Mill & HMA Overlay
8. Full Depth Reconstruction

Pavement Condition

* Crack Sealing to also be used in conjunction with other applications and as needed

Progressive Pavement Management - Preservation vs. Rehabilitation

Preservation Strategy:  
Years 5, 15, 30 & 39: Crack Sealing
Years 10 & 35: Micro Surfacing (Double)
Years 17 & 42: Cape Seal
Year 25: Mill & Pave
TOTAL COST/SY OVER 50 YEARS = $36.00

Rehabilitation Strategy:  
Year 15: FDR plus 4" Hot Mix Overlay
Year 30: FDR plus 4" Hot Mix Overlay
Year 45: FDR plus 4" Hot Mix Overlay
TOTAL COST/SY OVER 50 YEARS = $60.00

NHDOT – Pavement Management Section
2011 / 2012 Equivalent Annual Costs (EAC’s)

<table>
<thead>
<tr>
<th>Treatment Alternative</th>
<th>2011/2012 Approx. Costs (lane-mile)</th>
<th>2011/2012 Approx. Costs (SY )</th>
<th>Estimated Service Life (years)</th>
<th>Equivalent Annual Cost (SY/year)</th>
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<tbody>
<tr>
<td>Micro or 4.75 HMA</td>
<td>$22,010</td>
<td>$3.14</td>
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<tr>
<td>Double Chip Seal</td>
<td>$39,100</td>
<td>$5.72</td>
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<tr>
<td>2% Fiber Asphalt</td>
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<tr>
<td>1&quot; HBP Overlay</td>
<td>$33,100</td>
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<td>0.53</td>
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<tr>
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<td>Nova Chip (PPST)</td>
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<tr>
<td>1-1/2&quot; ARGOS Overlay</td>
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<td>$6.95</td>
<td>10</td>
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<tr>
<td>1-1/2&quot; HBP Overlay</td>
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<tr>
<td>1-1/2&quot; ARGOS Overlay</td>
<td>$70,100</td>
<td>$7.06</td>
<td>12</td>
<td>0.72</td>
</tr>
<tr>
<td>Thin Chip (HBP)</td>
<td>$62,200</td>
<td>$9.06</td>
<td>10</td>
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<td>PAR with 4&quot; HBP</td>
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<td>$19.06</td>
<td>16</td>
<td>1.47</td>
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<tr>
<td>PAR with 4&quot; HBP w/ 1-1/2&quot; ARGOS</td>
<td>$147,000</td>
<td>$19.06</td>
<td>16</td>
<td>1.47</td>
</tr>
<tr>
<td>PAR with 4&quot; HBP w/ 1-1/2&quot; HBP</td>
<td>$147,000</td>
<td>$19.06</td>
<td>16</td>
<td>1.47</td>
</tr>
</tbody>
</table>

Notes:
1. Costs per lane mile based on 12-foot lane width.
2. Costs shown here include a 20% multiplier to account for fixed costs.

Pavement Preservation HOW---
Some Options

- Crack Sealing
- Fog Sealing
- Slurry Seals and Micro Surfacing
- Chip Seals and Cape-Seals
- Thin Hot Mix Asphalt (HMA) Overlays (<1"")
Pavement Preservation HOW--
Crack Sealing

- Stop water intrusion
- Keep out incompressibles
- Excellent cost-benefit ratio

Photo Courtesy of Sealcoating, Inc.

Pavement Preservation HOW--
Fog Sealing

- Slow the rate of oxidation
- Reduce raveling
- Some add rejuvenation
- Very low cost “sunscreen” for pavements

Photo Courtesy of Mass DOT

Pavement Preservation HOW--
Fog Sealing

- Rejuvenating sealer applied Sept. 2006
- Macrotexture testing 3 years after application indicated greatly reduced raveling of the treated section

Photo Courtesy of Asphalt Systems, Inc.

Interstate 88 near Oneonta, NY

Pavement Preservation HOW--
Micro Surfacing

- Crack seal first
- Match aggregate to traffic
- Very high friction
- Consider performance additives
- Cost-effective life extension

Photo Courtesy of Sealcoating, Inc.
Pavement Preservation HOW---
Micro Surfacing

- NYS Thruway near the Westmoreland exit
- 2014 Micro Milling and Micro Surfacing to remove ruts and restore friction

Photo Courtesy of Suit-Kote Corporation

Pavement Preservation HOW---
Micro Surfacing

- I-93 near Concord, NH and NHDOT Main Office
- Micro Surfaced in 2009 (night work); photos taken July 14, 2016
- Unit bid price = $2.83/SY (current EAC at 7 years = $0.40/SY/Year)

Photos Courtesy of Sealcoating, Inc.

Pavement Preservation HOW---
Chip Seals

- Widespread global utilization
- Multiple binder and stone options
- Excellent friction
- Low life-cycle costs
- Consider a Cape Seal in urban/suburban locales

Photo Courtesy of New York Bituminous Products Corp.

Pavement Preservation HOW---
Chip Seals

- Conventional (HFRS-2P) Chip Seal
- NYSDOT Route #26 – Cincinnatus, NY

Photo Courtesy of Suit-Kote Corporation

Pavement Preservation HOW---
Chip Seals

- 2008 (installed)
- 2014 (at 6 years old)
Pavement Preservation HOW---

Chip Seals

- Asphalt-Rubber Chip Seal
- VTrans Route #100 – Dover, VT

Photo Courtesy of All States Materials Group

June 2013 (installed) October 2016 (current)

Cape Seals

- Restorative benefits of a Chip Seal
- Surface texture and aesthetics similar to HMA
- Life extension equivalent to thin overlays

Photo Courtesy of Sealcoating, Inc.

Pavement Preservation HOW---

Thin HMA Overlays

- Bonded Wearing Course (BWC - previously known as "NovaChip")
- NHDOT Route #3 – Nashua, NH

Photo Courtesy of All States Materials Group

July 2014 (installed) October 2016 (current)

Thin HMA Overlays

- MassDOT Route #3 near Burlington, MA
- Multiple BWC mixes applied in 2015 for comparative evaluation over time

Photo Courtesy of MassDOT
Why not more Pavement Preservation happening here in the Northeast?

- Agency resistance to change?
- Incumbent treatment providers defending against the new competition?
- Lack of knowledge and training about the options?
- Less than perfect past performance?

Pavement Preservation – HOW can we do it BETTER?

- New AASHTO standards (American Association of State Highway and Transportation Officials)
- Recommended performance guidelines
- AMRL accreditations for Pavement Preservation (AASHTO Materials Reference Laboratory)
- Expanded education and training
- Agency / Contractor certifications

Pavement Preservation – HOW can we do it BETTER?

New AASHTO Pavement Preservation Standards:

<table>
<thead>
<tr>
<th>Micro Surfacing</th>
<th>Chip Seal</th>
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<tbody>
<tr>
<td>MP028-16 - UL</td>
<td>MP027-16 - UL</td>
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<tr>
<td>PP083-16 - UL</td>
<td>PP082-16 - UL</td>
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<tr>
<td>Provisional Standard Practice for Micro Surfacing Design</td>
<td>Provisional Standard Practice for Emulsified Asphalt Chip Seals</td>
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Emulsion Specification Amendments:

<table>
<thead>
<tr>
<th>M140</th>
<th>M208</th>
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<tr>
<td>Emulsified Asphalt</td>
<td>Cationic Emulsified Asphalt</td>
</tr>
<tr>
<td>M316</td>
<td></td>
</tr>
<tr>
<td>Polymer-Modified Cationic Emulsified Asphalt</td>
<td></td>
</tr>
</tbody>
</table>
Pavement Preservation – HOW can we do it BETTER?

“High Performance” Micro Surfacing Guidelines in development (A153)

Some items being considered:

- Field tests to confirm mix
- Additional aggregate tests
- Higher binder contents
- Different binder grades
- Performance additives

Photo Courtesy of Sealcoating, Inc

Pavement Preservation – HOW can we do it BETTER?

AASHTO Materials Reference Laboratory (AMRL)
Pavement Preservation lab accreditation program

- ISSA recognized the need to qualify labs doing mix designs
- Completed 10 of 21 labs requesting certification this year

Photo Courtesy of Ingevity

Pavement Preservation – HOW can we do it BETTER?

Education & Training

ISSA Slurry Systems Workshop - January 23-26, 2017 - Las Vegas, NV
www.setun.org/event/2017-slurry-systems-workshop/

Web-Based Training
www.setun.org/education/industry-training-courses/web-based-courses/

How to:
- Construct High Quality Slurry Seal and Micro Surfacing Treatments - Parts 1 & 2
- Construct High Quality Chip Seal Treatments

Best Construction Practices:
- Operating a Spreader Box with Slurry or Micro Surfacing Materials
- Crack Sealing and Joint Filling of Asphalt and Concrete Pavements

NCPP Training Courses - https://www.pavementpreservation.org/classes/

Pavement Preservation – HOW can we do it BETTER?

Contractor & Agency Certifications

- Goal = Consistently high-quality treatment installations
- Nevada DOT became the 1st to require in 2016
- National Center for Pavement Preservation (NCPP) will administer the Certification exam at:
  ISSA Slurry Systems Workshop, Las Vegas, NV, Jan. 2017
  Register at: https://www.tsp2.org/register
Park Avenue
Sept 22, 2016

Bridgeport, CT
2004: 2” Mill & Fill

Fairfield, CT
2004: 2” Mill & Fill
2010: Crack Sealing & Microsurfacing

Photo Courtesy of Sealcoating, Inc.
Concrete Pavement Preservation
Quality Construction and Materials

CPP Beginnings
Concrete Pavement Preservation with diamond grinding was first used as part of an engineered system to preserve PCC Pavement in the early 1960’s.

Concrete Pavement Preservation Techniques
- Subsurface rehabilitation
- Cross-stitching longitudinal cracks/joints
- Dowel bar retrofit
- Partial-depth repair
- Full-depth repair
- Diamond grinding
- Joint & crack resealing

Cross Stitching
- Used for longitudinal cracks that are in good condition
- Used to maintain aggregate interlock and provide added reinforcement to crack
  - Strengthen longitudinal cracks
  - Prevent slab migration
  - Maintain aggregate interlock
  - Prevent lane separation
  - Prevent longitudinal joint faulting
Partial Depth Repair - PDR

- Partial-depth repairs are used on surface defects and joint spalls that are limited to the upper one-third of the PCC slab.
- Restores ride quality and pavement functionality with minimal traffic interruption.
- Costs less than a full depth repair.

MNDOT PDR Method

- Concrete removal by modified cold-milling.
- Must faster and less expensive than sawing and jackhammering.
- Since PDR is a bonding operation, irregular shapes are permitted.
- Provides long term performance (20 years plus).
Cementitious vs Non-Cementitious

- New cementitious fast setting materials minimize traffic disruption and increase durability
- Non-cement based materials do not require reformation of the joint or crack due to greater flexibility
  - Polymer Resins
  - Elastomeric Materials
- More expensive than cement based mixes

Dowel Bar Retrofit - DBR

- Placement of load transfer devices across joints or cracks of existing pavements
- Reestablishes load transfer across joints or cracks in PCCP
- Used in undoweled pavements to limit future faulting

WSDOT DBR Research

- Since 1992, WSDOT has retrofitted over 300 Lane-mi or 650,000 bars
- Average age of pavement prior to DBR was 32 yrs
- Many 30 and 40 year PCCPs successfully retrofitted, adding over 20 years additional pavement life at a fraction of the cost of reconstruction

Full-Depth Repair

- Removal and replacement of concrete through entire depth
- Restores ride quality
- Fast setting materials minimize traffic disruption
- Pin/lift-out removal speeds process
  - Full depth saw cuts done days prior to the lift out
  - Minimizes traffic disruption
  - Preserves base and minimizes base repair labor and materials
**Diamond Grinding**

- Removal of thin surface layer of hardened PCC using closely spaced diamond saw blades
- Results in smooth, level pavement surface
- Provides a longitudinal texture with desirable friction and low noise characteristics
- Frequently performed in conjunction with other CPP techniques, such as full-depth repair, dowel bar retrofit, and joint resealing

**Advantages of Diamond Grinding**

- Can be used on both concrete and asphalt pavements
- Costs substantially less than overlays
- Enhances surface friction and safety
- Can be accomplished during off-peak hours with short lane closures and without encroaching into adjacent lanes
- Grinding of one lane does not require grinding of the adjacent lane
- Does not affect overhead clearances underneath bridges
- Blends patching and other surface irregularities into a consistent, identical surface
- Environmentally friendly

**Pavement Problems Addressed**

- Faulting at joints and cracks
- Built-in or construction roughness
- Polished surface
- Wheel-path rutting
- Permanent upward slab warping
- Inadequate transverse slope
- Unacceptable noise level

**Safety, Surface Texture and Friction**

- MoDOT increased macro-texture of asphalt surface by diamond grinding to improve profile and drainage of water at tire-pavement interface
- In Wisconsin Marquette University found that overall accident rates for ground surfaces were 40% less than for unground surfaces over a 6-year period, 57% in wet weather conditions
Blade Spacing Can Be Optimized

- Noise, Friction, or Smoothness can be optimized by blade spacing
- Research conducted by the National Concrete Pavement Technology Center shows diamond grinding as the most quiet PCCP surface texture commonly used

IRI of Kentucky Interstate PCCP

Impact of CPP Strategy in KY

- IRI improved from 112.1 to 74.5 in 5 years
- Lowest recorded average IRI ever covering 536 lane miles
- $188,000 per lane mile
- Diamond grinding had an avg. cost of $2.75 per sq. yd. in KY over a 5-year period
- Reconstruction cost would have been $1.5 - $2.5 million/lane mile
- Preservation saved over $1 Billion

Summary

- This is a challenging time for the transportation industry
- Innovative, cost-effective solutions are needed to meet these challenges
- Many CPP techniques provide sustainable benefits such as increased friction (safety), reduced noise, improved smoothness and long life
- Concrete Pavement Preservation can extend pavement life significantly at a competitive cost
- When building roadways we must begin with the end in mind – consider sacrificial thickness for future grinding
- IGGA/ACPA is ready to assist
For Additional Information

https://www.fhwa.dot.gov/pavement/pres.cfm
https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/
http://igga.net
http://acpa.org
MICRO SURFACING
Association and Industry Acumen
Best Practices – HOW

Rusty Price
International Slurry Surfacing Association – President
Intermountain Slurry Seal – Vice President and Operations Manager

Best Practices
- Inspection
- Training
- Specifications
- Equipment and Calibration
- Mix Design
- Laboratory Accreditation
- Certification
- QC/QA Process and TQM
- Innovative Contracting Methods

Survey to DOTs
Micro Surfacing Survey for Agencies
SurveyMonkey

Q3 If “Past Problems” was checked above, please elaborate here (Check all that apply)
Inspection

“You don’t get what you Spec, you get what you Inspect!”

- Micro surfacing is a cold, thin surface treatment that requires specialized personnel, equipment and experience...
- What it is not... “Black Magic”
- Knowledge and experience are critical at all levels of the process / contractor and agency

Training

- ISSA Slurry Systems Workshop
- (WBT) Web-Base Training
  1. How to construct high-quality micro surfacing treatments
  2. Best construction practices for operating a spreader box for micro surfacing
- NCPP Training Courses
  ncpp@egr.msu.edu
- ISSA Inspectors Manual

Specifications

AASHTO... New Specifications for Micro surfacing

- PP083-16-UL Provisional Standard Practice for micro surfacing design.
- M316 Polymer Modified Cationic Emulsified Asphalt
- Local Department of Transportation Standard Specifications or Special Provisions
Calibration

- Why do we calibrate?
- We calibrate the machine so we can adjust it to obtain the ratio of the mix as set forth in the mix design
- Job Mix Formula (J MF) mix design information
- Test strip prior to construction
- Verify J MF proportions
Mix Design

ISSA A 143 Specifications

<table>
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<tr>
<th>ISSA TEST NO.</th>
<th>DESCRIPTION</th>
<th>SPECIFICATION</th>
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<tbody>
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<td>ISSA TB-139</td>
<td>Wet Cohesion @ 30 Minutes Minimum (Set)</td>
<td>12 kg-cm Minimum, 20 kg-cm Minimum or Near Span</td>
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<td></td>
<td>Wet Cohesion @ 60 Minutes Minimum (Traffic)</td>
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<tr>
<td>ISSA TB-109</td>
<td>Excess Asphalt by LWT Sand Abrasion</td>
<td>50 g/ft² Maximum (538 g/m² Maximum)</td>
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<tr>
<td>ISSA TB-114</td>
<td>Wet Stripping</td>
<td>Pass (90% Minimum)</td>
</tr>
<tr>
<td>ISSA TB-100</td>
<td>Wet Track Abrasion Loss</td>
<td>50 g/ft² (538 g/m²) Maximum, 75 g/ft² (807 g/m²) Maximum</td>
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<tr>
<td>ISSA TB-147</td>
<td>Lateral Displacement</td>
<td>5% Maximum</td>
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<td>ISSA TB-114</td>
<td>Classification Compatibility</td>
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<td>ISSA TB-113</td>
<td>Mix Time @ 77˚F (25˚C)</td>
<td>Controllable to 120 Seconds Minimum</td>
</tr>
</tbody>
</table>

Laboratory Accreditation for Microsurfacing Mix Designs

ISSA and AMRL have been working together for 2 years.

- Proficiency sampling
- Assessment
- Accreditation


- NCPP – National Center for Pavement Preservation
- ISSA – International Slurry Surfacing Association
- AASHTO – American Association of State Highway Transportation Officials
- TSP² – AASHTO Transportation System Preservation Program (the AASHTO voice for preservation)
- PPP – Pavement preservation partnerships (regional groups of TSP² Members)

Certification: Why

- Over the past 5+ years the Regional PPP have looked for ways to increase use of preservation among member states
- Have identified 3 major points that, if adopted, would increase the use of preservation
  - Mix Design lab accreditation
  - Updated specifications
  - Contractor certification
## Quality Assurance

Micro surfacing Quality Assurance Research

- **Quality Assurance (QA)** is NOT Quality Control (QC)
- The **difference** is that QA is process oriented and QC is product oriented
  - Testing is product oriented and is in QC domain
  - Testing for quality doesn’t assure quality; it controls it
- **QA** makes sure you are doing the right things in the right way

## Total Quality Management

- **Quality** – degree of satisfaction of the customer
- **Quality Control (QC)** – assess and adjust the level of quality produced for the end product
- **Quality Assurance (QA)** – confidence that a product or service will perform satisfactorily and the continued evaluation of all project activities
- **Independent Assurance** – third party assessment of product and reliability of the testing
- **Verification** – determining the accuracy of test results, sampling, and testing part of the QC/QA process

**TOTAL QUALITY MANAGEMENT** – the ultimate in managing the design and construction of the above

## Innovative Contracting Methods

- Method of Measurement and Payment
- Incentive / Disincentive Pay Factors
- P + T / Lane Rental / IDIQ
- Performance Measures or Specifications
- Certification
- Laboratory Mix Design Accreditation

## Do’s

- [Image of a road and vehicles]

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Success

- Specifications / Innovative Contracting
- Experience / Training
- Equipment
- High-Quality Materials
- Testing and Verification
- Inspection
- PLEASE BE SAFE!

Don'ts
Virtual Summit Presenter
Biographies and Presentations
Virtual Summit Presenter

Biographies

**Todd Kinney** is a 1993 graduate of Iowa State University with BS in Civil Engineering. He has 8 years of experience as a consulting engineer and 15 years of experience serving as the Clinton County Engineer. He is an active member of the National Association of County Engineers, serving as chair of the NACE Pavement Preservation committee the last three years. In 2015 he was selected as the NACE Rural County Engineer of the Year.

**Presented at Virtual Summit on:** September 28, 2016

**Presentation on page:** 63

**Bob Jerman** has been with Ingevity for almost 30 years. He began his career with Ingevity in 1986 in their Research Division. In 1995, he joined the Pavement Technologies team. He was promoted to Technical Service Manager in 2000. He is currently the Director of Technical Services, responsible for global technical support for the Pavement Preservation and Evotherm Technologies businesses provided from the Ingevity laboratories in Lille, France; Shanghai, China; Bangalore, India; and Charleston, South Carolina. In addition to his Ingevity responsibilities, Bob has served on ISSA’s Board of Directors as Technical Director for the last nine years.

**Presented at Virtual Summit on:** September 28, 2016

**Presentation on page:** 68
Concrete Pavement Repair
Best Practices
Clinton County, Iowa
Todd Kinney, P.E.
County Engineer

Best Practices - Full Depth Repair

- Selection of repair sites
- Work staging
- Materials
- Standards
- Work zones

Clinton County, Iowa
- 220 miles of paved roads
- Approximately 50,000 population
- 780 miles of aggregate roads
- 39 Road Department employees
- 10th largest county in Iowa by area
- Our eastern county line is the Mississippi River
- $50,000–$75,000 per year on PCC repair

How sites are selected
- Faulted or cracked areas that cause rideability issues
- Summer time blowups
- Over drainage structures that experience heave differentials and settlement issues
- Over Drainage structures recently replaced in preparation for resurfacing project
- Restore rideability and structural integrity
Freeze/Thaw heave differential

Freeze/Thaw issue

Culvert replacement

Work Staging
- Sawcut patching area 1-2 days in advance
- Traffic disruption 7:30AM-3:30PM
- One lane patching completed at a time
- Through traffic maintained via traffic control
- Scope of repair work sized for one day lane closures only
Saw cut replacement area

Materials
- High early strength ready mix concrete
- 5 hour cure time
- 6% air entrainment target
- 3” slump
- No flyash
- Calcium chloride additive
- Epoxy coated rebar

Standards
- Foreman have copies of Iowa DOT standard details
- Basic/uniform method for repairs
- Employees have familiarity with process and requirements
- Reduces errors and re-work
- Adequate load transfer at transverse joints

Epoxy coated rebar
**Work Zones**

- Each Foreman has Work Zone Handbook
- Designated traffic control trailer (standard signs and equipment)
- Temporary work zone speed limits
- Patch usually placed by 10-11AM (opened by end of the day)
- Work zone signage discussed at safety meetings (annual flagger training)
Traffic Control Trailer

Other Best Practices

- Patching trailer with tools, re-usable steel forms, vibrator, power screed, saw, etc... stocked and ready to go
- Transverse tine finish
- Self propelled compaction unit (uniform subgrade support)
- Usually high speed locations 55 mph and up (get in and get out)

Questions?

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Clinton County Engineer
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Innovations in Slurry Systems - Association/Industry Insight

Domestic and International Perspectives from the International Slurry Surfacing Association (ISSA) and Industry
Bob Jerman
ISSA Technical Director / Ingevity Pavement Technologies Technical Service Director

ISSA Pavement Preservation Treatments

- Slurry Seal
- Micro Surfacing
- Chip Seal
- Crack Treatment

PERFORMANCE GUIDELINES

EXPRESSWAY MICRO SURFACING

Photo sources: (1) American Concrete Pavement Association; (2) Utah DOT; (3) Applied Pavement Technology, Inc.; (4) National Park Service; (5) Washington State DOT
MICRO SURFACING, CRACK TREATMENT AND SLURRY SEAL

SWITZERLAND  ARIZONA

MICRO SURFACING

BANGKOK EXPRESSWAY  KING RAMA IX BRIDGE BANGKOK

Next ??? 2017 ???

- Recommended Performance Guideline for Polymer-Modified Emulsified Asphalt Slurry Seal – A110 ???
- Recommended Performance Guideline for High Performance Micro Surfacing – A153 ???

AASHTO ... New Standards Impacting Pavement Preservation

- Micro Surfacing
  - PP083-16-UL Provisional Standard Practice for Micro Surfacing Design
- Chip Seal
  - PP062-16-UL Provisional Standard Practice for Emulsified Asphalt Chip Seals
- Emulsion Specification Amendments
  - M140 Emulsified Asphalt
  - M208 Cationic Emulsified Asphalt
  - M316 Polymer-Modified Cationic Emulsified Asphalt
Communication / Education / Training

• ISSA Slurry Systems Workshop

• Web-Based Training (WBT)
  • How to Con struct High Quality Slurry Seal and Micro Surfacing Treatments — Part 1 and Part 2
  • How to Con struct High Quality Chip Seal Treatments
  • Best Construction Practices for Operating a Spreader Box used with Slurry/Micro Surfacing Materials
  • Best Construction Practices for Crack Sealing and Joint Filling of Asphalt and Concrete Pavements

• NCPP Training Courses
  • For Training Course Details, Contact ncpp@egr.msu.edu

Accreditation and Certification

• AMRL ... Pavement Preservation Laboratory Accreditation Program

• Agency/Contractor Certification

_Thank You_  
For Questions/Comments:

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