

**Midwest Pavement Preservation Partnership  
Annual Meeting  
September 9, 2008  
Roger Hayner**

**How Laboratories are Approved  
for Microsurfacing Mix Design**



# Microsurfacing Mix Design Lab Approval



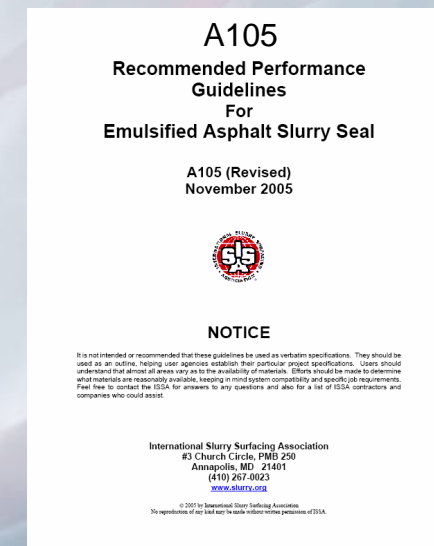
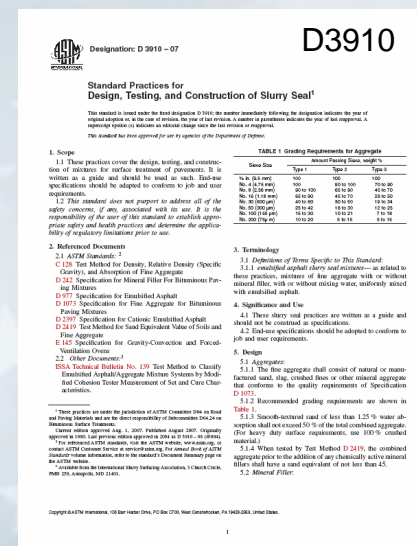
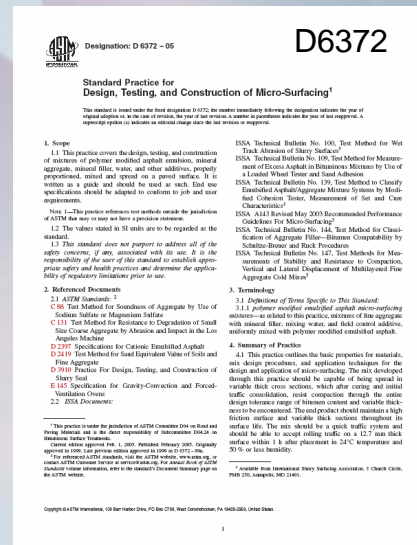
- What is a Slurry/Microsurfacing Mix Design?
- What is required?
- Is there a “Standard Process” to approve laboratories?
- How are laboratories approved now?
- Why is an “Approval Process” needed?
- What is being done to address Mix Design “Approval Process” in the Pavement Preservation Age?

# What is a Slurry/Microsurfacing Mix Design?



- Analysis performed by an experienced laboratory which evaluates and recommends each of the components to be used in the mixture and defines their compatibility and relative performance characteristics when combined into a pavement surfacing mixture.

- Aggregates
- Mineral Fillers
- Asphalt Emulsion
- Additives
- ASTM and ISSA Guidelines



# Aggregates



- Make up 78-90 Percent of Mix
- 100% Crushed, Abrasion Resistant, and Free of Deleterious Materials
- Define type of aggregate and reactivity
- Define abrasion resistance and frictional properties of final mix
- Contributes to constructability of final product



# Aggregate



- **Sand Equivalent** (ASTM D2419) = 65 Minimum
- **Soundness** (ASTM C88) = 15% Maximum using  $\text{Na}_2\text{SO}_4$   
or 25% Maximum using  $\text{MgSO}_4$
- **Abrasion Resistance** (ASTM C131) = 30% Maximum\*
  - Ran on Parent Aggregate
  - Manufactured Crushed Stone including Granite, Slag, Limestone, Traprock or other High Quality aggregate
  - Parent Aggregate Larger than Largest Stone in Gradation to assure 100% crushed material
  - \*Should Meet State Polishing Requirements
  - Some Tests May be Waived with Demonstrated Proven Performance

# Aggregate Gradation



Sieve Size	Type II Percent Passing	Type III Percent Passing	Stockpile Tolerance
3/8" (9.5mm)	100	100	
#4 (4.5mm)	90-100	70-90	+/- 5%
#8 (2.36mm)	65-90	45-70	+/- 5%
#16 (1.18mm)	45-70	28-50	+/-5%
#30 (600um)	30-50	19-34	+/-5%
#50 (330um)	18-30	12-25	+/-4%
#100(150um)	10-21	7-18	+/-3%
#200(75um)	5-15	5-15	+/-2%

# Mineral Fillers



- Portland Cement
- Hydrated Lime
- Free from lumps and free flowing
- Considered as part of Aggregate Gradation



# Water



- Determines Mixture Consistency
- Deficiency causes stiff mix which is difficult to spread and adheres poorly to pavement surface
- Excess can cause mix segregation and asphalt floatation to the surface- bleeding mix and discolorations
- Must be potable and free of harmful soluble salts or reactive chemicals and any other contaminants

# Asphalt Emulsion



- 10-20% of Mix
- Usually Cationic
- Quick Set or Slow Set
- Emulsifier & Asphalt Choices?
- Aggregate Compatibility?



# Asphalt Emulsion



<u>AASHTO TEST</u>	<u>ASTM TEST</u>	<u>QUALITY</u>	<u>SPECIFICATION</u>
<u>EMULSION</u>			
AASHTO T59	ASTM D244	Residue After Distillation	62% Minimum
<u>RESIDUE</u>			
AASHTO T53	ASTM D36	Softening Point, R&B	135°F(57°C) Minimum
AASHTO T49	ASTM D5	Penetration at 77°F (25°C)	40-90* dmm
AASHTO T201	ASTM D2170	Kinematic Viscosity @275°F(135°C)	650 cSt/sec. Minimum
* Climate Conditions			

# Other Additives



- Accelerate or Retard Mix Times
  - Helps in Constructability and controlling Quick Traffic Properties of the mix during hot or cool weather conditions
- Minimal use rates- Included in Mix Design and compatible with other components of the mix
- Added mainly in field during construction process



# Mix Compatibility Performance Tests



<u>ISSA TEST NO.</u>	<u>DESCRIPTION</u>	<u>SPECIFICATION</u>
ISSA TB-139	Wet Cohesion @30 Minutes Min (Set) @60 Minutes Min (Traffic)	12 kg-cm Minimum 20 kg-cm Minimum
ISSA TB-109	Excess Asphalt by LWT Sand Adhesion	50g/sq.ft Maximum (538g/sq.m Maximum)
ISSA TB-114	Wet Stripping	Pass (90% Minimum)
ISSA TB-100	Wet Track Abrasion Loss One-Hour Soak Six-Day Soak	50g/ft <sup>2</sup> (538g/m <sup>2</sup> ) Maximum 75g/ft <sup>2</sup> (807g/m <sup>2</sup> ) Maximum
ISSA TB-147	Lateral Displacement  Specific Gravity after 1000 cycles of 125lbs (56.71Kg)	5% Maximum  2.1 Maximum
ISSA TB-144	Classification Compatibility	11 Grade Pts. AAA or BAA
ISSA TB-113	Mix Time @ 77°F (25°C)	Controllable to 120Sec. Minimum

# Mix Design Components



COMPONENT MATERIALS	LIMITS
<b>Residual Asphalt</b>	5.5 to 10.5% by dry weight of aggregate
<b>Mineral Filler</b>	0.0 to 3% by dry weight of aggregate
<b>Polymer-Based Modifier</b>	Minimum of 3% solids based on bitumen weight content
<b>Additives</b>	As Needed
<b>Water</b>	As required to produce proper mix consistency

# What is required to Do a Microsurfacing Mix Design?



- Experience
- Equipped Laboratory



Loaded Wheel Tester



Sand Equivalency



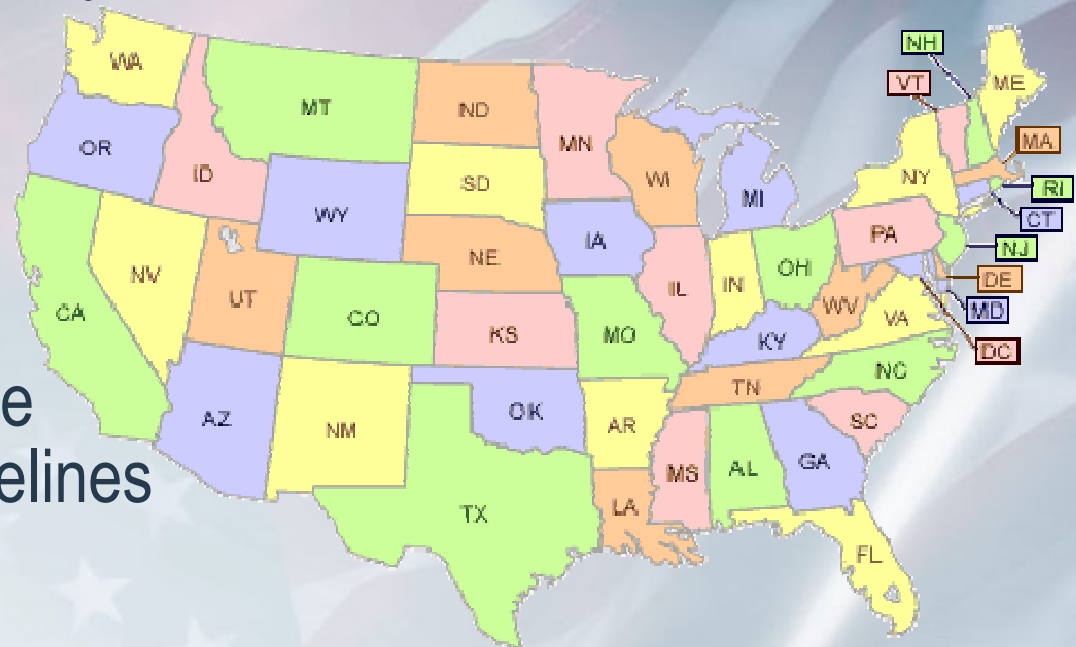
Cohesimeter



# Is there a Standard Process for Laboratory Approval for Mix Designs?



- In a word- “No”
- Requirements Vary By Agency
- No AASHTO or AMRL Requirements
- ISSA Workshop Training
- Only ASTM and ISSA have Available Mix Design Guidelines



# How are Designs Approved Now?



- Varies by State- Mainly Experience and Performance
- **Minnesota**- “Qualified Laboratory Experienced in Microsurfacing”
- **Indiana**- “Contractor Shall Submit A Design Mix Formula one week prior to use”
- **Iowa**- “The contractor shall be responsible for designing and proportioning the mixture. Mix design shall be prepared by a laboratory having 3 years experience in designing Microsurfacing using ISSA Guidelines.”
- **California**- “Contractor shall submit a mix design which shall be performed by a laboratory capable of performing the applicable ISSA tests.”

# Why is a Standard Approval Process needed?



- Microsurfacing is becoming more predominate in today's Pavement Preservation World
- Multi-State Servicing by Contractor & Supplier Base
- Requirements Currently Vary by State and Agency
- Higher Demand and Industry Refocus will Require More Contractors Involved in the Business
- Buyers Desire to Improve Levels of Performance in Final Product
- Limited Resources by Agencies Demands Contractor/Supplier Expertise & Assurance.

# What is being Done to Address Laboratory Design Certification Issue?



- FHWA and State Research Projects
  - Fugro – Slurry/Microsurfacing Mix Design Procedure- Caltrans 65A0151
    - Review of Existing and Proposal of New mix design procedures
- FHWA Pavement Preservation ETG- Emulsion Task Force
  - Formed in January 2008 at the AEMA annual meeting
  - 5 subcommittees- 26 Members
    - Emulsion Testing & Residue Recovery Methods
    - Residue Tests
    - Aggregates, Mix Designs, & Performance Tests
    - Approved Supplier Certification Procedures
    - Inspection & Acceptance
  - Priority on Microsurfacing & Chipseals

# In Conclusion



- No Standardized Laboratory Approval Process for Microsurfacing Mix Designs Exists
- Pavement Preservation Movement is Coming with Demands
- Standardized Requirements Needed to Maintain and Improve Quality of Products/Projects Completed with Preventive Maintenance Products
- FHWA Active in Process



# Microsurfacing Lab Mix Design Approval



Thank You