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



#### D6372

Standard Practice for Design, Testing, and Construction of Micro-Surfacing<sup>1</sup>

This standard is inseed under the fixed designation D 6372; the number immediately delicysting the designation indicates the year of equival page for c. in the case of revision, the year of last responses, it is parenthese indicates the year of last responses.

I. Scope 1.1 This practice covers the design, testing, and construction of mixtures of polymer modified asphalt enrulsion, minora aggregate, minoral miller, water, and other additives, properly propertiesed, mixed and spread on a proved surface. It is written as a guide and should be used as such. End us specifications should be adapted to conform to job and use

Note: 1—This practice references test methods outside the jurisdiction of ASTM that may or may not have a precision statement.

standard.

13. This standard does not purport to address oil of the sufery concerns, if any, associated with its are. It is the responsibility of the sure of this standard to residelish appropriate sufery and health practices and determine the applicability of regulatory limitations prior to sure.

2. Referenced Documents

 Test Method for Soundness of Aggregate by Use of Sodium Suffate or Magnetium Sulfate
 C 131 Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los

Fine Aggregate
D3910 Practice For Design, Testing, and Construction of
Slury Seal
E 145 Specification for Gravity-Convection and ForcedVariables Course.

ISSA Technical Bulletin No. 100, Test Method for Wet Track Abrasion of Slurry Surfaces<sup>3</sup> ISSA Technical Bulletin No. 109, Test Method for Measure-

a Louded Wheel Tester and Sand Adhesion ISSA. Technical Bulletin No. 139, Test Method to Classify Enubsified Asphult/Aggregate Mixture Systems by Modified Cobasion Tester, Measurement of Set and Cure Characteristics?

issa, recurring memorary relations of the companion of Canadiscation of Aggregate Filler—Blumma Companiolility by Schultze-Breas and Ruck Procedures
ISSA Technical Bulletin No. 147, Test Methods for Measurements of Subility and Resistance to Compaction, Vertical and Lateral Displacement of Multilayened Fine

. Terminology

3.1 Definitions of Terms Specific to This Standard: 3.1.1 polymer modified emultified asphalt micro-nurfacing matures—are related to this pecific, mixtures of fine aggregate with mineral filler, mixing water, and field control additive,

4.1 This practice outlines the basic properties for materials mis design procedures, and applications trackings for the design and application of micro-surfacing. The mis developed through their particles obstudie to confidence of micro-surfacing. The miss developed to their present in variable thick cross sections, which after compa and initia tracks consolidations, resist composition through the critical materials and variable this known through the critical materials and variable this known through the present in surface life. The mis should be a quick traffic system and cloud be able to accept rotting traffic on a 12.7 mm mid-load be added to accept rotting traffic.

<sup>5</sup> Analytic from International Starry Surfacing Association, 3 Church Clots 1948 250, Assupellis, MD 21401.

opytijn GASTM international, 108 Start Harbor Drivs, PO Star C758, West Consideration, PA 16438-2669, United States.

#### A143

DSA A343 (revised)

Recommended Performance Guidelines

For

Micro-Surfacing A143 (Revised)



#### NOTICE

It is not intered or recommended that these guidelines be used as selbutin apsolitorion. They should be used as an outline, helping user againses establish their panticular project specification. Helping have a proposed to the market project of markets. Effects should be made to determine understand that abross all seven very as to the anotherity of markets. Effects should be made to determine what marketsha are reasonably available, keeping in mind system compatibility and specific job requirements. Feel the to contact the 150A for annews to any questions and also for a list of 650A contraction and

> ternational Sturry Surfacing Associatio #3 Church Circle, PMB 250 Annapolis, MD 21491 (410) 257-0023

> © 2007 by Interestinal Story Serbeing Association contributes of our Visit care bounds without entire parameters of TVS

#### Designation: D 3910 - 0

#### D3910

#### Standard Practices for Design, Testing, and Construction of Slurry Seal<sup>1</sup>

This institute is limited which the fixed designation in D-MFC the market insendantly following the designation indicates the year england adoption on, in the case of resolution, the year of their revision. A market in parameters indicates the year of had reappeared, expectedly expellent (c) indicates an adoption change since the last revision or engagement.

Stope
 These practices cover the design, setting, and come
tion of mixtures for surface treatment of poweners,
written as a guide and shrell be used as such. Entspecifications should be adopted to conform to job and
engineering.
 The conformation of the property to address all of
property of the surface of the surf

1.2 This standard does not purport to address all of the suffery concerns, if any, associated with its use. It is the expoundability of the auer of this standard to establish appropriate sufery and health practices and determine the applicability of regulatory limitations prior to use.
2. Butternood Documents.

Referenced Documents
 1.1 ASTM Standards: 
 C 128 Test Method for Densky, Relative Densky (Specific Currity), and Absorption of Fine Aggregate

Carnity), and Absorption of Fine Aggargate
D 242 Specification for Mineral Filler For Bituminous Paring Mixtures
D 977 Specification for Emulatified Asphalt
D 1073 Specification for Fine Aggregate for Bituminous

Pasing Missures
D 2397 Specification for Cationic Emulsified Asphalt
D 2419 Test Method for Sand Equivalent Value of Soils and
Fine Aggregate

"These practices are related by picketions of ACTMC Considers Defe on Bread and Periolog Materials and as the direct encoprolatively of finder-resides Defe 2-c on Breadlines Indirect Transactions.

1. The Consideration of the Consideration

TABLE 1 Grading Requirements for Aggregate

Sizes Size

Sizes Size

Typs 1 Type 2 Type 3

Sizes Sizes

3. Terminology

3.1. Depinitions of Perms Specific to This Standard: 3.1.1 emissified angihal theory scal microser—as related to these practices, mixtures of fine aggregate with or without mineral filler, with or without mixing water, uniformly mixed with emulsified asphale.

Significance and Use
 These shary seed practices are written as a guide and should not be construed as specifications.
 4.2 End-use specifications should be adopted to conform to

5. Design

(1) 5.1.1 The fine aggregate shall consist of natural or manudiffectured surf, slag, crushed fines or other mineral aggregate that conforms to the quality requirements of Specification D 1073.

5.1.2 Recommended grading requirements are shown Table 1.
5.1.3 Smooth-textured sand of less than 1.25 % water a sception shall not exceed 50 % of the total combined aggregate

5.1.4 When tested by Test Method D 2419, the combin aggregate prior to the addition of any chemically active mine tillers shall have a sand equivalent of not less than 45.
5.2 Mineral Filter.

Copyright G.A.STM International, 100 Starr Harber Drive, P.O. Box C700, Wast Cerahehookan, Pin 19409-0063, United State

#### A105

## Recommended Performance Guidelines For Emulsified Asphalt Slurry Seal

A105 (Revised)



#### NOTICE

It is not intended or recommended that these guidelines be used as verbatim specifications. They should used as an outline, helping user agencies establish their portious projects peptilizations. Users shou understand that almost all areas vary as to the availability of materials. Efforts should be made to determ what materials are reasonably available, keeping in mind system composibility and specific job requiremen. Feel free to contact the ISSA for answers to any questions and also for a list of ISSA contractors, a companies who could desist.

> sternational Slurry Surfacing Association #3 Church Circle, PMB 250 Annapolis, MD 21401 (410) 267-0023

© 2005 by International Shary Surfacing Association. No reproduction of any hind may be made without written permission of I

### 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 Na<sub>2</sub>SO<sub>4</sub> or 25% Maximum using MgSO<sub>4</sub>

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	Type III Percent	Stockpile Tolerance
	Passing	Passing	
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 contaminates

## **Asphalt Emulsion**



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





## **Asphalt Emulsion**



AASHTO TEST	ASTM TEST	QUALITY	SPECIFICATION
<b>EMULSION</b>			
AASHTO T59	ASTM D244	Residue After Distillation	62% Minimum
RESIDUE			
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	650 cSt/sec.
		Viscosity @275°F(135°C)	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



ISSA TEST NO.	DESCRIPTION	SPECIFICATION
ISSA TB-139	Wet Cohesion	
	@30 Minutes Min (Set)	12 kg-cm Minimum
	@60 Minutes Min (Traffic)	20 kg-cm Minimum
ISSA TB-109	Excess Asphalt by LWT Sand	50g/sq.ft Maximum
	Adhesion	(538g/sq.m Maximum)
ISSA TB-114	Wet Stripping	Pass (90% Minimum)
ISSA TB-100	Wet Track Abrasion Loss	
	One-Hour Soak	50g/ft <sup>2</sup> (538g/m <sup>2</sup> ) Maximum
	Six-Day Soak	75g/ft <sup>2</sup> (807g/m <sup>2</sup> ) Maximum
ISSA TB-147	Lateral Displacement	5% Maximum
	Specific Gravity after 1000 cycles of 125lbs (56.71Kg)	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
Residual Asphalt	5.5 to 10.5% by dry weight of aggregate
Mineral Filler	0.0 to 3% by dry weight of aggregate
Polymer-Based Modifier	Minimum of 3% solids based on bitumen weight content
Additives	As Needed
Water	As required to produce proper mix consistency

# What is required to Do a Microsurfacing Mix Design?



Experience

Equipped Laboratory













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



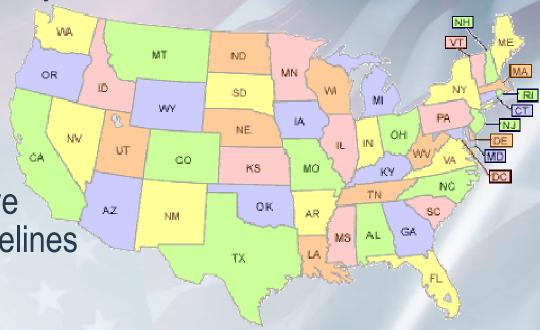
In a word- "No"

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"
- <u>lowa-"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."</u>
- <u>California</u>- "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