# **Smoothseal** A Polymer Modified Thin Lift Asphalt Application

Cliff Ursich, PE Flexible Pavements of Ohio

Asphalt ... Defining Value ! Safe, Smooth and Sustainable

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- Product Development
- Description of Candidate Projects
- Materials Characterization
- Thickness Guidelines
- Manufacturing and Placement
- Summary of Attributes
- Photo Gallery

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Product Development

Developed in the early 19 0's by Ohio's asphalt paving industry.

- Response to growing interest in microsurfacing
- FHWA PM init interest

Looking for a hot mix product that...

- C up be placed in thin lifts (to lower cost per SY)
- Any contractor could manufacture

Was cost-competitive with other PM materials

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#### • Product Development Product

 492.1 Arstergmon. Ins work some properties, and sphal crement prepared in a formulation of the sensiting mixture me formulation. The materials shall be apread in required.
 402.2 Materials. All materials shall e and specifically as follows:

Item Asphalt Cement (60-70, 85-100, 120-150,

MI

Pr

F1

CO

Asphalt Cement (UN AC-20) AC-5, AC-10, or AC-20) Coarse Aggregate

Fine Aggregate Mineral Filler The grade of asphalt cement will be specified i

402.2.1 The gradation of coarse aggre meets the gradation requirements specified for aggregate feeders.

402.2.2 The contractor may at his e approved quality in lieu of coarse aggregate slag is used, it shall meet the requirements for of wear specified in Sec 1002.1.1 shall not apply

402.3 Composition of Mixture.

402.3.1 Gradation of Combined Aggreg than those containing wet bottom boiler slag mixing with asphalt cement shall meet the follo

Sieve Size

Phone: (314) 635-6071

										1		
3/4-inch							•					
1/2-inch								4		2		
No. 4							1					
No. 8							2		•		•	
No. 30								e	•	e	•	
No. 200												

402.3.1.1 The total aggregate for mixture of coarse aggregate, at the time of mixing with gradation requirements: PROPOSAL FOR SNDOTHSEAL PAVEMENT FOR VARIOUS STREETS IN THE CITY OF ROCKVILLE, MARYLAND

> City of Rockville, Maryland Maryland At Vinson Rockville, Maryland

# BULLETIN

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ous Thin Overlays.

A ASPHALT PAVEMENT ASSOCIATION EF P.0. BOX 78817, OKLAHOMA GTY, OKLAHOMA 73147 FP.E. PRESIDENT, (405) 947-7875 November 1, 1988

ODOT Special Provisions for the mix

thout any problem. On one project, ts with little trouble.

thin lift, care should be taken to ng of tack. Possible one-half the lifts of HMA.

Oklahoma City Special Provisions tion is slightly finer.

and 5.5 percent A/C by weight.

ohalt.

- Product Development
  Where do we start?
  - Survey of state associatio
  - NAPA pub. on thin-lift minipulation
  - Ohio DOT's Ralumac spe Latex Modified Emulsifie



BENEFITS OF THIN SURFACINGS



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- Product Development Fast Forward to 2005
  - Governed by ODOT, Item 424, <u>Fine Graded</u> <u>Polymer Asphalt Concrete</u>
  - For use as a pavement preservation (PM) treatment
  - Since 2002 in excess of 1.2 million tons placed\*
    - \* Represents material sold on ODOT contracts. Does not include tonnage sold on local OHIO RIDES ON US government contracts.

- Product Development
- Description of Candidate Projects

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Description of Candidate Projects

Pavements suitable for a surface treatment overlay show the following distresses:

 Pavements where curb reveal does not permit heavy lift thicknesses

Description of Candidate Projects

Candidate pavements will have...

- No unrepaired structural (fatigue) damage
- No appreciable rutting (< <sup>1</sup>/<sub>4</sub> inch)
- Sufficient remaining structural capacity to last the life of the treatment

**Note:** Rapidly deteriorating pavements are not good candidates for PM. Rapid deterioration is indicative of inadequate pavement strength.

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- Product Development
- Description of Candidate Projects
- Materials Characterization



- Materials Characterization
  - Types of Smoothseal
    - Type A
      - Mix Design Recipe mix (all traffic types)

#### Type B

 Mix design – Volumetric mix design (light, medium, or heavy traffic pavements)

- Materials Characterization
  - Types of Smoothseal
    - Type A
      - Composition:
        - » Blend of sands w/ 8.5% polymer modified asphalt binder (76-22 SBS or 64-22 w/5% SBR)
        - » Silicon dioxide requirement on the fine agg. ensures good skid resistance
        - » Highest polymer dosage used in Ohio's market enhances mix toughness, stability, and longevity

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- Materials Characterization
  - Types of Smoothseal
    - Type B
      - Composition:
        - » ½-inch max. sized coarse agg. and sand particles w/ min. polymer binder content of 6.4% (76-22 SBS or 64-22 w/5% SBR)
        - » 100% two-faced crushed coarse agg. for heavy traffic mixes to provide stability
        - » Silicon dioxide requirement on the fine agg. ensures good skid resistance

- Materials Characterization
  - Types of Smoothseal
    - Type B
      - Composition (continued):
        - » Highest polymer dosage used in Ohio's market enhances mix toughness, stability, and longevity
        - » 10% RAP permitted

#### Smoothseal - Ohio DOT's Fine-



#### Materials Characterization



#### Materials Characterization



Microsurfacing							
3/8 inch	100						
No. 4	85-100						
No. 8	50-80						
No. 16	40-65						
No. 30	28-45						
No. 50	13-25						
No. 100							
No. 200	5-15						

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#### Types of Smoothseal

- Product Development
- Description of Candidate Projects
- Materials Characterization
- Thickness Guidelines



Overlay thickness guidelines
Type A mix

- 5/8" < thickness < 1 1/8"

#### Type B mix

- 3/4" < thickness < 1 1/2"

**Note:** Pavement surfaces having significant irregularity will require a leveling course or milling prior to placement of *Smoothseal*.

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- Product Development
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- Materials Characterization
- Thickness Guidelines
- Manufacturing and Placement

- Manufacturing and Placement
  - Manufacturing Smoothseal will be similar to other polymer-modified HMA
    - Greater heat during production
    - Elevated mix temperature at the project site max. 350°F
      - Sufficiently hot to compact
      - Not so hot so as to cause binder draindown
      - At least 290°F at time of compaction

Has been manufactured as WMA

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Manufacturing and Placement

Placing Smoothseal

- Heightened attention to factors affecting pavement smoothness
- Uniformity in production, temperature, mix delivery, head of material before the screed, and compaction all become critically important
- Handling and raking should be minimized...very, very sticky mix!

- Avoid feathering
- Butt joints preferred for joint construction

- Manufacturing and Placement
  - Ensuring a successful Smoothseal job
    - Place material on clean and dry pavement
    - Place material on pavement having a minimum 60°F surface temperature
    - Ensure uniform application of tack coat, set prior to paving
    - DO NOT USE PNEUMATIC TIRE ROLLERS.
    - Construct hot longitudinal joints or seal cold joints with bituminous material thoroughly coating the vertical face without runoff OHIO RIDES ON US

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#### What the owner says...

- Smoothseal (Type A) for light to medium traffic applications
  - High polymer modification for long term durability and performance
  - Suprisingly high skid resistance for improved safety
  - Typical thickness is ¾" but can go to 5/8" for less impact on castings or curb reveal
  - Somewhat self-healing in summer months
  - Attractive mix... stays black for entire life of product
  - Provides optimum contrast with pavement markings for improved safety

#### What the owner says...

- Smoothseal (Type B) for medium to heavy traffic applications
  - High quality PG 76-22M binder for long term durability and performance
  - High quality aggregates for strength, stability, rut resistance
  - Very good skid resistance and safety due to silica dioxide requirement for fine aggregate – coarse agg. can be blended for even better skids in critical locations
  - Typical thickness is 1" but can be placed at ¾" for less impact on curb reveal and guardrail
  - High polymer mixes will crack like all asphalt but cracks seem to stay tight and are somewhat less prone to degrade and form potholes

- Attractive dense mix, seemingly less permeable
- Can be applied as warm mix asphalt



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#### **Placed 1-inch thick**

**Smoothsealing** US6 in Henry and Wood Counties - 2001/02



#### -US6 in Henry – 10 years later

12 06 2011 15:27



Lucas County US23 / IR475 Smoothsealed 2002/03

#### Placed 1-inch thick

#### US23 in Lucas Co. – 9 years later

The second

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Paving Englewood city streets with Smoothseal-2002

Paving Englewood city streets with Smoothseal-2002

*Smoothsealing* SR82 in Cuyahoga County - 2003

North Coast Inland Bike Path – 2005 Paved with *Smoothseal*, Type A

IWX IR 70, Franklin Co. -2006 Smoothseal, Type B



#### IR 675, Montgomery Co. -2007 *Smoothseal*, Type B

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SR 146, Muskingum Co. -2010 Smoothseal, Type B

US 30, Richland Co. – 2011 *Smoothseal,* Type B



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# Questions?

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