


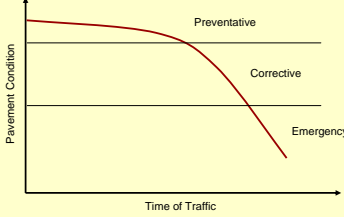
**Perpetual Pavement Preservation:
4.75 mm Maintenance Mixes**



Allen Cooley, Ph.D.
Burns Cooley Dennis, Inc.

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Perpetual Pavement Preservation?????????

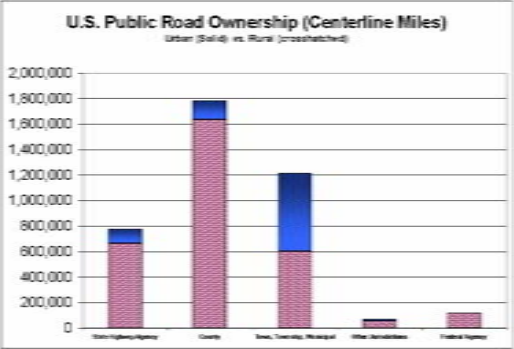


"Selecting a Preventive Maintenance Treatment for Flexible Pavements"
Dr. R. Gary Hicks, P.E., Stephen B. Seeks, P.E., David G. Postwin, P.E., March 2000

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What are We Talking About?

U.S. Public Road Ownership (Centerline Miles)
Urban (Solid) vs. Rural (crosshatched)



Stephen R. Mueller, P.E.
FHWA Pavement and Materials Engineer

What are We Talking About?

Pavement Preservation Guidelines

Type of Activity	Increase Capacity	Increase Strength	Reduce Aging	Restore Serviceability
	New Construction	X	X	X
Reconstruction	X	X	X	X
Major (Heavy) Rehabilitation		X	X	X
Structural Overlay		X	X	X
Minor (Light) Rehabilitation			X	X
Preventive Maintenance			X	X
Routine Maintenance				X
Corrective (Reactive) Maintenance				X
Catastrophic Maintenance				X

Pavement Preservation

Table 1- Pavement Preservation Guidelines FHWA Memo from Director, Office of Asset Management "Pavement Preservation Definitions"

What are We Talking About?

- **Thin Lift Hot Mix Asphalt**
 - **Thin Overlay** – A HMA overlay with one lift of surface course generally with a thickness of 38 mm (1.5 in) or less.
 - PAVEMENT PRESERVATION GLOSSARY OF TERMS November 2, 2001–Foundation of Pavement Preservation
- **What are We Really Talking About?**
 - **4.75 mm NMAS** – Probably ¾" to 1"
 - **Specifically for Lower Volume Roadways**

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Outline

- **Discuss Several Research Studies**
 - 4.75 mm NMAS Superpave Mixes
 - Screenings Mixes
- **Show Some Slides from ALDOT's first 4.75 mm NMAS Project (2003)**
- **Show Some Slides from First Thin Lift Project from Overland Park, KS (2008)**

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Research

- Research Results from Two Studies
 - Develop 4.75 mm NMAS Superpave Mixes
 - Screening Mixes
- Tie it all together

Both Conducted at NCAT

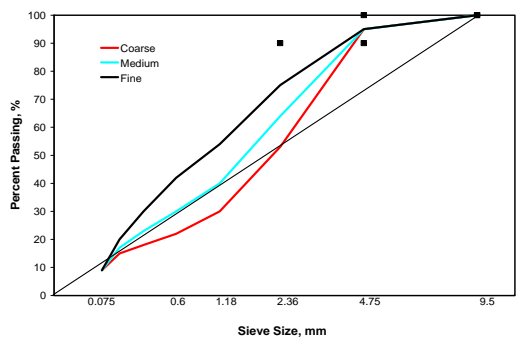
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4.75 mm NMAS Matrix

- Two Aggregates ~ Granite & Limestone
- 3 Gradations ~ Coarse, Medium & Fine
- 3 Dust Contents ~ 6, 9, & 12 percent
- 2 Design Air Void Contents ~ 4 & 8 percent
- $N_{des} = 75$ gyrations
- PG 64-22

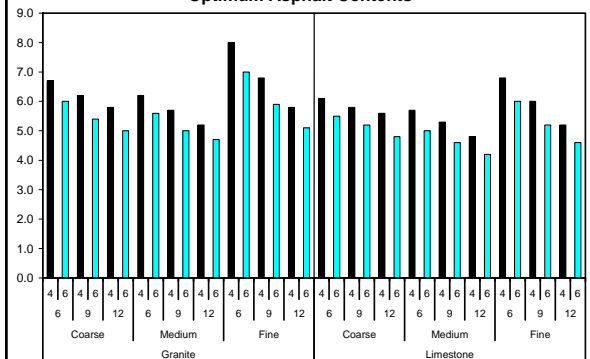
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General Gradation Shapes



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Optimum Asphalt Contents



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Performance Testing

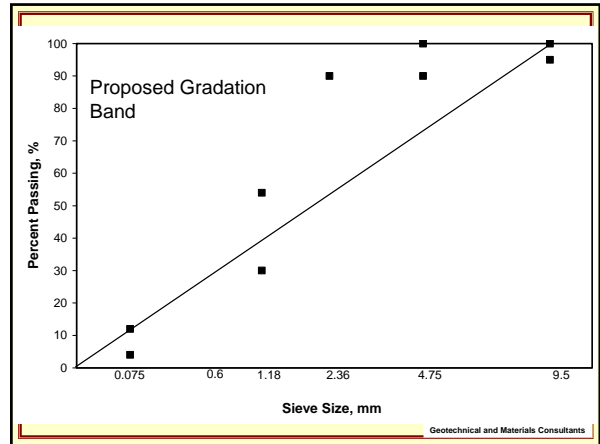
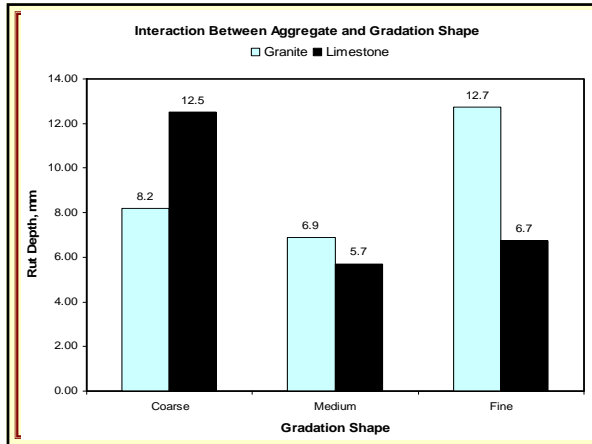
- Rut Testing Only
 - Asphalt Pavement Analyzer
 - 64°C
 - Design Air Void Content
 - 120 lb/120 psi

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Analysis of Rut Depth Data

- All Main Factors Significant
 - Aggregate Type
 - Design Air Voids
 - Gradation Shape
 - Dust Content

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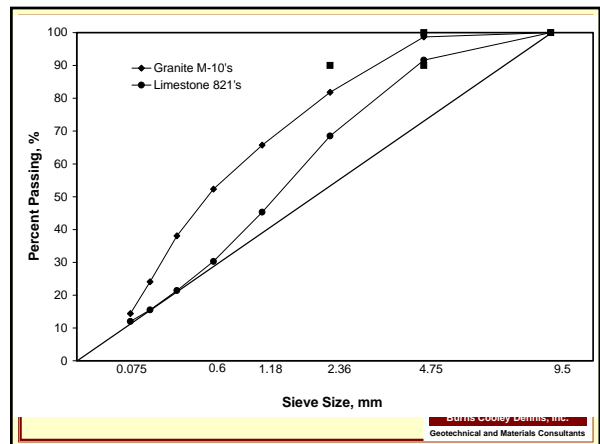


- ### 4.75 mm Volumetric Criteria
- Design Air Void Content
 - All Design Levels 4%
 - VMA Criteria
 - Ndes = 50 16% min.
 - Ndes = 75, 100, 125 16 – 18 %
 - VFA
 - Ndes = 50 75 – 80%
 - Ndes = 75, 100, 125 75 – 78 %
 - D/A Ratio
 - All Design Levels 0.9 – 2.2
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Use of Screenings to Produce HMA Mixtures

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- ### Screenings Materials
- 2 Screenings Stockpiles: Granite Limestone
 - 2 Binders: PG 67-22 and PG 76-22
 - With and Without Fiber
 - 3 Target Air Voids: 4, 5 and 6
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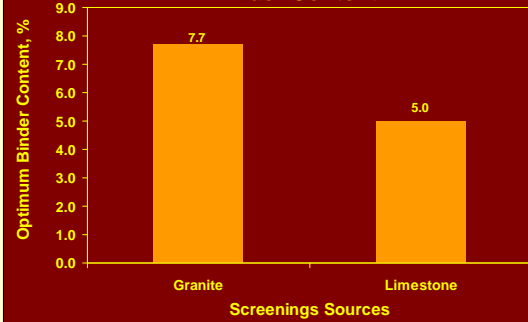
Optimum Binder Content

Significant Factors:

- Screenings Material
- Existence of Fiber
- Design Voids Content

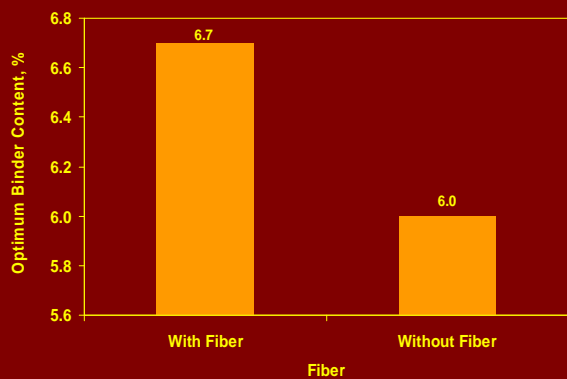
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Effect of Screenings Source on Optimum Binder Content

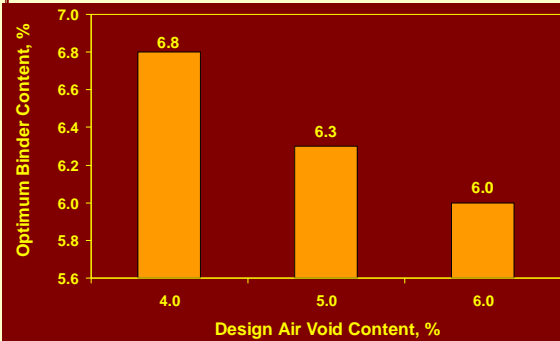


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Effect of Fiber on Optimum Binder Content



Effect of Design VTM on Optimum Binder Content



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Asphalt Pavement Analyzer Rut Testing

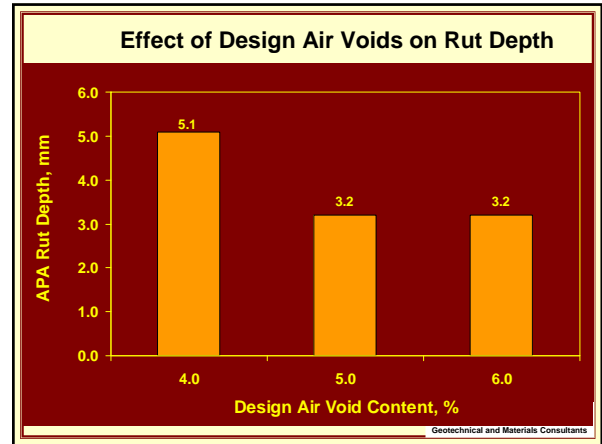
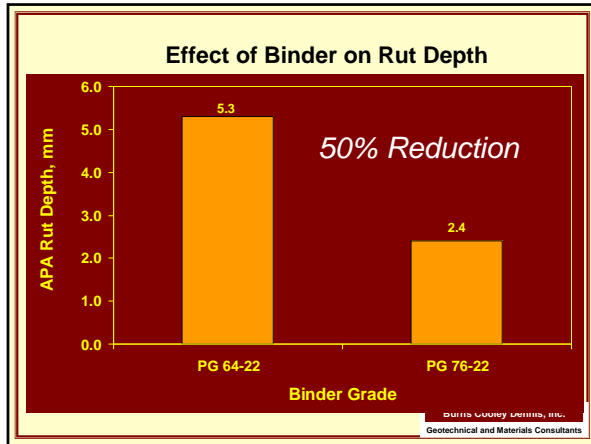
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Analysis of Rut Depth Data

Significant Factors:

- Binder Type
- Screenings Material
- Design Void Content

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Fiber not significant **

Even though mixes with fiber had 0.7% higher OAC

This indicates: for a given screenings and gradation, fiber would allow for an increase in binder content without the loss of stability.

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Recommendations

Based Upon the Two Studies, the following criteria are recommended

Property	Criteria
Design Air Void Content, %	4 to 6
Effective Volume of Binder, %	12 min.
Voids Filled with Asphalt, %	67-80

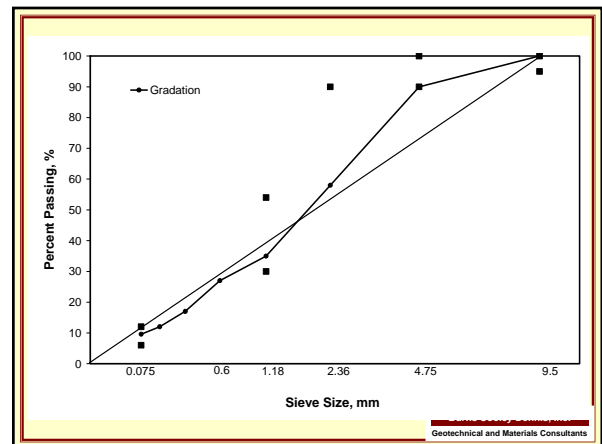
Other Needs:
Proper Ndesign Value
Aggregate Requirements (FAA)

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ALDOT's First 4.75 mm Superpave Mix

(Placed in 2003)

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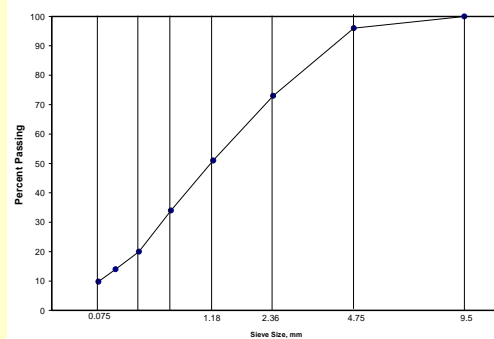
JMF

- Aggregates
 - Granite Screenings (38%)
 - Limestone Screenings (50%)
 - Sand (10%)
 - Baghouse Fines (2%)
- Binder Content – 6.3% (Ndes=75)
- D/A – 1.66
- VMA – 17.1%

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Overland Park, KS

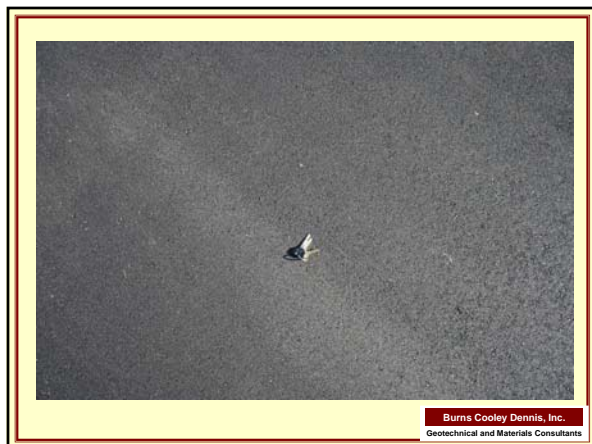


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Overland Park, KS

- Limestone
- Chat
- Sand
- **35% RAP**

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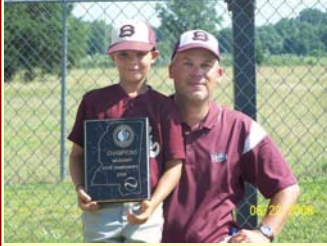
Conclusions

- 4.75 mm NMAS or 4.75 mm Like Mixes Can Be Designed
- These Type Mixes can be Constructed
- In Some States, These Type Mixes Have Performed for Many Years
- **4.75 mm Mixes Should Be Considered for Preventative Maintenance or Pavement Preservation, Especially in Urban Environments or Low Volume Highways**

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Thanks!
Questions?



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