Test Method for Measuring for Quality in Milling Operations

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January 28, 2005

NCAUPG HMA Conference
Lafayette, Indiana
Milling

Questions, Contact

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Indiana’s Quality Journey

• 1986 QC/QA for Marshall Mixtures
• 1992 Sampling from Roadway
• 1994 QC/QA for Superpave Mixtures
• 1994 QC/QA for Aggregates
• 1995 QCP for HMA Plant Operations
• 1996 QC/QA for Binders
• 1996 Warranties
• 2000 Volumetric Acceptance
• 2003 Quality Testing for Milling
Indiana’s Milling Experience

• 1979 Started Milling Operations
• 1985 Standard Specifications
• 2000 Specs modified to require equipment “automatic control devices to establish profile grades”
• 2003 Surface Macrotexture requirements added
CUTTING PATTERN

Standard Pattern

Slow Speed
TEXTURE TESTING

60 FPM
POOR CONDITIONS

Problems

1 SENSOR

BAD TEETH AND HOLDERS
Specifications for Milling w/Macrotexture

1. **Asphalt Scarification/Profile Milling.** Asphalt scarification milling is used to provide roughened texture to an existing surface. (1/4-1/2 in.)

2. **Asphalt Milling.** Asphalt milling is used to remove material from an existing pavement to a specified average depth by milling the surface and creating a uniform profile. (1.0, 1.5, 2.0, 3.0 or 4.0 in.)
3. **Asphalt Removal Milling.** Asphalt removal milling is used to remove an entire asphalt overlay.

4. **Transition Milling.** Transition milling is used to provide a connection between an HMA overlay and an adjoining pavement. (>1.5 in.)
Basis for Macrotexture Testing

- **ASTM E 965-01**, *Standard Test Method for Measuring Pavement Macrotexture Depth using a Volumetric Technique*. Referred to as the “Sand Patch Test”.

- **Note 1** – “…. This test method is not considered suitable for use on grooved surfaces or pavements with large (> 1.0 in. (25 mm)) surface voids.”
Testing Equipment

- 200 ml
- 8 in. Diameter Disk
Select Area

- Random Number Generation
- Representative Milled Area
- Free of localized Features
  - Cracking
  - Spalling
  - Repairs, etc.
  - Special Milling
Clean Area

- Power Broom
- Wire Brush
- Soft Bristle Brush
Set up Wind Screen
Pour Glass Beads

- Type of Beads
  - Coarse Glass
  - AASHTO M 247, Type I

Glass Beads Used in Traffic Paints

- Quantity (200 ml)
  - Pre-measured

- Pour Height
  - 2-4 inches
Spread Glass Beads

- Circular Motion
- Slow Motion
- Defined Edges
Measure the Area

- Standard Ruler - 12 inch
- Measure four times at 90 Degrees
- Calculate Average Diameter
- Compare Macrotexture Ratio to Specifications
  - 1.8 for Single HMA Lays
  - 2.2 for Multiple HMA Lays
Benefits of Milling Specifications to Indiana

- Testing operations are not complicated, are quick and repeatable
- Visual observations can be correlated with Macrotexture Testing
- Minimal Testing Costs
  - Time (Few minutes)
  - Materials (Standard)
Benefits of Milling Cont.

- Measurement Procedures and results are not “too” sensitive to field techniques -> (± ¼ in.)
- Plate Sampling for mixture acceptance is more consistent
- Improved working platform has improved the densities of the mixtures
INDOT Milling for 2004

- Quality not quantity
- Get it right the first time
- Ground speed w/ grade and slope controls
- Full width milling
- Averaging systems
- Knowledgeable field crews
Thank You!