Tack Coat Best Practices
FHWA Cooperative Agreement Subtask
Idaho Asphalt Conference
October 22, 2015

Tack Coat Workshops
As of September 2015

- 2014 – Pilot, VA
- Completed (25)
- Scheduled (19)
- Requested (6)
- Have not Requested (3)
Far too frequent practices.
Importance of Tack Coats

• To promote the bond between pavement layers.
• To prevent slippage between pavement layers.
• Vital for structural performance of the pavement.
• All layers working together.

Why do we use Tack Coats?

Bonded Demonstration

½" Deflection, 60# Load

⅛" Deflection, 160# Load

Unbonded

Fully Bonded
Bonded Demonstration Highlights

- Up to 5 sheets (layers)
- 48” x 4” x 11/32”
- 60, 100, or 160 pound loadings
- Various Bonding Configurations

- Two bonded layers had less deflection than five unbonded (60#).
- Five bonded layer deflected half as much as five unbonded with 267% greater loading (60# vs. 160#).

Pavement Behavior

Shear Transfer?

Soil Subgrade

Aggregate Base

Compression

Stress Distribution

Tension

Courtesy of Rich May
**Consequences of Debonding**

- Layer independence
- Reduced fatigue life
- Increased rutting
- Slippage
- Shoving
- Compaction difficulty

**Consequences of Poor Bonding**

```
• Layer independence
• Reduced fatigue life
• Increased rutting
• Slippage
• Shoving
• Compaction difficulty
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Direction of traffic?
Loss of Fatigue Life Examples

- May and King:
  - 10% bond loss = 50% less fatigue life

- Roffe and Chaignon
  - No bond = 60% loss of life

- Brown and Brunton
  - No Bond = 75% loss of life
  - 30% bond loss = 70% loss of life

8 – 10 years (est.) Interstate Pavement

Courtesy of MODOT
So is it worth it to apply a tack coat?

**Cost of Tack Coat**

- **New or Reconstruction**
  - About 0.1-0.2% of Project Total
  - About 1.0-1.5% of Pavement Total Cost

- **Mill and Overlay**
  - About 1.0-2.0% of Project Total
  - About 1.0-2.5% of Pavement Total Cost

Cores Showing Debonding

Bonding Failures

Courtesy of MODOT
Estimated Cost of Bond Failure in Only the Top Lift

- Assume no inflation for materials
- Estimated traffic control
- Used project plans for thicknesses
- Used bid tabs for:
  - Milling
  - Material costs
  - Replaced pavement markings

30-100% of Original Pavement Costs

Tack Coat Challenges

- Contractor
  - Application Rate
  - Consistency of Application
  - Tack Coat Pickup or Tracking By Vehicles
  - Traction for Construction Equipment
  - Breaking/Setting Time
- Agency
  - Acceptance
  - Dilution?
  - Application Measurement
  - Bond Quality
  - Tort Claims
Best Practices

- Surfaces need to be clean and dry.
- Uniform application.
- All surfaces are tacked.
- Tack should not be tracked off the road.

Best Practices

- Match application to conditions.
  - Materials
  - Residual rate
- Verify application rate.
- Resist tacking too far ahead of paver.
Distributor Truck Setup

- Liquid temperature
  - Monitor and match to material
- Calibrate distributor truck
  - Spray bar height
  - Spray bar pressure
  - Nozzle angle
  - Nozzle selection
  - Thermometers
  - Volumeter

Calculating field application rates

- There are three primary methods of determining field application rates.
  - Determination by volume.
  - Determination by weight or mass.
  - Determination by direct measurement, ASTM D2995
Critical elements in determining application rates

• Dilution rates are critical in determining final application rates.
• Temperature is important in determining accurate volumetric rates.

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### Recommended Application Rates

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<tr>
<th>Surface Type</th>
<th>Residual Rate (gsy)</th>
<th>Appx. Bar Rate Undiluted* (gsy)</th>
<th>Appx. Bar Rate Diluted 1:1* (gsy)</th>
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<td>0.030 – 0.065</td>
<td>0.060 – 0.130</td>
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<td>Existing Asphalt</td>
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<td>0.060 – 0.105</td>
<td>0.120 – 0.210</td>
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<td>Milled Surface</td>
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<td>Portland Cement Concrete</td>
<td>0.030 – 0.050</td>
<td>0.045 – 0.075</td>
<td>0.090 – 0.150</td>
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*Assume emulsion is 33% water and 67% asphalt.

### Review and Summary
Areas of Known Agreement

- Layer Bonding is Vital
- Surface Preparation
  - Clean
  - Dry
- Millings Improves Field Performance
  - Shear
  - Cleaning

Areas of Known Agreement

- Application Quality Vital
  - Proper Rate
  - Consistency
- Distributor Truck
  - Setup
  - Calibration/Verification
  - Maintenance
- Tacking of Longitudinal Joints
  - Bonding
  - Confinement
- Excessive Tack is Bad
- Thicker/Stiffer Lifts Less Prone to Slippage
Areas of Known Agreement

• Tack Coat Rate Depends on Surface Condition
  • Fresh
  • Weathered
  • Raveled
  • Milled
• Need for Research
  • Field Performance
  • Field Testing
    • Bond strength
    • Application amount
• Treat Tack as **Separate Pay Item** vs. Incidental Item

Tack Coat Application
Free 4-hour workshop requested through FHWA divisional offices

Questions?

Free webinar: