ODOT MATERIALS & INSPECTION

Spec Notes & Best Practices

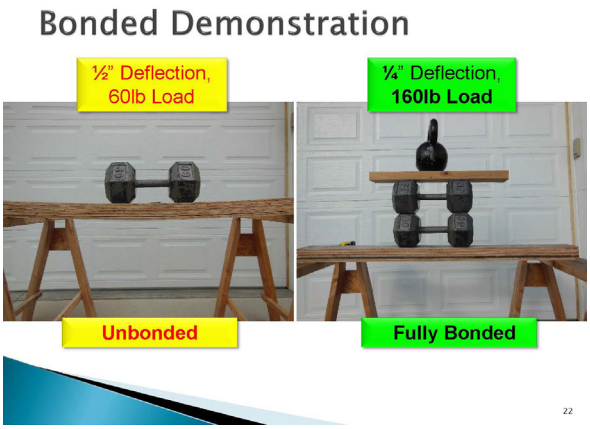
June 2015 Number 4

00730 Emulsified Asphalt Tack Coat

Tack Bonding

Ultimate Goal – To produce uniform, complete, and adequate tack coverage to bond asphalt pavements to better resist shear stresses.

Section 00730.11 – Dilution of tack coat material (adding additional water) may be allowed up to a maximum 1:1 ratio with Engineer approval.



Poorly Bonded Asphalt Pavements

- Reduce fatigue life
- 10% bond loss = approximate 50% less fatigue life
- No bond = approximate 60 to 75% loss of pavement life
- Increase slippage and shoving
- Can be difficult to compact

Resources

- 2015 Oregon Standard Specifications for Construction
- ODOT HMAC Inspector Certification Manual http://www.oregon.gov/ODOT/HWY/
- Best Practices for Emulsion Tack Coats, NAPA 2013

Technical Contact

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Recommended Application Rates Using Asphalt Emulsions (gallons/square yard)

Condition of Existing Surface	Undiluted Residual Rate (asphalt only in tack)	Undiluted Shot Rate (asphalt and water in tack)	1:1 Diluted Shot Rate (additional water)
New Asphalt (Multilayer)*	0.03 to 0.04	0.04 to 0.06	0.09 to 0.12
Old Asphalt (Overlay)	0.04 to 0.06	0.06 to 0.09	0.12 to 0.18
Milled Asphalt (Inlay)	0.04 to 0.08	0.06 to 0.12	0.12 to 0.36
Portland cement concrete	0.04 to 0.06	0.06 to 0.09	0.12 to 0.18

*If tack coat is applied to newly paved ACP surface the residual rate may be reduced to 0.02 gallons/square yard.

Application Rate Multiplication Factors**

Type of Tack Coat Material	Multiplier Factor (to maintain residual asphalt)
Asphalt Binder (Hot Tack)	1.0
Undiluted Asphalt Emulsion	1.5
1:1 Diluted Asphalt Emulsion	3.0

** The application rate for diluted asphalt emulsions needs to be adjusted to maintain the same residual rate of tack

Tack Dilution Advantages and Disadvantages

Advantage

- Easier to provide a uniform coverage
- Less Likely to plug nozzles
- Diluted tack may track less

Disadvantages

- May take longer for tack to break (water and asphalt separate)
- May be prone to run-off
- Difficult to measure and confirm rate
  - » May need ODOT lab test for dilution rate
- Difficult to calculate undiluted asphalt emulsion for payment

Distributor Checklist

- Adequate distributor pressure for even tack flow
- Application rate (calculate for proper residual rate)
- Temperature of emulsion
  - » Asphalt emulsions typically 130° to 160° F
  - » PG type asphalt binder typically 350° to 400° F
- Bar height (ensure triple coverage)
- Correctly sized nozzle clean and free-flowing
- Nozzle angle setting 15 to 30 degrees

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Controls to Minimize Tracking of Emulsified Tack

- Minimize construction vehicle traffic especially when tack is breaking
- Prior to tack application, make sure all surfaces are clean especially with grinding operations
- Apply evenly across surface
- Dilute asphalt emulsions
- Use alternate approved asphalt emulsion (CSS-1H)
- Contact the asphalt emulsion supplier for other methods

Asphalt Emulsion (Tack) Breaking and Setting

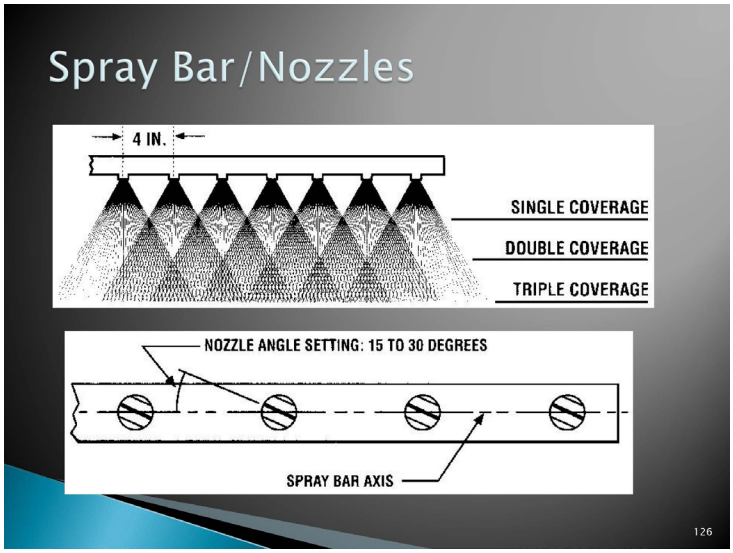
- Look for the color to change: brown to black
- Supplier can adjust tack formulation to increase/decrease set time if needed
- Variables that may affect break time
  - » Weather (damp weather will delay set time)
  - » Uniformity of tack coat (pooled tack will set slower)
  - » Type of tack (softer tacks will set slower)
  - » Initial temperature of tack (lower tack temperature will delay set time)
  - » Ambient temperature (cooler temperatures will delay set time)

Sampling and Handling of Asphalt Emulsions

- Sample **undiluted** asphalt emulsions
- Use non-metallic containers for the sample storage
- Keep sample out of direct sunlight
- Do not excessively jostle or disturb sample
- Deliver to the ODOT materials laboratory as soon as possible
- Material should be tested within 30 days of sampling

Spec Notes are prepared for inspectors by the Construction Quality Assurance Unit to provide background information around design elements and specifications. For additional Spec Notes, visit us at http://www.oregon.gov/ODOT/HWY/CONSTRUCTION/Pages/QAIndex.aspx.

If you have an idea for a Spec Notes topic, please e-mail us at ODOTConstructionTraining@odot.state.or.us or contact us at 503.986.5453.



Construction vehicle traffic on tack

- Minimize construction vehicle traffic as much as possible.
- Stagger vehicle traffic to minimize tack pick up
- Best to allow tack to set completely (all water evaporated) before allowing construction vehicle traffic on tack
- May allow construction vehicle traffic on fresh non-breaking tack coat though equipment may have slippage or traction issues
- Avoid all traffic while tack is breaking or in a flocculant state where the water is evaporating away from the asphalt

Tack Yield Calculations

Multiply shot rate (gals/yd$^{2)}$ by binder ratio (typically 2/3 or 1/3) to get residual rate

Mass Method (recommended for full load applications)
Length X Width (feet) of area covered = Area
Net weight of tack used X Gallon conversion[1] = Gallons
Gallons ÷ Area ÷ 9 (convert to square yards) = gals/yd^2

[1]gallon conversion on tack bill of lading

Volume Method
Length X Width (feet) of area covered = Area
Gallons of tack applied X 60° F conversion Factor[2] = Gallons
Gallons ÷ Area ÷ 9 (convert to square yards) = gals/yd^2

[2]see attached temperature volume correction chart for multiplier

Temperature Volume Correction for Emulsified Asphalt[3]

125	0.98375	130	0.98125
135	0.98125	140	0.98000
145	0.97875	150	0.97750
155	0.97625	160	0.97500
165	0.97375	170	0.97250
175	0.97125	180	0.97100
185	0.96875		

[3]Interpolate correction values for temperatures not shown