

Tack Coat Construction Issues

A Florida DOT Perspective


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(The King of Asphalt and a Prince of a Man)

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Overview


- Purpose of Tack Coats.
- Types of Materials.
- Do Tack Coats really work?
- Research work by FL DOT and others.
- Some Specification pointers.
- New materials and applications.



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Why Tack Coats?


- Bond layers together
- Renewed emphasis
 - Construction Slippage Failures
 - TRB Session 2005 on Tack Coats
 - Bond Failures at Accelerated Pavement Test Facilities
 - New materials: "trackless" and polymer modified tacks
 - NCHRP project 9-40 on Optimization of Tack Coats



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Tack Coat Materials

- Asphalt Cement
 - Safety and Application Concerns 250-300F+
- Cut Back Asphalt
 - Asphalt cement in solvent
 - Environmental Concerns.
- Emulsified Asphalt
 - Asphalt, emulsifier and water.
 - Anionic is typical product used in Florida



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Evolution of FL Tack Materials

- Allow just about any emulsified tack (1970's)
 - SS, MS, RS, different base AC's, anionic/cationic
 - Engineer set rate .02 to .08 gal/sy
- Problems and Failures.
 - Use wrong material at wrong rate for situation.
 - Dilution and Mixing of multiple materials
 - DOT and Industry lack experienced personnel.
- Change RS-1h or RS-2 (1990) pretested/no dilution
 - RS-1h with AC-20 base, RS-2 with AC-10 base.
 - AC-5 for night paving.

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Do Tack Coats Work? FL Research

- Developed simple Bond Strength tester.
 - Adapted from PCC Iowa Bond Strength test.
 - Test and loading parameters in research report
- Rain (water) decreases bond strength (big time).
 - Effect decreases with time.
- Rate of application increases bond strength.
 - 0.02, 0.04, 0.08 gal/sy.

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Do Tack Coats Work? FL Research

- Time/Traffic increases bond strength.
 - Tested 1 day, 2 weeks, 5 weeks, and 14 weeks
- Interface texture affects bond strength.
 - Milled surface, coarse texture, fine texture.
- Validated common sense.
 - Published AAPT 2004
- NCHRP project 9-40 to LTRC (2005)

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Device for Pine Equipment



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Specifications for Shear Strength?

- Difficult to do....what we have found:
 - Strength is dependent on age.
 - Mixture types (surface texture) affect strength.
 - Different requirements for different traffic.
- FL deficiencies covered under 3-year "materials & workmanship" **performance** warranty (Jan 2004).
- Bond failures usually show up early.
- Test best suited for failure investigation.



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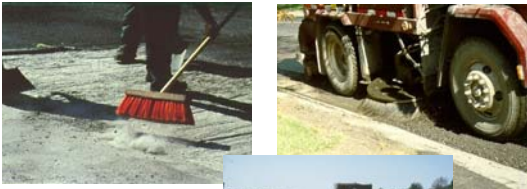
Specification Pointers

- Recommend Emulsified Asphalts.
 - Limit the number of materials
 - Pretest material / no dilution allowed
- **Heat** the Emulsified AC to 140-180F.
- **CLEAN** the Surface and Tack **ALL** layers.
- Use right application .02-.08gal/sy & **Check** rate
 - Old milled surface .06gal/sy
 - New asphalt .02gal/sy
 - OGFC .045gal/sy
- Get right the first time



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Clean the Surface!!



- Do what it takes!



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Don't Blame Emulsion for Bond Failure

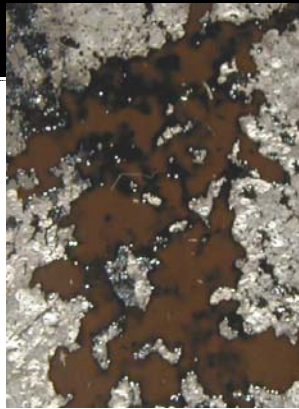
- Many Mysterious Material Requirements
 - Saybolt Vis, Sieve test, Demulsibility, etc.
 - Pumping / Spraying / Breaking
- But it's the Asphalt (residue)
 - Bond / Stick
 - Characteristics of residue.
 - Amount of residue.
 - Quick field test.



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Emulsion

- "Unbroke" Emulsion is Brown
- "Broke" Emulsion is Black
- HMA will boil water



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Some Current Concerns

- Night Paving.
 - Breaking of emulsified tack.
- Bond Failures.
 - Usually construction related.
 - Not usually failure of residual asphalt material.
- Tracking of Tack.
 - Pick up on tires of HMA delivery vehicles.
 - Make sure surface is clean (run traffic).
 - Can look like stripping failure

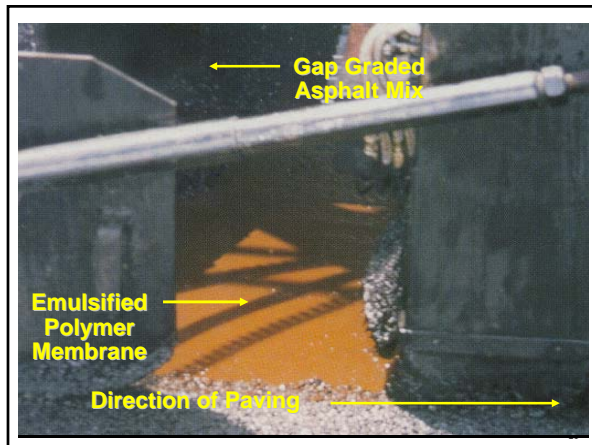


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New Materials & Applications

- CRS-1h (cationic tack)
 - Better breaking characteristics for night paving
- NTSS-1hm ("trackless tack")
 - Modified (Softening Pt 149F min, Penetration 20 max)
- Bonded Surface Course (say Novachip®)
 - Polymer modified tack at 0.20gal/sy.
 - Tack placed internal in the paver just before mix
 - New construction: with OGFC.
 - Maintenance: with gap graded over cracked pavement



Surface of Mix

Existing Pavement

1/2

1/3

- Wicks 1/2 way up when hot.
- Final wick is 1/3 of depth.
- Polymer tack is sticky.
- Process/paver is patented®.

Tack Summary

- Clean the surface.
- Use pretested material
- Don't mix or dilute.
- Use calibrated tank / meter
- Use the right material for the situation.
- Use the right tack rate & check it.
- Get a uniform application on the surface.
- One opportunity to "Get it Right".

