Guidelines on Design and Construction of High Performance Thin HMA Overlays

Cindy K. Estakhri
Tommy Blackmore
Tom Scullion

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Class Overview

Part I – Morning 10:00 to noon
- Why Thin Overlays
- Types of Thin Overlays
- Materials Selection
- Specifications
- Mix Design
- Site Selection
- Houston Candidates

Part II – Afternoon 1:00-3:00
- Project Inspection
- Tack Coat/Bonding Underseals
- Mixture Placement and Compaction
  - Weather/Temperature
  - Good Practices
  - Haul Distances
  - Managing Windrows
- Acceptance Testing
Fatigue & Longitudinal Cracking after 18 months

Conventional Overlays
Why Thin Overlays?

Statewide Cost-Savings - TOM vs. Conventional Overlays

Cost

- $179,188.64
- $3,909,321.37
- $9,723,113.84
- $(9,866.24)
- $7,990,772.56
- $9,201,869.65
- $18,416,530.07
- $19,055,371.95
- $11,392,341.61

2008-2016
Why Thin Overlays  Good Performance

Rut/Crack resistance
Skid resistance
  SAC B – High 30’s to Mid 40’s
  SAC A – High 40’s to Low 50’s
Smoothness (IRI improvement)
  Typically 25-35% improvement – depends on pre-existing conditions
Sound Abatement
  2 to 6 times reduction in noise
  96.5-98dB = PFC

IH-35 (ADT >100k):
  Before/After
Long-Term Distress Performance (2008-2014)

- Average Distress Score:
  - Years in Service: 0
    - Score: 70.3
  - Years in Service: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
    - Scores: 96.9, 99.2, 96.6, 95.8, 94.8, 91.0

- Trend: ~80.3% +/- 6

- Graph shows the decrease in average distress score over time, with a trendline indicating a steady decline.

Footer Text
Types of Thin Overlays
Aggregate Components

Grade 5 (1/4 inch)  Screenings
Mixture Types

- 30% Cost savings over traditional mixes - lifts of 1 inch or less
- Pass Rutting (HWTT) and Cracking (OT) performance tests
- Mandate PG 76-22 SAC A Grade 5 Rock + Screenings
- Structurally Sound Pavements ONLY
Key Components of Mix Design and Material Properties

• High-quality aggregate – SAC A for high volume roads
• PG 70 or 76 (Polymer Modified binders)
• RAP and RAS (shingles) not allowed
• Minimum binder content (Over 6%)
• Pay for binder separately ??
• Performance test requirements
• Warm mix additives (for long haul distances)
SAC A and SAC B blending
Mix Design and Specifications
Item 347
Thin Overlay Mixtures (TOM)

1. DESCRIPTION

Construct a thin surface course composed of a compacted mixture of aggregate and asphalt binder mixed hot in a mixing plant. Produce a thin surface course with a minimum lift thickness of 1/2 in. for TOM Type F mixture and 3/4 in. for TOM Type C mixture.
# Higher Aggregate Quality Requirements

## Table 1

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coarse Aggregate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAC</td>
<td>Tex-499-A (AQMP)</td>
<td>A¹</td>
</tr>
<tr>
<td>Deleterious material, %, Max</td>
<td>Tex-217-F, Part I</td>
<td>1.5</td>
</tr>
<tr>
<td>Decantation, %, Max</td>
<td>Tex-217-F, Part II</td>
<td>1.5</td>
</tr>
<tr>
<td>Micro-Deval abrasion, %</td>
<td>Tex-461-A</td>
<td>Note²</td>
</tr>
<tr>
<td>Los Angeles abrasion, %, Max</td>
<td>Tex-410-A</td>
<td>30</td>
</tr>
<tr>
<td>Magnesium sulfate soundness, 5 cycles, %, Max</td>
<td>Tex-411-A</td>
<td>20</td>
</tr>
<tr>
<td>Crushed face count, %, Min</td>
<td>Tex-460-A, Part I</td>
<td>95</td>
</tr>
<tr>
<td>Flat and elongated particles @ 5:1, %, Max</td>
<td>Tex-280-F</td>
<td>10</td>
</tr>
<tr>
<td>Fine Aggregate</td>
<td>Tex-107-E</td>
<td>3</td>
</tr>
<tr>
<td>Combined Aggregate</td>
<td>Tex-203-F</td>
<td>45</td>
</tr>
</tbody>
</table>

1. Surface Aggregate Classification of “A” is required unless otherwise shown on the plans.
2. Used to estimate the magnesium sulfate soundness loss in accordance with Section 347.2.1.1.2., “Micro-Deval Abrasion.”
3. Only applies to crushed gravel.
4. Aggregates, without mineral filler or additives, combined as used in the job-mix formula (JMF).
Thermal Imaging Requirement

4.7.1.1. When Using a Thermal Imaging System. The Contractor may pave any time the roadway is dry and the roadway surface temperature is at least 32°F; however, the Engineer may restrict the Contractor from paving surface mixtures if the ambient temperature is likely to drop below 32°F within 12 hr. of paving. Provide output data from the thermal imaging system to demonstrate to the Engineer that no recurring severe thermal segregation exists in accordance with Section 347.4.7.3.1.2., “Thermal Imaging System.”
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Critical Requirement

4.7.2. Tack Coat. Clean the surface before placing the tack coat. The Engineer will set the rate between 0.04 and 0.10 gal. of residual asphalt per square yard of surface area. Apply a uniform tack coat at the specified rate.

Trackless Tack strongly recommended
Item 347: Thin Overlay Mixture (TOM)

Provide an asphalt binder PG 76-22. Substitution of the PG binder is not allowed.

Place mixture at the compacted lift thickness of one (1) inch.

Provide 100% SAC “A” aggregate. Blending of coarse aggregate is not allowed. A maximum of 25% SAC “B” screening material can be used.

Do not use RAP and RAS in the mixture.

A Pave-IR system or Thermal camera system is mandatory for this project. The contractor must demonstrate that the mixture is being placed with no severe thermal segregation.

Provide a mix which lasts more than 500 cycles in the Overlay Tester.

For breakdown rolling use two steel-wheel rollers working in tandem without excessive breakage of the aggregate and provide a smooth surface and uniform texture, keeping the rollers as close as possible to the lay-down machine. Do not use pneumatic-tire rollers. Use a steel wheel as the finish roller.
Water flow measurements as per Tx Method 246 are mandatory for setting rolling patterns. The contractor must report the selected patterns to TxDOT and show that it meets the water flow requirements.


Avoid excessive compaction where water flows of greater than 10 minutes are not allowed, the final surface must have acceptable macro-texture.

The tack coat must be a hot applied trackless tack.

All construction joints must be placed under the paint stripes between the lanes. (No joints near wheel paths)

Performance test will be required on all mix design and trial batch samples, for each mold 6 samples at optimum asphalt content at 7% air voids content each will be 6 inches in diameter by 2.4 inches thick (Hamburg sized samples). The samples are to be sent to the Texas Transportation Institute (TTI) for Hamburg Wheel Test and Overlay test. This work is subsidiary to the various bid items.
Typical Water Flow – 6 seconds for PFC

6-in diameter by 10-in high cylinder. Plumber’s putty used to seal the edges of the pipe to pavement surface so water flows through the PFC.
New Approaches to Mix Design
Balancing Rutting and Reflection Cracking Requirements

Rutting test

Reflection Cracking test

Standard prep
## Laboratory Mixture Design Properties

<table>
<thead>
<tr>
<th>Mixture Property</th>
<th>Test Method</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target laboratory-molded density, % (TGC)</td>
<td>Tex 207 F</td>
<td>97.5(^1)</td>
</tr>
<tr>
<td>Design gyrations (Ndesign for SGC)</td>
<td>Tex-241-F</td>
<td>50(^2)</td>
</tr>
<tr>
<td>Hamburg Wheel test, passes at 12.5 mm rut depth for PG 70 mixtures</td>
<td>Tex-242-F</td>
<td>15,000 Min</td>
</tr>
<tr>
<td>Hamburg Wheel test, passes at 12.5 mm rut depth for PG 76 mixtures</td>
<td>Tex-242-F</td>
<td>20,000 Min</td>
</tr>
<tr>
<td>Tensile strength (dry), psi.</td>
<td>Tex-226-F</td>
<td>85-200</td>
</tr>
<tr>
<td>Overlay test, number of cycles</td>
<td>Tex-248-F</td>
<td>300 Min</td>
</tr>
<tr>
<td>Drain-down, %</td>
<td>Tex-235-F</td>
<td>0.20 Max</td>
</tr>
</tbody>
</table>
Century Asphalts TOM Mix for Houston
HWTT = 5.4 and 3.9 mm    OT =1000 cycles
## Conventional vs. TOM Surface Mixes

<table>
<thead>
<tr>
<th>Properties</th>
<th>Conventional HMA</th>
<th>TOM-C</th>
<th>TOM-F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gradation</td>
<td>Dense</td>
<td>GAP</td>
<td>Dense</td>
</tr>
<tr>
<td>Polymer Modified AC</td>
<td>Maybe</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>High Quality Aggr.</td>
<td>Maybe</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>AC Content</td>
<td>~ 4.8 – 5.2%</td>
<td>6.0% min</td>
<td>6.5% min</td>
</tr>
<tr>
<td>RAP</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>RAS</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Rutting Requirement</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cracking Requirement</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Item 342
Permeable Friction Course (PFC)

1. DESCRIPTION

Construct a hot-mix asphalt (HMA) surface course composed of a compacted permeable mixture of aggregate, asphalt binder, and additives mixed hot in a mixing plant.
<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>PG 76 Mixtures</th>
<th>A-R Mixtures</th>
<th>Test Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fine (PFC-F)</td>
<td>Coarse (PFC-C)</td>
<td>Coarse (PFCR-C)</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>–</td>
<td>100.0¹</td>
<td>100.0¹</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>100.0¹</td>
<td>80.0-100.0</td>
<td>95.0-100.0</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>95.0-100.0</td>
<td>35.0-60.0</td>
<td>50.0-80.0</td>
</tr>
<tr>
<td>#4</td>
<td>20.0-55.0</td>
<td>1.0-20.0</td>
<td>0.0-8.0</td>
</tr>
<tr>
<td>#8</td>
<td>1.0-10.0</td>
<td>1.0-10.0</td>
<td>0.0-4.0</td>
</tr>
<tr>
<td>#200</td>
<td>1.0-4.0</td>
<td>1.0-4.0</td>
<td>0.0-4.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixture Properties</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asphalt binder content, %</td>
<td>6.0-7.0</td>
<td>6.0-7.0</td>
<td>8.0-10.0</td>
</tr>
<tr>
<td>Design gyrations (N\text{design})</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Lab-molded density, %</td>
<td>78.0 Max</td>
<td>82.0 Max</td>
<td>82.0 Max</td>
</tr>
<tr>
<td>Hamburg Wheel test,² passes at 12.5 mm rut depth</td>
<td>10,000 Min³</td>
<td>Note²</td>
<td>Note²</td>
</tr>
<tr>
<td>Overlay tester,² number of cycles</td>
<td>200 Min</td>
<td>Note²</td>
<td>Note²</td>
</tr>
<tr>
<td>Drain-down, %</td>
<td>0.10 Max</td>
<td>0.10 Max</td>
<td>0.10 Max</td>
</tr>
<tr>
<td>Fiber content, % by wt. of total PG 76 mixture</td>
<td>0.20⁴-0.50</td>
<td>0.20⁴-0.50</td>
<td>–</td>
</tr>
<tr>
<td>Lime content, % by wt. of total aggregate</td>
<td>1.0⁵</td>
<td>1.0⁵</td>
<td>1.0⁵</td>
</tr>
<tr>
<td>CRM content, % by wt. of A-R binder</td>
<td>–</td>
<td>–</td>
<td>15.0 Min</td>
</tr>
<tr>
<td>Boil test³</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Cantabro loss, %</td>
<td>20.0 Max</td>
<td>20.0 Max</td>
<td>20.0 Max</td>
</tr>
</tbody>
</table>

² Hamburg Wheel test and Overlay tester are conducted as per AASHTO T 311, T 312, and T 314 for PG 76 Mixtures and A-R Mixtures.
³ Boil test is conducted as per AASHTO T 304 for PG 76 Mixtures and A-R Mixtures.
⁴ Fiber content is determined by a Universal Testing Machine (UTM) test.
⁵ Lime content is determined by a lime saturator test.
⁶ CRM content is determined by a cementitious mixture test.
Fine PFC vs Conventional PFC
Thin (<1 inch) Overlays

Type 1    Fine PFC (Item 342)  0.75 to 1 inch
          Safety/drainage/noise/bleeding
Type 2    TOM-F (Item 347)  0.5 to 1 inch
          Rut/crack/urban areas/ultra thin
Type 3    TOM-C (Item 347)  0.75 to 1 inch
          Rut/crack resistance/skid/high speed
Good Candidates for TOM C –

- Urban areas (Curb lines need to be maintained)
- To maintain bridge underpass/guardrail height clearances
- To resist shear forces in stopping/accelerating/turning areas
- Alternative to PFCs in intersections
- Any roadway where a crack resistant overlay is needed.

¾ to 1-inch thick
District Use of TOM-C

Houston Projects
- US 59 Main lanes
- US 59 Frontage Roads
- IH 45
- FM 1488
- FM 1887

Upcoming
- FM 1960
Successful High Volume Traffic
TOM-C Applications
Successful Low Traffic Volume Uses

Thinlay: A Win-Win Deep in the Heart of Texas

Low life-cycle costs, skid resistance, and noise reduction make this pavement popular with everyone

By Kelli Reyna and Martha K. Silver

In real estate, there is an old adage: “location, location, location.” But when that location is on a noisy roadway, “home sweet home” loses its value as a peaceful retreat. For residents along Ranch-to-Market Road 12 in Dripping Springs, Texas, their idyllic location was filled with complaints about road noise, which reached new highs before a summer asphalt Thinlay significantly reduced noise levels and improved safety.

Intersection of Unsafe and Unquiet

Just 30 minutes west of Austin, Texas, is the bedroom community of Dripping Springs—known as the Gateway to Texas Hill Country. In the past decade, the city of Austin has spread through growth and the annexation of surrounding communities. As Austin’s borders have approached Dripping Springs, traffic has increased, too.
Good Candidates for TOM-F Mixes

• As a maintenance alternative for seal coats.
• Sections where an additional seal coat is not a good option.
• FM 2920 Tomball – April 2016

½ to ¾ inch thick
Where ½-in TOM-F Overlays Used
Successful Uses of TOM-F Mixes
July 2012 Full Scale Project
Brownwood

- Full scale project US 183, Brownwood, to correct bleeding surface trt.
- 8.75 miles, 5000 tons, $97/ton (Zack Burkett), CSJ 6231-69-001
Sept 2012

Cost ~ $3.50 sq yd
Typical Water Flow – 6 seconds

6-in diameter by 10-in high cylinder. Plumber’s putty used to seal the edges of the pipe to pavement surface so water flows through the PFC.
Video showing typically traffic...
What’s next for Fine PFC

Looking to place Fine PFC over deteriorated existing coarse PFC
Site Selection
Pavement Selection Considerations

• Use on structurally sound pavements – Pavements needing extensive base repair or requiring structural improvement should be avoided.

• Use on pavements requiring only restoration of the surface wearing course properties, such as skid resistance, elimination of surface distresses, improve ride quality, reduce noise.
Good Candidates

- Shallow rutting < ½ in
- Top down cracking
- Longitudinal cracking
- Raveling
- Highly oxidized surface
- Polished surface – restore skid
- Acceptable ride quality (or level up also needed)
- Where cross slope correction not required
- Overlay not needed on shoulders
- CRCP Concrete pavements (Repair failures)
- JCP Concrete (Check joint movement)
- Bridge decks
- Where low noise surface is desired
- Both low and high volume traffic roadways
Candidate Evaluation Process

• Is it a good Candidate for a TOM
  – Video Log (always)
  – GPR (Flexible) (if needed)
  – FWD (Flexible) (if needed)
  – TPAD (Concrete – especially Jointed) (if needed)

• If so:
  – what prep work is needed
    • Do I need a level up and/or chip seal?
    • Which areas need patching/milling

  – What problem areas are identified
    • Driveways
    • Intersections
Surface Preparation (Austin District)

• Preparing and Repairing
  – Perform crack sealing and spot repair in highly distressed areas
  – Milled-in shoulder texturing and raised profile markings will reflect through – remove or fill
  – Mill and fill areas with fatigue cracking or shallow rutted areas with a fine dense-graded mix
    • Helps match existing surface
    • Promotes better ride with thin overlay

• Level-up
  – Should get a 25 to 35% improvement in IRI
  – If roughness > 120 in/mile, place level-up
Roadway Video Logging

Distress in the inside lane

Location by distance and GPS coordinates

Able to convert to and TRM

16 mi 1397 ft
Start an area of distress for repair

Creates a table for all areas of distress requiring repair

Maps the repair area
Pavement Selection Consideration for TOMs

Does the Projects have any near surface defects

- Ground Penetrating Radar (GPR): Determine existing pavement thickness, including HMA and base course thickness, near surface defects (stripping)
Pavement Selection Consideration for TOMs

- Is the project structurally OK
  - Falling Weight Deflectometer (Flexible): or TPAD Testing (Concrete)
  Pavement response to determine overall pavement capacity and subgrade support
Case 1
Is this JCP a candidate for a Thin Overlay
Yes good for thin Overlay
90% of project looked like this
Structurally Deficient – Not Good Candidates
Case Study on FM 1960

• Is it a Good candidate
• What areas of Concern
Transition from wide shoulder also start of poor surface mix about 1.25 miles east of US 59
Poor Surface Mix raveling (thermal segregation) at least 60% of section
Typical narrow shoulder section
Full edge paving   Mill 1 inch
Typical Wide shoulder section
Possible only Pave 18 inches inside shoulder and taper mix
Few localized bumps must be milled flat
Few areas with wide cracks
Patch any failures or locations with loose material
Many major intersections
Lots of traffic loops etc
Case Study 2
IH 45
Trapped Water under outside lane?
Drill Dry Hole  what is this (Moisture/Uretek/grout)
Is this patch stable
NB problem patch
End of Part I of Class
Part II of Class Project Inspection

• Surface prep
• HMA bonding
• Compaction
• Acceptance
Mixture Types

- 30% Cost savings over traditional mixes - lifts of 1 inch or less
- Pass Rutting (HWTT) and Cracking (OT) performance tests
- Mandate PG 76-22  SAC A Grade 5 Rock + Screenings
Thin (<1 inch) Overlays

Type 1  Fine PFC (Item 342)  0.75 to 1 inch
  Safety/drainage/noise/bleeding
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  Rut/crack resistance/skid/high speed
Start an area of distress for repair

Creates a table for all areas of distress requiring repair

Maps the repair area
Item 347: Thin Overlay Mixture (TOM)

Provide an asphalt binder PG 76-22. Substitution of the PG binder is not allowed.

Place mixture at the compacted lift thickness of one (1) inch.

Provide 100% SAC “A” aggregate. Blending of coarse aggregate is not allowed. A maximum of 25% SAC “B” screening material can be used.

Do not use RAP and RAS in the mixture.

A Pave-IR system or Thermal camera system is mandatory for this project. The contractor must demonstrate that the mixture is being placed with no severe thermal segregation.

Provide a mix which lasts more than 500 cycles in the Overlay Tester.

For breakdown rolling use two steel-wheel rollers working in tandem without excessive breakage of the aggregate and provide a smooth surface and uniform texture, keeping the rollers as close as possible to the lay-down machine. Do not use pneumatic-tire rollers. Use a steel wheel as the finish roller.
Water flow measurements as per Tx Method 246 are mandatory for setting rolling patterns. The contractor must report the selected patterns to TxDOT and show that it meets the water flow requirements


Avoid excessive compaction where water flows of greater than 10 minutes are not allowed, the final surface must have acceptable macro-texture.

The tack coat must be a hot applied trackless tack.

All construction joints must be placed under the paint stripes between the lanes. (No joints near wheel paths)

Performance test will be required on all mix design and trial batch samples, for each mold 6 samples at optimum asphalt content at 7% air voids content each will be 6 inches in diameter by 2.4 inches thick (Hamburg sized samples). The samples are to be sent to the Texas Transportation Institute (TTI) for Hamburg Wheel Test and Overlay test. This work is subsidiary to the various bid items.
Typical Water Flow – 6 seconds for PFC

6-in diameter by 10-in high cylinder. Plumber’s putty used to seal the edges of the pipe to pavement surface so water flows through the PFC.
Keys to Successful Construction

• Preparation
  – Spot Repair: Isolated failures
  – Level-Up: Areas with greater than 120 in/mile
  – Milling: Recommend micromilling for smaller peak to valley
Surface Preparation

• Preparing and Repairing
  – Perform crack sealing and spot repair in highly distressed areas
  – Milled-in shoulder texturing and raised profile markings will reflect through – remove or fill
  – Mill and fill areas with fatigue cracking or shallow rutted areas with a fine dense-graded mix
    • Helps match existing surface
    • Promotes better ride with thin overlay

• Level-up
  – Should get a 25 to 35% improvement in IRI
  – If roughness > 120 in/mile, place level-up
Milling

• Milling recommended if
  – Pavement highly oxidized/stiff
  – Cross-slope corrections needed
  – Minor to moderate ride issues
  – Extensive thermal or top-down cracking (>40 percent by area)
  – Extensive recent crack seal

  – Micromilling recommended if milling required - creates a finer finish with small peak-to-valley depths to prevent compaction and ride issues
Plant Inspection/Role of Inspector
Plant Inspection

- Proportioning aggregates
- Metering Asphalt
- Setting Feeding Unit
- Pugmill Mixer
- Mixing Time
- Checks on Asphalt Content
Sampling and Testing

• Purpose of tests
• Sampling Schedule
• Testing Trial Batch

4.4.2.1.13. **Trial Batch Testing.** Test the trial batch to ensure the mixture produced using the proposed JMF1 meets the mixture requirements in Table 8. Ensure the trial batch mixture is also in compliance with the Hamburg Wheel test, Overlay test, and drain-down requirements listed in Table 7. Use a Department-approved laboratory to perform the Hamburg Wheel test on the trial batch mixture or request that the Department perform the Hamburg Wheel test. Obtain and provide approximately 50 lb. of trial batch mixture in sealed containers, boxes, or bags labeled with the CSJ, mixture type, lot, and subplot number for the Overlay test. The Engineer will be allowed 10 working days to provide the Contractor with Hamburg Wheel test and Overlay test results on the trial batch. Provide the Engineer with a copy of the trial batch test results.
Production

• Keep Plant clean to prevent clumps = Pop outs

• Load Temperatures = 315 – 330°F
Tack Coats/Bonding/Underseals
Seal and Bond

• Bond is critical for thin overlays
• TOM-C is somewhat open graded, so a good seal is important to prevent moisture infiltration.

4.7.2. **Tack Coat.** Clean the surface before placing the tack coat. The Engineer will set the rate between 0.04 and 0.10 gal. of residual asphalt per square yard of surface area. Apply a uniform tack coat at the specified rate.

**Trackless Tack Strongly Recommended**
Tack Coats

• Bonding
  – On existing HMA, apply non-tracking tack, chip seal, or use spray paver.
  – Apply non-tracking tacks at 0.03 to 0.06 gal/sy
Problems with the spray bar
Check Nozzle Angles

CORRECT
All Nozzles at the Same Angle

INCORRECT
Some Nozzles at Different Angles
Poor Nozzle Alignment
Proper Nozzle Alignment
Check Nozzle Angles

**YES**

- Same Angle
- Fans are the same width

**NO**

- Different Angles
- Fans are different widths
Real problems with heavy shot rates under Roadtec loads
Underseals

• Underseals (chip seals/interlayers)
  – Only if significant unsealed cracks
  – If milling will expose underlying cracking
  – If overlaying newly widened sections
  – Use polymer modified binder in chip seal
  – Design chip seal with smaller aggregate (Grade 4 or 5)
  – Use proper chip seal construction practices
Seal Coat and Bonding Best Practices

– Light aggregate rates when using underseals
– Prefer heavy tacks - prevent bonding issues in areas with too much aggregate
– Windrow and transfer material with a shuttle buggy in the adjacent lane
– VERY clean surface to promote good bonding
– Take cores to verify bond and thickness
Roadtec feeding paver and also dropping stuff
Direct Tensile Bond Test
ASTM C-1583

Diagram showing the setup for the Direct Tensile Bond Test, including a tensile loading device, swivel joint, circular cut through overlay or surface treatment material, steel disk, and epoxy adhesive.
Sequence in the Bond strength test
Thin Overlay did not Bond to Traffic Loops.....mill them out!!
Placement and Compaction
Good Paving Practices

– Laydown Machine Operation
– Rollers
– Materials Transvers vs traditional pick up
– Pave IR
Mixture Placement

Best Practice

• Use a shuttle buggy to maintain temperature
• Use insulated truck and trapped
• WMA additive helped as a compaction aid in cooler temperatures
• District may require WMA for hauls greater than 50 miles
Temperature Requirements

• Item 347 allows the following:
  – Roadway temperature of 32F when using thermal imaging system **NOT RECOMMENDED!!!**
  – *Use the following Plan Note:*
    – When not using thermal imaging system, surface temperature should be min 60F
Thermal Profile – SR 220

- Good thermal uniformity
- $\Delta T$ between 18 and 28 °F
- Paver idle 7% of time due to paver stops
- AVG speed 26.9 ft/min
Post-Process view and report from IR Profile

View and annotate profile

Histograms

Project metrics

– Paver speed
– Idle time
– Total duration
Measured temperature drops on thin lifts; Need 2 rollers working in echelon.
Placement and Compaction

- Limit hand work
  - Irregularities show up more dramatically in thin overlays

- No pneumatics.... Closes surface
  - Macrotecture for skid resistance is diminished
  - Cools too quick to take out impressions

- Rollers should be right behind the paver Harsh mix and cools quickly
Compaction
Compaction

- Recommend dual rollers in tandem
- TOM-C (3 passes – each pass is one vibratory/one static)
- TOM-F mixes 3-5 static passes
- Fine PFC, 1 to 3 static passes
- Need adequate release agents (mix very sticky)
SH 73 Beaumont’s first TOM-C

- Rolling Crown
- Over-compaction
Day 1 Problems  Streaking + No water flow
Day 1 > 15 mins
Paving Operation
Rolling Crown was an Issue
Adjustments to Rolling pattern

• Two rollers side by side in main lanes
• Smaller roller only doing edge
• Change to vib up static back
• Water flow 4 mins
• Texture good
Acceptance Testing
Acceptance Testing

• Acceptance in the Field
  – Water Flow Test (Tex 246-F)
    • (Flow rate > 2 minutes) for TOMs
    • < 20 secs for PFC
For more information contact:

T-Scullion@tti.tamu.edu
T-Blackmore@tti.tamu.edu
C-estakhri@tti.tamu.edu