SPECIFICATIONS
FULL DEPTH RECLAMATION USING EMULSION & FOAMED ASPHALT

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Soils & Aggregates Section
Materials & Tests Division
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Special Specifications

- New specifications that are not in TxDOT’s standard specification book.
- They may apply to new or revised Item specification requirements, new materials, not used in many project lettings Statewide or that often.
- Statewide, Districtwide, or One-Time-Use.
- Special specifications 3,000 to 3,999 assigned for Surface Courses/Pavements

### Special Specification 3003
Emulsion Treatment (Road Mixed)

1. **DESCRIPTION**

Mix and compact emulsion, additives, water, and base, with or without asphalt concrete pavement, in the roadway.

### Special Specification 3063
Full Depth Reclamation Using Foamed Asphalt (Road-Mixed)

1. **DESCRIPTION**

Perform full depth reclamation (FDR) using an in-place mixing process to obtain a homogenous mixture of the existing surface and the underlying base material (with or without new material and additive added) using a foamed asphalt.
**History & Use of Specifications**

**Emulsion**

- Total of 45 project lettings from 9 Districts.

- February, 1994 - First Special Specification (3017) was used for a project letting in Abilene. (1993 Standard Specifications - Blue Book).


- 35 Special specifications used until Statewide specification, several revisions from 1994 to 2013.
History & Use of Specifications

**Emulsion**

- April, 2015 - Second Statewide Specification (3003) used for a project letting (2014 Standard Specifications - White & Blue Book)

- DRAFT revision for a new Statewide Special Specification under FHWA Review (May - June 2019).
Emulsion

DISTRICT PROJECT LETTINGS
### EMULSION PROJECT LETTINGS

<table>
<thead>
<tr>
<th>DISTRICT</th>
<th># PROJECTS</th>
<th>YEAR (LETTING)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abilene</td>
<td>1</td>
<td>1994</td>
</tr>
<tr>
<td>Amarillo</td>
<td>10</td>
<td>2004 – 2018</td>
</tr>
<tr>
<td>Austin</td>
<td>1</td>
<td>2001</td>
</tr>
<tr>
<td>Beaumont</td>
<td>5</td>
<td>2014 – 2018</td>
</tr>
<tr>
<td>Dallas</td>
<td>9</td>
<td>1999 – 2010</td>
</tr>
<tr>
<td>Odessa</td>
<td>5</td>
<td>2015 – 2018</td>
</tr>
<tr>
<td>San Angelo</td>
<td>2</td>
<td>2016 - 2017</td>
</tr>
<tr>
<td>San Antonio</td>
<td>11</td>
<td>2004 – 2013</td>
</tr>
<tr>
<td>Yoakum</td>
<td>1</td>
<td>2007</td>
</tr>
</tbody>
</table>
History & Use of Specifications

Foamed Asphalt

✓ Total of 7 project lettings from 7 Districts.

✓ August, 1999 - Special Specification (3158) was used for first project letting in Wichita Falls. (1993 Standard Specifications - Blue Book).

✓ December, 2013 - Special specification (3279) was used for second project letting in Corpus Christi (2004 Standard Specifications – Maroon Book).

✓ First Statewide special specification (3063) became available in July, 2018, not used as of yet.
Foamed Asphalt
<table>
<thead>
<tr>
<th>DISTRICT</th>
<th># PROJECTS</th>
<th>YEAR (LETTING)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bryan</td>
<td>1</td>
<td>2015</td>
</tr>
<tr>
<td>Corpus Christi</td>
<td>1</td>
<td>2013</td>
</tr>
<tr>
<td>Laredo</td>
<td>1</td>
<td>2016</td>
</tr>
<tr>
<td>San Antonio</td>
<td>1</td>
<td>2014</td>
</tr>
<tr>
<td>Waco</td>
<td>1</td>
<td>2018</td>
</tr>
<tr>
<td>Wichita Falls</td>
<td>1</td>
<td>1999</td>
</tr>
</tbody>
</table>
Why is there a big gap in foamed asphalt project lettings?

- Outside wheelpath experienced severe rutting and alligator & longitudinal cracking.
- Finer, higher than recommended PI material reclaimed and mixed with foamed asphalt.
- Upfront sampling & testing critical for project selection and success.
Why Were Special Specifications Revised?

- Collaborative effort with Industry and Texas A&M Transportation Institute (TTI) to address areas in need of revisions.
- Reflect current mixture design practices and address concerns observed from projects.
- Compliance with Code of Federal Regulations (CFR) for using ‘Quality Control’ test results for acceptance.

CFR allows the use of contractor test results in making the acceptance decision.....
Why Were Special Specifications Revised?

TxDOT must validate Contractor’s Quality Control test results used for acceptance.

3. What is FHWA’s policy on the use of contractor's quality control test results for acceptance?
The FHWA policy on the use of contractor's quality control test results for acceptance requires validation of all data not generated by the State transportation department (STD) or its designated agent if used in the acceptance decision. The requirements are codified in Title 23 Code of Federal Regulations Part 637 Subpart B (23 CFR 637B), located at http://www.access.gpo.gov/nara/cfr/waisidx_03/23cfr637_03.html. (Note that the use of STD is in line with 23 CFR 637 B, as of April 1, 2003. In this Technical Advisory, all references to State Highway Agency (SHA) or "agency" have been replaced with STD or "department.")
Why Were Special Specifications Revised?

- Move away from one-time-use specifications so all project lettings use the same Statewide specification.
- Harmonize the special specifications to have similar content and intent.
- Include similar language and format from 2014 specifications for treatment Items using cement, fly-ash, and lime.
- Same Section numbers, names, and comparable information for alternate bidding.
- Goal is to have one statewide special specification for Full-Depth Reclamation (FDR) Using Asphalt.
SECTION 1. DESCRIPTION

Perform full depth reclamation (FDR) using a cold in-place mixing process to obtain a homogenous mixture of the existing surface and the underlying base material (with or without new material and additive added) using an emulsified asphalt or foamed asphalt.
SECTION 2. MATERIALS

- **Emulsion**
  - Reference to TxDOT Item 300, Asphalts, Oils, and Emulsions
  - Cationic Emulsified Asphalt, Slow-Setting
  - CSS-1H

- **Foamed Asphalt**
  - Reference to TxDOT Item 300, Asphalts, Oils, and Emulsions
  - Performance-Graded Binders
  - PG 64-22
  - Foamed Asphalt Properties listed in special specification.
SECTION 2. MATERIALS

- **Additional Material**
  - Flexible Base, Item 247

- **Additive**
  - Lime
  - Cement
  - Fly Ash

- **Water**
  - Free of industrial waste and other objectionable material.
SECTION 2. MATERIALS

- **MIXTURE DESIGN**
  - Engineer will provide an approved mixture design, unless otherwise directed.
  - Required to use Materials & Tests Division’s mixture design procedure.
  - Mixture design procedure not published yet.
  - Private labs have limited to no experience with the procedure thus defaulting to Engineer providing the mixture design.
  - Plan is to move it back to Contractor’s responsibility in the future.

- **MIXTURE DESIGN VERIFICATION** - At Engineer’s discretion.

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E. Preparation of the Base Specimens Stabilized with the Emulsion-Cement Mix - CONTINUED

- Mix for no more than 60 ± 10 seconds.
- Place the loose mixture into a bowl.
- Move the blended specimens into an oven and cure at 60°C (140°F) for 30 minutes. Do not mix during curing.
- Compact the cured mixture according to (B).
- Place the compacted specimens on the porous stone.
- Move the specimens into a climate chamber set at 60°C (140°F).
- Cure the specimens in the chamber for 48 hours (2 days).
- Remove the specimens from the hot chamber and cool them at 25°C (77°F) for 24 hours (1 day), but not more than 48 hours (2 days).
Equipment, Staffing, and Control Section

- **SECTION 3. EQUIPMENT**
  - Additive, rollers, and reclaimer.

- **SECTION 4. STAFFING REQUIREMENTS**
  - Certification by Department-approved Soils & Base Certification Program to conduct all sampling and testing (SB 102 - TXAPA).

- **SECTION 5. CONTROL SECTION**
  - Construct a control section only when directed by the Engineer
  - Lane width, minimum 300 feet in length, and depth shown on the plans.
**SECTION 6. CONSTRUCTION**

- **REPORTING AND RESPONSIBILITIES**
  - Requires to record and electronically submit all test results and pertinent information using Department-provided templates.
  - SiteManager templates created for emulsion (Tex-122-E) and foamed asphalt (Tex-134-E) draft mix design test procedures.

- **PRE-SHAPING**
  - Shape existing material to conform to typical sections shown on the plans, such as cross slope; not very often.

- **APPLICATION OF ADDITIVE**
  - Dry & slurry placement.
  - No significant changes from Items 260 & 275, lime & cement treatment.
WEATHER RESTRICTIONS

- Surface temperature below 50°F.
- Weather forecast calls for freezing temperatures within 3 days after treatment.

MIXING

- Engineer determines emulsion and foamed asphalt % using meter readings or truck weight tickets.
- Engineer determines gradation.
- Includes frequency of sampling & testing because specifications and materials are not listed in the Guide Schedule.
COMPACTION

✓ Suspend field operations and notify the Engineer when significant changes of materials being treated occur.

✓ Engineer may suspend field operations and investigate areas of concern.

✓ ‘Investigate’ may include:
  • Reviewing Process Control (Quality Control) test results
  • Field testing, such as Ground Penetrating Radar (GPR) and Dynamic Cone Penetrometer (DCP).
  • Sampling & testing of materials.
What *may* be the consequences when there are significant changes of materials being treated in the field?

- Inadequate mixing & bonding of reclaimed materials.
- Does not meet density & moisture requirements.
- Is not stable and prone to shoving & rutting.
- Does not meet gradation requirements.
- Surface too fine and not bond with seal coat delamination.
SECTION 6. CONSTRUCTION

➢ **ORDINARY COMPACTION**

  ✓ Roll with approved compaction equipment as directed by the Engineer.

➢ **DENSITY AND MOISTURE CONTROL**

  ✓ Full depth layer must be compacted to an average 97.0% density.

  ✓ Added ‘Moisture Control’ within 2% below the optimum moisture content and no more than 0.5% above.

    • When material does not meet density but meets moisture content, perform additional compaction or rework and recompact.

    • When moisture content is more than 0.5% above the optimum moisture content, aerate and recompact.

    • When moisture content is more than 2.0% below the optimum moisture content; rework, add moisture, and Recompact.
SECTION 6. CONSTRUCTION

CURING

☑ Emulsion – moisture content is a minimum 2% below the optimum moisture content.
☑ Foamed Asphalt – minimum of 2 hours.
☑ Foamed Asphalt - removed language requiring fog or fog/sand sealing.
Contractor is required to perform process control (quality control) testing during treatment process at locations independent from the Engineer’s testing locations.

Process control test results will not be used for acceptance.

Contractor may perform any additional testing as they deem necessary for process control.

Modify operations when process control test results do not meet specification requirements.

Suspend operations when process control test results performed after modifications do not meet specification requirements.
### CONTRACTOR MINIMUM TESTING FREQUENCY (EMULSION)

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>TEST METHOD</th>
<th>MINIMUM FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth of Pulverization</td>
<td>Tex-140-E</td>
<td>1 per Day of Production</td>
</tr>
<tr>
<td>Gradation</td>
<td>Tex-101-E, Part III</td>
<td></td>
</tr>
<tr>
<td>Emulsion Content</td>
<td>Meter Readings or Truck Weight Tickets</td>
<td></td>
</tr>
<tr>
<td>Moisture Content</td>
<td>Tex-103-E</td>
<td>3 per Day of Production</td>
</tr>
</tbody>
</table>

*Moisture content is measured before adding the emulsion.*
## CONTRACTOR MINIMUM TESTING FREQUENCY (FOAMED ASPHALT)

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>TEST METHOD</th>
<th>MINIMUM FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth of Pulverization</td>
<td>Tex-140-E</td>
<td></td>
</tr>
<tr>
<td>Gradation</td>
<td>Tex-101-E, Part III</td>
<td>1 per Day of Production</td>
</tr>
<tr>
<td>Foamed Asphalt Content</td>
<td>Meter Readings or Truck Weight Tickets</td>
<td></td>
</tr>
<tr>
<td>Foamed Asphalt Treatment Water Content</td>
<td>Meter Readings</td>
<td></td>
</tr>
<tr>
<td>Moisture Content</td>
<td>Tex-103-E</td>
<td>3 per Day of Production</td>
</tr>
</tbody>
</table>

*Moisture content is measured before adding the foamed asphalt.*
No tests and testing frequencies listed in Guide Schedule (June 2018) for FDR using asphalt.

Sampling & testing requirements will be included in SiteManager.

Mixture design & field testing SiteManager templates will be available.

<table>
<thead>
<tr>
<th>Asphalt, Flexible Base, Additive</th>
<th>Quality Monitoring (QM) Program or 1 per project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixture Design</td>
<td>Materials &amp; Tests Division (MTD)</td>
</tr>
<tr>
<td>Mixture Design Verification</td>
<td></td>
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<tr>
<td>Control Section</td>
<td>Witness Contractor Sampling and Testing</td>
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<tr>
<td>Emulsion or Foamed Asphalt Content</td>
<td>Meter Readings or Truck Weight Tickets</td>
</tr>
<tr>
<td>Foamed Asphalt Treatment Water Content</td>
<td>Meter Readings</td>
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<tr>
<td>Gradation</td>
<td>Tex-101-E, Part III</td>
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<tr>
<td>Depth of Pulverization</td>
<td>Tex-140-E</td>
</tr>
<tr>
<td>Density and Moisture Content</td>
<td>Tex-115-E</td>
</tr>
<tr>
<td></td>
<td>1 per 3,000 CY</td>
</tr>
</tbody>
</table>
**SECTION 8 & 9. MEASUREMENT & PAYMENT**

- Three item description codes required for project lettings.

  1. *Emulsion or Foamed Asphalt* - Unit of measure by gallon (by ton is allowed)

  2. *Additive* – Unit of measure by ton

  3. *Treatment* – Unit of measure by square yard

    - Existing Material
    - Mix Existing Material & New Base
    - Specified depth, inches is included.
Support Available from TxDOT

Research Project 0-6880

*Full Depth Reclamation in Maintenance Operations using Emerging Technologies*

Texas A&M Transportation Institute (TTI)

Expand the toolkit for effective FDR treatment.

Analyze use of next-generation FDR technology in maintenance operations.
Research Project 0-6880

Roles & Responsibilities for TTI & TxDOT

<table>
<thead>
<tr>
<th>TTI</th>
<th>TxDOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Provide reclaimer, padfoot &amp; pneumatic rollers, and operator training.</td>
<td>• Provide operators</td>
</tr>
<tr>
<td>• Help facilitate pre-con mtg. and construction startup / process control</td>
<td>• Procure supplies (CSS-1H/PG64-22, cement, new base)</td>
</tr>
<tr>
<td>• Provide support throughout project</td>
<td>• Provide TCP and operate equipment during placement of section</td>
</tr>
<tr>
<td>• Monitor section performance</td>
<td>• Provide water trucks, blade, smooth drum roller</td>
</tr>
<tr>
<td></td>
<td>• Seal section/place surface</td>
</tr>
</tbody>
</table>
Support Available from TxDOT

- **Materials & Tests Division (MTD)**
  - Soils & Aggregates Section

- **Interagency Contract**
  - Contracted with Texas A&M Transportation Institute (TTI).
  - Perform non-destructive testing to identify variability & sampling locations.
  - Perform field testing and sampling of materials.
  - Mixture design recommendations.
  - Pavement design recommendations.
  - Provide pavement rehabilitation options.
  - Project start-up support.
Rapidly Strengthen Pavement
Improve Safety
Save Time
Save Money
Save Natural Resources

QUESTIONS?