Asphalt Guidelines

Monday, December 3, 2018
Outline

Materials

• Liquid Asphalt
• Aggregates
• Asphalt Mixtures
  ◦ Superpave Mix Design
  ◦ Reclaimed Asphalt & Shingles (RAP & RAS)
  ◦ New grading system
• Construction
  ◦ Equipment
  ◦ Laydown
• Newer Technologies
The 3 A’s of Hot Mix Asphalt

Asphalt (binder), Aggregates, and Air

HMA = Asphalt + Aggregates + Air
Differences: Asphalt & Tar

• **Asphalt**
  ◦ Can be naturally occurring
  ◦ Product crude refining
  ◦ Soluble in petroleum
  ◦ Superior for hotmix

• **Tar**
  ◦ Product of coke production from coal
  ◦ Resistant to petroleum
  ◦ Not good for hotmix
  ◦ Better for surface sealing
  ◦ Falling out of favor
Coal Tar-Based Products

- Resistant to fuel spills
- Different expansion rate
  - Shrinkage cracks
  - Fuel attacks thru cracks
- High exposure areas
  - Service stations
  - PCC pump islands
Petroleum Asphalt

Heavy Sour/Light Sweet
Asphalt Binder Properties

Asphalt is a thermoplastic
- Softens as it is heated
- Hardens as it cools

- Rate of Loading
  - More time, more deformation

Semi-Solid

Loading

Liquid

Heat

Time

Graph showing the relationship between heat and time, with liquid, semi-solid, and loading as axes.
• 3 Ways to “Liquefy”
  ◦ Heat
  ◦ Thin w/ solvents (cutbacks)
  ◦ Water-based emulsion
Cutback Asphalt Grades

- **Rapid cure (RC) (Naphtha or Gasoline)**
  - High volatility of solvent
  - Tack coats, surface treatments
- **Medium cure (MC) (Kerosene)**
  - Moderate volatility
  - Stockpile patching mix
- **Slow cure (SC) (Low viscosity oil)**
  - Low volatility
  - Tack coats, prime coat, dust control
Emulsions

- Dispersion of a liquid in another liquid
  - Typically don’t mix
- One of the liquids is usually water
Asphalt Emulsions

Schematic of Batch Emulsion Plant

- asphalt
- 140°C
- emulsion
- 90°C
- batch soap tank
- stabilizer
- acid
- emulsifier
- 50°C
- water
- colloid mill
- Latex
Asphalt Emulsions

• Colloid mill
  ◦ High-speed rotor revolves
    • 1,000–6,000 rpms (17–100 Hz)
  ◦ Clearance about 0.01 to 0.02 inches
    • 0.25 to 0.50 millimeters
Asphalt Emulsion

- Photomicrograph of an Asphalt Emulsion
- Typically droplets are 1-20 micron in diameter
Asphalt Emulsions

Types

• Anionic:
  ◦ Negatively charged asphalt particles

• Cationic:
  ◦ Positively charged asphalt particles

• Never
  ◦ Mix the two types!
  ◦ Store over long periods
Asphalt Emulsions

Anionic emulsions
- Negatively charged
- Bond best with positively charged aggregates
- Limestones, dolomites

Cationic emulsions
- Positively charged
- Bond best with negatively charged aggregates
- Granites, sandstones

For more information, check with your local emulsion supplier
Asphalt droplets suspended in water
- Breaking
  - Contact with surface changes pH; reducing charge
- Curing
  - Evaporation leads to coalescence
  - Original asphalt characteristics return
Asphalt Emulsions

Classification

- How quickly do asphalt droplets coalesce?
- Two letter codes used to simplify + standardize
  - RS – Rapid Setting
  - MS – Medium Setting
  - SS – Slow Setting
  - QS – Quick Setting
- C designates a cationic emulsion
  - CRS, CMS, CSS
Tack Coat Materials

• Emulsified Asphalts
  ◦ Most common options
    • SS-1, SS-1H
    • CSS-1, CSS-1H
    • RS-1, RS-1H, RS-2
    • CRS-1, CRS-2
    • HFMS-2
    • PMAE
    • Reduced Tracking
Uses of Emulsified Asphalts

Tack/Bond Coats
Promote Bonding between Layers
Best Practices

- Surfaces need to be clean and dry
- Uniform application
- Tack all surfaces
  - Horizontal
  - Vertical
Slippage Cracks
MS-19 Basic Asphalt Emulsion Manual

www.asphaltinstitute.org
Superpave

Strategic Highway Research Program (SHRP)

• Superpave, which stands for
  ◦ **Superior**
  ◦ **Performing Asphalt**
  ◦ **Pavements**

• Performance-based specification
  ◦ Tougher aggregate requirements
  ◦ **Asphalt grades are called**
    ◦ Performance Graded (PG) Binders
PG Binders

PG 64-22

147.2 F  -7.6 F

“Performance Grade”

Average 7-day max pavement temperature

Minimum pavement temperature
PG Binder Grades

The Rule of 92

PG 70-28

PG 70-28 Probably Modified

PG 64-22

PG 64-22 Probably Unmodified

TEMPERATURE °C
DOT Specifications
• Example
  ◦ Mainline pavement
    PG 64-22
  ◦ Toll booth
    PG 70-22
  ◦ Weigh Stations
    PG 76-22

70 mph

Slow

Stopping
Aggregate Types

- Natural
- Processed
- Synthetic
- Round (uncrushed)
- Single Crushed Face
- Multiple Crushed Faces
Soundness

Before

After
<table>
<thead>
<tr>
<th>Diameter (in)</th>
<th>Millimeter Value</th>
<th>Sieve Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>50 mm</td>
<td>#8</td>
</tr>
<tr>
<td>1 1/2</td>
<td>37.5 mm</td>
<td>#16</td>
</tr>
<tr>
<td>1</td>
<td>25 mm</td>
<td>#30</td>
</tr>
<tr>
<td>3/4</td>
<td>19 mm</td>
<td>#50</td>
</tr>
<tr>
<td>1/2</td>
<td>12.5 mm</td>
<td>#100</td>
</tr>
<tr>
<td>3/8</td>
<td>9.5 mm</td>
<td>#200</td>
</tr>
<tr>
<td>#4</td>
<td>75 mm</td>
<td></td>
</tr>
</tbody>
</table>
Aggregate Size Definitions

• **Nominal Maximum Aggregate Size**
  ◦ One size larger
    • Than first sieve to retain more than 10%

• **Maximum Aggregate Size**
  ◦ One size larger than nominal maximum size
# Superpave Size Designations

**Superpave Max Size, Designation mm**

<table>
<thead>
<tr>
<th>Superpave Designation</th>
<th>Max Size, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.5 mm</td>
<td>50.0</td>
</tr>
<tr>
<td>25.0 mm</td>
<td>37.5</td>
</tr>
<tr>
<td>19.0 mm</td>
<td>25.0</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>19.0</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>12.5</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>9.5</td>
</tr>
</tbody>
</table>

*If plant tells you: Remember:*
Mat Defects

- Mat thickness
  - 3x max aggregate
  - 4x larger stone mixes
- Fracture aggregate
- Open Texture
- Water intrusion
Section 5.0 Intermediate Pavement Course

- A leveling course of a hot plant mix having a maximum aggregate size of 3/8" to 3/4" in accordance with specifications of the state's Department of Transportation
- And/or the Asphalt Institute
- Should be constructed over the base course to a compacted thickness of not less than 1 1/2"

<table>
<thead>
<tr>
<th>Maximum</th>
<th>Superpave</th>
<th>3x</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8 max</td>
<td>4.75 mm</td>
<td>(3/8 x 3 = 1 1/8 inch)</td>
</tr>
<tr>
<td>1/2 max</td>
<td>9.5 mm</td>
<td>(1/2 x 3 = 1 1/2 inch)</td>
</tr>
<tr>
<td>3/4 max</td>
<td>12.5 mm</td>
<td>(3/4 x 3 = 2 1/4 inch)</td>
</tr>
</tbody>
</table>
Section 6.0 Asphalt Surface Course

- A surface course of a hot plant mix having a maximum aggregate size of 3/8" and a minimum aggregate size of 1/4"
- Should be constructed over the hotmix intermediate course to a compacted thickness of not less than 1 inch

Maximum Superpave 3x
- 3/8 max = 4.75 mm (3/8 x 3 = 1 1/8 inch)
Reclaimed Asphalt Pavements
Field performance has shown

- **Below 3% air voids**
  - Susceptible to rutting & shoving
- **Over 5% air voids**
  - Susceptible to raveling, oxidation
- **4% air voids typically allows for optimal design**
  - Not too open
  - Little extra compaction under traffic
Air Voids \leq 7 \text{ or } 8\% 

Mix generally not permeable
Asphalt Mix Compaction

Air Voids > 10%

Mix generally permeable
Hot Mix Asphalt Compaction

Reference Density Chart

For 4% Air Void Mix Design

% of Lab Density (Gmb) | % of Maximum Density (Gmm) | In-Place Air Voids
100 | 100 | 0
99 | 99 | 1
98 | 98 | 2
97 | 97 | 3
96 | 96 | 4
95 | 95 | 5
94 | 94 | 6
93 | 93 | 7
92 | 92 | 8
91 | 91 | 9

% of Control Strip Density

100
99
99
98
97
96
96
92
92
91
91
WMA Technologies

• Several ways to classify WMA technologies
  • One is by temperature reduction
    ◦ Hot Mix Asphalt > 275 °F (135 °C)
    ◦ Warm Mix Asphalt > 212 °F (100 °C)
    ◦ Half-Warm asphalt mixtures < 212°F (100 °C)
Plant modifications for foaming

- Maxam AQUABlack
- Terex Warm Mix Asphalt
- Gencor Green Machine
- Astec Green
- StanSteel Accu-Shear
- Meeker
Chemical Process

Additive

Volumetric Pump

Asphalt Line

Injection Point
Warm Mix Asphalt
Warm Mix Asphalt

Placement and Compaction
• “Business as usual”

Primarily use:
• Longer Season
• Early opening to traffic
• Longer hauls
• Wet weather paving
• Multi-lift construction
• Crack filler reflecting
• Workability
Warm Mix Asphalt

HMA@ 320°F

WMA@ 250°F
Warm Mix Asphalt

Pavement stays blacker, longer
PG Grading

Not Always Predict Performance

• Study of the two mixes with the same aggregate structure, but different binders.

PG 63-22 Modified
No Rutting

PG 67-22 Unmodified
15mm Ruts
**MSCR Overview**

- Multiple Stress Creep Recovery Test (MSCR)
  - A performance-related binder spec
  - Blind to modification type
  - Can predict polymer-modified binders’
    - Potential rutting performance
    - To actual in-service pavements
- Allows a more economic use of polymers
  - To improve performance
  - Adding un-reacted Polymers to just stiffen
New PG Grading System

- AASHTO M 332

- Environmental grade plus traffic level designation;
- For example: PG 64S-22
- Four traffic levels based on million ESALs
  - S = Standard: < 10 M ESALs with Standard loading
  - H = Heavy: 10-30 M ESALs or Slow moving traffic
  - V = Very Heavy: > 30 M ESALs or Standing traffic
  - E = Extra Heavy: > 30 M ESALs and Standing traffic
Note: AI phasing out MSCR Database and moving data to Binder Specification Database
Description:

The Asphalt Institute and PRI Asphalt Technologies have collaborated to develop this binder specification database. Available below (as downloadable pdf files) are individual documents for each of the 50 State highway agencies which summarize their respective asphalt binder specifications. A standardized format is used to list the PG requirements as well as PG-Plus requirements for grades listed in that State’s specifications. Notes are included for additional details. Other information includes the State website where the specifications can be found, the State contact person, specification exclusions, descriptions, etc.

Updating:

AI will periodically contact the Binder or Materials Engineer listed on the document to review the information for accuracy. Date of this last review is included. Corrections or comments may be e-mailed to us by using the link below. Changes will only be made after confirmation by the individual listed for that State.

Disclaimer:

While care has been taken to provide the most accurate and current information, users are warned that there may be errors that exist in the documents. We are working to fix these errors. Users should make sure to verify the accuracy of the specifications prior to use.
Binder State Specification Database
### Asphalt Binder

<table>
<thead>
<tr>
<th>Section 916-1.1</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Superpave PG asphalt binders, identified as PG 52-28, 58-22, 67-22, 76-22 (PMA), 76-22 (ARB), 82-22 (PMA), shall meet the requirements of 916-2. Where PG binder is used in mixes containing reclaimed asphalt pavement (RAP), the requirements of 334-2.3.1 and 334-2.3.5 must also be met. For all PG binder used in all hot mix asphalt, silicone may be added to the PG binder at the rate of 25 cm³ of silicone mixed to each 5,000 gal. of PG binder. The blending of the silicone with the PG binder shall be done by the supplier prior to the shipment. Unless FM 1-T 283 test results suggest otherwise, all PG binder for Friction Course mixes and for other HMA products containing RAP shall contain 0.5% heat stable liquid anti-strip additive by weight of PG binder, added by the supplier during loading.&quot;</td>
<td></td>
</tr>
</tbody>
</table>

| PMA’s | |
| All asphalt binders having a high temperature designation of PG 67 or lower shall be prepared without modification. All PG asphalt binders having a high temperature designation higher than PG 67 shall be produced with an SBS or SBS polymer (PMA) or ground tire rubber meeting the requirement of Section 919 (ARB). For modified binders, the base grade, the type of modifier and amount added shall be indicated when applying for inclusion on the Approved Products List. |

<table>
<thead>
<tr>
<th>Section 916-1.3</th>
<th>QC Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier shall have a QC program meeting requirements of 916-2.2.</td>
<td></td>
</tr>
</tbody>
</table>
# Grade/Specs in Table Format

## Table 1: PG Requirements for Performance-Graded Asphalt Binders

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Requirements by Performance Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>52-28</td>
</tr>
<tr>
<td><strong>ORIGINAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flash Point, °F</td>
<td>T 48</td>
<td>450 min.</td>
</tr>
<tr>
<td>Rotational Viscosity, Pa·s (1)</td>
<td>T 316</td>
<td>3.0 max.</td>
</tr>
<tr>
<td>Dynamic Shear, kPa (G*/sin δ, 10 rad./sec) (2)</td>
<td>T 315</td>
<td>1.00 min.</td>
</tr>
<tr>
<td>Phase Angle, °</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RTFO RESIDUE</strong></td>
<td>T 240</td>
<td>1.00 max.</td>
</tr>
<tr>
<td>Mass Change, %</td>
<td>T 240</td>
<td>1.00 max.</td>
</tr>
<tr>
<td>MSCR, J₉₃₂₋₂ (kPa⁻¹) (1) At Grade Temperature</td>
<td>M 332 / T 350</td>
<td>“S”</td>
</tr>
<tr>
<td>MSCR, J₉₃₂₋₂ (kPa⁻¹) (2)</td>
<td></td>
<td>4.5 max.</td>
</tr>
<tr>
<td>MSCR, J₉₃₂₋₂ (kPa⁻¹) (2)</td>
<td></td>
<td>1.0 max.</td>
</tr>
<tr>
<td>MSCR, %R₃₂ (2)</td>
<td>M 332 / T 350</td>
<td>75 max.</td>
</tr>
<tr>
<td>MSCR, %R₃₂ (2)</td>
<td></td>
<td>75 max.</td>
</tr>
<tr>
<td>MSCR, %R₃₂ (2)</td>
<td></td>
<td>75 max.</td>
</tr>
<tr>
<td>MSCR, %R₃₂ (2)</td>
<td></td>
<td>%R₃₂ ≥ 29.37 (J₉₃₂)⁰.₂⁶₃³</td>
</tr>
</tbody>
</table>

*Table 1 Continues on Page 2*
## Example Virginia

<table>
<thead>
<tr>
<th>State: Virginia</th>
<th>Materials: Re: Section 210 – Asphalt Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Last Reviewed: 11/7/18</td>
<td>Web Address: <a href="http://www.dot.state.va.us">www.dot.state.va.us</a></td>
</tr>
<tr>
<td>Contact: Andy Babish (State Materials Engineer)</td>
<td>Contact Info: <a href="mailto:Andy.Babish@vdot.virginia.gov">Andy.Babish@vdot.virginia.gov</a></td>
</tr>
</tbody>
</table>

### Asphalt Binder

<table>
<thead>
<tr>
<th>Section 210</th>
<th>Description</th>
<th>PMA’s</th>
<th>Exclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Asphalt materials shall conform to the requirements of Section 210 except asphalt cement materials shall be Performance Graded conforming to the requirements of AASHTO M332.</td>
<td>None stated.</td>
<td>No restrictions on the use of REOB/VTAE.</td>
</tr>
</tbody>
</table>

### Virginia

#### Table 1: PG Requirements for Performance-Graded Asphalt Binders

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method: AASHTO (T)</th>
<th>Requirements by Performance Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ASTM</td>
<td>64S-22</td>
</tr>
<tr>
<td>Original</td>
<td>Flash Point, °C</td>
<td>T48</td>
</tr>
<tr>
<td></td>
<td>Rotational Viscosity, Pa-s</td>
<td>135°C</td>
</tr>
</tbody>
</table>
Asphalt Binder

Use the Performance-Graded Binder (PG) in the production of these mixtures that meet the AASHTO M 320 Standard Specification for Performance-Graded Asphalt Binder. The temperature of PG Binder delivered to the HMA Production Facility will not exceed 175°C, unless the PG Binder supplier recommends it.

- PMA’s: 58E-34, 64V-22, 64E-22
- Exclusions: PPA, Motor Oil

New York

Table 1: PG Requirements for Performance-Graded Asphalt Binders

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method: AASTHO (T), ASTM (D) or other</th>
<th>Requirements by Performance Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>58E-34</td>
<td>64S-22</td>
</tr>
<tr>
<td>Flash Point, °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotational Viscosity, Pa*s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamic Shear, kPa (G*/sin δ. 10)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### State: New York

**Date Last Reviewed:** 12/28/16  
**Materials Engineer:** Zoeb Zavery

### Materials: Re: Section 401-2.04 - Bituminous Materials  
**Web Address:** www.dot.state.ny.us  
**Contact Info:** zzavery@dot.state.ny.us

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#### Asphalt Binder

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<table>
<thead>
<tr>
<th>Section 401-2.04</th>
<th>Description</th>
<th>58E-34</th>
<th>64S-22</th>
<th>64H-22</th>
<th>64V-22</th>
<th>64E-22</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMA’s</td>
<td>58E-34, 64V-22, 64E-22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exclusions</td>
<td>PPA, Motor Oil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

#### New York

**Table 1: PG Requirements for Performance-Graded Asphalt Binders**

<table>
<thead>
<tr>
<th>Property</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>58E-34</td>
</tr>
<tr>
<td>Original</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flash Point, °C</td>
<td>T48</td>
<td></td>
</tr>
<tr>
<td>Rotational Viscosity, Pa·s</td>
<td>135° C</td>
<td></td>
</tr>
<tr>
<td>Dynamic Shear, kPa (G*/sin δ)</td>
<td>At Grade</td>
<td>T315</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Requirements by Performance Grade</th>
<th>58E-34</th>
<th>64S-22</th>
<th>64H-22</th>
<th>64V-22</th>
<th>64E-22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash Point, °C</td>
<td>230</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotational Viscosity, Pa·s</td>
<td></td>
<td>3.0 max.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamic Shear, kPa (G*/sin δ)</td>
<td></td>
<td></td>
<td>1.00 min.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Outline

Materials
• Liquid Asphalt
• Aggregates
• Asphalt Mixtures
  — Superpave Mix Design
  — Reclaimed Asphalt & Shingles (RAP & RAS)
  — New grading system
• Construction
  — Equipment
  — Laydown
• New Technologies
Equipment - Paver Types

**Wheeled Pavers**
- Easy to operate
- Cheaper to maintain

**Tracked Pavers**
- Best for soft surfaces
- More stability
Understanding the Paver

Basic Functions
- Material feed
- Self-leveling
Understanding the Paver

Tractor Self-Leveling

• Screed can rise & fall
  ◦ Free Floating
• Constant line of pull when set up properly
• Smooth surface over irregular grade
Understanding the Paver

Material Feed System

Augers

Sensors

Slat feeders

Receiving Hopper

Gravity feed
Understanding the Paver

Flow of Material

• Hopper
• Through tunnel
• In front of screed
• Augers move mix transversely
Understanding the Paver

Material Handling
- Break Load
- Move in mass
- Avoid “tailgating”
  - Segregates
Visual Inspection of material

Problem Indicators

- Blue smoke
- Stiff (high peak)
- Slumped
- Dry, dull appearance

- Moisture (steam or condensate)
- Segregation
- Contamination
  - Solid
  - fuel or solvents
Understanding the Paver

Loading Hopper

• Avoid spillage
• Driver’s apply light brake pressure
• Removed prior to advancing
• Worker safety!
Understanding the Paver

Exposing Conveyor
• Segregation
• Cold material
Understanding the Paver

Basic Principle Has Not Changed
Understanding the Paver

Free-Floating Screed

- *Position* determines mat thickness
- *Screed position* is constant as long
  - *All factors* remain constant
Factors Affecting the Screed
- Head of material
- Paving speed
- Screed adjustments
- Mix design
- Temperatures
  - Mix
  - Air
  - Grade
Understanding the Paver

Head of Material
• Uniform flow
• Uniform force against face of screed
• Too much material, screed will rise up

• Correct amount of material, screed remains level

• Too little material, screed will dip down
Understanding the Paver

Correct Elevation

Auger Overloaded

Auger Underloaded
Understanding the Paver

Correct Amount of Material
• Auger extensions
• Bulkhead extensions
Understanding the Paver

Paving Speed
- Constant
- Feeders match
  - Paving speed
  - Speed changes
Understanding the Paver

Constant Speed
• Shear force is constant
• Depth remains constant
Understanding the Paver

Increased Speed
- Shear force decrease
- Depth decreases
Decreased Speed
• Shear force increases
• Depth increases
Understanding the Paver

- Mix design
- Temperatures
  - Mix
  - Air
  - Grade

Temperature [Air/Grade/Mix]
Paving Speed
Head of Material

Material Design
Understanding the Paver

Mixtures Changes
- Compaction varies
- Adjust thickness to match desired mat thickness
Understanding the Paver

Screed Adjustments

Tow Point
- Fixed on Tractor Unit
- Screed pivots
Understanding the Paver

Tow Arm
Understanding the Paver
Understanding the Paver

Angle of attack
• Changes amount of material flow under screed
Understanding the Paver

Angle of Attack
• Screed nose & grade
• Nose up attitude
• Screed reaches equilibrium
Understanding the Paver

Increase Angle of Attack
• More material passes under screed
• Screed rises to new level
Understanding the Paver

Increased Angle of Attack:
• Screed climbs
• Forces balanced
• Achieves equilibrium
• Returns to original angle
Understanding the Paver

Reaction to Angle of Attack Changes

– 65% of change
– 35% of change in the last 4 lengths

Takes over 5 tow arm lengths

• 8 foot tow arm vs 78 ft court length
• One change = ½ court length
Understanding the Paver

Main Screed Crown

- Main screed “broken”
- Positive or negative

Excessive Crown
Understanding the Paver

Crown Correct
- Zero out all crown
- Even texture full width
- 1/4 to 3/8 turn lead crown

Uniform Texture
Understanding the Paver

*Lead Crown Low*
- Open texture in center
- Tight on sides
- Add 3 mm (1/8"") crown
Lead Crown High

- Tight, shiny strip in center
- Open texture on sides
- Reduce lead crown
Joint Construction

• Center tow point
• Set width
• Set crown
• Set extender slope & height
• Use boards that allow for compaction rate
Joint Construction

- Null screed
Joint Construction

• Introduce angle
  
• ( Deer + Deer )
Joint Construction

- Fill auger chamber half full
- Auger manually
- Shovel if needed
Transverse Joints - Starting a Lane
Understanding the Paver

Straight lines
- Offsets
- Edge/center line
- Stringline
- Position of Guides
Mat Defects

Longitudinal Joints;
• Avoid overlap
Mat Defects

Cutting Back the Joint
- Eliminates low density area
- When HMA still warm
- Straight is critical

B. Prowell photos
Mat Defects
Mat Defects

Grade Conditions

• Leveling courses

Correct

Incorrect
Mat Defects

Surface Patching

• Partial depth
• Infrared heater
• Heat existing pavement
• Add material
• “Weld” to surrounding material
• Straight edge
• Compact
• Do not overheat
Mat Defects

Segregation

- Course mix is susceptible
- Cold spots in truck or hopper
- Aggregate stockpile
Truck-end segregation

- Uniformly spaced
- Segregation in the truck transfers the paver
Mat Defects

Screed Alignment
• Main Screed
• Gates
• Full Extensions.
Porous Pavement
Porous Pavement
Porous Pavement
Questions?

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