Construction of Quality Hot Mix Asphalt Pavements

59th Annual Asphalt Paving Conference

“Best Practices for Pavement Construction”

Outline

Placement Best Practices

- Surface Prep
- Project planning
- Understanding the paver
- Factors affecting the screed
- Screed Adjustments
- Paving process

Proof Rolling

- Tire pressure
  - 90% of maximum
- 6600 lb. per tire
- Roll full width
- Two complete passes
- Soft, yielding, unstable:
  - Remove
  - Replace with approved material
- Test roll corrected area

Surface Preparation

Pavement performance is strongly related to the condition of the surface on which it is constructed
Preparing to Overlay Existing HMA

Or it may involve one or more of the following:
- Patching
- Cleaning and filling cracks
- Placing a leveling course
- Milling the surface

Failed areas MUST be cleaned, repaired and brought into good structural condition before overlaying.

Patching

- Mark at least 1 foot into the sound pavement
- Cut with vertical faces
- Remove all loose material
- Tack base and vertical faces
- Patches must be strong enough to become part of the permanent structure

Patching

Irregular patch - getting proper compaction is going to be difficult on this one.

Straight lines, no distress visible outside the patched area.

Cleaning the Surface

Thoroughly clean the surface
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**Tack Coat**

**GOOD**
- Even uniform coverage
- No puddles
- No stripes

**BAD**
- Uneven coverage
- Clogged nozzles / improper orientation
- Stripes are clearly visible

**Project Planning**

**Wheeled Pavers**
- Maneuverable, cheaper to maintain

**Tracked Pavers**
- Best for soft surfaces & better traction

**Project Planning**

**Balance:**
- **Project Tonnage**
- **Hot plant output**
- **Length of haul**
- **Traffic conditions**
- **Number of trucks**

**Consistency = Quality**

**Project Planning**

**Types of Longitudinal Joints**

- Butt Joint (paver construction)
- Butt Joint (milled or cutback)
- Notched Wedge Joint
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Poor planning – joint in wheelpath

Danny Gierhart photo

First Pass Must Be Straight!
• String-lines
• Other reference

Understanding the Paver

Tractor Self-Leveling
Power Unit
Screed can rise & fall
• Free Floating
Constant line of pull when set up properly
Smooth’s irregular grade

Understanding the Paver

Material Feed System
Augers
Receiving Hopper
Sensors
Slat feeders
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Visual Inspection of HMA

<table>
<thead>
<tr>
<th>Problem Indicators</th>
<th>Blue smoke</th>
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<tbody>
<tr>
<td></td>
<td>Stiff (high peak)</td>
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<tr>
<td></td>
<td>Slumped</td>
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<tr>
<td></td>
<td>Dry, dull appearance</td>
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<tr>
<td></td>
<td>Moisture</td>
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<tr>
<td></td>
<td>• Steam</td>
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<tr>
<td></td>
<td>• Condensate</td>
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<tr>
<td></td>
<td>Segregation</td>
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<tr>
<td></td>
<td>Contamination</td>
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<tr>
<td></td>
<td>• Solid</td>
</tr>
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<td></td>
<td>• Fuel or solvents</td>
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Loading the Hopper

- Avoid spilling in front of the paver
- Truck applies light brake pressure
- Remove prior to advancing
- Adhere to worker safety!

Slat Conveyors and Flow Gates

Newer pavers do not have flow gates; slat conveyors speed controls matl flow

The Hopper
Hopper Management

Conveyor area is exposed and augers are starved!

Basic Principle Has Not Changed

Understanding the Paver

Keep in good condition
Scheduled inspection
Maintenance guidelines
Safety Guidelines
• Lockout/Tag out
• Locking Pins
• Wheel Chokes

Understanding the Paver

Free-Floating Screed Position determines mat thickness
Screed position
• Will remain constant
• If all factors remain constant
Factors Affecting the Screed

- Head of material
- Paving speed
- Screed adjustments
- Mix design
- Temperatures
  - Mix
  - Air
  - Grade

Factors Affecting Screed

- Too much material, screed forced to rise
- Correct amount of material, screed remains level
- Too little material, screed will dip down

Factors Affecting Screed

- Uniform Head of Material
- Across Width of Auger

Factors Affecting Screed

- Flow Gates Set Properly
  - Material
    - Uniform Amount
    - Shafts half covered

- Feeder Ratio Set Properly
  - Same principle as flow
Factors Affecting Screed

Auger Speed
Auger speed uniform
20-40 rpm
Too high or too low
• Cause mat streaks

Feed Sensors
• Controls head of material
• Speed of conveyor & auger
• Situated at end of auger
• Contact or non-contact
• Paddle or mercury switch
• Infrared or ultrasonic sensors

Factors Affecting Screed

Auger Confinement Tunnels
• Controls material flow to end of the Screed

No Auger Extensions or Confinement

Auger Extensions & Confinement

Factors Affecting the Screed

Head of material
Paving speed
Screed adjustments
Mix design
Temperatures
• Mix
• Air
• Grade

Understanding the Paver
Factors Affecting Screed

Constant Speed
Shear factor is constant
Depth remains constant

Increased Speed
Shear force decrease
Depth decreases

Factors Affecting Screed

Decreased Speed
Shear force increases
Depth increases
Depth change varies with speed change
Type of Mix affects shear force

Factors Affecting the Screed

Head of material
Paving speed
Screed adjustments
Mix design
Temperatures
- Mix
- Air
- Grade

Understanding the Paver
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Screed Adjustments
- Tow Point
- Fixed on Tractor Unit
- Line of pull
- Screed pivots
- Height tow point
- Changes Angle of Attack

Developing the Line of Pull
- 1/8 inch change
- 1 inch change

Screed Adjustments
- Pivots on both ends of tow arm
- Angle of Attack

Changing the Angle of Attack
- Depth Crank Increases or Decreases Attack Angle
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**Screed Adjustments**

Starting Angle of Attack
Screed nose & grade
Nose up attitude
Screed in equilibrium
Free Floating

Increase Angle of Attack
More matl under screed
Screed rises to new level

Increased Angle of Attack:
Screed climbs
Till forces balance
Achieves equilibrium
Returns to original angle

Reaction to Angle of Attack Changes

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

Takes over 5 tow arm lengths

- Longer tow arm equals a longer distance
  - Improves rideability
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**Controlling Yield**

Depth Check
- One check, No correction
- Make series of checks
- Average readings
- Correct based on average
- Improves
  - Smoothness
  - Yield

**Understanding the Paver**

Factors Affecting Screed
- Head of material
  - Paving speed
  - Screed adjustments

Mix design
- Course vs fine

Temperatures
- Mix
- Air
- Grade

**Joint Construction**

Good joints
- Are no mystery
- Training & practice
- Attention to details
- L/J

**Transverse Joints - Starting a Lane**

- Pick starting point
- Hand placed a starter mat
- Previous day’s mat
  - Full depth of existing
  - Saw cut & remove
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**Transverse Joints**

- At start-up
- All vertical edges
  - Clean
  - Tack

**Transverse Joints**

- Null screed
  - Zero out angle of Attack
- Boards allow for rolldown thickness

**Transverse Joints**

- Introduce angle of attack
- Crank until resistance is felt

**Transverse Joints**

- Fill auger half full
- Conveyor manually
- Auger manually
- Shovel if needed
Transverse Joints

- Roll transverse
- Roll static
- Start on cold side
- Move over in 6” - 8” until on hot side

Transverse Joints

Traffic Safety is always an issue

Vibratory Screed Should Always Be On
Joint Matchers

Proper Overlap:
• 1.0 ± 0.5 inches
• Exception: Milled or sawed joint should be 0.5 inches

Contact Grade Sensor
Ultrasonic Grade Sensor
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Asphalt Paver & Placement

Questions?