Everything You Always Wanted to Know About Paving with HP (But Were Afraid to Ask)

Available Languages—English, Metric
Highly Modified Asphalt - HiMA

- What Is It?
- What Are the Market Applications?
- As a Contractor, What Do I Need to Know?
What Is Highly Modified Asphalt?

Highly Modified Asphalt is exactly what it says, asphalt with more than double the normal amount of SBS polymer.

This gives a much denser polymer network with up to 10X rutting and fatigue cracking resistance.

Current FDOT spec is PG 76E-22 with $J_{nr3.2} \leq 0.1 \text{ kPa}^{-1}$ and $R_{3.2\%} \geq 90$.

Over 5,000,000 tons in over 70 projects around the world have demonstrated superior performance at reduced thickness.
HP Market Applications - Where Does It Add Value?

Structural Applications
   With a sound base, thinner pavements with lower upfront cost
   Demonstrated at NCAT and in many field applications
   With weak base, much longer lifetime can be achieved

Thin Overlays
   Superior resistance to reflective cracking BUT requires finer, richer mix.

Micro Surfacing

Open Grade Mixes for Reduced Raveling

SAMI Layers

High Stress Applications - ramps, intersections

AASHTOWare® Pavement ME Design works for HiMA designs
We largely defer to...
An Introduction to Modified Asphalt Binders

Presented by:

Short Course 2015
Handling Modified Binders (Contractor’s View)

Presented By: Bob Kluttz

Prepared for the Association of Modified Asphalt Producers Training Program
Outline

• Handling of Modified Asphalts
  ▪ Handling of Asphalt Binder at the Terminal
  ▪ Handling of Asphalt Binder at the Hot Mix Asphalt Plant
  ▪ Recommended Plant Operations
  ▪ Laydown of Modified Asphalt Mix
  ▪ Contractor Liquid Asphalt QC Plan
Handling Modified Asphalts
Handling Modified Asphalts

• Between 5-20% of all asphalts are currently modified
• Most modified binders are in the PG 64-28 to 76-22 range
• Be safe and follow manufacturer’s recommendations
Handling Modified Asphalts

- Mixing PMA with other asphalts can cause the asphalt to fail to meet the PG grade requirements
- Reduce contamination at the terminal
  - Tanker truck empty before loading at terminal
  - Load from correct loading arm at terminal
Handling PMA at the Plant

• Reduce contamination at the HMA plant
  ▪ Pump into correct tank at HMA plant
  ▪ Use dedicated tanks, if possible
  ▪ If dedicated tank is not available
    • Empty tank as much as possible if previous material was different
    • Add 2 or 3 full loads of PMA before testing and/or using the material in the tank

• Diluted PMA may fail PG grade!!!
Handling PMA at the Plant

- Vertical tanks
  - Vertical tanks provide more efficient agitation
  - Very few PMAs requires agitation to prevent separation
  - Agitation is recommended for GTR modified asphalt
  - Check with supplier

- Check and maintain proper temperatures
Handling PMA at the Plant

• Horizontal Tanks
  – Horizontal tanks work fine for most PMAs
  – Circulate to achieve uniform temperatures above and below heating coils
Proper Circulation in Horizontal Tanks

- Suction and return lines at opposite ends of tank to completely circulate material
- Return line near bottom of tank to prevent oxidation
Handling PMA at the Plant

- BEWARE OF MIXING MODIFIED ASPHALTS FROM DIFFERENT SUPPLIERS!!
  - Different suppliers may use different polymer technologies
  - Differing technologies may not be compatible
  - Polymer separation may occur
Handling PMA at the Plant

- **BEWARE OF USING DIRECT-FIRE HEATERS WITH MODIFIED ASPHALTS!!!**
  - Direct-fire heat tubes may develop hot spots
  - Hot spots will immediately destroy the polymer network in the asphalt
What’s Different with HP?

Modified Asphalt Storage

Not much.
Follow all the same general guidelines.
Ideal storage temperature ~320 °F.
Do not overheat!
Cool down if holding for days.
EC-101 Recommendations

Grade
Mix Temperature
Min EC101
Max EC101
Midpoint EC101
Poly. (Midpoint EC101)
## General Guidelines for Storage and Mixing Temperatures

<table>
<thead>
<tr>
<th>PG Binder</th>
<th>Storage Temperature (°F)</th>
<th>Mixing Temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>64-22</td>
<td>285-315</td>
<td>265-320</td>
</tr>
<tr>
<td>70-22</td>
<td>300-325</td>
<td>280-330</td>
</tr>
<tr>
<td>76-22</td>
<td>315-340</td>
<td>285-335</td>
</tr>
<tr>
<td>Extended Storage</td>
<td>&lt;275 °F</td>
<td></td>
</tr>
</tbody>
</table>

Source: EC-101
HMA Plant Asphalt Pump

- Adequately sized AC pump
  - PMA will cause higher amperage draw
- AC pump in good condition
- Calibrated
- Strainer
  - Larger than standard holes – ¼”
  - Clean
HMA Plant Asphalt Pump Operation

- Circulate unmodified asphalt first before start-up
- Switch to PMA and circulate before start-up
- Switch to unmodified asphalt and circulate through pump after shutdown at end of shift
- Unmodified asphalt in AC pump, meter and strainer until next shift
HMA Plant Slat Conveyor

- Properly sized
- Good condition
- PMA will increase amperage draw on conveyor
  - Start at reduced tonnage rate
  - Start on unmodified mix to heat conveyor
What’s Different with HP?

Modified Asphalt Mixing

Again, not much.

Ideal mixing temperature is mix dependent, but 325-330 °F is generally good.

Start up a little hotter to heat up conveyor, silos and trucks.
Modified HMA Storage

• **DO NOT STORE OVERNIGHT!!!**
Transporting Modified HMA to Paver

- Clean, smooth truck beds
- Release agent
  - Type
  - Amount
  - Powdered Tide detergent
- Tarps
What’s Different with HP?

Modified Asphalt Silo Storage and Hauling

Nothing.

All the same best practices for general polymer modified asphalts apply to HiMA.
Placing Modified HMA

- No modifications to equipment
- Handwork is more difficult
- Attention to detail
- Weather Conditions – 50 °F minimum
Compacting Modified HMA

- Compaction Equipment
  - Number - 3 or 4
  - Type – high frequency
  - Size

- Mix temperature
  - Only high enough to allow proper compaction
  - Extra 10 °F doubles fumes
  - High temperatures can damage PMA

- Roller pattern
  - Front roller close to paver

- Field monitoring
  - Temp
  - Density
Compacting Modified HMA

- Compacting mixes with PMA may actually be easier than un-modified asphalt mixes
  - Compaction requires confinement
  - PMA may eliminate tender zone
What’s Different with HP?

Modified Asphalt Placing & Compacting

Again, not much.

Aim for temperature behind screed to be about 300 °F.

Keep breakdown roller close to the paver.

Only significant caveat - HiMA mixes will stiffen faster than conventional PMA so do not let it cool too much.

This especially applies to clean up!
Best Practices Per ACAF

- Laydown of HP binders doesn’t pose a significant problem as reported thus far, but keep in mind good construction practices:
  - Follow best practices to prevent end of load segregation. HP binders will magnify poor practices!
  - Balance your production rates (plant = trucking = paver = rollers). Keep the mix moving and avoid long stops.
  - Be ready when the trucks arrive on project. Temperature is critical for this mix.
  - Keep compactors tight with paver and adjust rolling pattern as needed to maintain your target density.

- Plant Storage of HP binders is different and requires attention:

Jim Warren, Executive Director, ACAF

HP Storage Per ACAF

- Limited shelf life
- Scheduling & frequent communication with binder supplier
- Do not store indefinitely
- Follow supplier specific handling instructions (storage temperature, storage time, circulation, etc.)
- Best practices will vary with supplier

Jim Warren, Executive Director, ACAF

Some additional recommendations:

- Do not overheat. High temperature accelerates viscosity rise.
- Monitor viscosity daily.
- Warm mix is good.
- Definitely circulate, a sidearm mixer may not be adequate.
- Leftover or high vis product - dilution to PG 76-22 is definitely viable.
- Do not overheat.
Summary

- PMA improves the performance of HMA pavements
- Understand the product you are using and treat it with respect
  - Follow supplier’s recommendations
  - Best Practices
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