July 2019

ASPHALT PAVING
FIELD INSPECTION TRAINING

Purpose and Learning Objectives

- Provide guidance and instruction to inspectors involved in the construction of hot mix asphalt (HMA) pavements
- Help inspectors learn the various aspects of what is involved in an HMA paving operation
- Become familiar with HMA pavement grade inspection duties
- Assist inspectors in recognizing problems during a project and offering solutions
Agenda

- Mix Properties
- Equipment
- Role of the Inspector
- Mix Delivery, Placement, and Compaction
- Problems and Solutions

Disclaimer

- Remember, this training is not to be all inclusive of your duties as an Inspector, but rather it is only the START of things to know, items to track and ideas on which to expand to become a better Inspector!
- The two most important items for an inspector after safety are documentation and photos!!
Hot Mix Asphalt (HMA)

What is hot mix asphalt?
- Asphalt binder, aggregate, and air blended together in precise proportions to produce a mix with the desired qualities.
- There are many different types of asphalt binder and aggregates, so it is possible to combine them to make different hot mix asphalt pavements.

Why use hot mix asphalt?
- Existing pavement surfaces can be upgraded relatively quickly with the least inconvenience to the traveling public.
- Maintenance repairs and surface corrections can be made quicker and cheaper than PCC pavements.
- Flexible pavement is not likely to suffer damage related to gradual settlements and movements.
- Other benefits include increased smoothness and higher contrast with pavement markings versus PCC pavements.

Mix Properties
- Stability - Stability of a hot mix asphalt pavement is the ability to resist shoving and rutting under traffic. The primary sources of pavement instability are excess asphalt binder in the mix, excess medium sized sand in the mix, or rounded aggregate with little or no crushed surfaces.
- Density - The density of the compacted mix is its unit weight, or the weight of a specific volume of mix. For compacted HMA, this is approximately 145 pounds per cubic foot. Density is particularly important because high density of the finished pavement is essential for long term pavement performance.
- Fatigue Resistance - Fatigue resistance is the pavement’s resistance to repeated bending under wheel loads (traffic). Air voids and asphalt binder viscosity has a significant effect on fatigue resistance. As air voids in the pavement increase, either by design or lack of compaction, fatigue resistance is reduced.
Mix Properties

- **Asphalt Binder Content** - The asphalt binder content in the mixture is critical and must be accurately determined in the laboratory and precisely controlled on the job. It is usually expressed as a percentage, by weight, of asphalt binder in the mix. For our purposes, it is the amount of asphalt binder that effectively forms a bonding film on the aggregate surfaces.

- **Air Voids** - Air voids are small pockets of air between the coated aggregate particles in the final compacted mix. The durability of a hot mix asphalt pavement is a function of the air void content.

Equipment

- Brooms/Sweepers
- Grinders/Cold Planing Machines
- Tack Distributors
- AC Trucks
- Pavers
- Rollers
**Brooms/Sweepers**

- Brooms/sweepers are used for cleaning and preparation of base pavement. They provide a surface free of foreign material, which increases the bond between the existing pavement and HMA resurfacing.

**Grinders/Cold Planing Machines**

- Cold Planing Machines are used to remove existing pavement for digouts/base repairs, full width grinds, edge grinds, and header cuts prior to final resurfacing.
Tack Distributors

- Tack distributors shall be mounted on motor trucks or trailers.
- Distributors shall be equipped with adequately sized burners for heating the bituminous material and with a means of circulating the material when the burners are in operation.
- Each unit shall be equipped with an accurate thermometer for indicating the temperature of the bitumen in the tank.
- The distributor shall be capable of distributing bitumen at specified rates ranging from 0.03 to 0.07 gallons per square yard.
- The size of the spray nozzles shall be such that bitumen may be spread in a uniform coating without the forward speed exceeding 20 mph.

AC Trucks

- Various types of trucks are used to deliver hot mix asphalt to the job site.
- The two most common types used are end-dump trucks and bottom-dump trucks.
Pavers

- Pavers are machines designed to place and initially compact an HMA mixture on the roadway to a specified depth. The paver must be self-propelled for laying widths of 8 feet or more, and mounted on crawler treads or pneumatic tires.

Rollers

- Vibratory
- Pneumatic-Tired
- Smooth Steel-Wheeled
Role of the Inspector

Inspectors are accountable to the project engineer for satisfactory performance of their duties. The primary responsibilities for an inspector include:

- Plan Familiarity
- Work Done Without Inspection
- Contract Compliance
- Unacceptable Work
- Testing
- Daily Diary

Duties Typically Performed

- Checking
- Observing
- Sampling & Testing
- Documentation & Reporting
- Photo Documentation
Other Inspection Duties

- Check & Record Contractor’s Equipment/Labor/Materials
- Check Material Certifications
- Check Dimensions
- Check Quantities and Yields
- Check Traffic Control Setup
- Check Temperatures
- Check Mix Uniformity
  - Temperature
  - Segregation
  - Aggregate Clumps

Inspector Daily Report Example
Inspector Daily Report Example

**ENGINEER’S DAILY REPORT - NARRATIVE**

**Site Specification**
- Project Manager: [Name]
- Site Manager: [Name]
- Work Hours: [Start Time] - [End Time]

- **Progress:**
  - [Description of progress made at the site]
  - [List of tasks completed]

- **Weather Conditions:**
  - Temperature: [Temperature]
  - Weather: [Weather description]

- **Safety:**
  - [List of safety precautions and measures taken]

- **Issues:**
  - [List of issues encountered]
  - [Actions taken to resolve]

- **Next Steps:**
  - [Tasks to be completed next]
  - [Schedule for next day]

**Daily Activities**

1. [Activity 1]
   - [Description]
   - [Location]
   - [Quantity]

2. [Activity 2]
   - [Description]
   - [Location]
   - [Quantity]

**Equipment Log**

- [List of equipment used]
- [Maintenance log]

**Photographs**

- [Images of the site, equipment, personnel]
- [Annotations for each photograph]

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Mix Delivery, Placement, and Compaction

- **Truck Unloading** – Temperatures - Segregation
- **Paver Speeds** - It is important to adjust paver speed to match plant output in order to minimize paver stoppages.
- **Paver Operations**
- **Transverse & Longitudinal Joints**
- **Hand Racking**
- **Compaction**
- **Rollers** – Breakdown/Intermediate/Finish
Paver Operations

- Keep the paver hopper sufficiently full at all times. The hopper level should consistently run between 25 and 75 percent full.
- If load interval segregation is present, make sure the contractor is not lifting the wings with each load.
- Make sure that the augers are running as much of the time as possible. To control this, the speed of the conveyor and the control gates can be adjusted to maximize the use of the augers.
- Try to keep a consistent level of HMA ahead of the screed.

Transverse & Longitudinal Joints

- Longitudinal joints occur wherever adjacent lanes are placed. Hot joints are formed when two pavers are operated in echelon. Cold joints occur when one lane is placed and compacted. At a later time, after the first lane has cooled, the companion lane is placed against it.
Hand Racking

- Whenever practical, mix should be spread by the paver with no handwork necessary. “Bumping” of mix at centerline joint should not be necessary, if the paver is being properly operated. Stop the lay down operation if there is excessive handwork required, and correct the cause of the problem.

- In small or irregular areas, however, spreading by hand may be unavoidable, as paver use is often either impossible or impractical. Placing and spreading by hand should be done carefully and the material distributed evenly to avoid segregating the mix. Workers shall not stand on the loose mixture while spreading.

Compaction

- Increased stability
- Reduces air voids
- Provides smooth surface

Compaction chart:
- Major factors affecting rolling time: Mat thickness, mix temperature, base temperature
- High or low values: allows more or less time

Compaction needed for:
- Mix confinement
- Correct mix temperature

Most efficient compaction: Usually occurs at the lower end of the range.
Rollers – Breakdown/Intermediate/Finish

- **Breakdown** - Breakdown rolling is the first interaction between the roller and the mat. Most contractors use steel drum vibratory rollers to breakdown the mix, increase the mat density, and establish the mat smoothness. The majority of density is obtained during breakdown rolling, so it is important to keep this roller moving as much of the time as possible.

- **Intermediate** - Intermediate rolling may or may not be required on a project. In most cases, a pneumatic (rubber-tired) roller is used. Intermediate rolling is usually required if adequate density cannot be achieved with the breakdown roller, or if the surface texture and kneading action of a rubber-tired roller is desired.

- **Finish** - Finish rolling is the last step in the operation and is normally used to "iron" out any roller marks left by breakdown and intermediate rollers. Very little additional compaction is achieved during finishing rolling, as it is done after the mat has cooled significantly. This roller is typically a static steel wheel roller, or a steel vibratory roller operating in a static mode.

Problems and Solutions

- **Segregation** – Truckload & Temperature

- **Tack Coat Application** - Application Rate, Uniform Tack Coat Application, and Breaking of Tack Coat

- **Mix Pickup** - Mix pickup, particularly by pneumatic (rubber-tired) rollers, has always been a concern when compacting HMA mixes. The best technique to minimize mix pickup is to keep roller tires hot, as close to mix temperature as possible.

- **Cracking** - Cracking may occur immediately in a newly placed mat, or may show up at a later time. Over-rolling can be a prime cause of cracking in a newly placed mat.

- **Centerline Joints** – pay attention to length of first lane placement and temperatures
Questions?

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