Pavement Maintenance

Purdue Road School
March 2004

Types of Maintenance
- Preventative Maintenance
- Corrective Maintenance
- Emergency Maintenance

Preventative Maintenance
- Arrest Minor Deterioration
- Retard Progressive Failure
- Reduce Need for Corrective Maintenance
- Performed Before Significant Distress Appears

Corrective Maintenance
- Performed after Deficiency Occurs
  - Loss of Friction
  - Extensive Cracking
  - Moderate to Severe Rutting

Topics To Be Covered
- Crack sealing
- Patching

Crack Sealing
Introduction

- Crack sealing is applied to:
  - Extend the service life of the existing pavement
  - Preparation of existing pavement prior to construction of an overlay

Why Crack Seal?

- Prevent water and incompressibles from entering pavement structure
- Note:
  - If cracks are due to a defect in the pavement structure, it is doubtful that sealing will work

Types of Cracks To Seal

- Joints, shrinkage and linear cracks
- Commonly used on reflective cracks, though not a long-term solution

Crack Filling/Sealing Materials

- Thermoplastic
- Themosetting

Thermoplastic Sealant Materials

- Thermoplastic sealants are bitumen based materials that typically soften upon heating and harden upon cooling
  - Hot Applied
  - Cold Applied

Thermoplastic Crack Sealing Materials

- Hot-poured modified asphalt rubber
  - May contain granulated crumb rubber
  - May contain plasticizers
  - Conforms to ASTM D-3405
- PG Grade with polyester fibers
Thermosetting Sealant Materials

- Thermosetting sealants are typically one or two-component materials that set by the release of solvents or cure through a chemical reaction
  - Chemically Cured
  - Solvent Release

Thermosetting Crack Filling

- For large cracks:
  - Emulsion mixed with sand forced into crack until 1/8 to 1/4 in. below surface
  - Allow emulsion/sand mixture to cure
  - Top off with emulsion
  - Broadcast sand to prevent pick-up
- Materials:
  - Emulsions: SS-1, SS-1h, CSS-1, CSS-1h
  - Proprietary products

Crack Sealing

- May be used on cracks from 1/8 to 1 1/2 in.
- Can be used on reflective cracks
- Uses better preparation and materials

Crack Sealing Equipment

- Preparation:
  - Crack routing which widens but does not deepen a crack provides a reservoir for sealant
  - Crack cleaned and dried with a hot-air lance capable of blowing 300 °F air at 3000 feet per second
Crack Sealing Procedures

- Preparation – Continued
  - Cracks that cannot be filled due to a large void may be plugged with backer rod, sand or aggregate
- Application
  - Fill Crack from Bottom-up in continuous manner
  - Use shoe to create over banding
Finish Crack Seal

Performance of Crack Sealing

- Performance life
  - Average of 3 to 5 years
  - Some report 5 to 6 years
  - SPS-3 results suggest 6 to 8 years
- Timing
  - Moderate temperatures (spring or fall)
  - Most effective if performed right after cracks develop

Patching

Purpose and Application

- Patching of existing HMA
  - Repair localized distress
  - Improve motorist safety
  - Reduce pavement roughness
  - Reduce the rate of deterioration
  - Repair pavement prior to overlay

Definitions

- Bituminous patching materials
  - Cold-mix
    - Used as temporary patches
    - Placed in stockpile and used over a period of time (Emulsion or cutback binders)
    - Special open-graded mixes
  - Hot-mix asphalt (HMA)
    - Placed immediately while hot
    - Standard dense graded HMA

Construction

- Winter maintenance
  - “Throw and Go” the most cost effective
- Summer maintenance
  - Semi-permanent patch found to be three times more cost effective
  - “Throw and Roll” also provides satisfactory results with high quality materials
Cut Boundaries

Remove Material

Clean Debris

Blowpipe

Debris

Debris

Seal Edges

Yes! Brush

Yes! Spray

No! Pour

puddle

Material Placement

Segregation

Rake

Tamp

Shovel

Sufficient Material for Compaction

Max lift - 6 in
Compacting The Patch

- 1/8" to 1/4"
- Good compaction
- Poor compaction

Surface Treatments

Introduction

- Surface treatments
  - Have been historically used on low-volume roads in rural areas
  - With improved materials and processes are now being used on higher volume roads

Functions of Surface Treatments

- Provide a new wearing surface
- Seal cracks in the surface
- Waterproof the surface
- Improve pavement surface friction and surface drainage

Functions of Surface Treatments

- Slow pavement weathering and aging
- Improve the surface appearance
- Provide visual delineation as between the mainline pavement and the shoulder
Seal Treatments

- Chip Seal
- Latex/Rubberized Chip Seal
- Slurry Seal
- Microsurfacing
- Blot/Modified Blot Seal
- Fog Seal
- Cape Seal
- Scrub Seal
- Sandwich Seal
- Rejuvenator Seal
- Coal Tar Seal

Fog Seal

- Application of diluted emulsion to enrich surface
- Used to anticipate and preclude raveling, oxidation, and minor surface cracks
- Expected life not greater than 3 to 4 years

Scrub Seal

- Application of a polymer modified asphalt followed by the broom scrubbing the asphalt into cracks and voids.
- An even coat of sand or small aggregate is applied and the pavement is broomed a second time.
- The seal is then rolled with a rubber tired roller.

Sand Seal

- Application of asphalt material covered with fine aggregate. Used to improve skid resistance and to seal against air and water intrusion.

Chip Seal

- Waterproof the surface, seal small cracks and improve surface friction
- Low-volume roadways, but have been used on high-volume facilities
- May be single, double or triple application
- Expected life is 5-7 years

Latex/Rubberized Chip Seal

- Conventional Chip Seal or Surface Treatment equipment and process
- Asphalt emulsions modified with latex or rubberized materials to enhance aggregate retention
- Expected life is 5-7 years
Blot/Modified Blot Seal
- Two or three applications of chip seal w/ progressively smaller aggregate
- Final application covered with sand or fine aggregate
- Waterproof surface, seal small cracks, improve surface friction
- Normally used on low-volume roadways
- Expected life is 3 to 7 years

Design Problems - Asphalt Chip Seals
Too much asphalt or too little?

Slurry Seal
- A mixture of slow setting emulsified asphalt, fine aggregate, mineral filler, and water
- Fills minor cracks and restores uniform surface texture
- Seals the surface to prevent moisture and air intrusion
- Can be used to provide greater skid resistance
- Expected life is 3 to 6 years

Construction Procedures
1. Aggregate Bin
2. Filler Bin
3. Aggregate Flow Gate
4. Aggregate Conveyor Belt
5. Emulsion Injector
6. Water Injector
7. Pugmill
8. Spreader Box
9. Slurry

Slurry Seal

Microsurfacing
- A mixture of polymer modified asphalt emulsion, mineral aggregate, mineral filler, water, and other additives, properly proportioned, mixed and spread on a paved surface
- Expected life is 3 to 6 years
Rut Fill

• Combination of Slurry Seal and Chip Seal
• A slurry seal is applied over a new surface treatment application
• Cape seals are used to provide a dense, waterproof surface with improved skid resistance

Cape Seal

Coal Tar Seal

• Application of coal tar formulation as a protective seal against petroleum and other chemicals damaging the asphalt
• Typically modified with rubber or other additives to provide greater flexibility
• Sand added to improved skid resistance
• May be sprayed or machine applied

Thank You!