Pavement Maintenance

Purdue Road School
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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
- Thermosetting

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 ¼ 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

Filled Crack

Crack Sealing

- May be used on cracks from 1/8 to 1 ½ in.
- Can be used on reflective cracks
- Uses better preparation and materials

Crack Sealing Equipment

Crack Sealing Procedures

- 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

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
Seal Edges

Material Placement
Sufficient Material for Compaction

- Max lift - 6 in
Compacting The Patch

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

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**

- Fog Seal
- Cape Seal
- Scrub Seal
- Sand Seal
- Sandwich Seal
- Rejuvenator Seal
- Coal Tar Seal

**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 with 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**

**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**

**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

Cape Seal

- 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

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 improve skid resistance
- May be sprayed or machine applied

Thank You!