

Pavement Maintenance

Purdue Road School
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PURDUE
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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 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



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



Rotary Impact Router



Airblasting



Hot Air Lance



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



Placement Configurations



Flush-Fill



Overband



Reservoir



Combination



Squeegeed Sealant



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

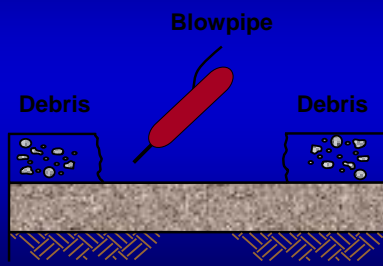
Cut Boundaries



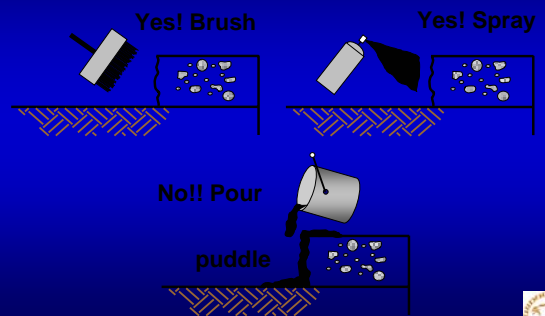
Remove Material



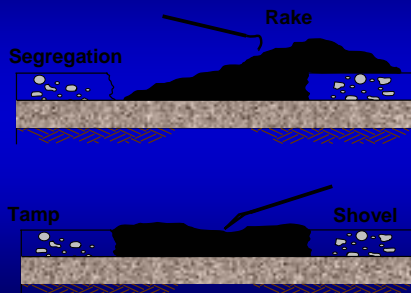
Clean Debris



Seal Edges

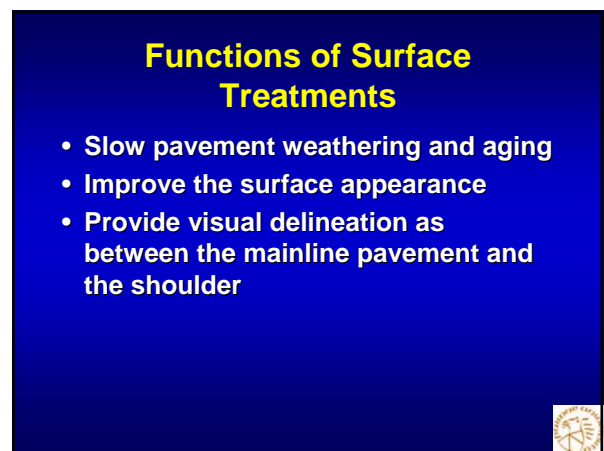
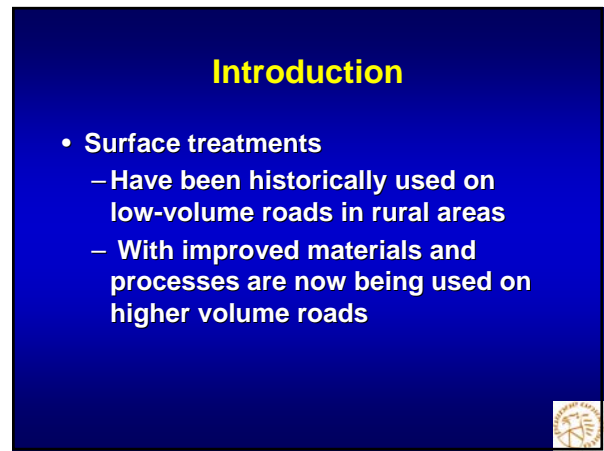
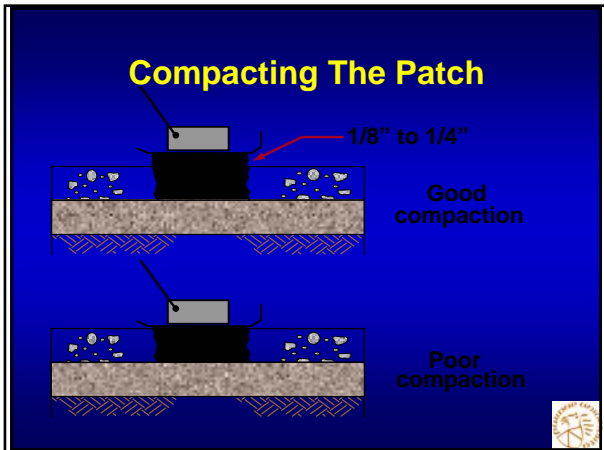


Material Placement



Sufficient Material for Compaction





Seal Treatments

- Chip Seal
- Latex/Rubberized Chip Seal
- Slurry Seal
- Microsurfacing
- Blot/Modified Blot Seal
- Fog Seal
- Cape Seal
- Scrub Seal
- Sand 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



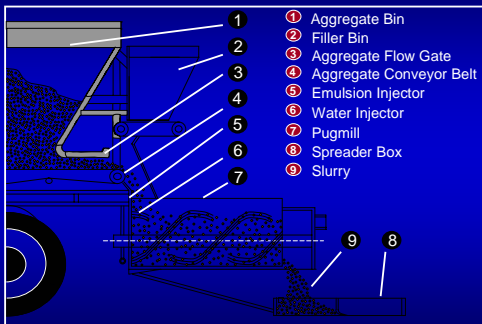
- A mixture of slow setting emulsified asphalt, fine aggregate, mineral filler, and water
- Fills minor cracks and restores uniform surface texture
- Seals the surface to prevent moisture and air intrusion
- Can be used to provide greater skid resistance
- Expected life is 3 to 6 years



Slurry Seal



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 improved skid resistance
- May be sprayed or machine applied



Thank You!

