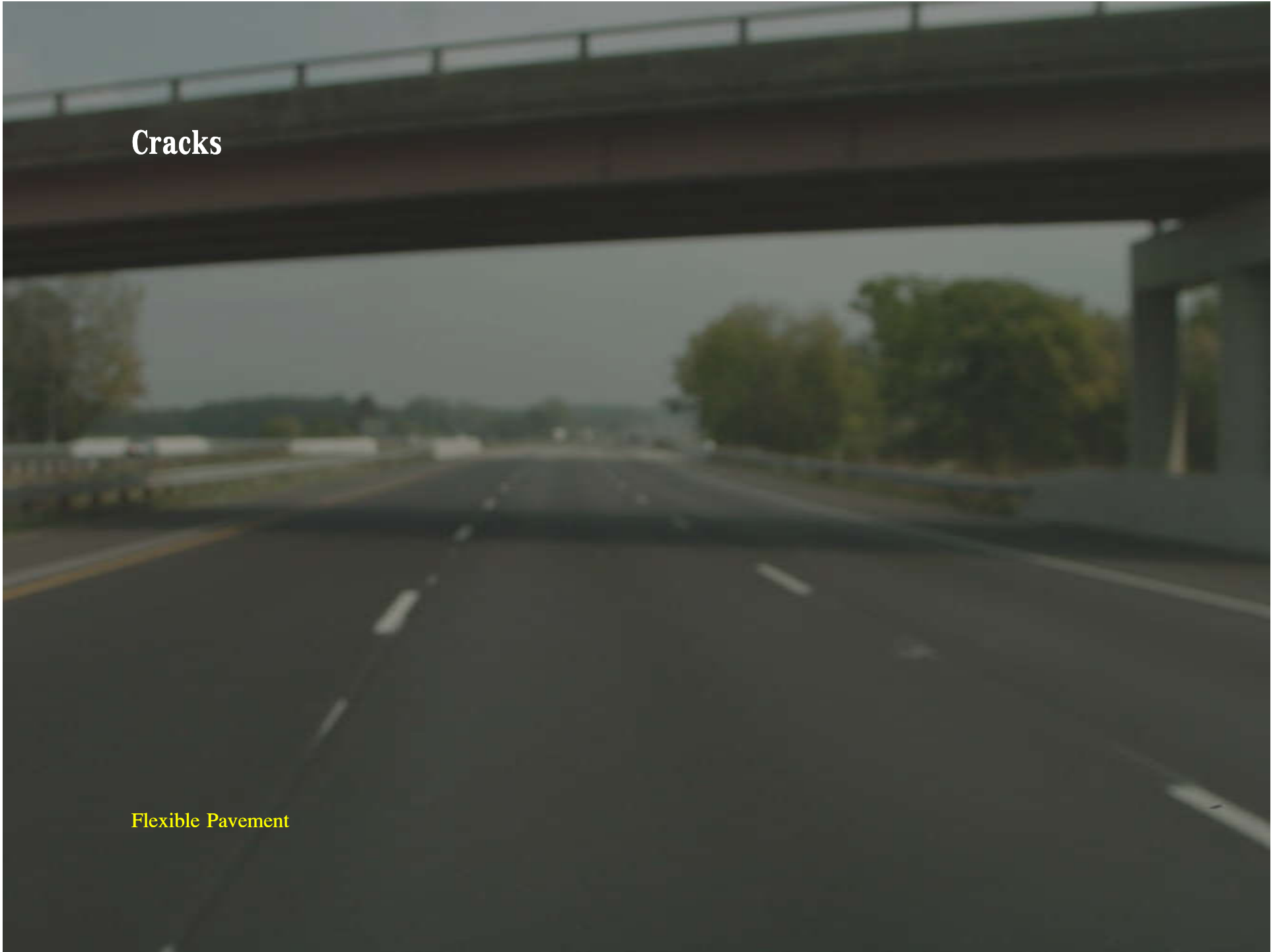


Cracks

Flexible Pavement



Basic Terms

■ Crack Seal

Crack sealing uses specialized materials that bond to the walls of the crack, while being able to move with the pavement as it expands and contracts, preventing intrusion of water and debris into the crack. Crack sealant is specifically engineered to remain flexible at low temperatures so it doesn't crack or split open, and remains stable at higher temperatures so that it doesn't track or bleed on the pavement.

Basic Terms

■ Crack filling

Crack filling uses ordinary materials that do not bond well to the crack; it only fills the void and reduces intrusion of water and debris into the crack and does not move with the pavement as it expands and contracts. Crack filler does not have high or low temperature properties. When pavement movement takes place due to temperature change or traffic loads, the crack filler is separated from the edge allowing water and incompressible materials to enter the crack and into the pavement. Crack filler does not achieve the same level of service life as crack sealant, and it does not preserve the pavement as long as crack sealant. Crack sealing is a long-term pavement preservation solution while crack filling is a band-aid.



■ Chip Seal

Chip seal is a two-step process which includes first an application of asphalt emulsion and then a layer of crushed rock to an existing asphalt pavement surface. A chip seal gets its name from the “chips” or small crushed rock placed on the surface.



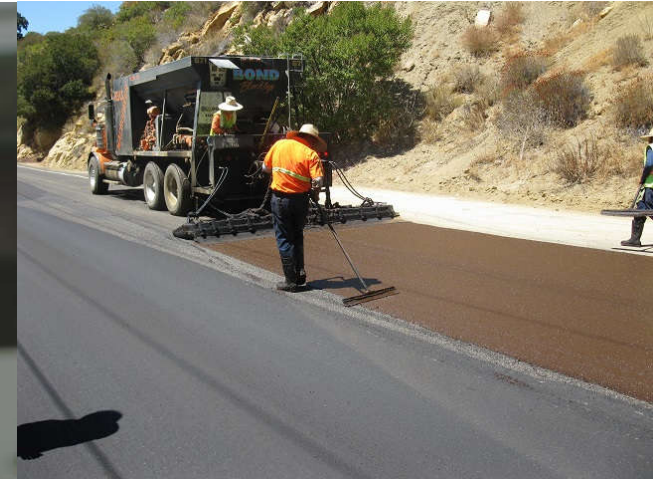
■ Slurry seal

Slurry seal is the application of a mixture of water, asphalt emulsion, aggregate (very small crushed rock), and additives to an existing asphalt pavement surface. This combined mixture of the emulsion and aggregates represents “slurry.” Polymer is commonly added to the asphalt emulsion to provide better mixture properties. The placement of this mixture on existing pavement is the “seal” as it is intended to seal the pavement surface. Slurry seals are generally used on residential streets



■ Microsurfacing

micro surfacing is similar to slurry seal. It consists of the application of a mixture of water, asphalt emulsion, aggregate (very small crushed rock), and chemical additives to an existing asphalt concrete pavement surface. Polymer is commonly added to the asphalt emulsion to provide better mixture properties. The major difference between slurry seal and microsurfacing is in how they “break” or harden. Slurry relies on evaporation of the water in the asphalt emulsion. The asphalt emulsion used in micro surfacing contains chemical additives which allow it to break without relying on the sun or heat for evaporation to occur. Thus, micro surfacing is an application that hardens quicker than slurry seals and can be used when conditions would not allow slurry seal to be successfully placed. Streets that have a lot of shade and streets that have a lot of traffic are good candidates for micro surfacing



Milling is the removal of a small thickness (1 inch or less) of existing asphalt concrete prior to placing a surface treatment. Milling provides for a smoother surface and is typically used before a slurry seal or microsurfacing treatment.

 Milling



The background of the slide is a photograph of a multi-lane highway with an overpass. The image is dark and slightly blurred, with the overpass structure visible in the upper half. The text is overlaid on a semi-transparent dark grey box.

■ Thin Asphalt Overlays

Thin HMA overlays, 1 ½" or less, are the cost effective solution for pavement preservation primarily because of their ability to:

- Provide improved ride quality,
- Reduce surface distresses,
- Maintain surface geometrics,
- Reduce noise levels,
- Reduce life cycle costs, and
- Provide long-lasting service.

Thin HMA overlays should be placed before the pavement deterioration has reached a critical stage where more extensive rehabilitation is required. This will maximize your performance and yield a more cost-effective solution for your pavement.

Thin HMA overlays can be expected to provide 10 years or more on existing asphalt surfaces.

Transverse Cracks



Transverse Cracks

■ Causes:

- Temperature changes



Flexible Pavement

Transverse Cracks

■ Causes:

- Temperature changes
- Shrinkage of asphalt



Flexible Pavement

Transverse Cracks

■ Cures

- Crack Seal
- Chip Seal
- Thin Overlay



Flexible Pavement

Block Cracks



Block Cracks

■ Causes:

- Aging and shrinking asphalt



Block Cracks

■ Causes:

- Aging and shrinking asphalt
- Frost action
- Heavy traffic



Block Cracks

■ Cures:

- Seal coating
- Overlays
- Reconstruction



Longitudinal Cracks



Longitudinal Cracks

■ Causes:

- Inadequate bonding



Longitudinal Cracks

■ Causes:

- Inadequate bonding
- Reflection cracks



Longitudinal Cracks

■ Causes:

- Inadequate bonding
- Reflection cracks
- Wheel track: heavy load



Longitudinal Joint Cracking

Center Line

■ Causes:

- Inadequate bonding
- Reflection cracks
- Wheel track: heavy load
- Alligator Crack:
insufficient thickness



Longitudinal Cracking

■ Cures

- Crack Seal
- Strengthening with overlay
- Reconstruction
- Excavate & rebuild
- Total reconstruction
- Improve drainage



Flexible Pavement

Edge Cracking



Edge Cracking

■ Causes:

- Weakened sub-base at edge



Flexible Pavement

Edge Cracking

■ Causes:

- Weakened sub-base at edge
- Heavy loads



Flexible Pavement

Edge Cracking

■ Causes:

- Weakened sub-base at edge
- Heavy loads
- Poor pavement edge support



Flexible Pavement

Edge Cracking

■ Causes:

- Weakened sub-base at edge
- Heavy loads
- Poor pavement edge support
- Poor shoulder drainage

Flexible Pavement



Edge Cracking

■ Cures:

- Fill & Seal Cracks



Flexible Pavement

Edge Cracking

■ Cures:

- Fill & Seal Cracks
- Strengthen with overlay or reconstruction
- Widen lane or stabilize shoulders



Flexible Pavement

Rutting



Flexible Pavement

Rutting

■ Causes:

- Improper asphalt density



Flexible Pavement

Rutting

■ Causes:

- Improper asphalt density
- Lack of compaction



Flexible Pavement

Rutting

■ Causes:

- Improper asphalt density
- Lack of compaction
- Traffic and heat



Flexible Pavement

Rutting

Causes:

- Improper asphalt density
- Lack of compaction
- Traffic and heat
- Weak subgrade

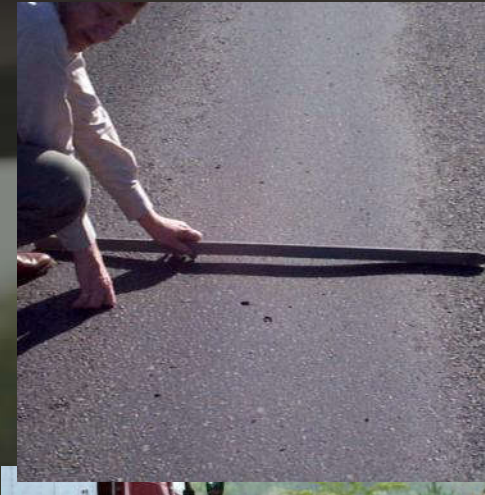
Flexible Pavement



Rutting

Cures

- Microsurfacing
- Mill & Fill
- Overlay
- Subgrade reconstruction



Flexible Pavement

Corrugations



Flexible Pavement

Corrugations

■ Causes:

- Unstable asphalt mix



Flexible Pavement

Corrugations

■ Causes:

- Unstable asphalt mix
- Weak subgrade
- Traffic and heat



Flexible Pavement

Corrugations

■ Cures:

- Mill & Fill
- Reconstruction



Flexible Pavement

Debonding



Debonding

■ Causes

- Improper compaction



Debonding

■ Causes

- Improper compaction
- Poor tack coat



Debonding

■ Causes

- Improper compaction
- Poor tack coat
- Insufficient layer thickness



Debonding

■ Cures

- Partial depth patches
- Partial depth patches with microsurfacing
- Mill and overlay



Raveling



Flexible Pavement

Raveling

■ Causes:

- Improper compaction



Flexible Pavement

Raveling

■ Causes:

- Improper compaction
- Lack of density



Flexible Pavement

Raveling

■ Causes:

- Improper compaction
- Lack of density
- Uneven mixture



Flexible Pavement

Raveling

■ Causes:

- Improper compaction
- Lack of density
- Uneven mixture
- QC of gradation
- Clay in gravel



Flexible Pavement

Raveling

■ Causes:

- Improper compaction
- Lack of density
- Uneven mixture
- QC of gradation
- Clay in gravel
- Aging pavement, binders oxidized



Flexible Pavement

Raveling

■ Cures

- Crack Sealing
- Chip Sealing
- Microsurfacing
- Thin Overlay
- Mill & Fill



Flexible Pavement

Potholes



Flexible Pavement

Potholes

■ Causes

- Excess moisture in subbase or subgrade



Flexible Pavement

Potholes

■ Causes

- Excess moisture in subbase or subgrade
- Insufficient thickness



Flexible Pavement

Potholes

■ Causes

- Excess moisture in subbase or subgrade
- Insufficient thickness
- Freeze/thaw



Flexible Pavement

Potholes

■ Causes

- Excess moisture in subbase or subgrade
- Insufficient thickness
- Freeze/thaw
- Constant loading



Flexible Pavement

Potholes

■ Cures

- Excavate and rebuild
- Including subgrade and subbase



Flexible Pavement

Bleeding (Flushing)



Flexible Pavement

Bleeding (Flushing)

■ Causes:

- High asphalt cement content

Flexible Pavement



Bleeding (Flushing)

■ Causes:

- High asphalt cement content
- Improper compaction



Flexible Pavement

Bleeding (Flushing)

■ Causes:

- High asphalt cement content
- Improper compaction
- High truck counts

Flexible Pavement



Bleeding (Flushing)

■ Causes:

- High asphalt cement content
- Improper compaction
- High truck counts
- Insufficient cooling

Flexible Pavement



Bleeding (Flushing)

■ Cures:

- Microsurfacing
- Mill and Overlay



Flexible Pavement