AF2903 Road Construction and Maintenance

Pavement Maintenance and Rehabilitation

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Overview

The combined effects of traffic loading and environmental factors will cause every pavement to deteriorate over time. Maintenance and rehabilitation are what we use to slow down or reset this deterioration process.

Maintenance actions, such as crack sealing, joint sealing, fog seals and patching help *slow the rate of deterioration* by identifying and addressing specific pavement deficiencies.

Rehabilitation is the act of repairing portions of an existing pavement to *reset the deterioration process*. For instance, removing and replacing the wearing course.

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Pavement Maintenance

Preventive maintenance

Fog Seal
Sand Seal
Rejuvenators
Slurry Seal
Crack Seal
Chip Seal (Surface treatment)

Corrective Maintenance

Cape Seal (Chip + Slurry)
Micro-Surfacing
Patching
Thin Overlay

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Maintenance

Fog Seal	Asphalt Only	Rejuvenate
Slurry Seal	Asphalt/Sand Mix	Fill Small Cracks Friction Microtexture
Sand/Chip Seal	Asphalt then Aggregate	Friction Macrotexture
Micro-Surfacing	Slurry Seal with Dense-Graded	Leveling Fill up to 37mm

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Fog Seal

- ✓ Spraying a light coat of asphalt binder, usually an asphalt emulsion heated up to 150F (0.03-0.05 gall/sq.yd.) on the surface of an existing pavement.
- ✓ Prolong the life of an AC pavement, reduce raveling and improve waterproofing.
- ✓ Good for pavements with little or no traffic (includes paved shoulders).

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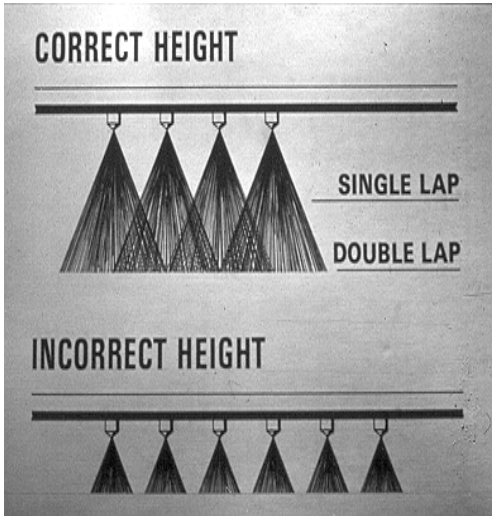
Fog Seal

- Protects old oxidized asphalt surfaces
- Seals small cracks and surface voids
- Significantly reduces dust in chip seals
- Blackens new chip seals
- Prevents raveling of open-graded surfaces
- Maintains and delineates shoulders in high-volume roads



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Crack Seal

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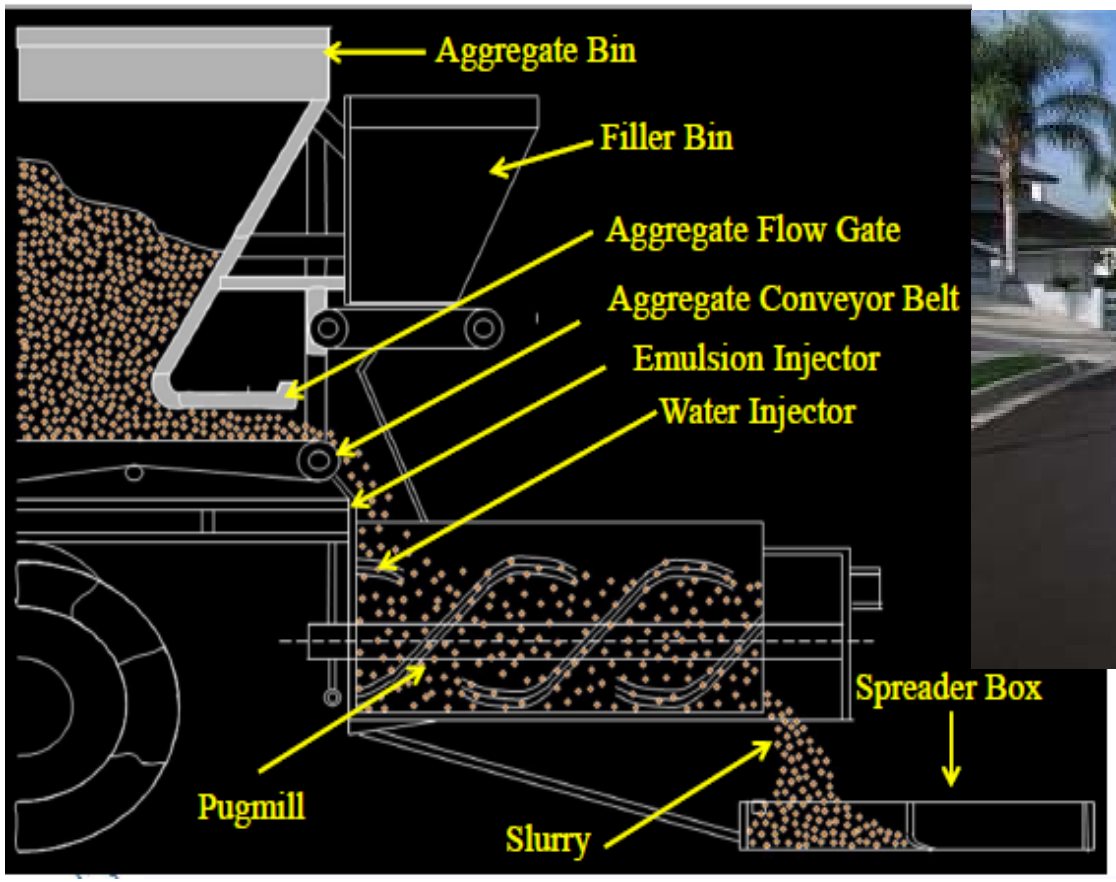
Slurry Seal



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Slurry Seal

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Microsurfacing

Advanced form of slurry seal that uses the same basic ingredients (emulsified asphalt, water, fine aggregate and mineral filler) and combines them with advanced polymer additives.

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Chip Seal (Surface Treatment)

1. Asphalt application
2. Rock application
3. Rolling/compaction
4. Sweeping/brooming

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Patching

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Granular Material Surface

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Non-structural Overlay

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Pavement Rehabilitation

Structure Restoration (Near surface)

Cold In-Place Recycling
Hot In-Place Recycling
Structural PCC Overlays (Whitetopping)
Structural HMA Overlays
Open-Graded Friction Courses

Reconstruction (Full Depth)

Full-Depth Reclamation (HMA)

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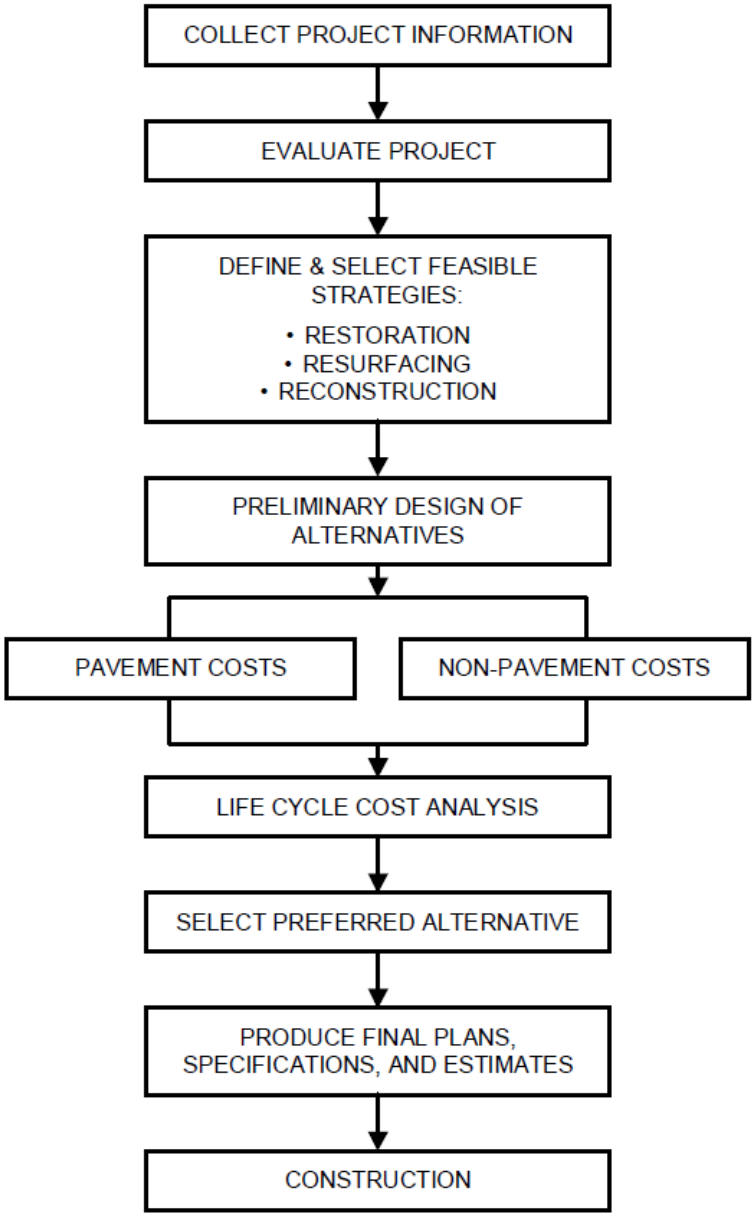
Pavement Rehabilitation Process



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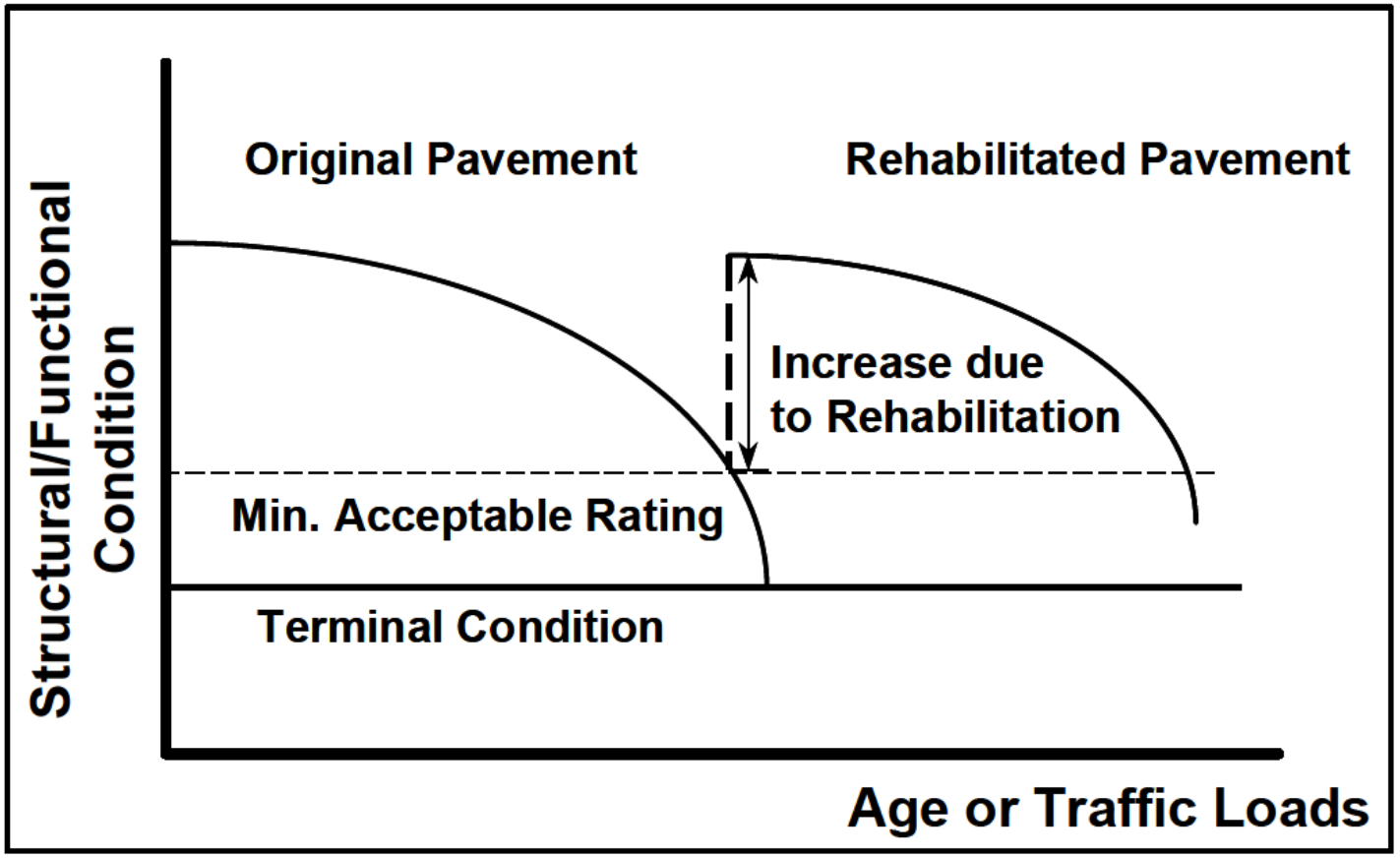
Pavement Rehabilitation Timing



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Cold-In-Place Recycling (CIR)

Cold in-place recycling (CIR) is the processing and treatment with bituminous and/or chemical additives of existing HMA pavements without heating to produce a restored pavement layer.

The typical CIR process involves seven basic steps:

- Milling
- Gradation Control.
- Additive incorporation.
- Mixture placement.
- Compaction.
- Fog seal.
- Surface course construction

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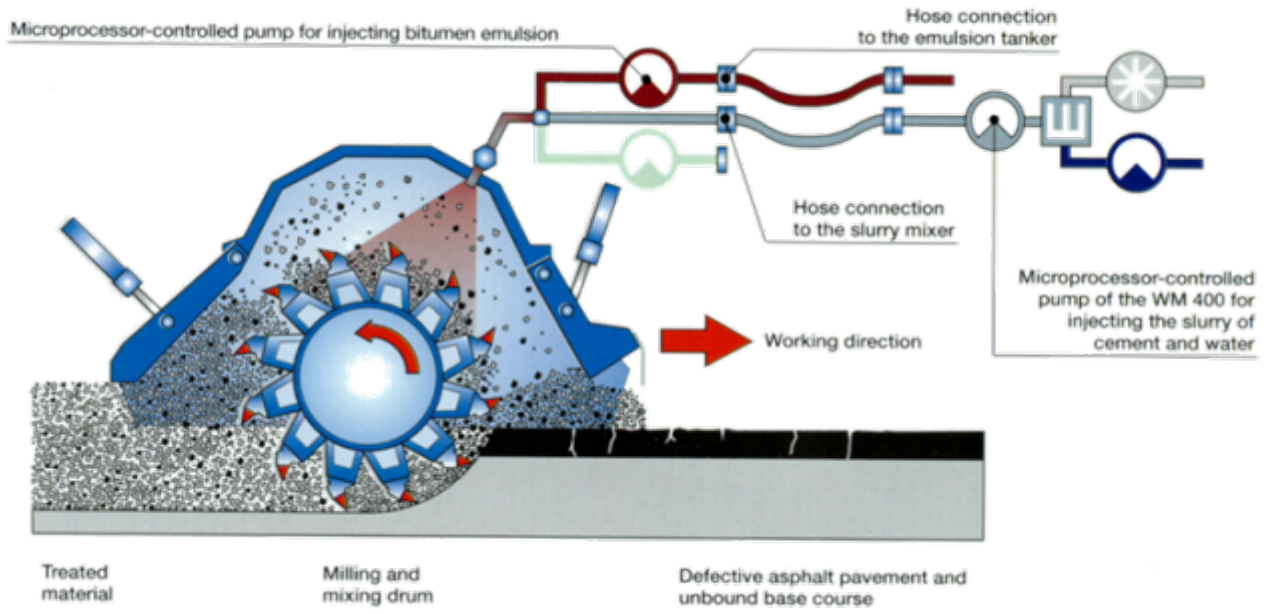
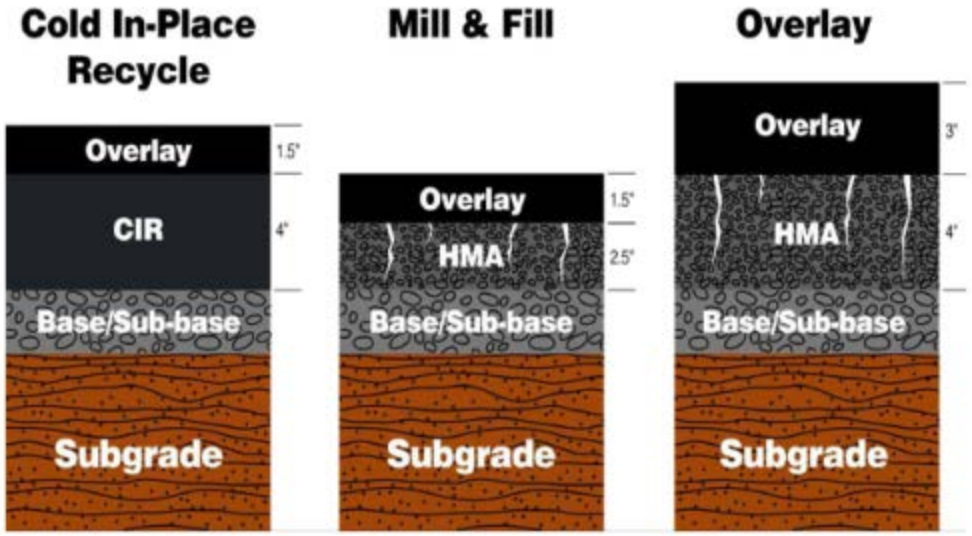
Cold-In-Place Recycling (CIR)





- Reuse valuable materials
- Reduce overall cost
- Improve quality

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Cold-In-Place Recycling (CIR)

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Hot-In-Place Recycling (HIR)

Three basic HIR construction processes:

- Heater scarification (Figure 1).
- Repaving.
- Remixing (Adds new virgin aggregates)

HIR is only applicable to specific situations:

- Air void content of the existing asphalt binder must be high enough to accept the necessary amount of asphalt binder rejuvenator.
- HIR can only adequately address shallow surface distress problems (less than 50 mm (2 inches)).
- Pavements that have been rutted, heavily patched, or chip-sealed are not good candidates for HIR projects

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Hot-In-Place Recycling (HIR)

Pre-Heater takes pavement temp to 80C – 95C degrees

Heater takes pavement temp to 135C – 150C degrees

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Hot-In-Place Recycling (HIR)

Scarification

Rejuvenating agent + mixing

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Hot-In-Place Recycling (HIR)

Laydown

Rolling

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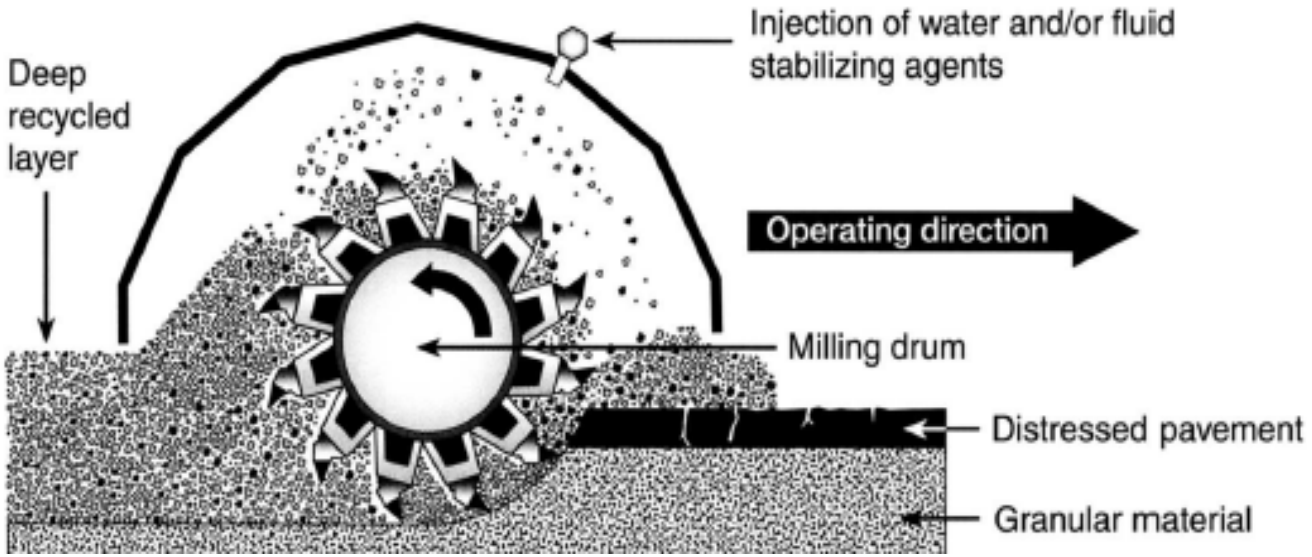
What is FDR?

- ✓ A Full Depth Reclamation is a pavement rehabilitation technique in which the full flexible pavement section and a pre-determined portion of the underlying materials are uniformly crushed, pulverized or blended, resulting in a stabilized base course (SBC); further stabilization may be obtained through the use of available additives.



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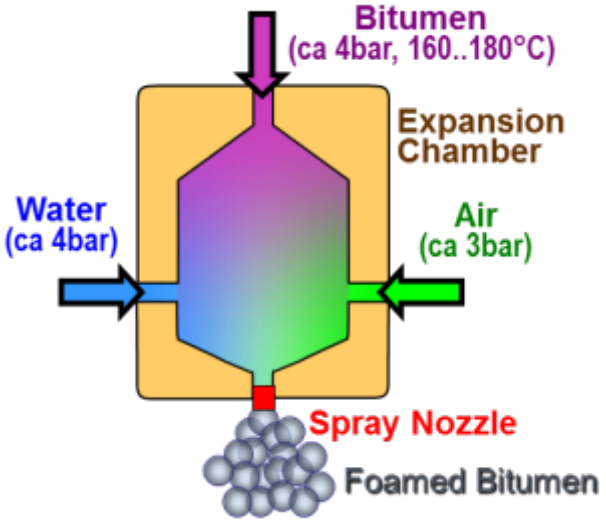
Full-Depth Reclamation (FDR)

FDR WITH FOAMED ASPHALT



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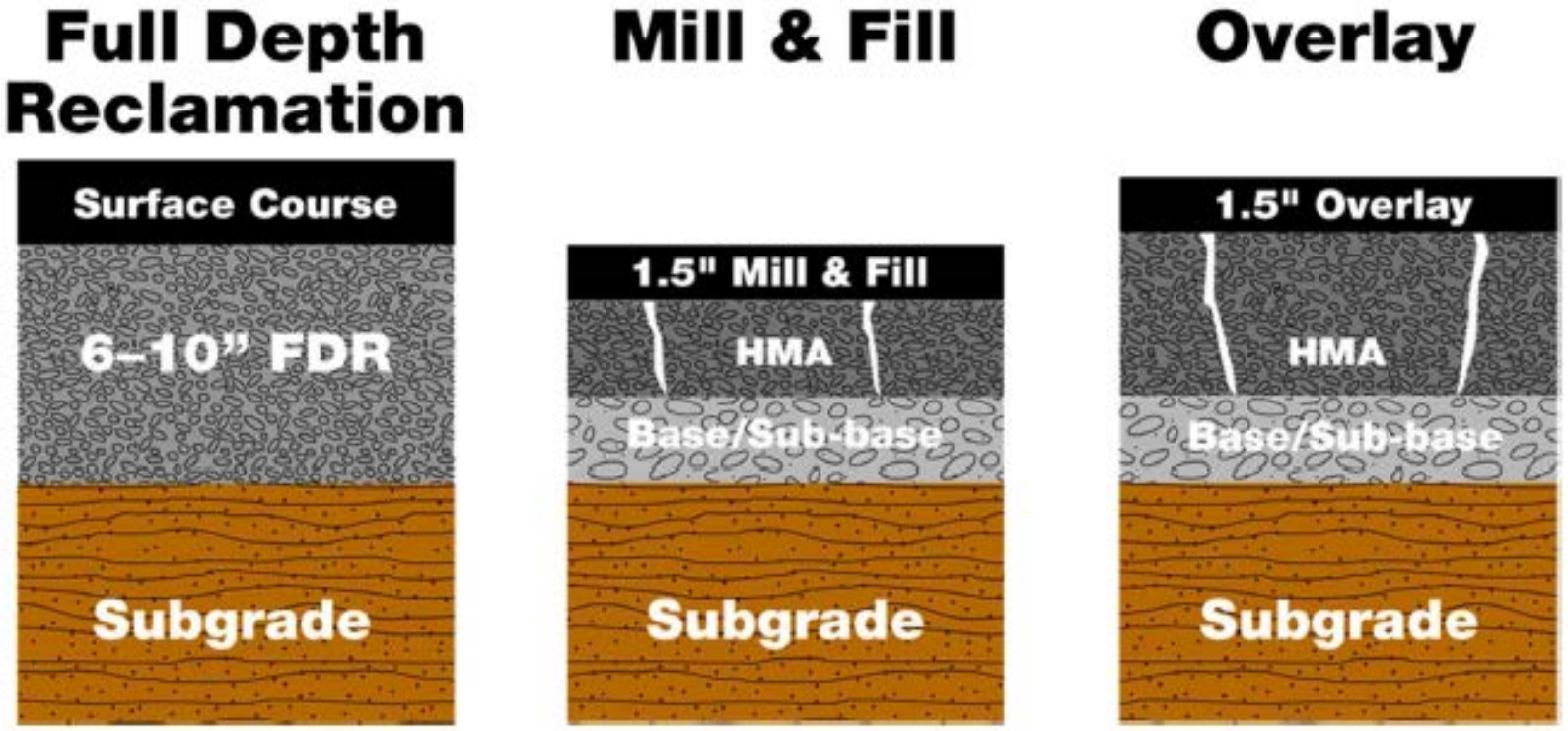
FDR – Cross Section



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Winter Maintenance

The purpose of winter maintenance is to keep the roads and railroads safe, and open to the public.

Snow removal
Salt / deicing / anti-icing chemicals
protect the environment

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Winter Maintenance

Snow Removal for Highways

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Winter Maintenance

Whiteout!

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Focus on Friction

- De-icing chemicals
- Anti-icing chemicals
- Abrasives (sand, ash, sawdust, wood pellets, etc.)
- Types of tires (summer, winter, all season, studded)
- Snow chains

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Winter Maintenance

Liquid and sand Spreaders

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Summary

- ✓ Strategy must deal with cause of distress
  - Surface treatments and overlay will not solve
    - Deficient structure
    - Unmilled surface in poor condition
  - Nothing will solve
    - Poor drainage
    - Poor geometry
    - Poor edge conditions
- ✓ Must understand
  - Distress and its causes
  - Rehabilitation strategies

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Summary

- ✓ Rehabilitation is more cost effective if performed early
  - Pavement management
- ✓ Best Solution
  - Deals with the cause
  - Cost effective
    - Available resources
      - Materials
      - Methods
      - Funds/Budget
  - Considers non-monetary factors
    - Schedule
    - Disruption
    - Enviroment

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Questions?

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