NORTH DAKOTA ASPHALT CONFERENCE

April 5–6, 2016 • Ramada Bismarck Hotel

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ROCK SOLID™
STABILIZATION & RECLAMATION, INC.

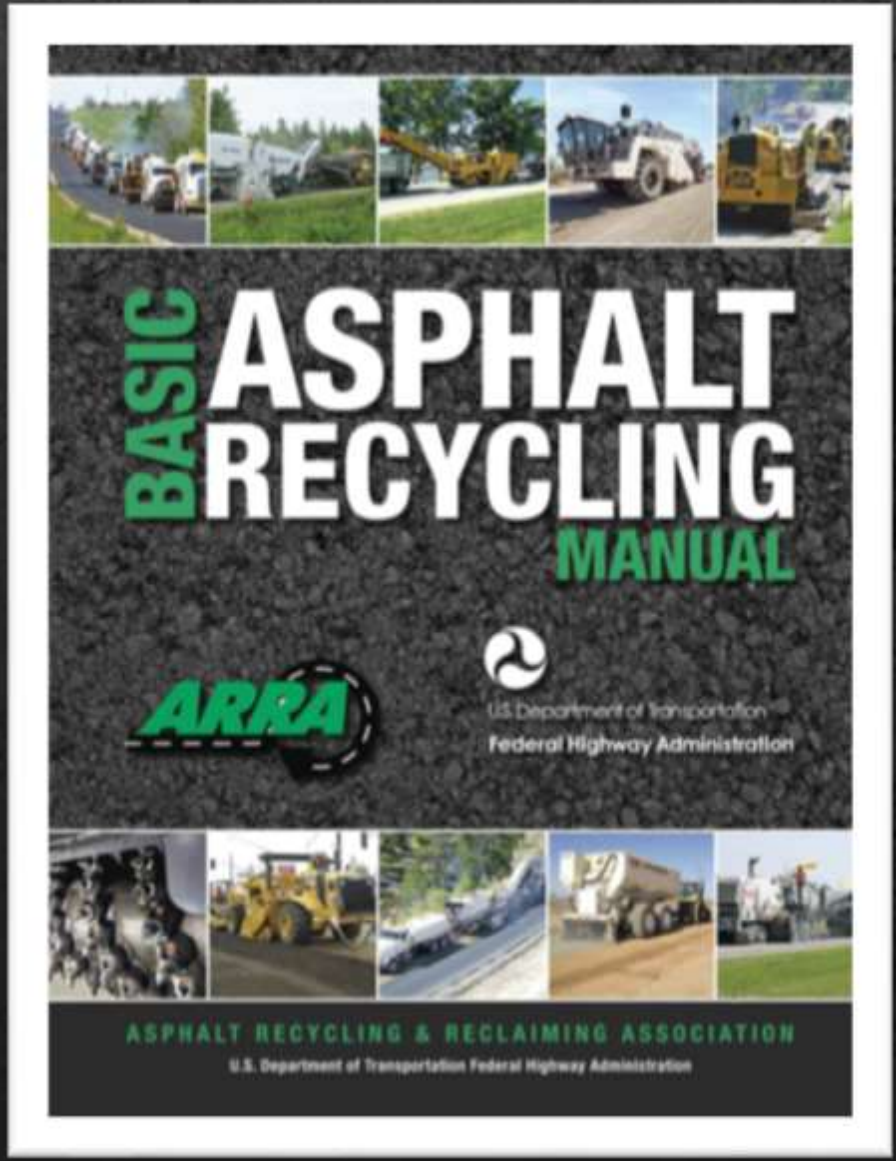
ARRA

NDSU | UPPER GREAT PLAINS TRANSPORTATION INSTITUTE
NORTH DAKOTA LOCAL TECHNICAL ASSISTANCE PROGRAM

Who is ARRA?

Incorporated in September 1976, ARRA's primary function has been to promote the recycling of existing roadway materials through various construction methodologies, to preserve limited natural resources and reduce costs. This ongoing effort continues through education, strategic alliances and partnering at both the industry and agency level. (Mission Statement)

- Not for Profit Organization made up of DOT agencies, equipment suppliers, Material suppliers, contractors & etc.
- Closer Partnerships with the FHWA and others to build awareness of the overall industry



Industry Overview
Choose the right process, @ the right time, on the right road, for the right price

- Visual site investigation
- Subsurface investigation (includes subgrade)
- Classify & Quantify each layer to determine existing condition/performance
- Mix Design and/or recommendations from experienced person for all present varying conditions, choose the “right team”
- Cost comparison of available options
- Fix subgrade drainage issues if needed
- Utilizing a competent “team” of civil engineer, geotechnical engineer and contractor
- Realize and inform customer that there can be field changes due to unforeseen circumstances at times
- Infield QC/QA when possible

Industry overview
pavement preservation processes

Crack Treatments

Chip Seal

Slurry Pavement

Micro Surfacing

Combination of (ex. Cape Seal)

Industry Overview
recycling processes

Milling

HIR - Hot In-Place Recycling

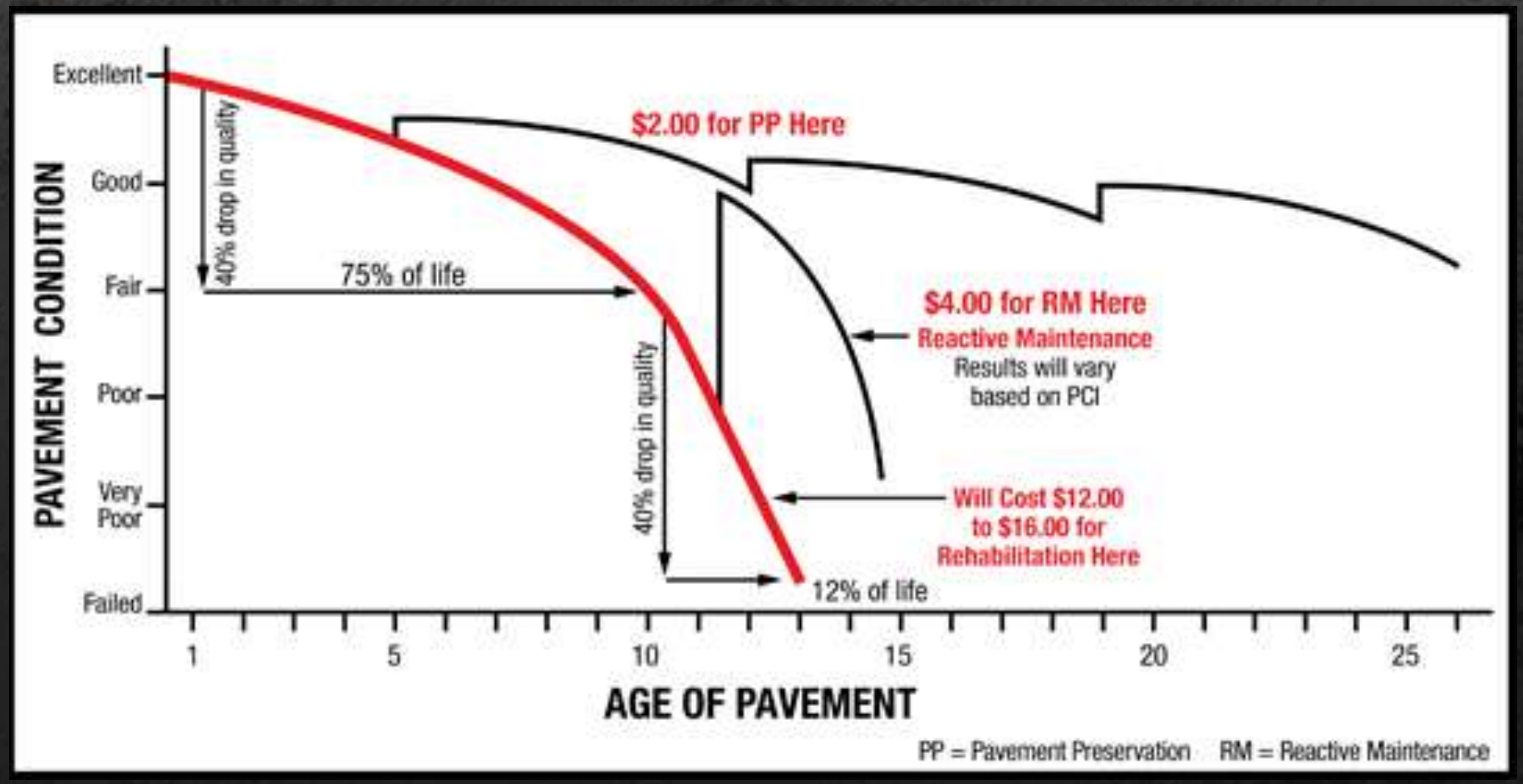
CIR - Cold In-Place Recycling

FDR - Full Depth Reclamation

Soil Stabilization/ Modification

Mix Design/ Testing

Pavement Condition Index



Crack Treatments

Crack treatments consist of placing specialized materials into prepared cracks to prevent water and incompressible intrusion into the cracks and underlying pavement layers, and to reinforce the adjacent pavement. Restriction of water entry into underlying pavement base and sub-grade layers serves to maintain pavement strength and prolong pavement life. Pavements in different climate zones, with different construction types, and with different traffic loadings experience different types of cracking. The various crack types experience different movement ranges depending mostly on crack spacing and temperature variations. Different types of crack treatment materials and installation geometries are required for the different conditions. (ISSA)

Chip Seal

Chip Seal is an application of a bituminous binder covered with an application of clean graded aggregate to an existing asphalt surface. It is also known as armor coat, bituminous sealing or seal coat, to name a few. The binders may be emulsions, paving grade asphalt cements, and modified versions of each being modified with various polymers such as latex, tire and natural rubbers.

The aggregates commonly vary in size from a maximum of 5/8 of an inch to a minimum of ¼ inch with less than 5% passing the No. 4 screen. Aggregate must be durable with the use of crushed stone, gravels or manufactured aggregates. Aggregates may be precoated with a small % of asphalt cement when used with hot asphalt binders. Chip Seal has been used in various forms since at least the early 1900's. The quality has improved over the years with better binder technology, cleaner aggregates, and improved equipment and a better understanding of how the materials perform together. (ISSA)

Slurry Pavement

Slurry Pavement is the principal materials used to create slurry seal such as aggregate, asphalt emulsion, and filler, which are mixed together according to a laboratory's design-mix formula. Water is also added for workability.

Asphalt emulsions serve as a binder, holding the crushed aggregate together and adhering the new slurry surfacing to the old surface over which it is being applied. Various emulsions and aggregates are used to meet the conditions, specifications, and requirements of individual projects.

The aggregate must be clean, crushed, durable, properly graded, and uniform. The asphalt emulsion is a three-part system consisting of asphalt, water, and emulsifier. Fillers such as Portland cement, hydrated lime, or aluminum sulfate liquid are often used in small quantities as stabilizers or chemical modifiers. (ISSA)

Micro-Surfacing

Micro Surfacing, one of the most versatile tools in the road maintenance arsenal, is a polymer-modified cold-mix paving system that can remedy a broad range of problems on today's streets, highways, and airfields. Like its parent product, slurry seal, Micro Surfacing begins as a mixture of dense-graded aggregate, asphalt emulsion, water, and mineral fillers. While conventional slurry seal is used around the world as an economical treatment for sealing and extending the service life of both urban and rural roads, Micro Surfacing has added capabilities, thanks to the use of high-quality, carefully monitored materials, including advanced polymers and other modern additives. (ISSA)

Any combination of the previous treatments (Cape Seal)

Cape Seal is a layer of bituminous surface treatment or chip seal, followed by an application of the micro surfacing. This process combines the benefits of chip sealing and micro surfacing and offers a finish that is similar to an asphalt overlay, but at a lower cost. (ISSA)

Milling Definition

Milling is the removal of a existing asphalt concrete prior to placing a surface treatment or full depth removal. There are many different reasons for milling and types of milling like Micro or profiling or full depth removal of asphalt.

HIR
Hot In-Place Recycling
Definition

Hot In-place Recycling is an on-site, in-place, pavement rehabilitation method that consists of heating, scarifying, softening, mixing, placing and re-compacting the existing bituminous pavement.

HIR
Hot In-Place Recycling
Methods

- Two Types of HIR Methods
  - Surface Method
    - Hot-In-Place Recycling Surface Method is an on-site, in place, pavement rehabilitation method that consists of **heating, scarifying, mixing, replacing and re-compacting** the existing bituminous pavement.
  - Re-HEAT Method
    - Re-HEAT is an on-site, in place, pavement rehabilitation method that consists of **heating** the existing pavement, **removing** the top surface course, **adding** an asphalt rejuvenating emulsion, **mixing** the material uniformly in an on-board mixing drum, **re-laying** the recycled material, followed by **compacting**.

HIR

Hot In-Place Recycling

the process (surface method)

1st Preheat (180 – 200 Degrees)

HIR

Hot In-Place Recycling

the process (surface method)

Preheat

2nd Preheat (280-300 Degrees)

HIR
Hot In-Place Recycling
the process (surface method)

Preheat

2nd Preheat

Rejuvenating Agent

HIR
Hot In-Place Recycling
the process (surface method)

Preheat

2nd Preheat

Rejuvenating Agent

Loosen Pavement

HIR
Hot In-Place Recycling
the process (surface method)

Preheat

2nd Preheat

Rejuvenating Agent

Loosen pavement

Remix

HIR
Hot In-Place Recycling
the process (surface method)

Preheat

2nd Preheat

Rejuvenating Agent

Loosen pavement

Re-profile

Remix

HIR
Hot In-Place Recycling
the process (surface method)

Preheat

2nd Preheat

Rejuvenating Agent

Loosen pavement

Finish Roll

Remix

Re-profile

HIR
Hot In-Place Recycling
the process (surface method)

Final Surface Course

Preheat

2nd Preheat

Rejuvenating Agent

Loosen pavement

Remix

Re-profile

Finish Roll

CIR
cold In-Place Recycling
definition

Cold In-place Recycling is a method of reconstructing the top layer of pavement where the need arises from structural failures. These failures include: transverse cracking, wheel rutting, potholes, surface irregularities, or a combination of the above. (ARRA)

CIR
cold In-Place Recycling
cross section

Existing

W/ CIR

CIR
cold In-Place Recycling
candidates

- Deteriorating Asphalt (Maintenance)
  - Secondary Roads
  - City Streets
  - Interstate Highways
  - Airport Runways
  - Large parking lots

CIR
cold In-Place Recycling
how to utilize CIR

- Thermal Cracking
- Poor Rideability
- Fatigue Cracking
- Patched/ Dry and Raveling Roads

CIR
cold In-Place Recycling
additives

- Emulsions
- Foamed Asphalt
- Other additives can be incorporated into either Emulsions or Foamed Asphalt

CIR
cold In-Place Recycling
single unit

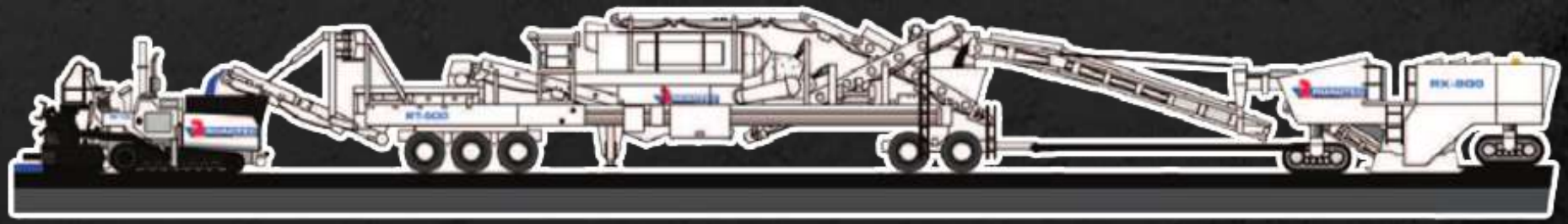
- Small size for urban projects
- Short turning radius
- Less operating/ mobilization costs

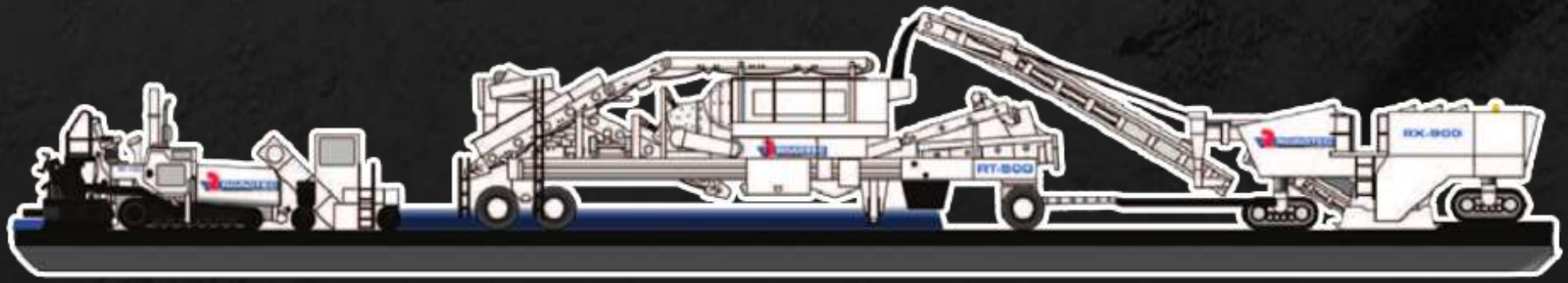
CIR
cold In-Place Recycling
the process (single train)

CIR
cold In-Place Recycling
multi unit

- Rural/ long stretches of roads
- Sizing control
- Mix in pugmill not a drum

cold In-Place Recycling
the process (multi-train)



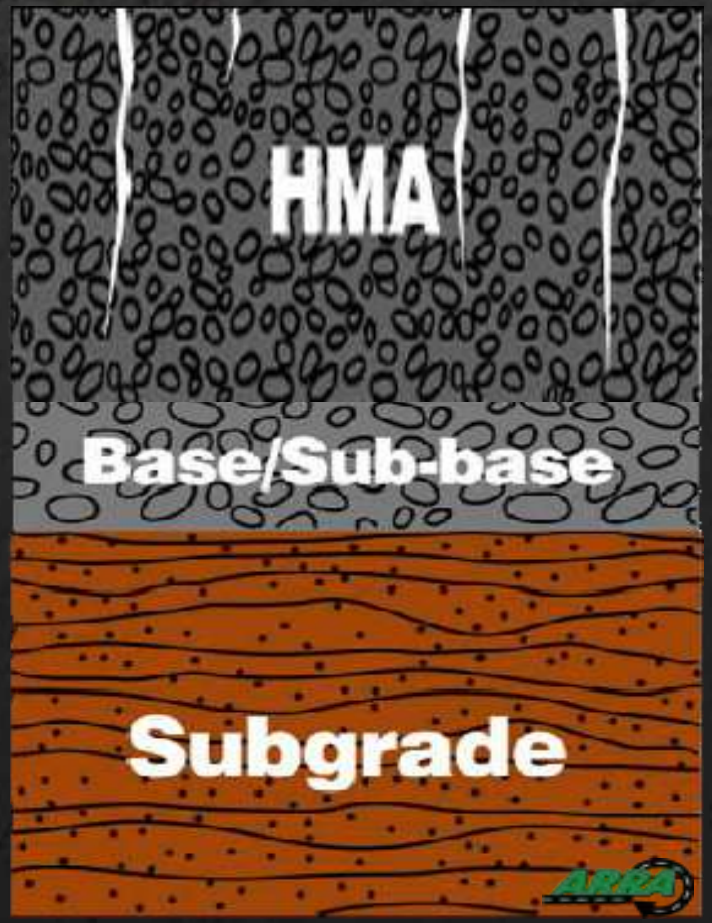


FDR
Full depth reclamation
definition

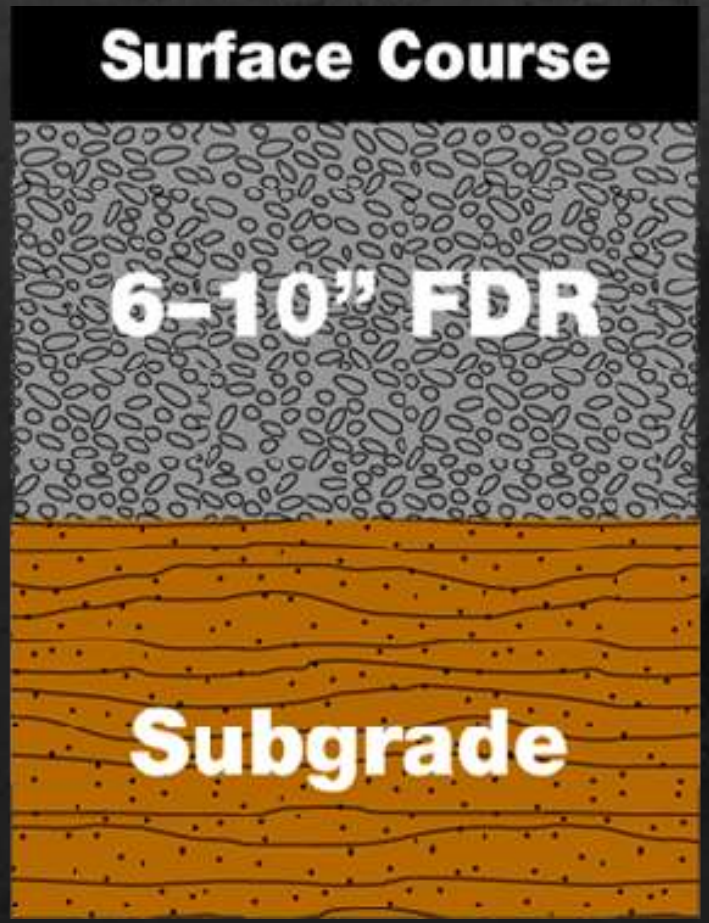
Full Depth Reclamation is a technique in which the full flexible pavement section and a predetermined portion of the underlying materials are uniformly crushed, pulverized, or blended, resulting in a stabilized base course; further stabilization may be obtained through the use of available additives. By addressing the entire pavement section, full depth reclamation is able to correct delinquent cross sections, increase the load-bearing strength of the base, and utilize 100% of the existing materials. (ARRA)

FDR
Full depth reclamation
cross section

Existing



Full Depth Reclamation



FDR
Full depth reclamation

Full depth reclamation
Cold Recycling Mill vs. reclaimer

- Collects millings into central windrow
- Utilize to remove surface asphalt if your project is sensitive to grade/ elevation

- Keeps pulverized material in same path
  - Creates homogenous blend
- Adds volume/ raises grade
- > 6” →compact before grading

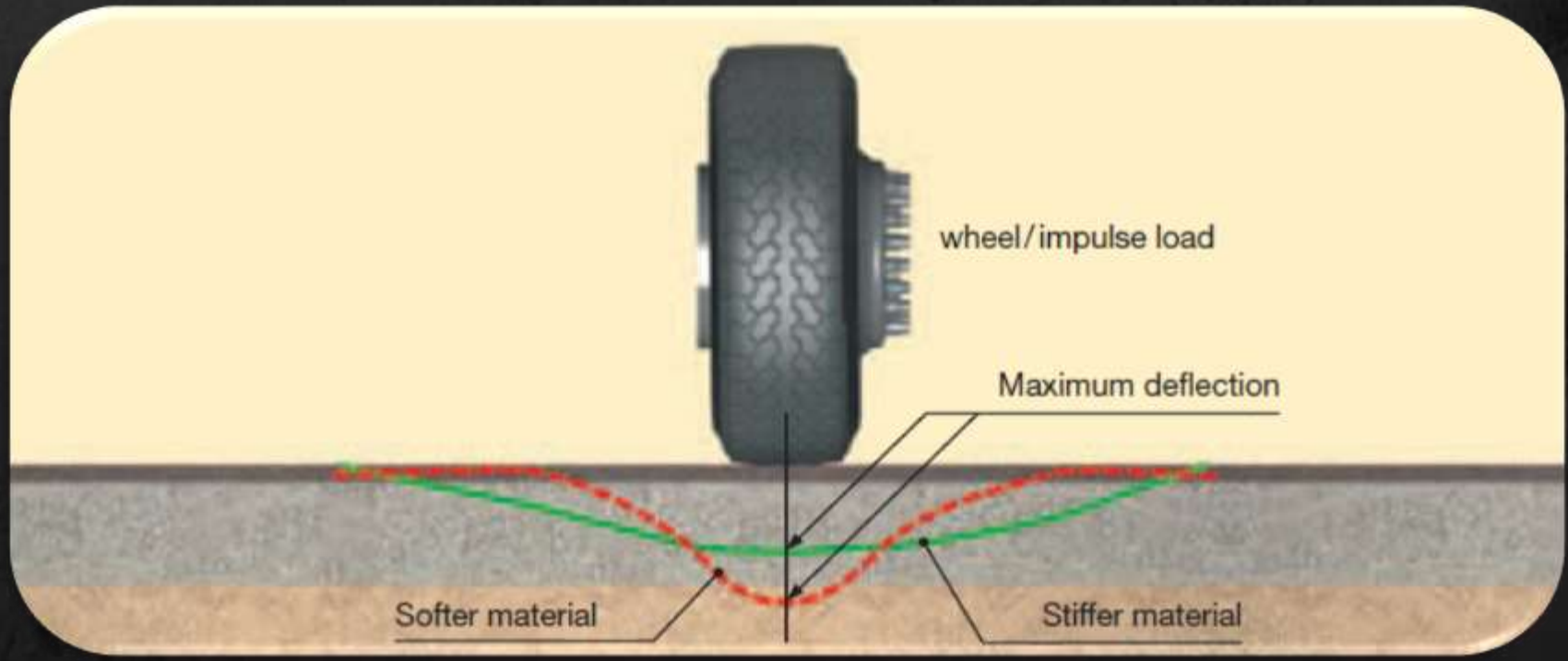
FDR
Full depth reclamation
Candidates

- Deteriorated Asphalt and/or Aggregate Base (Reconstruction)
  - Parking Lots
  - Industrial Storage Lots
  - All Roads
    - City Streets
    - Interstate Highways
    - Secondary Roads
  - Airport Runways

Full depth reclamation
when to utilize fdr

- Spec'd or Value Engineered on Asphalt Pavements in Need of Replacement

  - Frequent Deep Cracking
  - Reflective Cracking
  - Heavy Pothole Patching
  - Severe Rutting/ Shoveling
  - Frost Heaves (may require drainage corrections)
  - Insufficient Base Strength



FDR
Full depth reclamation
mechanical stabilization

- Recompaction of pulverized asphalt and/or aggregate surface
- May incorporate the addition of supplemental aggregate
- No stabilizer or binder are incorporated into the blend

Full depth reclamation chemical stabilization

- Includes the addition of chemical stabilizers such as:
  - Portland Cement
    - Dry or Slurry
  - Quicklime or Hydrated Lime
    - Dry or Slurry
  - Lime Kiln Dust (LKD)
  - Cement Kiln Dust (CKD)
  - Class “C” Fly ash
    - Or blends of the above

FDR
Full depth reclamation
bituminous stabilization

- Includes the addition of bituminous binders
  - Emulsified Asphalt
  - Expanded Foam

FDR
Full depth reclamation
The Process

Pre-pulverization

FDR
Full depth reclamation
The Process

Shape & Compact

Pre-pulverization

FDR
Full depth reclamation
The Process

Transportation

Pre-pulverization

Shape & Compact

FDR
Full depth reclamation
The Process

Spreading

Pre-pulverization

Shape & Compact

Transportation

FDR
Full depth reclamation
The Process

Mixing Powder

Pre-pulverization

Shape & Compact

Transportation

Spreading

FDR
Full depth reclamation
The Process

Mixing Emulsion/Foam

Pre-pulverization

Shape & Compact

Transportation

Spreading

Mixing

FDR
Full depth reclamation
The Process

Compacting

Pre-pulverization

Shape & Compact

Transportation

Spreading

Mixing

FDR
Full depth reclamation
The Process

Grading

Pre-pulverization

Shape & Compact

Transportation

Spreading

Mixing

Compacting

FDR
Full depth reclamation
The Process

Finish Static Roll

Pre-pulverization

Shape & Compact

Transportation

Spreading

Mixing

Compacting

Grading

Soil stabilization/ modification definition

Soil Modification, sometimes referred to as “mud drying”. Soil Modification is primarily intended to reduce moisture content and the plasticity in order to expedite construction, whereas stabilization can substantially increase the shear strength of a material such that it can be incorporated into the projects structural design. (ARRA)

Soil Stabilization is the long-term physical and chemical alteration of soils to enhance their physical and engineering properties. Stabilization of in-place soils by incorporating available additives can increase the shear strength of a soil and/or control the shrink-swell properties of a soil, thus improving the load bearing capacity of a subgrade to support pavements and foundations. (ARRA)

Soil stabilization/ modification cross section

Unstable Wet Subgrade

Stabilized Subgrade

Soil stabilization/ modification candidates

- **Soil Modification**
  - Up to 20'+
  - Dry wet/ unstable soil that cannot be properly compacted due to high moisture
    - High groundwater
    - Previous rain events
    - Unstable soil
  - Reduce moisture/ strengthen subgrade
- **Soil Stabilization**
  - Spec'd to add strength to the top 8" – 14" of subgrade
  - Spec'd to reduce moisture and stabilize soil characteristics of swelling and/or shrinkage

Soil stabilization/ modification
when to utilize soil stab/mod

- **Reactive**
  - To avoid project delays
  - To reduce costs of undercuts
  - To utilize onsite materials
  - To improve subgrade prior to aggregate placement (pass a proof roll)

- **Spec'd**
  - To improve structural integrity of the entire pavement section
  - To reduce thickness of aggregate base or asphalt to achieve overall structural strength determined by the engineer
    - 1" stabilized subgrade = 1" compacted aggregate base (.10 - .14 structural coefficient)

Soil stabilization/ modification typical stabilizers/ binders

- **Lime (%)**
  - Lime Kiln Dust (LKD) (3-6%)
  - Quicklime (1-3%)
- **Flyash(%)**
  - Class C (8-12%)
  - Class F, not on its own
- **Portland Cement (3-6%)**
  - Type I/II
- **Slurry**
  - Mostly urban areas
  - More expensive than powders
  - Less dusty
- **Others**
  - Enzymes, polymers, other stabilizers

KEY: GOOD / FAIR / POOR	Fine-Grained: More than 35% Passing No. 200					Coarse-Grained: Less than 35% Passing No. 200	
Type of Stabilizer	Plasticity Index (PI)					Plasticity Index (PI)	
	0	10	20	30	40 +	0	10 +
Portland Cement							
Lime							
Kiln Dust							
Class C Fly Ash							
Bituminous* (* Special Applications)		Not Applicable					N/A

Transportation

Soil stabilization/ modification the process

Transportation

Spreading

Soil stabilization/ modification the process

Transportation

Spreading

Mixing & Water

Soil stabilization/ modification the process

Transportation

Spreading

Mixing & Water

Compaction

Soil stabilization/ modification the process

Grading

Transportation

Spreading

Mixing & Water

Compaction

Soil stabilization/ modification the process

Finish Static Roll

Transportation

Spreading

Mixing & Water

Compaction

Grading

Mix Design/ Testing

SAVE THE DATE

IN-PLACE RECYCLING & RECLAIMING SEMINAR
WITH LIVE DEMONSTRATION

WHO SHOULD ATTEND:

The Seminar addresses the needs of professionals at all levels from Interstate Highways to Commercial and Residential Developments—Design Engineers, Highway Engineers, Consulting Engineers, other Public Works Officials, Contractors, and Material Suppliers, who want to incorporate responsible recycling into their pavement program.

Seminar Topics

- Slurry/ Micro Applications Live Demo
- Cold Planing Live Demo
- Hot In-Place Recycling Live Demo (WI Only)
- Cold In-Place Recycling Live Demo
- Full Depth Reclamation Live Demo
- Soil Stabilization Live Demo
- Alternative Road Designs
- Mix Designs

August 9th (Classroom) & 10th (Live Demonstrations), Ramada Plaza Fargo, ND 7:30 am - 5:00 pm
August 16th (Classroom) & 17th (Live Demonstrations), Lake Geneva, WI 7:30 am - 5:00 pm

FOR MORE INFORMATION VISIT WWW.ARRA.ORG