

Pavement Preservation With In-Place Recycling

Northeast Pavement Preservation Partnership

Burlington, Vermont

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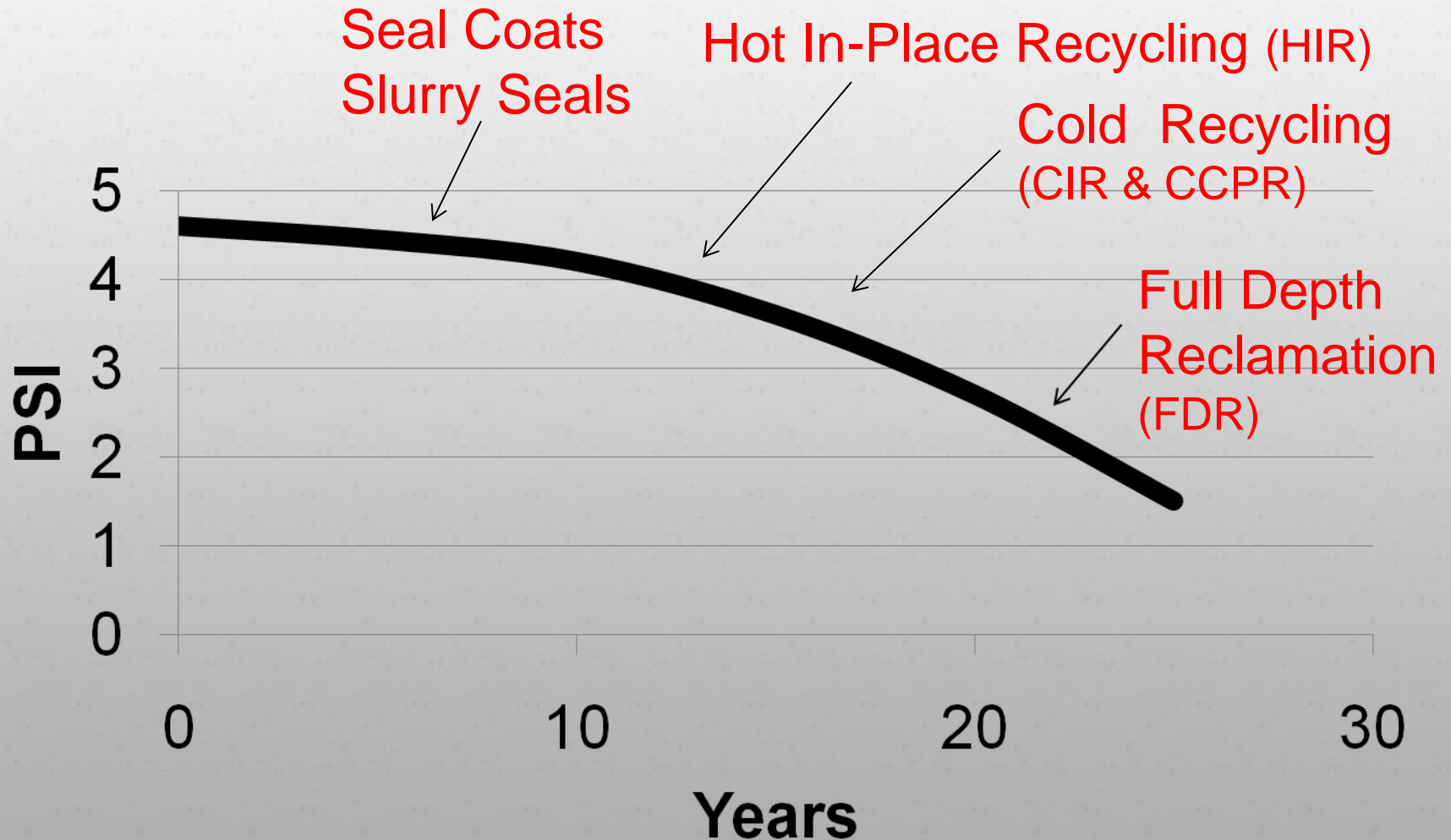
Asphalt Recycling & Reclaiming

Association



- ▶ **Asphalt Recycling & Reclaiming Association** www.ARRA.org
- ▶ **Industry Segments**
 - **Cold Planing**
 - **Hot In-Place Recycling**
 - **Cold Recycling**
 - **Full Depth Reclamation**
 - **Soil Stabilization**
 - **Hot Recycling**

Pavement Management



Recycling & Reclaiming Strategies

M&R	Strategy	Method	CP	HIR	CR	FDR
Construction	New					
	Reconstruction		X			X
Rehabilitation	Major		X		X*	X
	Structural Overlay		X	X*	X*	X*
Maintenance	Minor	PP	X	X	X	
	Preventative		X	X	X	
	Routine		X			
	Corrective		X	X	X	
	Catastrophic		X			

*With HMA Overlay

PP = Pavement Preservation

Cold Planing



- ▶ **Surface or grade preparation for other rehabilitation techniques**
- ▶ **Temporary driving surface**
- ▶ **Improving ride quality**
- ▶ **Fine & Micro-Milling**



Hot In-place Recycling

- ▶ **HIR uses heat to soften the existing asphalt pavement, mills or scarifies the pavement, adds recycling agent and additives (if desired), relays and compacts the pavement in one continuous process.**



Surface Recycling

Heating, reworking and rejuvenating top 1-2 inches of existing asphalt pavement in preparation of wearing surface.



Surface Remixing

Heating, reworking, and rejuvenating the top 1 to 2 inches of an existing asphalt pavement, adding new aggregate and/or admix and mixing the newly recycled mix material in a pugmill or drum mixing plant prior to laying, either as a binder or surface course.



Surface Repaving

- ▶ Heating, reworking and rejuvenating the top 1-2 inches of an existing asphalt pavement and simultaneously applying an overlay resulting in a single, thermally bonded layer



Modern Heating Equipment

Today's HIR equipment provides better heat to the pavement, allowing greater heat penetration, while minimizing damage to the binder.



Preheaters/Heater-Scarifying

- ▶ One or more preheaters
- ▶ One or more heater scarification units
- ▶ Remove/loosen pavement in one or more lifts



Milling/Scarifying

- ▶ Heated softened pavement is removed with tines or small diameter milling drums in a single pass or in sequential lifts



HIR Placement and Compaction: Similar to HMA

Placement



Compaction



HIR Benefits



- ▶ **Repairs distress**
- ▶ **Extends life**
- ▶ **Improves ride quality**
- ▶ **Eliminate need for a leveling course**
- ▶ **Improved bonding**
- ▶ **Environmentally friendly**
- ▶ **Cost savings**

Types of Cold Recycling

- ▶ **Cold Central Plant Recycling (CCPR)**



- ▶ **Cold In-Place Recycling (CIR)**



Cold Central Plant Recycling

A viable alternative when stockpiles of high quality RAP are available or when it is not possible to in-place recycle the pavement. Requires different emulsion formulations depending upon use (immediate lay or stockpile).



CIR Process Description

- ▶ **Restricted to asphalt pavement & minor amounts of base**
- ▶ **Pulverizing existing pavement 2-5” depth**
- ▶ **Sizing of the reclaimed asphalt (RAP)**
- ▶ **Addition of recycling agent and additives**
- ▶ **Mixing all component materials**
- ▶ **Placement and compaction of mixture**
- ▶ **Placement of surface course**

Multi-Unit CIR Train



Two & Single Unit Trains



CR – Placement & Compaction

Traditional
Asphalt
Pavers Used



Heavy (22-25 ton) pneumatic roller(s) and 10-12 ton vibratory steel wheel roller(s)

CR Recycling Agents & Additives

■ Recycling Agents

● Emulsified Asphalt

- Engineered Emulsions
- Polymer Modified Emulsions
- Solvent Free Emulsions (CSS) with Lime

● Foam (Expanded Asphalt)

■ Recycling Additives (added in small quantities)

- Cement
- Lime

CIR – Additive Application

Slurry Application. →

Cement and Lime may be applied in slurry form.



Dry Application.

Cement or Hydrated Lime may be spread dry in front of the recycling train (environmental issues).

Surface Course



- Seals for low volume roads
- Minimum 1.5" HMA medium traffic
- 3-4" HMA for high traffic
- CR Mixes: AASHTO structural number
"a coefficient" = 0.28-0.35

CR Advantages



- ▶ **Conserves energy**
- ▶ **Conserves materials**
- ▶ **Improved mix characteristics**
- ▶ **Cracks eliminated/reduced**
- ▶ **Cost effective**
- ▶ **Saves time**
- ▶ **May be performed under traffic**

What is FDR?



- ▶ A 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.

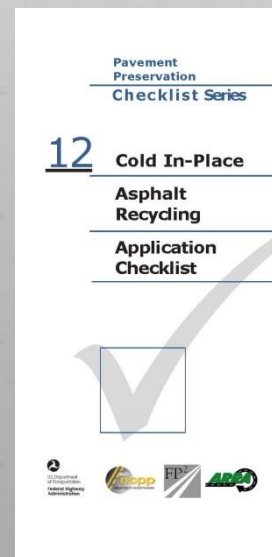
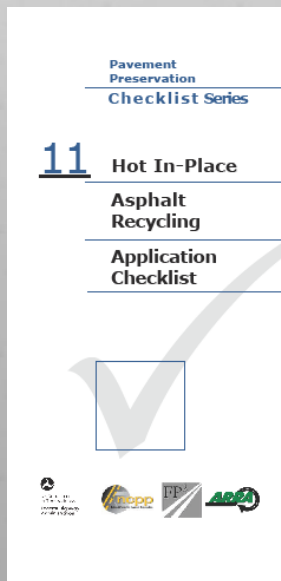


How to Get a Good In-Place Recycling Project?

- ▶ **Good Communication and Education**
 - **Especially For Inexperienced Agencies**
- ▶ **Proper Site Selection**
 - **Right Method Right Road**
- ▶ **Mix Design**
- ▶ **Good Specifications**
- ▶ **Experienced ARRA Contractor**

Education Resources

- ▶ Pavement Preservation Application Checklist Series
- ▶ Updated HIR & CIR, New FDR
- ▶ www.pavementpreservation.org
- ▶ www.arrya.org & www.fhwa.gov



Training Resources

- ▶ ***TCCC Inspector Training for Cold In-Place Recycling (CIR) Web Based***
FHWA-NHI-134114
- ▶ **http://www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=colId&typ=3&sf=0&course_no=134114**
- ▶ **www.tccc.gov**
- ▶ **TCCC Inspector Training for HIR and FDR under development.**

Training Resources

- ▶ **FHWA - National Highway Institute
FHWA-NHI-131050**
- ▶ **Asphalt Pavement In-Place
Recycling Techniques**
- ▶ **http://www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=131050&course_no=131050&res=1**
- ▶ **Two day course plus web based pre-course session**

ARRA Construction Guidelines

- ▶ **It is not intended or recommended that these guidelines be used verbatim within a specification. Owner agencies should use them to help establish their particular project specification.**

**Recommended
Quality Assurance Sampling and Testing Guidelines
For
Cold Recycling Using Bituminous Recycling Agents
CR301**

Last Revised 2-1-14



**Recommended Construction Guidelines
For
Full Depth Reclamation (FDR)
Using Cementitious Stabilization
FDR102**

Last Revised 1-11-14



ARRA Construction Guidelines

- ▶ **100 Series - Recommended Construction Guidelines**
- ▶ **200 Series - Recommended Mix Design Guidelines**
- ▶ **300 Series - Recommended Quality Assurance Sampling and Testing Guidelines**
- ▶ **400 Series – Recommended Project Selection Guidelines**

ARRA CR Construction Guidelines



- **CR101 Recommended Construction Guidelines For Cold In-place Recycling (CIR) Using Bituminous Recycling Agents**
- **CR301 Recommended Quality Assurance Sampling and Testing Guidelines For Cold Recycling Using Bituminous Recycling Agents**

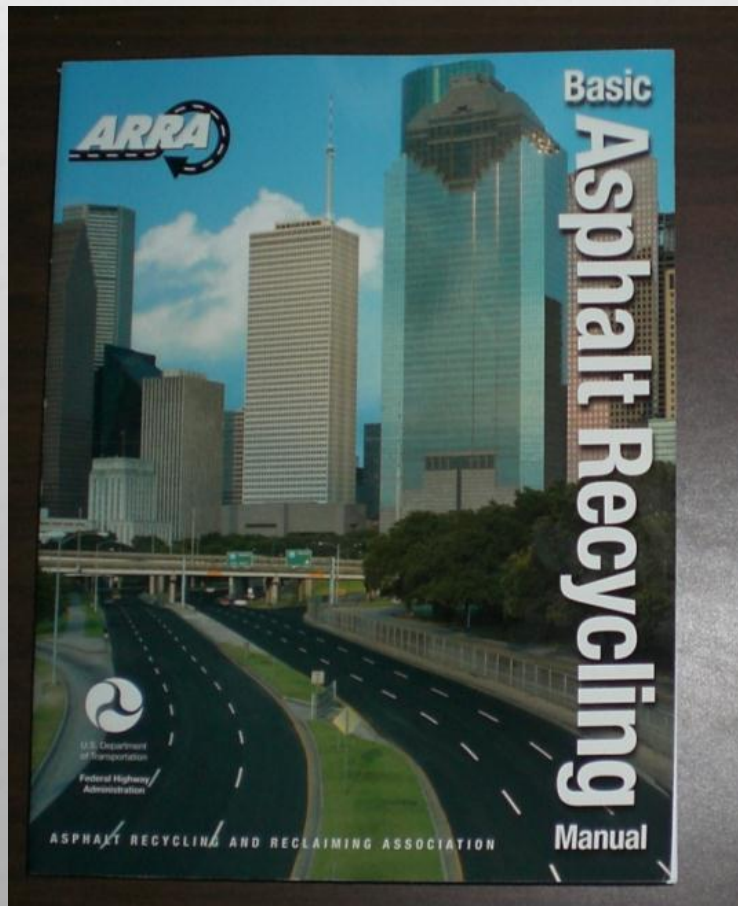
ARRA FDR Construction Guidelines



- **FDR101 Recommended Construction Guidelines For Full Depth Reclamation (FDR) Using Bituminous Stabilization**
- **FDR102 Recommended Construction Guidelines For Full Depth Reclamation (FDR) Using Cementitious Stabilization**
- **FDR103 Recommended Construction Guidelines For Full Depth Reclamation (FDR) Using Lime Stabilization**

Basic Asphalt Recycling Manual

2nd Edition



► Chapters on:

- Preconstruction Activities (project selection)
- Mix Design
- Construction
- QA Sampling & Testing
- Available Summer 2014

Thank You www.ARRA.org

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Magnitude 3.0 Earthquakes

