



ACTIVITIES

2014 International & Western States In-Place Recycling Conference

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**Asphalt Recycling & Reclaiming
Association**



Definitions

- ▶ **Asphalt Recycling & Reclaiming Association** www.ARRA.org
- ▶ **Industry Segments**
 - *Cold Planing (CP)*
 - *Hot In-place Recycling (HIR)*
 - *Cold Recycling (CR)*
 - *Cold In-place Recycling (CIR)*
 - *Cold Central Plant Recycling (CCPR)*
 - *Full Depth Reclamation (FDR)*

Other's Definitions

- ▶ *Hot In-Place Recycling (HIPR)*
- ▶ *Cold In-Place Recycling (CIPR)*
 - *Partial Depth CIPR*
 - *Same as ARRA's CIR*
 - *Full Depth CIPR*
 - *Same as ARRA's FDR*

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, scarifies the pavement, adds rejuvenating agent and additives (if desired), relays and compacts the pavement in one continuous process.**



Surface Recycling

Heating, reworking, rejuvenating and mixing the 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 admixture or new aggregate, if desired, mixing the newly recycled mix in a mixing chamber, placing and compacting



Surface Repaving

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



Single & Multiple Pass



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



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)**
- ▶ Also called partial depth cold in-place recycling



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. May be used immediately or stockpiled



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



Single Unit Trains



CR Advantages



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

Full Depth Reclamation(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.



Types of FDR

■ Mechanical Stabilization

- Pulverization
- Corrective Aggregate/RAP

■ Bituminous Stabilization

- Foamed Asphalt
- Emulsified Asphalt

■ Chemical Stabilization

- Cement
- Lime
- Fly Ash



FDR Construction



Add Stabilizing Agent = Stabilized Base

Cement Stabilization

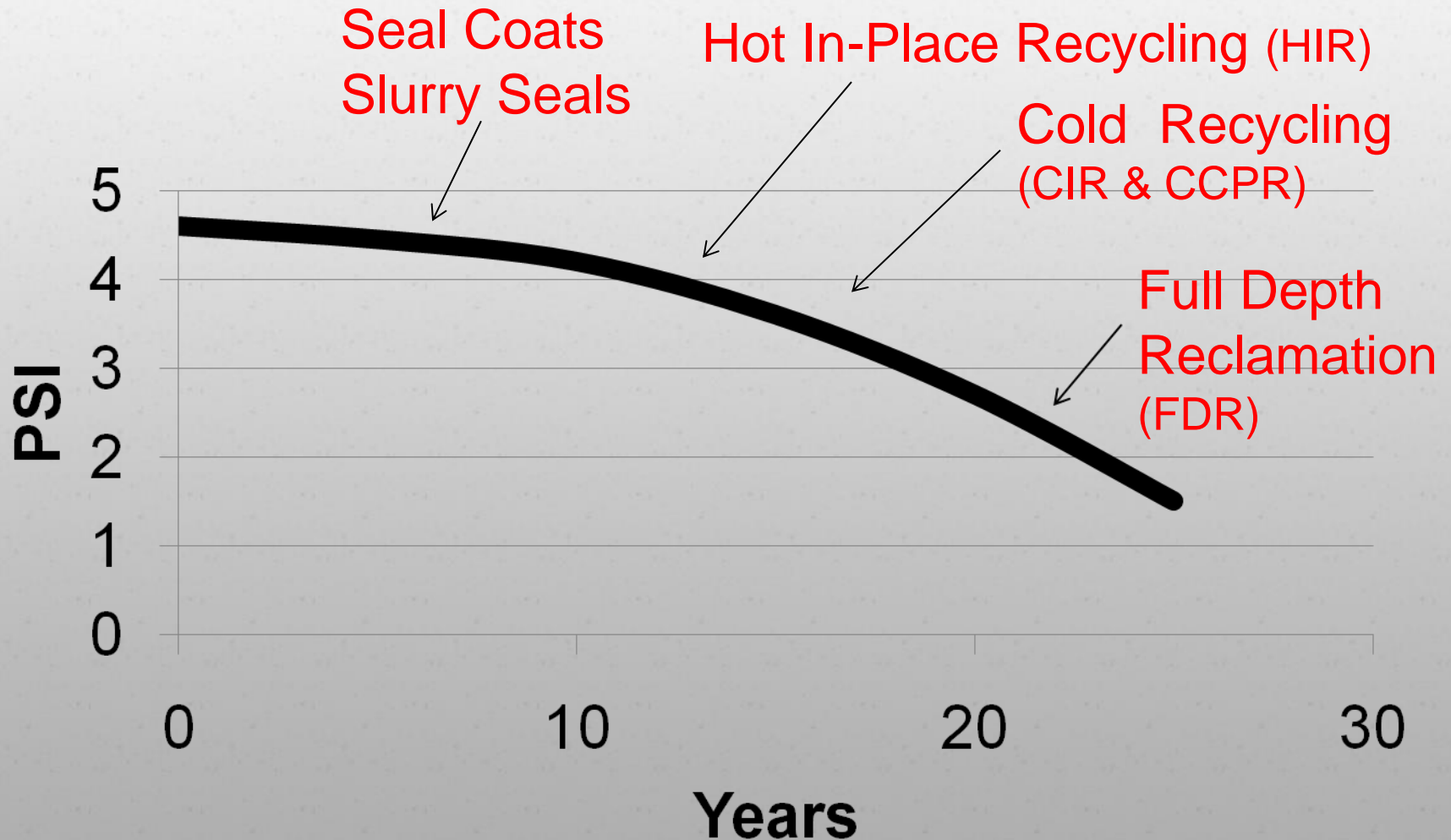


Bituminous Stabilization



Lime Stabilization

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

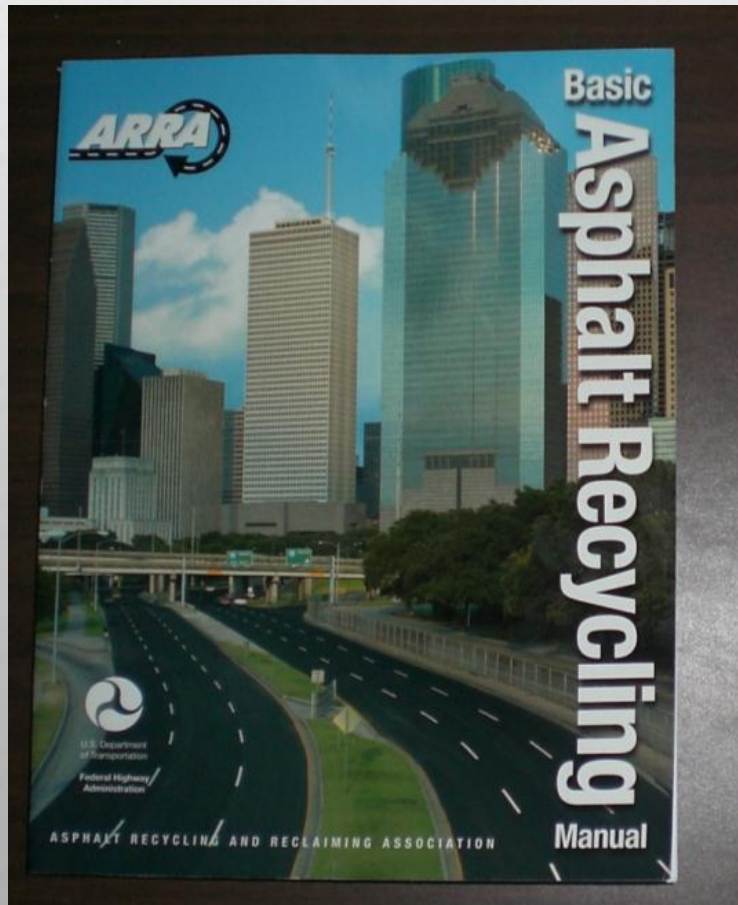
PP = Pavement Preservation

How to Get a Good In-Place Recycling Project?

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

Basic Asphalt Recycling Manual

2nd Edition

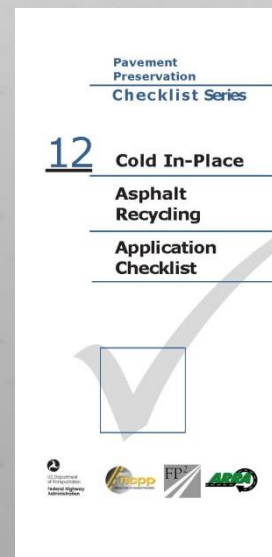
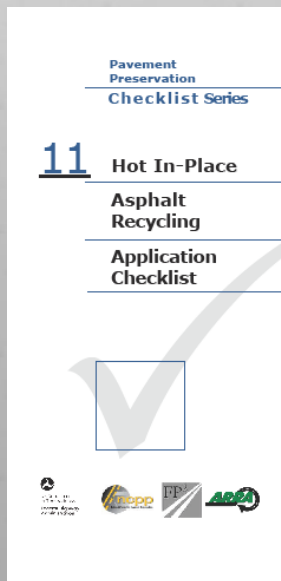


► Chapters on:

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

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.**

ARRA Best Practice Recycling 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 Guidelines

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

Status of ARRA Guidelines



Series	Cold Planing		Cold Recycling	
	Milling	Micro Milling	CIR	CCPR
100 Series Construction	Final Review	Final Review	Complete	Under Development
200 Series Mix Design	N/A	N/A	Complete*	
300 Series QC	Under Development		Complete	Under Development
400 Series Project Selection	N/A	N/A	Under Development	

Status of ARRA Guidelines



Series	Full Depth Reclamation (FDR)		
	Bituminous	Cementitious	Lime
100 Series Construction	Final Review	Final Review	Final Review
200 Series Mix Design	Under Development		
300 Series QC	Under Development		
400 Series Project Selection	Under Development		

Results QA Testing CIR

Test	No Delay	Delay
Lab Molded Voids	13.3%	20.6%
Dry Tensile Strength	74.5 psi	72.1 psi
Wet Tensile Strength	55.9 psi	64.9 psi
TSR	0.75	0.90
E* 20 C, 1 Hz	456,000 psi	355,000 psi

Thank You www.ARRA.org

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Magnitude 3.0 Earthquakes

