



# Specification Resources for In-Place Recycling

## SHRP2 Implementation Task Force Meeting

Stephen A Cross, PhD, PE  
Technical Director, ARRA

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U.S. Department of Transportation  
Federal Highway Administration

AMERICAN ASSOCIATION  
OF STATE HIGHWAY AND  
TRANSPORTATION OFFICIALS

**AASHIO**

# Cold Planing

- Surface or grade preparation for other rehabilitation techniques
- Temporary driving surface
- Improving ride quality
- Micro Milling
  - Permanent driving surface
  - Improving ride



# Hot In-place Recycling

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



# HIR Sub Disciplines

- Surface Recycling: Heating, reworking and rejuvenating top 1-2 inches of asphalt pavement in preparation of wearing surface.
- Remixing: Adding aggregate or admix and mixing in a pugmill or mixing drum.
- Repave: Simultaneously applying an overlay resulting in a single, thermally bonded layer



# 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. May be used immediately or stockpiled



# Types CIR Trains



# 4 Types of FDR

- Pulverization
- Mechanical Stabilization
  - Addition of RAP or Aggregate
- Bituminous Stabilization
  - Foamed or Emulsified Asphalt
- Chemical Stabilization
  - Cement
  - Lime
  - Type C Fly Ash





# Issues ARRA Faces

- Most Specifications In Use Were Generated By:
  - ◆ Contractors, Material Suppliers and Equipment Manufacturers
  - ◆ Geared to Their Own Specific Equipment, Materials or Techniques
- Unlimited Number of Environmental Conditions, Existing Materials and Traffic Levels Throughout North America
- There are Few Tests or Performance Parameters on ARRA Techniques
- Engineers Like Measures and Metrics. Not “Just Trust Me”



# Issues ARRA Faces

- Few issues with the hot processes such as hot in-place recycling
- Majority of issues are with the cold processes
- All must address issue of working with in-place materials
- Cold processes are time dependent (emulsions, foamed asphalt, cementitious materials) affects compacting field samples and coring
- Cold processes use water making field density measurements difficult



# Compaction Monitoring

- With CIR and CCPR ARRA recommends using a target density based on a rolling pattern and specifying heavy compaction equipment.
- Use nuclear density meter monitor compaction and wet density reading
- It can take weeks to months to recover an intact core
- FDR tends to use a field compacted Proctor to measure percent compaction along with a field moisture content.



# Verification of Field Mix Properties

- Sample age and temperature can have pronounced affect on measured mix properties
- Sealing uncompact samples in containers does not appreciably help
- Must specify maximum compaction delay and sample temperature
- Usually requires compaction on-site



# Results QA Testing on CIR

<b>Test</b>	<b>No Delay</b>	<b>Delay</b>
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

# ARRA Education Activities

- ARRA Best Practice Guidelines
- New Basic Asphalt Recycling Manual
- Transportation Curriculum Coordination Council (TC3) web based courses
- FHWA Tech Brief In-place Recycling Project Selection
- NHI In-place Recycling Course
- ARRA 1-Day Seminars



# Goals of ARRA Specification/Guidelines

- ARRA Recommendations for a Successful Project
- Become the Standard Across North America
- Satisfy the Vast Majority of ARRA Contractors, Product Suppliers and Equipment Manufactures
- Raise the Bar
  - Improve the Industry – Force competitors to get better – Level the playing field
  - Make Owner Agencies using them comfortable they will get the quality and performance they want



# ARRA Best Practice Guidelines to Complement BARM II

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





# ARRA Best Practice Guidelines

- **Best Practice Guidelines**
  - Suggested Specification Language
- **Sampling & Mix Design Guidelines**
- **QC Guidelines**
  - Recommended Quality Control Checks and Remediation Actions
- **Project Selection Guideline**
  - New FHWA Tech Brief
- All Provide User Notes for More Information







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Asphalt Recycling & Reclaiming Association's recycling of existing roadway materials through limited natural resources and reduce costs. New anti-terrorism policies and procedures, or the highways. Everyone acknowledges that soon and rehabilitated, and that the methods represent lasting alternatives for stretching available do

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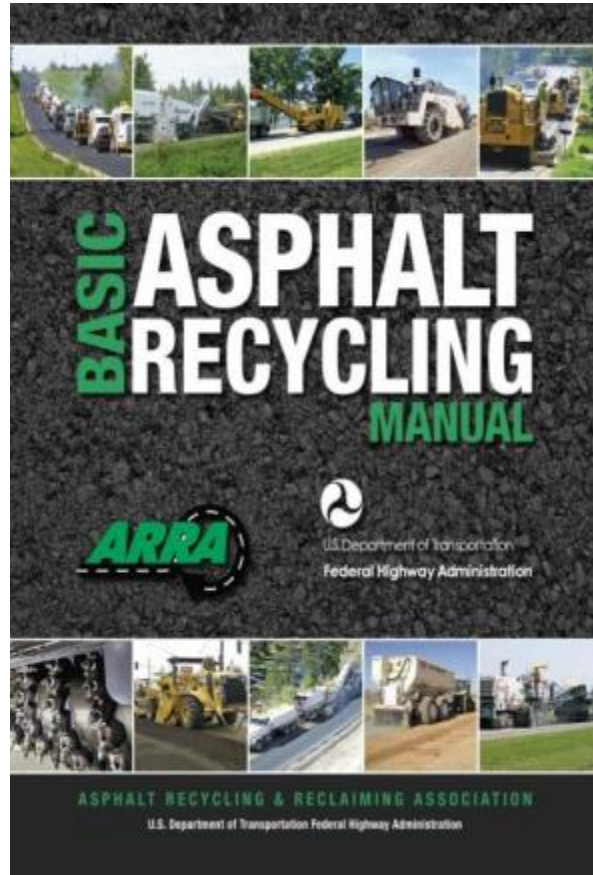


...n has been to promote the methodologies, to preserve with politics, social issues, certain – America needs its to be maintained, preserved, the least expensive, longest

SAVE THE DATE

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# BARM II

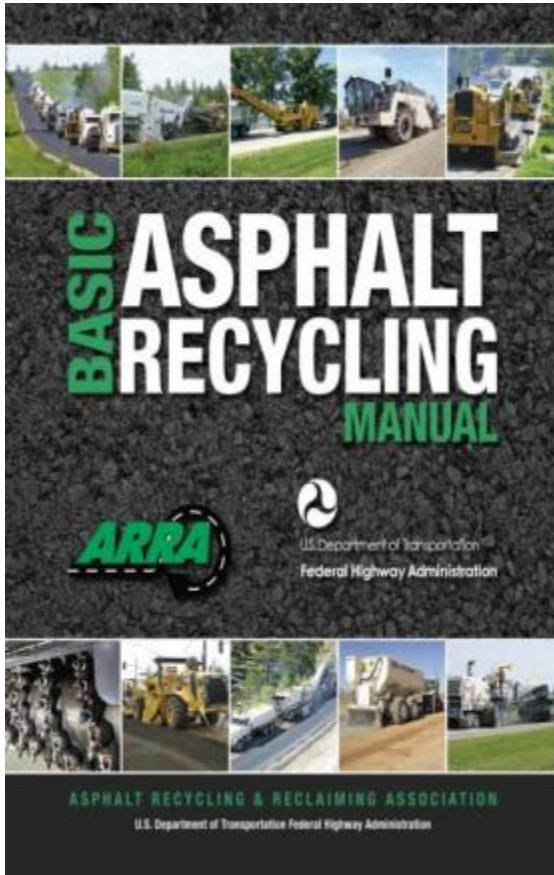


- **Sections on:**
- **Cold Planing**
- **Hot In-place Recycling**
- **Cold Recycling**
- **Full Depth Reclamation**

FHWA –HIF-14-001



# BARM II



## For Each Part - Chapters on:

- Detailed Project Analysis
- Mix Design
- Construction
- Project Specifications and Inspection



# Recent Studies

- *NCHRP 9-51* Material Properties of Cold In-Place Recycled and Full-Depth Reclamation Asphalt Concrete for Pavement Design – Nearing Completion.
- Virginia DOT I-81 Reports
- VDOT Test Sections at NCAT Test Track
- *Project 9-62*: Quality Assurance and Specifications for In-Place Recycled Pavements Constructed Using Asphalt Based Recycling Agents - Pending



# AASHTO CR Emulsion Mix Designs

**Both are working their way through approval process**

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**Standard Specification for**

**Materials for Cold Recycled  
Mixtures with Emulsified Asphalt**

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**AASHTO Designation: MP xxx-17<sup>1</sup>**

**Technical Section: 2a**

X1.1.1. Release: Group 3 (Month yyyy)

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**Standard Practice for**

**Emulsified Asphalt Content  
Cold Recycled Mixture Design**

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**AASHTO Designation: PP xxx-17<sup>1</sup>**

**Technical Section: 2a**

X1.1.1. Release: Group 3 (Month yyyy)



# TC3 Web Based Courses

Three Inspector Training  
Courses for HIR, CIR & FDR  
Hosted by AASHTO  
Free at Checkout

Module 1: Introduction to  
Cold In-Place Recycling

The presentation is available as an attachment from the paperclip icon in the bottom right-hand part of the screen.



[Continue](#) 



# TC3 Training Resources

- **Hot In-place Recycling (HIR): ID 2590**
  - [https://training.transportation.org/item\\_details.aspx?ID=2590](https://training.transportation.org/item_details.aspx?ID=2590)
- **Inspector Training for Cold In-place Recycling (CIR): ID 2509**
  - [https://training.transportation.org/item\\_details.aspx?ID=2509](https://training.transportation.org/item_details.aspx?ID=2509)
- **Full Depth Reclamation (FDR): ID 2593**
  - [https://training.transportation.org/item\\_details.aspx?ID=2593](https://training.transportation.org/item_details.aspx?ID=2593)



# Additional Training Classes

- ARRA Cold Milling & In-Place Recycling Workshops
- NHI 131050 Asphalt Pavement In-Place Recycling
  - 2 brief web based training modules
  - 2-day Instructor-led classroom

The Asphalt Recycling & Reclaiming Association's

## Cold Milling & In-Place Recycling Workshops



Need additional information on In-Place Recycling? Have a limited travel budget or unable to cross state lines for training? ARRA is developing a series of 1-day workshops that we can bring to your agency focusing on:

- Cold Planing
- Hot In-Place Recycling
- Cold Recycling (Both in-place and central plant)
- Full Depth Reclamation

These Workshops can be tailored to meet your specific needs and can cover all, a portion, or an individual ARRA discipline. Course content for the in-place recycling disciplines will cover:

1. Overview of the discipline or disciplines
2. Project selection criteria
3. Mix design procedures
4. Pavement/Thickness design procedures
5. Construction best practices
6. Quality Assurance and Specifications



Workshop content is based on the Second Edition of ARRA's Basic Asphalt Recycling Manual and ARRA's Best Practice Guidelines, which were developed with input from FHWA.

To learn more or to schedule a Workshop contact:  
Stephen A. Cross, PhD, PE  
Technical Director, ARRA  
405.334.3243  
steve.cross@okstate.edu



Thank You [www.ARRA.org](http://www.ARRA.org)

Stephen A. Cross, PhD, PE

Oklahoma State University

[steve.cross@okstate.edu](mailto:steve.cross@okstate.edu)

405-744-7200

Technical Director, ARRA

