Pavement Preservation With In-Place Recycling

Northeast Pavement Preservation Partnership

Burlington, Vermont
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Industry Segments

- Cold Planing
- Hot In-Place Recycling
- Cold Recycling
- Full Depth Reclamation
- Soil Stabilization
- Hot Recycling
Pavement Management

Seal Coats
Slurry Seals
Hot In-Place Recycling (HIR)
Cold Recycling (CIR & CCPR)
Full Depth Reclamation (FDR)

PSI
Years
0 10 20 30
# Recycling & Reclaiming Strategies

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<th>HIR</th>
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<th>FDR</th>
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*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
**Slurry Application.**

Cement and Lime may be applied in slurry form.

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**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.arrra.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
- 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.
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
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Magnitude 3.0 Earthquakes