

NCHRP 14-43 Construction Guide Specifications for Cold Recycling

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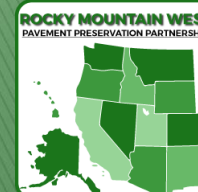
National Pavement Preservation Conference

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NCHRP 14-43 Objectives

- ▶ Develop a proposed AASHTO Construction Guide Specification for CIR and CCPR
 - Five-part AASHTO format
 - Includes commentary
- ▶ Develop Best Practice Guide and additional training material
 - Critical to implementation of guide spec

Team

- ▶ Ben Bowers, PI
- ▶ Brian Diefenderfer, Co-PI
- ▶ Steve Cross
- ▶ Adriana Vargas
- ▶ Fan Gu



S. Cross & Associates, LLC



What is included: CCPR Construction Process

1) Load RAP into CCPR plant mixing chamber and then into dump trucks



3) Compact to the specified density



2) Pave CCPR mixture



What is included: CIR Construction Process



Apply dry additive ahead of CIR train (if used)



Single unit train with attached screed



CIR crushing/screening unit and pugmill



Feeding into scalping screen and hopper



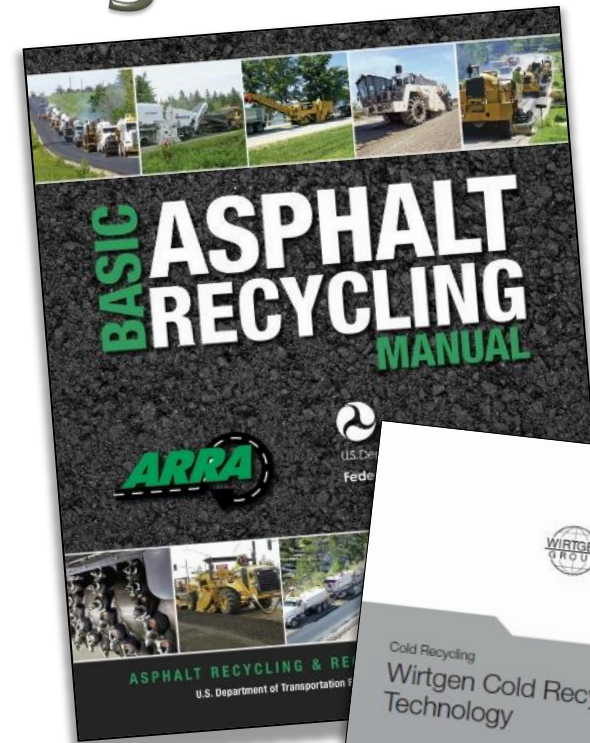
Multi-unit CIR train



Compact to target density

What is not included: Mix Design

- ▶ Great information can be found in:
 - AASHTO MP 31, MP 38, PP 86, PP 94
 - Wirtgen Cold Recycling Manual
 - Asphalt Recycling and Reclaiming Association (ARRA) Basic Asphalt Recycling Manual (BARM)



Focus Areas

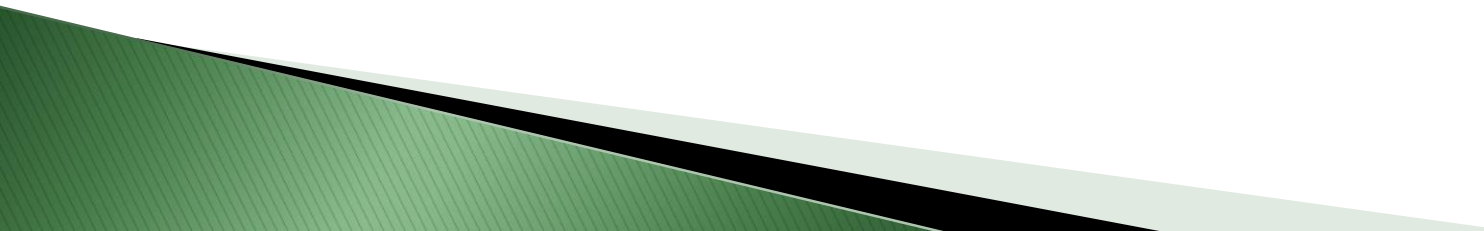
- ▶ Consistent terminology
 - Across all documents, mirrors BARM
- ▶ Nuanced but important differences between processes and recycling agents
 - CIR vs CCPR
 - Foamed vs emulsified asphalt binders
- ▶ Guide specification with details
 - Gives room for flexibility by agencies

Research Approach

▶ Phase I

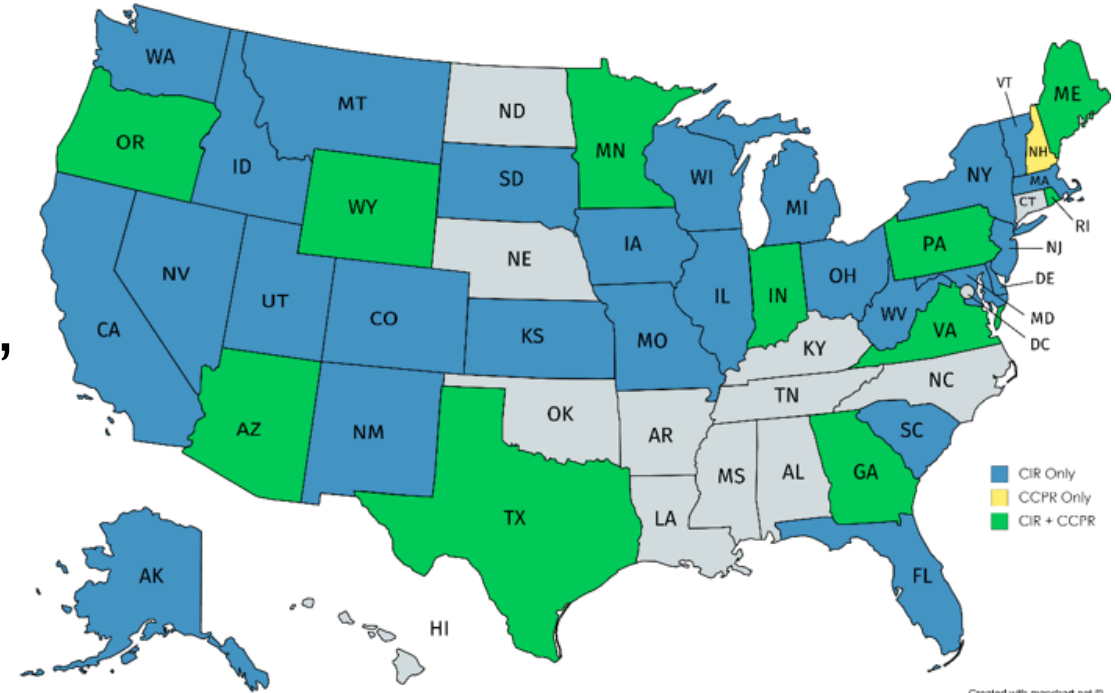
- Literature review
- Compile and summarize existing specs
- Survey stakeholders
- Targeted interviews

▶ Phase II

- Assess similarities and differences
 - Develop draft specifications
 - Summarize best practices
 - Develop training materials and implementation plan
- 

Phase I – Literature Review

- ▶ Reviewed state agency specifications and special provisions
- ▶ Collected specs from
 - AASHTO Committees on Maintenance, Materials and Pavements, and Construction
 - National Association of County Engineers

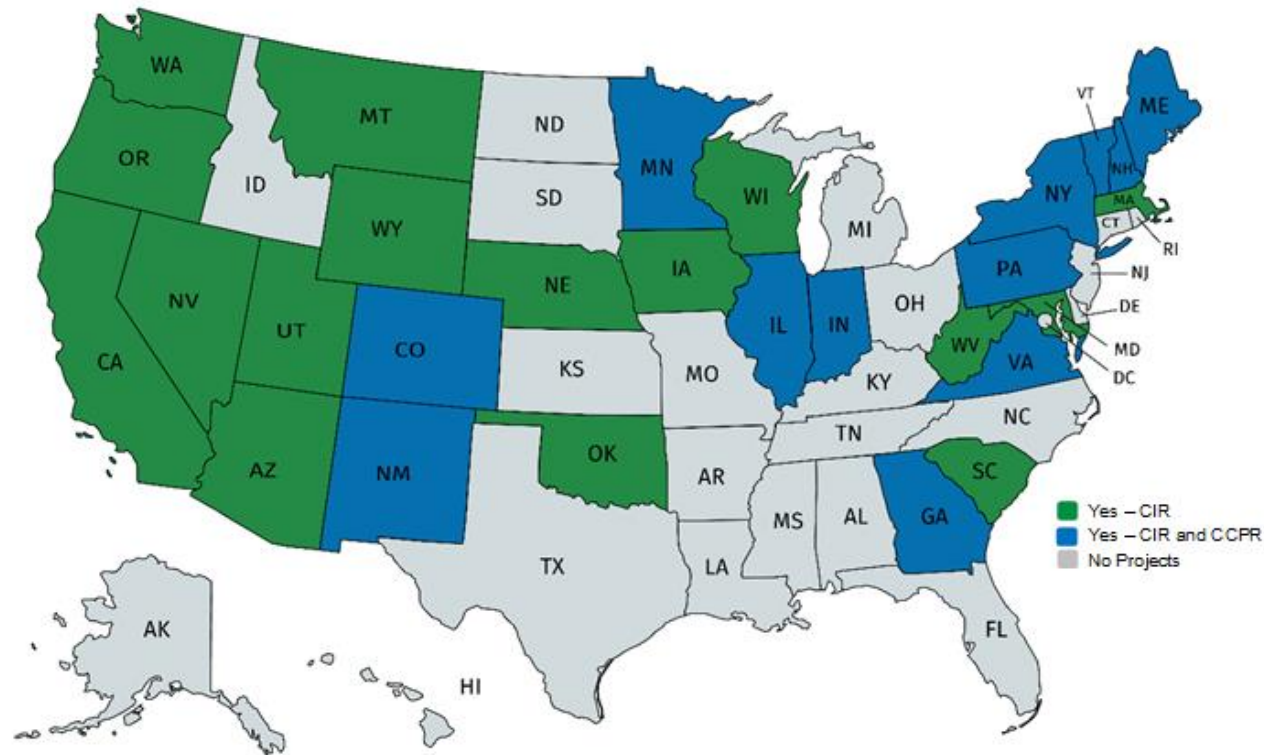


2019 Map of State Agencies Adopting Cold Recycling Specifications (Searchable)

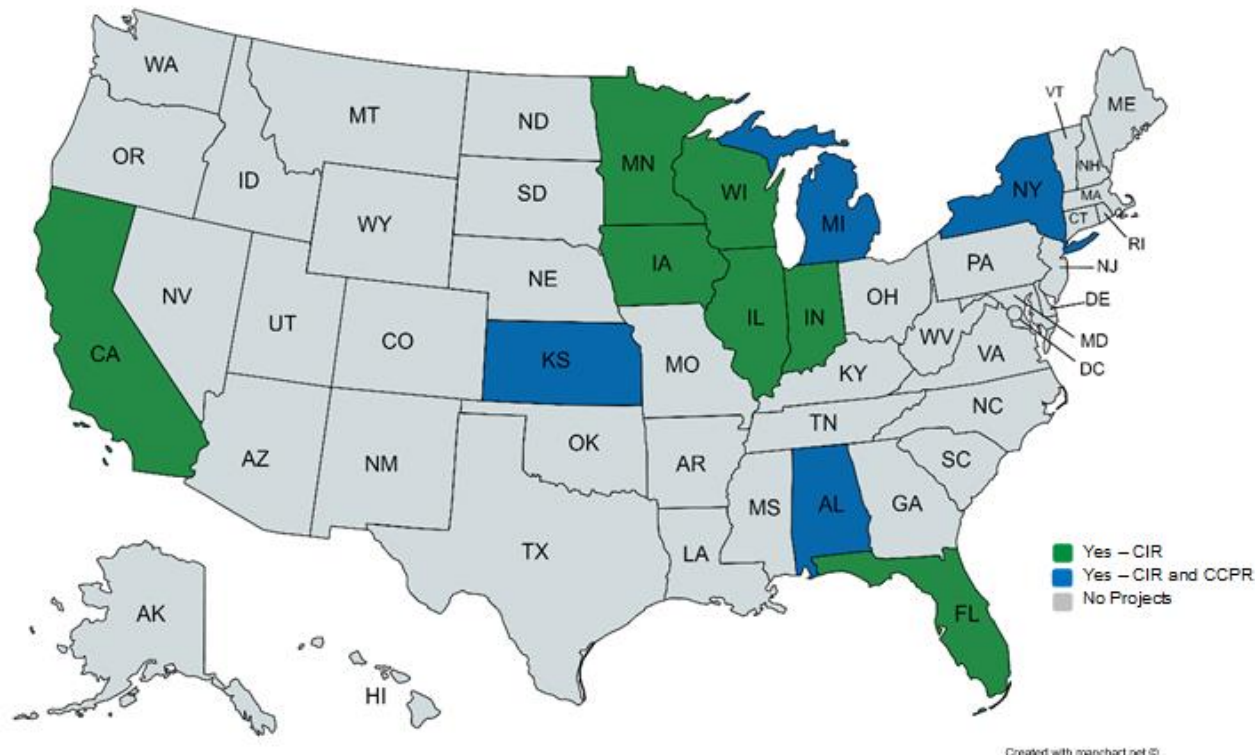
Phase I – Literature Review

- ▶ 44 state/provincial agencies
- ▶ 33 location agencies

State agencies that completed a project in the last five years.



State with local agencies that completed a project in the last five years.



Phase I – Focused Survey

- ▶ 10 agency and 6 industry participants
- ▶ Selected based on location and level of experience
- ▶ What works? What doesn't? What is missing?



Phase I – Focused Survey Findings

- ▶ Specification components to achieving good performance
 - Pre-construction quality control plan and just-in-time training were noted most often
- ▶ Specification components that may be unnecessary
 - Some requirements may not be adding significant value and may be surrogates for desired properties that are hard to measure
 - Examples include: gradation with many sieves, cracking tests, lab testing of field materials, curing requirements measured by moisture content

Phase I – Focused Survey Findings

- ▶ Specification components that are missing
 - Guidance documents
 - Field acceptance tests and design using balanced mix design concepts
- ▶ Test strip timing
 - Consider mobilization costs especially when the test strip is required to be performed and accepted prior to actual production

Phase I – Focused Survey Findings

- ▶ Moisture content measurements in the field
 - Low is good, high is bad. But what about in between?
 - Does a certain moisture content guarantee performance?
- ▶ Production density target
 - Specifications cover many ways to establish target density
 - Commentary is needed on challenges with each method and when to establish a new target

Phase I – Focused Survey Findings

- ▶ Mixture validation tests
 - May have a long time until results are obtained
 - Reduced value
 - Mat not be useful for acceptance
- ▶ Test requirements and test frequency
 - Consider adjusting based on traffic level or roadway type

Phase I – Focused Survey Findings

- ▶ Achieving good smoothness / surface tolerance
 - Various methods to measure along with their benefits/drawbacks are discussed in best practices document
- ▶ Measure smoothness / surface tolerance on recycled layer or final surface?
 - Most often final surface
 - May have implications if recycling is performed by a subcontractor

Phase II – Specification Development

- 1) Description
- 2) Referenced Documents
 - AASHTO Standards
 - Other published standards
- 3) Terminology
- 4) Materials
 - Materials
 - Reclaimed Asphalt Pavement (RAP)
 - Asphalt recycling agent
 - Mixture design
 - Referenced AASHTO Specifications for Mix Design



Phase II – Specification Development

5) Construction

a. Equipment requirements

- Self-propelled milling machine
- Sizing equipment
- Additives (dry or slurry)
- Cold Central Plant Recycling Equipment
- Water Supply

- Hauling equipment
 - Laydown equipment
 - Compaction equipment
 - Optional fog sealing and fine aggregate spreading equipment
- ### b. Equipment Calibration

Phase II – Specification Development

- 5) Construction (continued)
 - c. Preconstruction meetings
 - Just in time training
 - Preconstruction personnel training
 - d. Roadway preparation
 - e. Weather limitations
 - f. Processing and Mix operations
 - g. Paving operation
 - Placement
 - Compaction
 - h. Opening to traffic
 - i. Maintenance
 - j. Pavement Smoothness / Surface Tolerance
 - k. Surfacing
 - l. Quality Assurance Program
 - Equipment calibration
 - Quality control plan
 - Acceptance testing
 - Independent assurance

Phase II – Specification Development

- 6) Measurement
 - a. Mixture
 - b. Recycling agent
 - c. Active filler
 - d. Corrective aggregate
 - e. Fog seal and fine aggregate
 - f. Tack coat
 - g. Subgrade repair
- 7) Payment



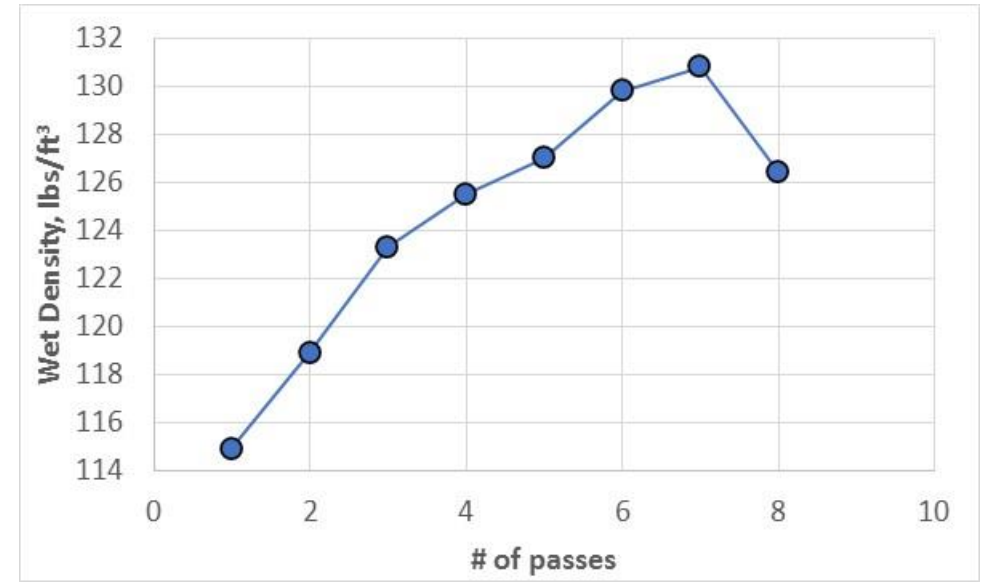
Phase II – Best Practice Guide and Training

- ▶ Best Practice Guide
 - Summarize best practices to produce a quality CR material
 - Identify areas where more research is needed to see if we can improve practices
- ▶ Training materials
 - Overview of CIR and CCPR construction
 - Linkage between Guide Specifications and Best Practice Guide

Examples

Construction: Test Strip

- ▶ Construct a test strip on the project at an approved location
 - Process a minimum 500-ft-long test strip with testing in the last 200 feet
- ▶ Provide the Engineer with...
 - Maximum in-place density achieved
 - Percent passing maximum sieve size
 - Application rates of recycling agent, water, and other additives used on the test strip



Construction: Trafficking

- ▶ Do not allow traffic on the recycled layer (including construction traffic) until:
 - The moisture content is reduced to 3.0% or less, or
 - Passing values using AASHTO xxxx (NCHRP 9-62 Short-Pin Raveling Test) are obtained, or
 - Approval from the Engineer



Acceptance Table

Property	Method	Minimum Frequency	Criteria
Density	AASHTO T 310 or T 355	Once per 100 ft	97–103% of target density
Gradation	AASHTO T 27	At least once in the first 250 ft of each day and then once per 2500 ft thereafter	100% passing max particle size
Cross Slope	Agency Method	At least once in the first 250 ft of each day and then once per 500 ft thereafter	±0.1% of planned percent cross slope
Surface Tolerance			Less than 3/8 inch using a 10–ft straight edge
Recycling Agent	Read Meter	At least once in the first 250 ft of each day and then once per 1000 ft thereafter	±0.25% of planned percent rate
Active Filler			±0.1% of planned percent rate
Corrective Aggregate			±0.1% of planned percent

Report and Specification Timeline

- ▶ Final report and best practice guides have been submitted to NCHRP and were approved by the project panel
 - Digital version expected later this year
- ▶ AASHTO specifications are in review

Section XXX

Construction Guide Specification for Cold Central Plant Recycling

XXX.1. DESCRIPTION

This guide specification is intended to provide information needed for agencies and contractors for the construction of cold central plant recycling (CCPR). CCPR consists of mixing an asphalt recycling agent, water, and additives with the reclaimed asphalt

Section XXX

Construction Guide Specification for Cold In-Place Recycling

XXX.1. DESCRIPTION

This guide specification is intended to provide information needed for, agencies and contractors for the construction of cold in-place recycling (CIR). CIR consists of milling and pulverizing existing asphalt layers to a specified depth; mixing an asphalt recycling

Questions?

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