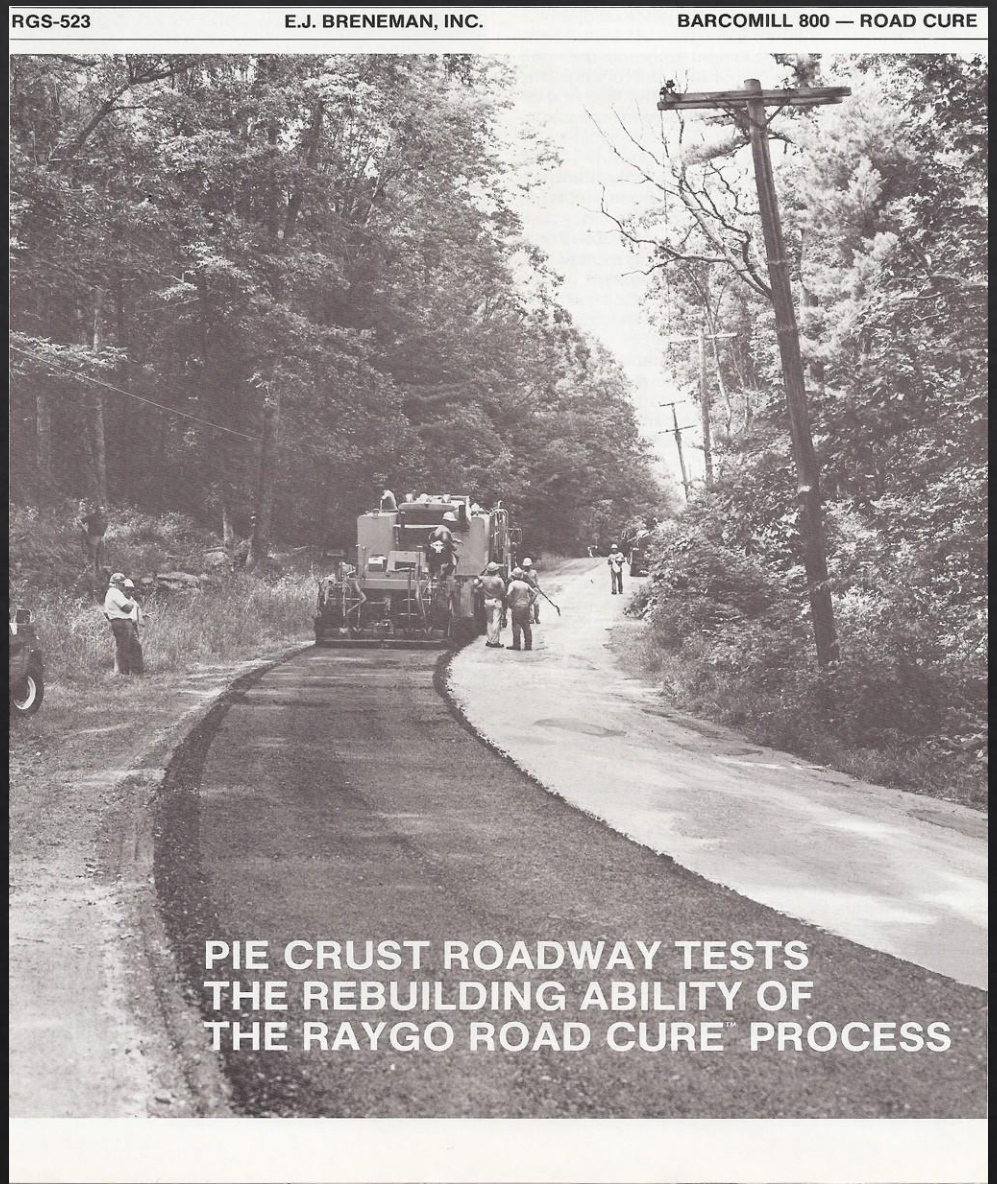
County Engineers Association of Maryland CEAM

Cold In-Place Asphalt Recycling

Recon Construction Services, Inc.,

Cold In-Place Asphalt Recycling (CIPR)

1983 Luzern County, Allegany County Pa Harford County Hess Road 1989



INTRODUCTION

Cold In-Place Asphalt Recycling

CIPR

We will discuss:

CIPR Process
Equipment
Candidates
In-Place Material
Mix Design
Additives
Compaction
Wearing Surface

What is Cold In-Place Recycling?

- The recycling of a deteriorated asphalt pavement material that has reached the end of its serviceable life. This includes asphalt wearing and asphalt base course material.
- In some cases, the underlying aggregate may be incorporated into the new recycled pavement.
- Dual additives and imported Aggregate or RAP may be introduced into the mix
- Typical depths are 3 to 5 inches.
- The milling machine down cuts and sizes the old asphalt pavement. The material is then mixed in-place with a new asphalt binder, and Portland cement paver-laid and compacted to the desired depth and scope of the project specifications, using steel drum vibratory rollers and pneumatic tire rollers for the compaction effort.

Asphalt pavements eventually will develop distress such as:

- Cracking
- Raveling
- Potholes
- Poor ride quality
- Corrugated or alligator cracks
- Cross section issues

Traffic, weather and hardening of the asphalt binder all contribute to these problems.

Pavement is not flexible, hard, dry

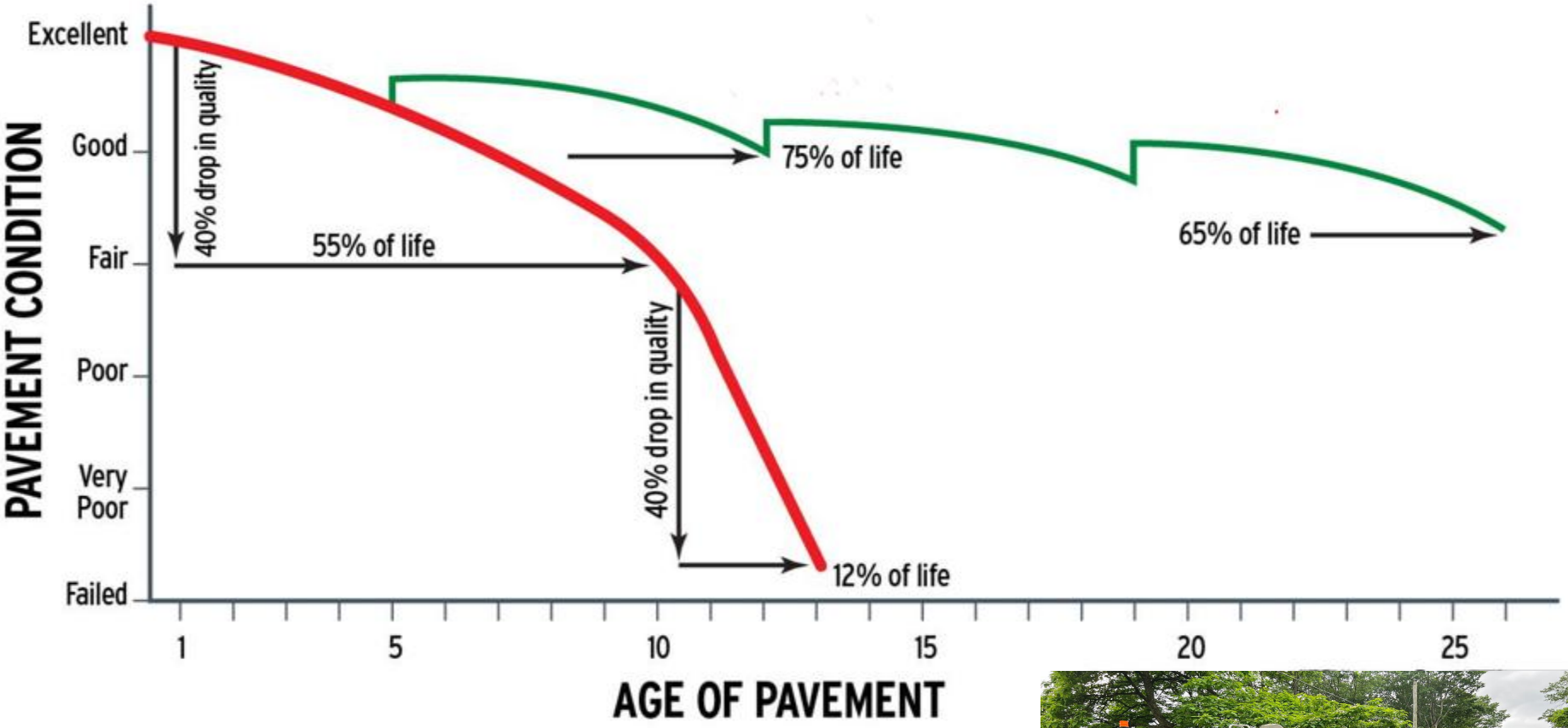
What does a CIPR candidate look like?

Mill & Fill or CIPR

MILL & FILL or CIPR

MILL & FILL or CIPR

Pavement Condition Index



How do we fix a deteriorated pavement

Cold In-Place Asphalt Recycling can be the answer

PROCESS

Benefits of Cold In-Place Recycling

- Roadway remains open during construction
- Conserves energy and natural resources, green technology
- Reduced impact on adjacent roadways
- Reduced cost over reconstruction
- Little material exported from site
- Re-use existing material
- Re-profile roadway
- Restores curb reveal
- Environmentally friendly
- Construction time halved
- No drop offs or open cuts

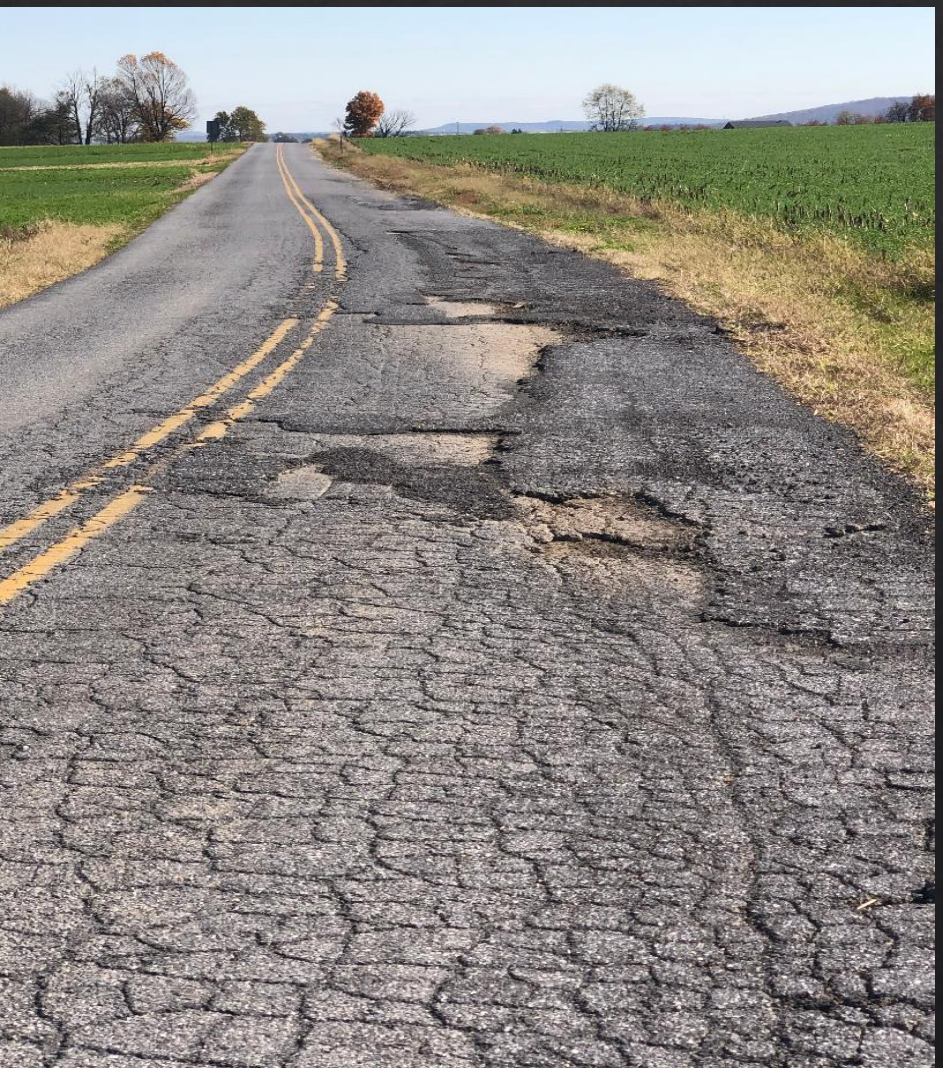
Road Preparation for CIR

- Any damaged cross pipes should be replaced, well before CIPR
- Drainage and water problems should be addressed
- Any vegetation growing on the pavement or pavement edge should be removed or graded off the edge of shoulder.
- Shoulder or pavement widening should take place prior to CIPR
- Any under ground utility should be addressed, check with utilities company's that no replacement lines are scheduled in the near future.
- Any overhead obstructions, tree limbs, power lines
- If a curbed roadway, check height of curb, check reveal needed.
- Check for “paved over” utilities

Left to late for CIPR

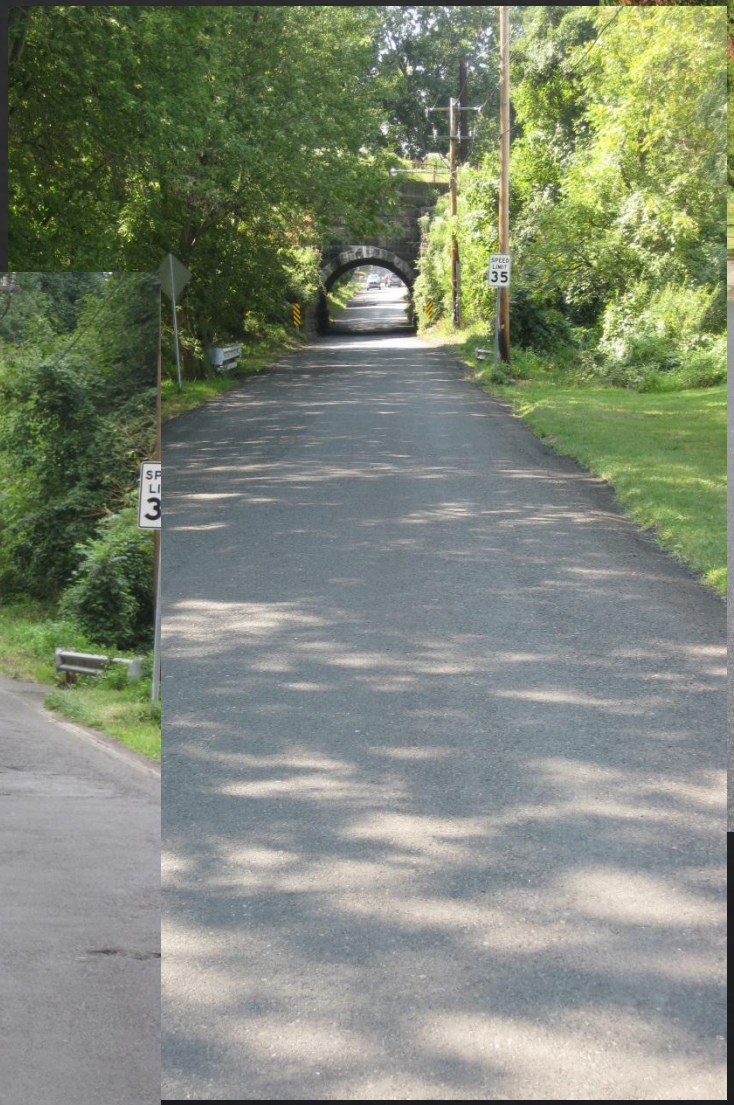
6 months later

What would prohibit a Cold In-Place Asphalt Recycled project



6 months later

Weight Restrictions


SPEED LIMIT
35


SPEED
LIMIT
35


ROADTEC
CARLSON

SPRINGS

Storm Water Correction

Storm Water Correction

The CIPR Process

- Core the roadway. Take representative cores samples right shoulder, left shoulder and centerline of roadway.
- PennDOT or State approved mix design
- Any widening should take place prior to CIPR
- If the roadway is curbed, check height of curb, what curb reveal is required after the installation of the wearing surface.
- The CIR train resizes, mixes & places the material into a bituminous paver and spreads to the desired depth & cross-slope
- Compact with a 12-ton steel wheel vibratory roller and a 22 - 25ton pneumatic tire roller or larger, under the guidance of a certified Nuclear Gage operator
- Placement of a suitable Wearing Surface

Core samples are essential in any Cold In-Place Asphalt Recycling project

You must Core Sample all Roadways


CRAFTSMAN

Multiple Overlays

GEO-TECHNOLOGY ASSOCIATES, INC.

GEOTECHNICAL AND
ENVIRONMENTAL CONSULTANTS

A Practicing Geoprofessional Business Association Member Firm

TO: Greg Parrs, Luzerne County Engineering
FROM: Jon Raab, Geo-Technology Associates, Inc.
RE: Barry's Road, Junk Yard Road, and Tunnel Road FDR
DATE: June 8, 2017

Following is a summary of the test pit excavations and laboratory test results for the following three roads:

- Barrys Road (CR 22) between SR 437 and Tunnel Road (CR 19),
- Junk Yard Road (CR 27) between SR 437 and Church Road (CR 21),
- Tunnel Road (CR 19) from SR 437 for a distance of 0.9 miles to the east.

Subsurface conditions within the roadways were evaluated by observing 29 test pit excavations on April 27 and 28, 2017. The test pits were performed by Township personnel and were observed and logged by GTA. The purpose of the test pits was to obtain soil, aggregate, and pavement samples for laboratory testing. A table summarizing the measured pavement thicknesses and the subgrade conditions is included as an Attachment. Following is a summary of the pavement thickness encountered in each road.

SUMMARY OF TEST PIT RESULTS

Roadway	Pavement Thickness (inch)	Aggregate Thickness (inch)	Visual Aggregate Description	Visual Soil Description
Barrys Road	4.5" to 9"	4" to 8.5"	Red Shale fragments (<3-inch dimeter)	*Sandy SILT with cobbles and boulders
Junk Yard Road	8" to 9"	3" to 7"	Oiled claystone and aggregate, with ballast in some places	*Silty SAND with rock fragments
Tunnel Road	4.5" to 7"	2" to 16"	Sandstone fragments with sand	*Silty SAND and sandy SILT with cobbles

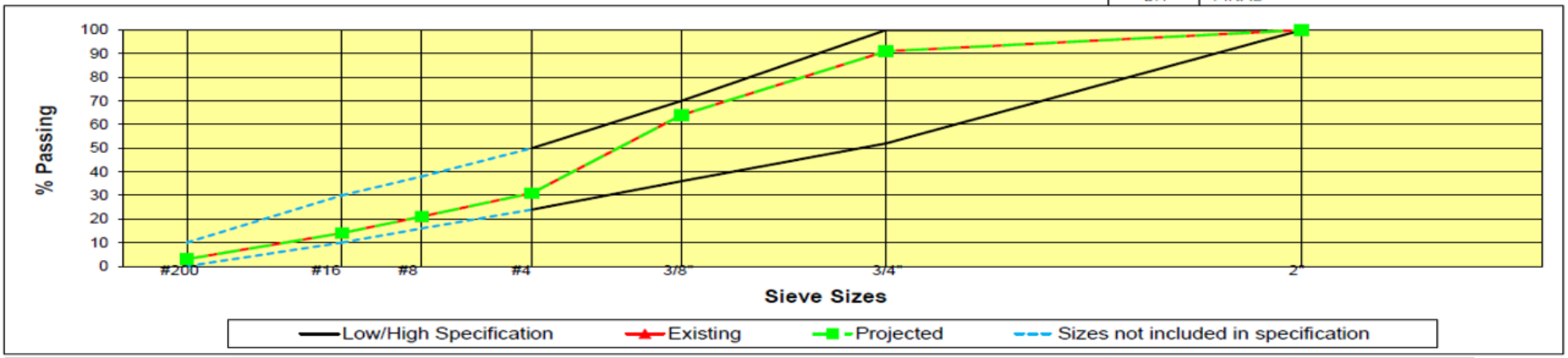
*Soil subgrade is glacial in origin and contained cobbles (<10-inch diameter) and boulder (>10-inch diameter) sized rock.

Laboratory testing included particle size analyses, and liquid and plastic limit testing for the classification of subgrade soils in accordance with ASTM D2487, moisture density testing in accordance with the Standard Proctor, and California Bearing Ratio (CBR) testing. Following is a summary of the testing performed on the native subgrade soils.

SUIT-KOTE

RECYCLE MIX DESIGN FORM

X	PRELIMINARY
CH	FINAL



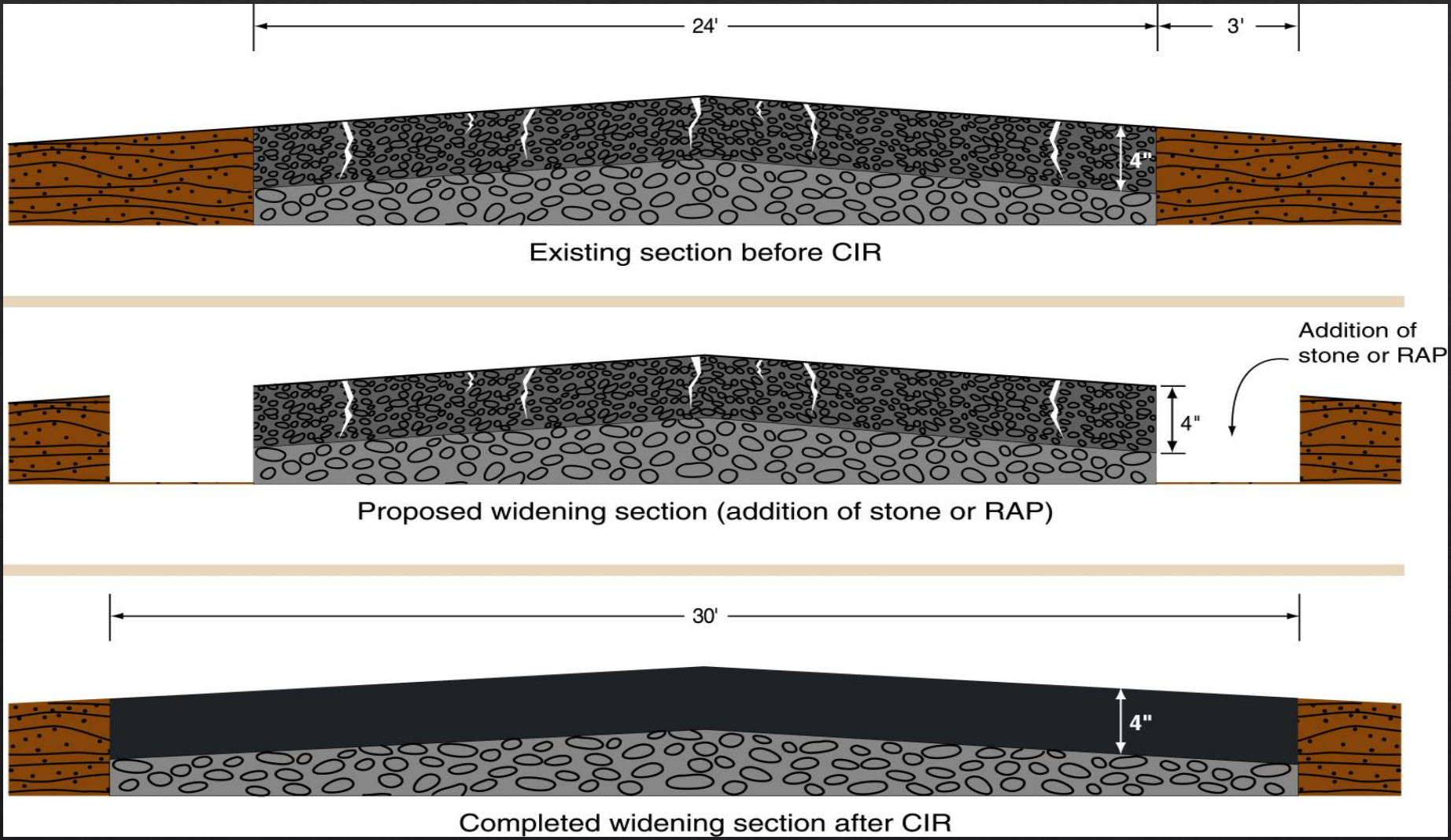
DATE: 7/2/2024	SIEVE SIZE		#200	#16	#8	#4	3/8"	3/4"	2"
SAMPLE #: RD24-PB-446PA	% PASSING	EXISTING	3	14	21	31	64	91	100
PROJECT/CUSTOMER		LOW SPEC.	0	10	16	24	36	52	100
Penndot- CARBON COUNTY		HIGH SPEC.	10	30	38	50	70	100	100
		PROJECTED	3	14	21	31	64	91	100
STATE ROUTE #1001	ADD STONE GRADATION		0	0	0	0	0	0	0

MIX TYPE: in place train	EXISTING CORE SAMPLE THICKNESS :				5"+	in.	
PROJECT LENGTH: 7.5 MI	DEPTH TO BE RECYCLED :		4 in.	LANE WIDTH(ft) :			10
FULL DEPTH AC X	EXISTING AVERAGE ASPHALT CONTENT %:						5.7
AC OVER CONCRETE	PROJECTED ASPHALT CONTENT %:						7.4
SAMPLED FOR:	MIX: 100 % RAP	0 %	7-8	GAL/TON	L/TONNE		
BRIAN HINKLEY	TYPE : SS-1		0.0 #/S.Y.	1.54 G/S.Y.	1.71 G/Lin.ft.		
RECYCLE METHOD :			0.0 kg/m²	6.97 L/m²	21.23 L/lin. m		
IN - PLACE	STONE SHALL BE SPREAD AT: 0	#/S.Y. AT: 9	FT. IN WIDTH TO GRIND AND PAVE :		10	FT.	

Comments: ADD STONE & LIQUID APPLICATION RATES MAY VARY BASED ON WEATHER & RAW STOCKPILE CONDITIONS.
BASE & DRAINAGE DEFICIENCIES IF PREVALENT,SHOULD BE ADDRESSED PRIOR TO CIPR PROCESS
Emulsion to be added at 3.0% based on weight of agg/rap material blend.
EXISTING GRADATION BASED ON DRY GRADATION FROM CRUSHED CORES (MECHANICAL CORE CRUSHER)
ASSUME EXISTING AND RAP GRADATIONS ARE THE SAME RAP WILL BE USED AS ADD AGGREGATE AT 58#S/Y
GRIND DEPTH AT 3" WITH 1 " OF ADD RAP TOTAL GRIND DEPTH OF 4"

CH **SR-1001 SEGMENTS 0010/2579 -0170/2579 CARBON COUNTY**

CIPR – Pavement Widening

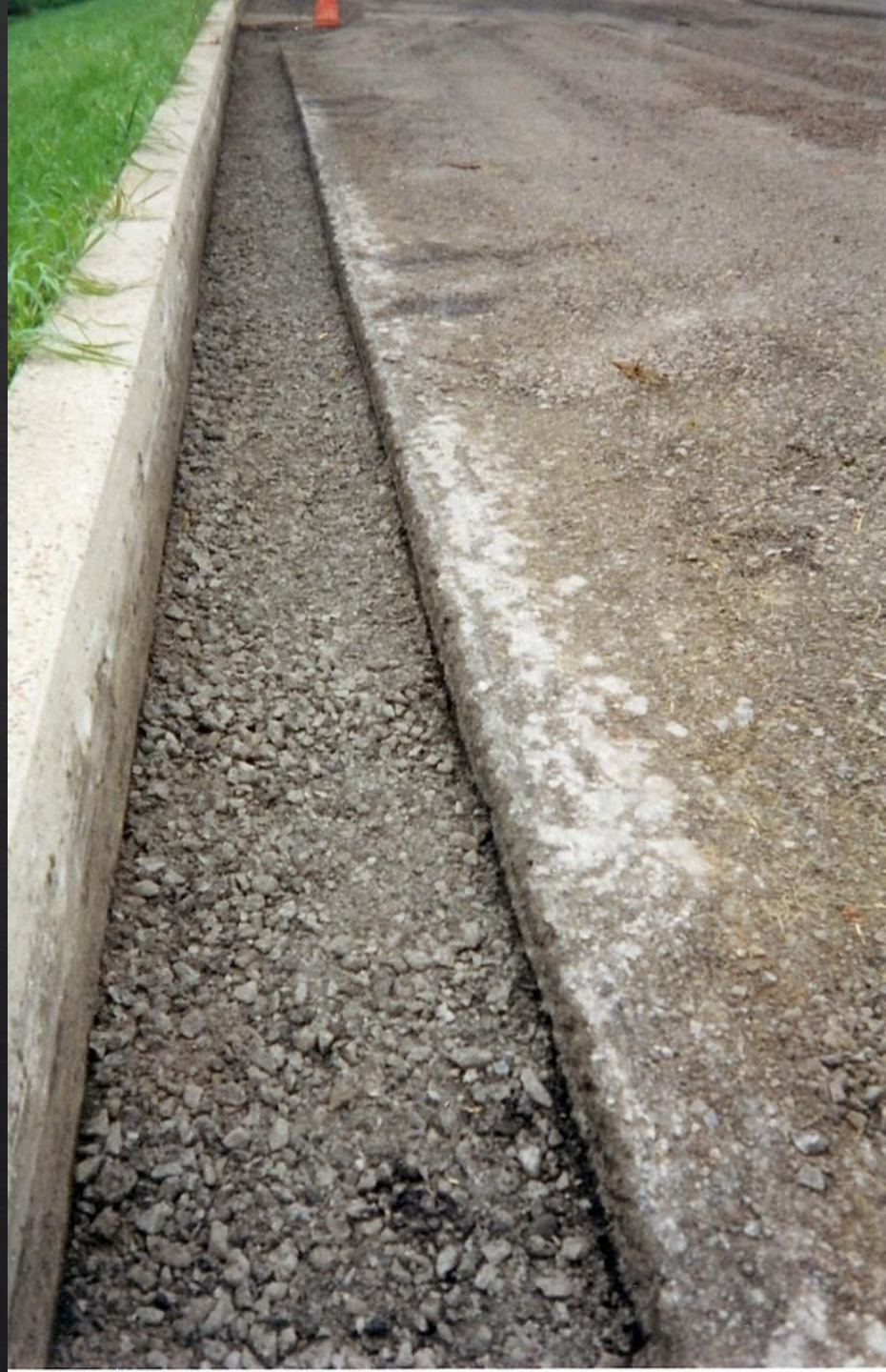


Widening - Soft Shoulders

Curbline Milling

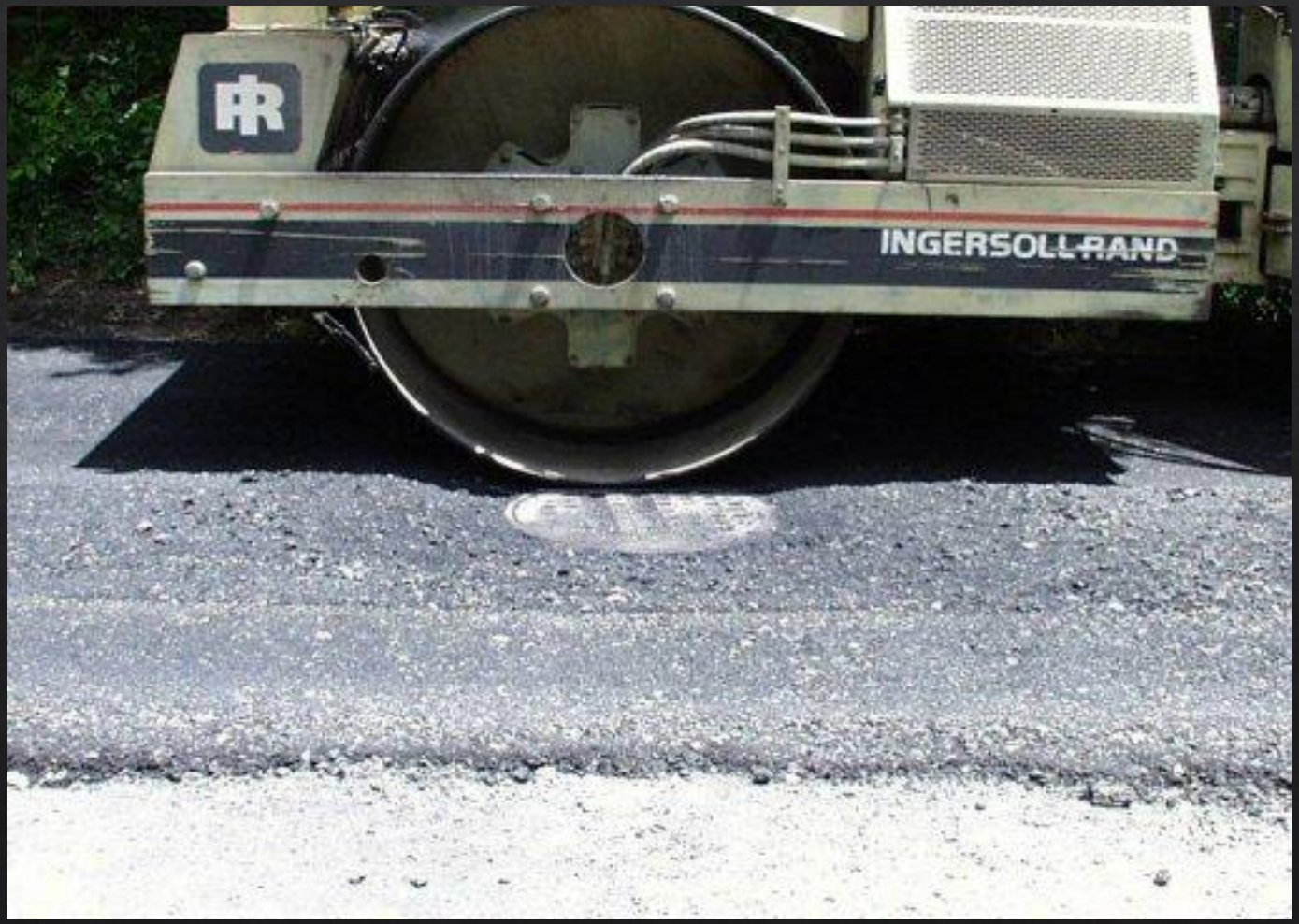
- Some Department of Transportation Roadways are within City, Town or Borough boundaries, curblines and utilities will be encountered
- Small Mills will be needed to excavate and export RAP material from curblines
- In some cases, the excess RAP may be used to fill low areas or create additional crown and cross section within the project area


MACK



Excavated manhole before CIPR

Compaction of CIPR around manhole

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CIPR – Aggregate or RAP Application

- The existing asphalt pavement properties may be enhanced with the addition of Aggregate or RAP. Not only can the mix properties be improved, but additional structure may also be added to the asphalt pavement. Add #57 to the mix or other sized aggregate

RAP or Aggregate can be added to increase pavement thickness

The Aggregate or RAP can be paver-laid or truck spread

RAP/Millings Placement

RAP or Aggregate can be added to create a thicker base material

Things to consider in a CIPR – QC/QA Plan

- All meters and computers should be calibrated
- Recycling additive – check specifications and compliance.
- Recycled mat smoothness
- Density and Compaction
- CIPR gradation
- Moisture content before overlay
- Check depth of milled and recycled material

CIPR – Mix Design

- Obtain Sample of RAP from Field
- Determine RAP Gradation, Binder Content, and Aged Binder Properties
- Select Amount and Gradation of Additional Aggregate or RAP, if required
- Select Type and Grade of Recycling Additive
- Test Trial Mixtures: Initial Cure Properties, Final Cure Properties, and Water Sensitivity
- Establish Job Mix Formula
- Follow PennDOT or State CIPR Mix Design

The gradation will vary depending on the aggregate size in the old asphalt materials

CIPR – Selection of Additive(s) ASHTO-PennDOT Approved

Bituminous Additives:

- **Asphalt Emulsion**

Anionic Emulsions	**HFMS-2** **HFMS-2s**
Cationic Emulsions	**CSS & CMS** **CSS-1h**

- **Rejuvenating Agents**
- **Foamed Asphalt**

CIPR – Selection of Additives Dual Additives Applications

Chemical Additives:

- Portland Cement – (1%) = 5 lbs.
- Portland Cement & Hydrated Lime have been used in conjunction with asphalt emulsion to improve early strength, increase rut resistance and improve moisture resistance
- Additional Aggregate. Correct gradation and build thickness and strength in mat
- RAP (Reclaimed Asphalt Pavement) or Millings used to enhance thickness of pavement

Portland cement application

CIPR Cure Time

SINGLE UNIT TRAIN

- Proportioning of Recycled Agent is based on volumetric depth and width of cut, the amount of liquid asphalt dispersed into the mix, and is based off the PennDOT Mix Design.
- Down cutting milling head, sizes material, forward speed of mill will determine size of RAP, increase or decrease in speed will produce larger or smaller particles.
- Material is mixed in milling head chamber
- Mixed material is placed directly into paver via a conveyer system or picked up by a windrow elevator and placed into the paver hopper.

Single Unit Cold In-Place Asphalt Recycling Train RX 700

Asphalt Additive CSS-1h

Cutting & Mixing Chamber

Asphalt Additives Controls

Cross slope and Elevation controls

First & Second stage Conveyer System

No contact Sensor Controls


RP-190e
ROADTEC
MOBA
MOBA


2
63-060
USDOT 859475


DANGER
ROADTEC


ROADTEC
CARLSON

Excess Material Removal

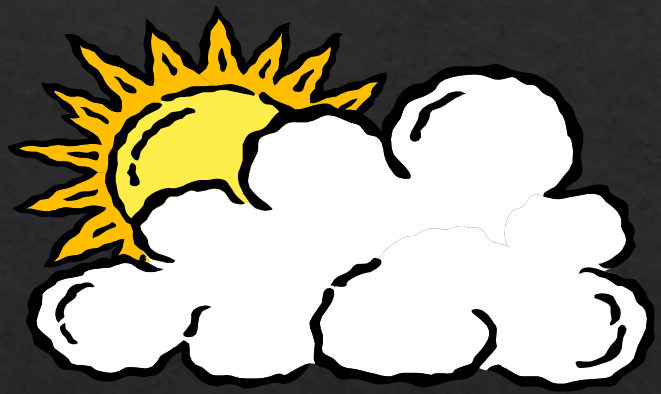
Steel Vibratory Rollers of 12 + Tons

Pneumatic Tire Roller of 25 tons or greater

Density & Compaction Testing

Cross Slope

Weather Limitations



- Air Temperature of 50 Degrees F. and Rising is preferred.
- Rain or Misting must not be occurring.

Fog Seal Application

Fog Seal Application


MANN CO.
SERVICE CONTRACTORS
TIONING • REFRIGERATION

What types of Roadways fall under CIPR


RP-190e
'33-012
SPEED LIMIT
30


Sears


BLANDON AVE
CATERPILLAR
STL


ALFAB


HERITAGE
TRUCK CENTERS
304-254-STAR

Old US 22

Heavy Highway Old US 22
SR 501 to SR 419


HAMM


RP-190e
ROADTEC
CARLSON


MakeItEssig.com
HAMM


RP-190e
Construction Services, Inc.
York, Pa

Wearing Surface Applications
Hot Mix Asphalt

Maryland County Projects 2026

Harford County:

Old Robinhood Road, Chaple Road, Arena Road,

Howard County

Old Waterloo Road, Brookdale Drive

Allegany County

State Road

Michael L. Polak

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QUESTIONS