Use of Emulsified Asphalt in Treated Base and 100 percent RAP

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COLAS Solutions

ARRA

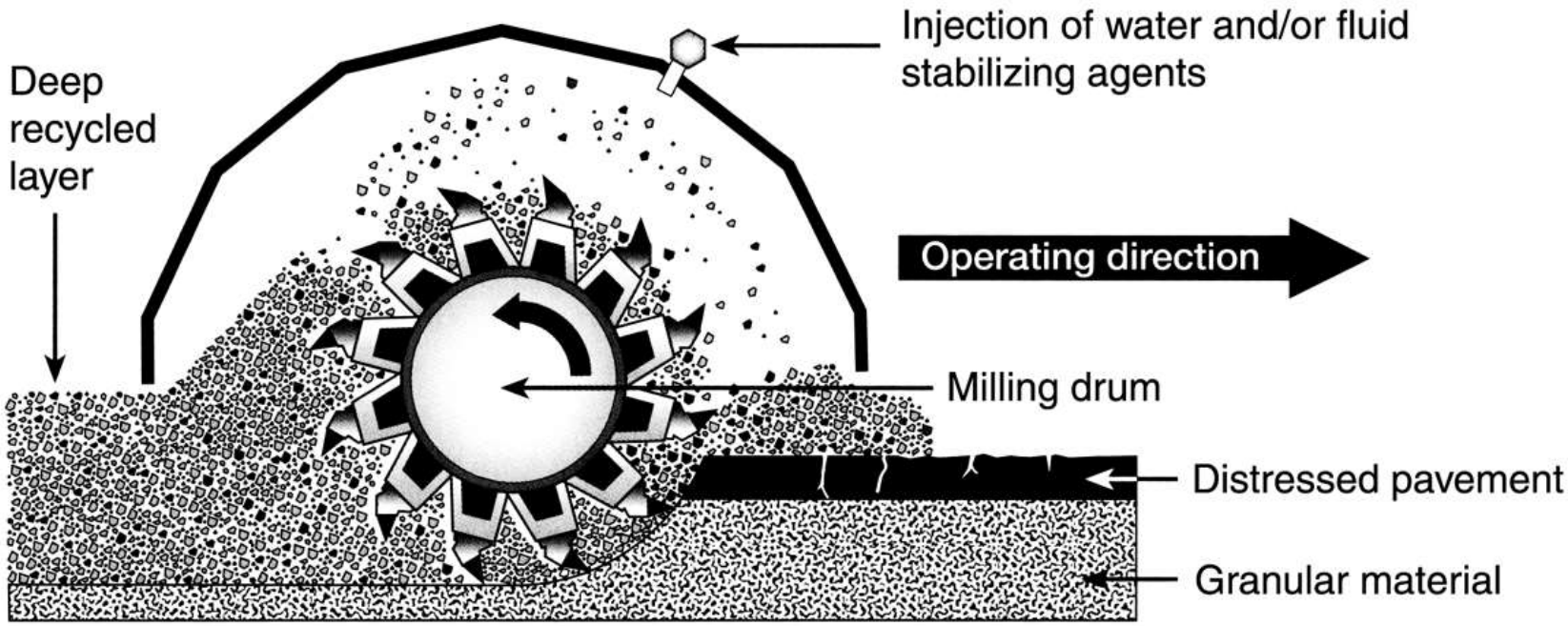
Outline

- Discuss range of asphalt layer to aggregate base layer ratios for emulsion-treated base
  - Expected properties
  - Projects
- 100% RAP with or without stabilization additive
- Mix design procedures

FDR / emulsion-treated base

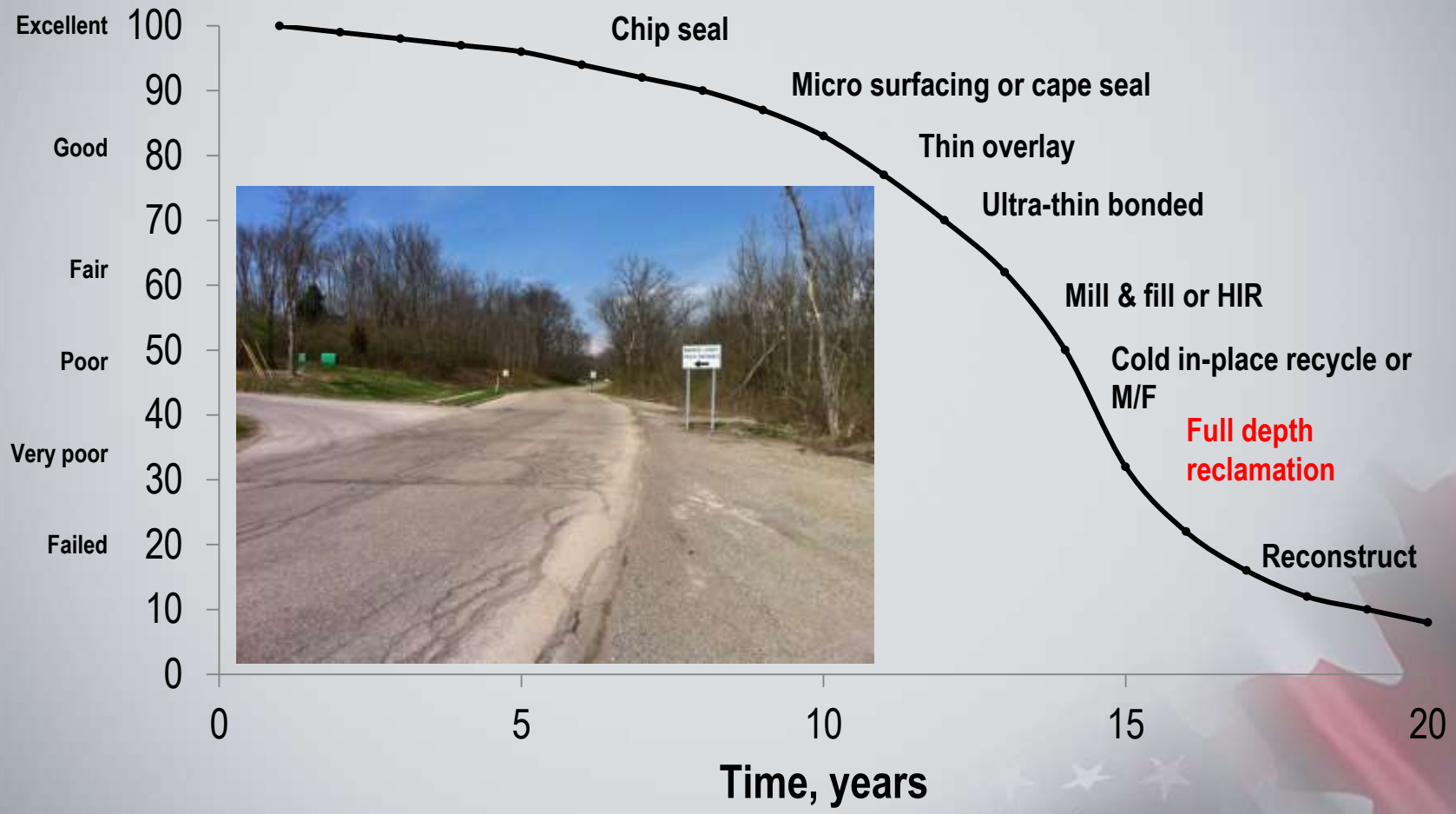
Full Depth Reclamation (FDR) is a pavement rehabilitation technique in which the full flexible pavement section and a predetermined portion of the underlying materials are uniformly pulverized and blended together to produce a homogeneous stabilized base course.

- Emulsified Asphalt Treated Base
- Foamed Asphalt Stabilized Base
- Cement Stabilized Base


Injection of water and/or fluid stabilizing agents
Deep recycled layer
Operating direction
Milling drum
Distressed pavement
Granular material

30

Generalized Performance Curve



Overview of proportions

	Near 100% asphalt	75 : 25 of asphalt to base	50 : 50 of asphalt to base	25 : 75 of asphalt to base	100% granular
Thickness examples	6-8” FDR: 5-7” AC over base	6-8” FDR: 4.5-6” AC over base	6-8” FDR: 3-4” AC over base	6-8” FDR: 1.5-2” AC over base	6-8” FDR: All agg. base
Est. emul. content range	1.5 to 3%	2 to 3.5%	2.5 to 4.5%	3 to 5%	4 to 6%
Mix design challenges	Crushing asphalt; Proctor	Crushing asphalt	Crushing asphalt	Crushing asphalt	Fines (SE>30 P200<20)
Const. challenges	Grading				Moisture

Near 100% asphalt

Gordon Airport – Nebraska

Asphalt depth = 9.5 inches

Pulverize at 10.5 inches

Stabilize at 6 inches

3.5% water

1% cement

3% emulsified asphalt

Final overlay = 2 inches

75% asphalt / 25% aggregate base

Markey Road - Lebanon, Ohio

Asphalt depth = 6 inches

Pulverize at 8 inches

Stabilize at 6 inches

3.5% water

No cement

3% emulsified asphalt

Final overlay = 2.75 inches

50% asphalt / 50% aggregate base

MnRoad High Volume (I-94, cell 2)

Asphalt depth = 6 inches (3 inches milled)

Pulverize at 6 inches

Stabilize at 6 inches

No cement

4% emulsified asphalt

Final overlay = 3 inches

25% asphalt / 75% aggregate base

Warren Road, Stevenson Co., Illinois

Asphalt depth = 2 inches of built-up <u>chip seals</u>

Pulverize at 6 inches

Stabilize at 6 inches

3% water

No cement

5% emulsified asphalt

Final overlay = Chip seal

100% granular

Washington Ave., Las Vegas

Asphalt removed to aggregate base

~~Pulverize~~

Stabilize at 6 inches

4 % water

No cement

5% emulsified asphalt

Final overlay = 6 inches

Gravel

ighways

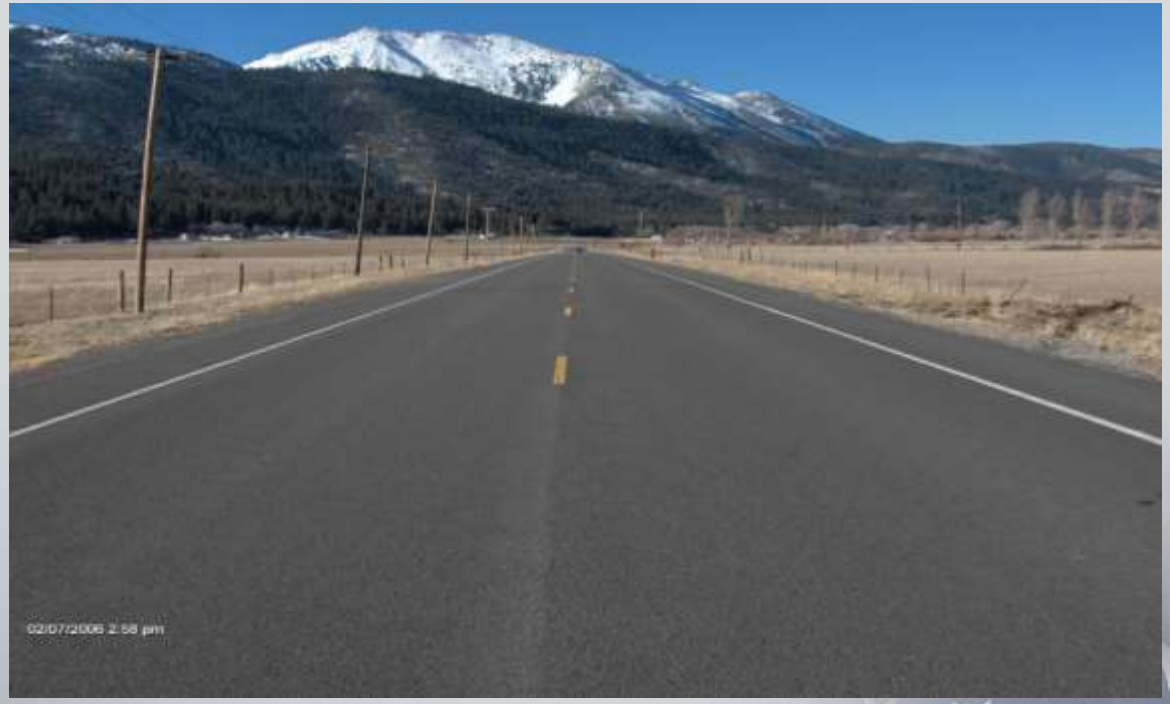
Airports

City streets

Interstates

FDR - surface courses

- HMA binder and wearing courses
- Surface treatments –chip seal, etc.
- Dense-graded cold mixes



Uses of 100% RAP

- Screened or crushed & screened and mixed in a pugmill mixer with emulsified asphalt and placed through a paver and compacted
- Spread on a gravel road and mixed in place with emulsified asphalt by a reclaimer
- Screened and placed through a paver and compacted
  - 3 to 6+ inches
  - Surface sprayed or not with rejuvenator

100% RAP – Pugmill and paved (Cold central-plant recycling)

- Screened or crushed & screened and mixed in a pugmill mixer with emulsified asphalt and placed through a paver and compacted
  - Pave immediately, or
  - Stockpile and pave at a future date

100% RAP – Pugmill and paved

County road in Warren Co., Ohio

Recovered binder PG 82-10

Crushed to 100% passing 9/16”

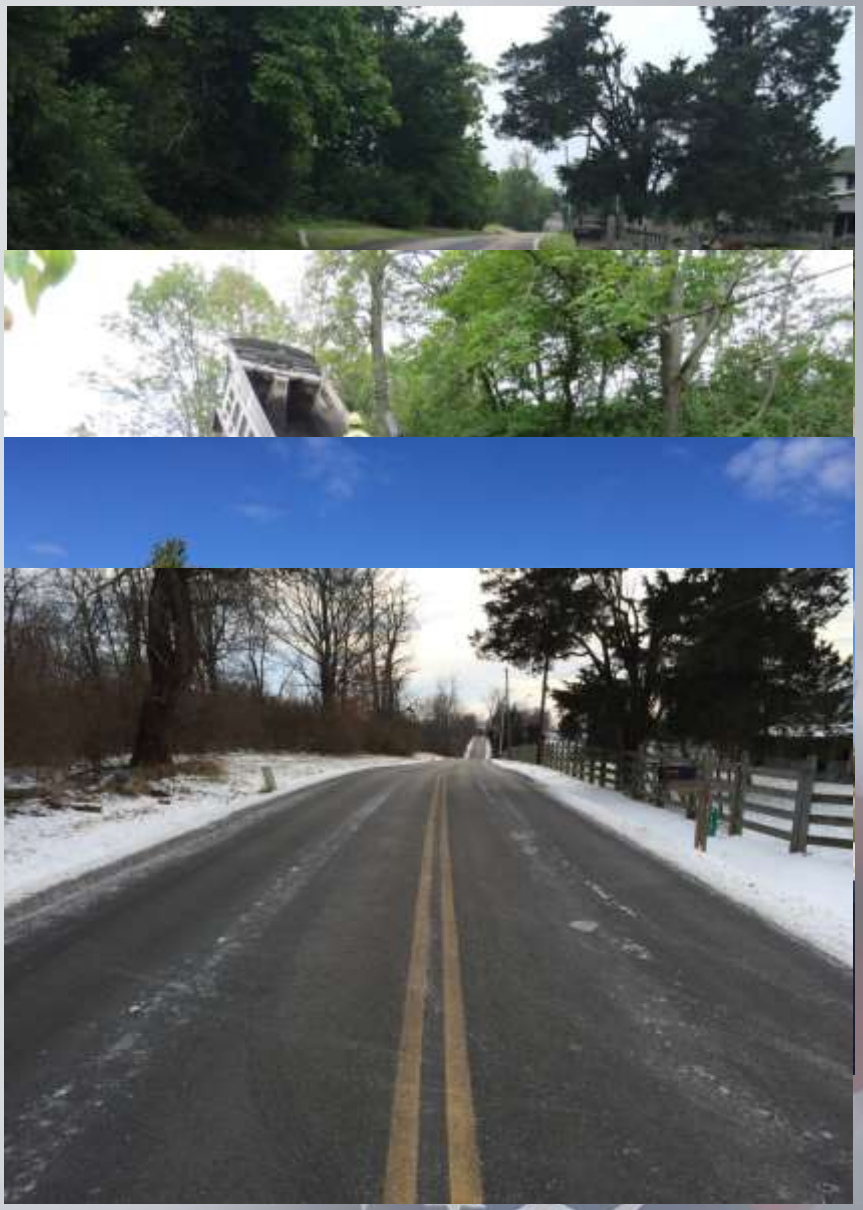
3% emulsified asphalt with a vegetable-based rejuvenator

Compacted to 2” thick

- Thicker is an option

Left un-covered (trial)

- Could surface treat or overlay



Uses of 100% RAP - reclaimer

- Spread on a gravel road and mixed in place with emulsified asphalt by a reclaimer
- Could be any ratio of asphalt to base desired - see FDR

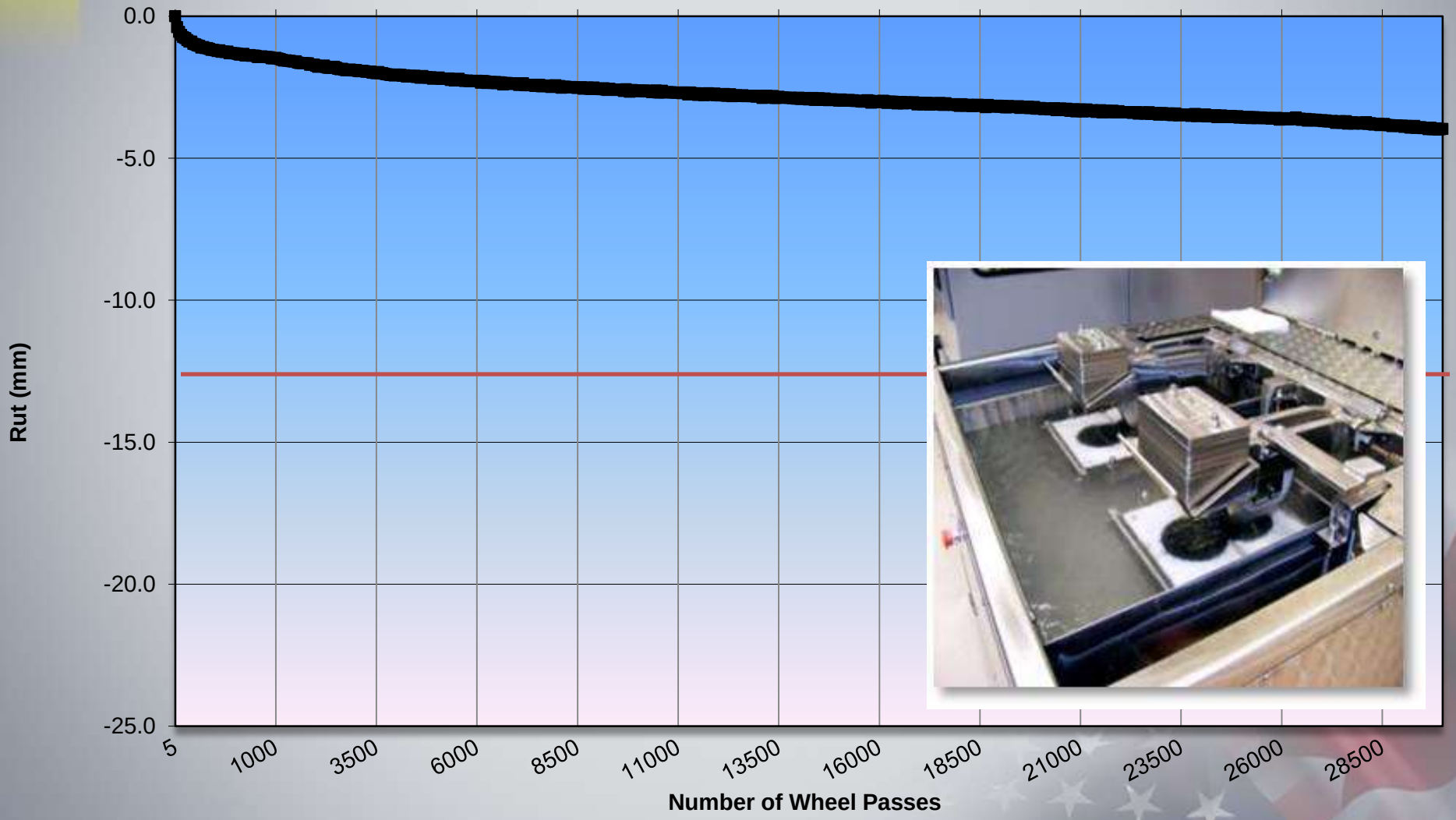
Uses of 100% RAP – no additive

- Screened and placed through a paver and compacted
  - 3 to 6+ inches
  - Surface might be sprayed with rejuvenator or CSS-1
- Can build cohesion depending on RAP properties and weather
- Gets rough, develops potholes, edges crumble
- Hard to re-grade when distresses develop
- Spraying surface will seal it and perform better

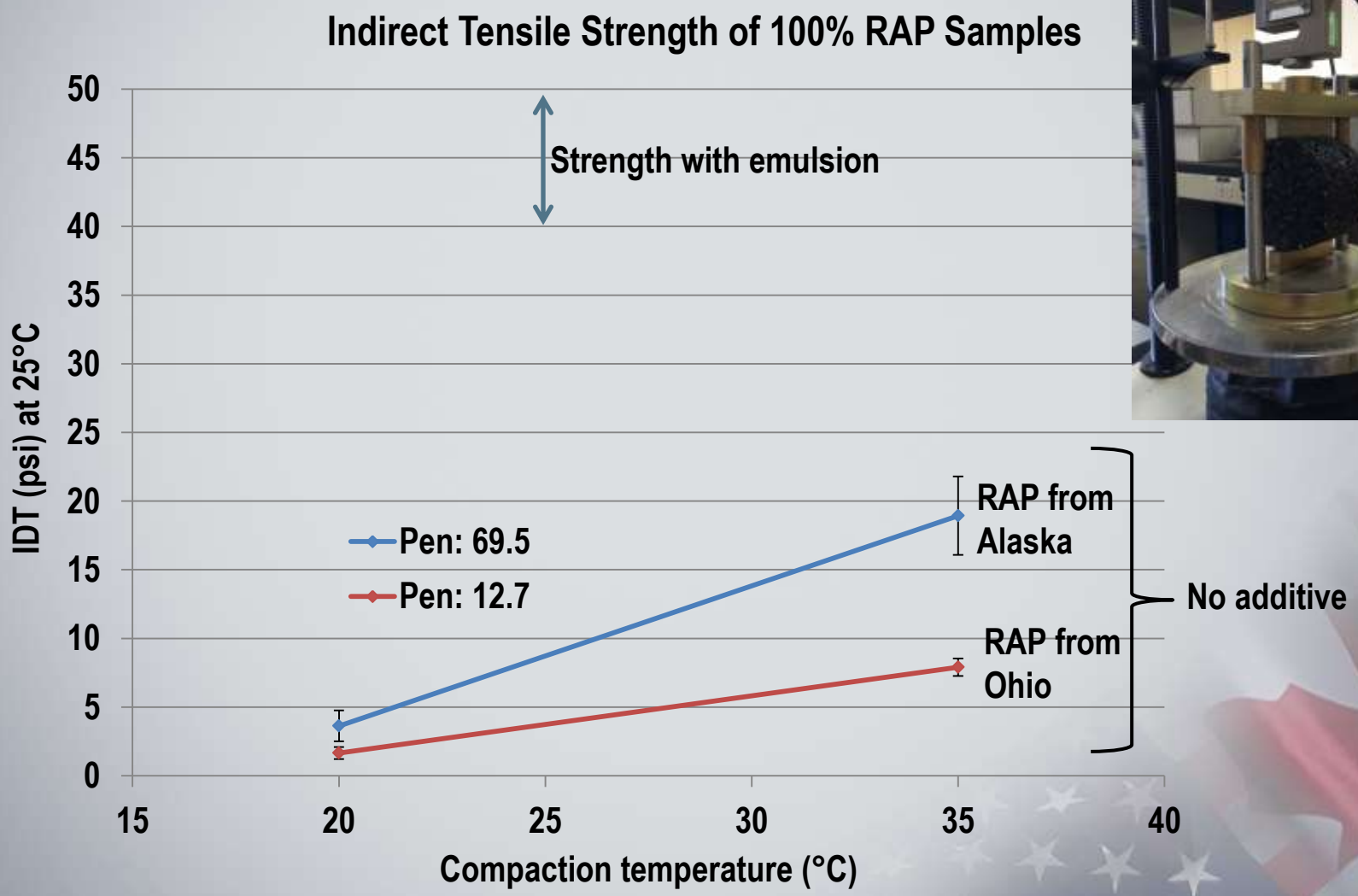
Uses of 100% RAP – no additive

Mat-Su borough projects in Wasilla

100% RAP - no additive – Hamburg Wheel Tracking Device



100% RAP – no additive



Emulsified Asphalt Mix Design

Mixing

Compaction

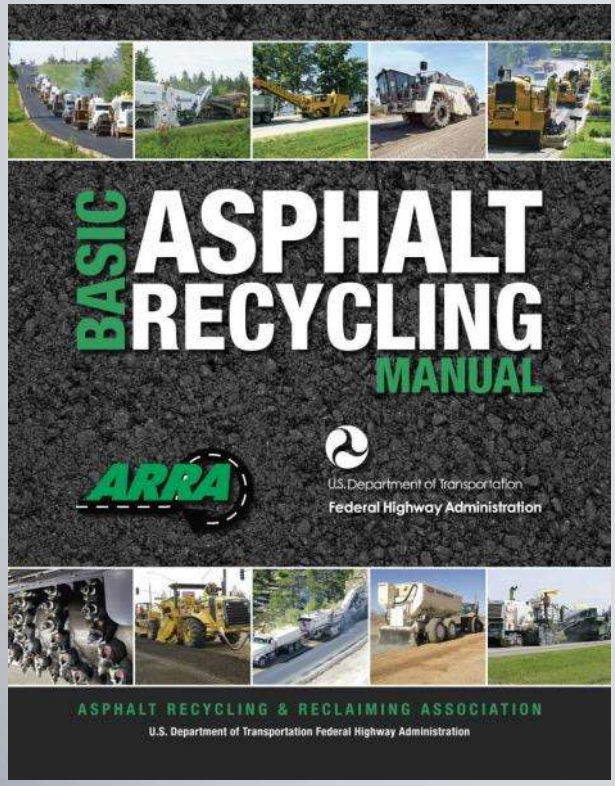
Oven curing (40 to 60°C)

Indirect tensile strength

Moisture sensitivity

BARM II

- Completely rewritten
- All new color photos (117)



- Divided into six parts
  - Introduction
  - Cold Planing
  - Hot In-place Recycling
  - Cold Recycling
  - Full Depth Reclamation
  - Appendix
- Available on ARRA website under “Shop”

Questions?

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