

COLD IN-PLACE RECYCLING AND FULL-DEPTH RECYCLING WITH ASPHALT PRODUCTS

ICT-R27-12

RESEARCH REPORT ICT-09-036
(March 2009)

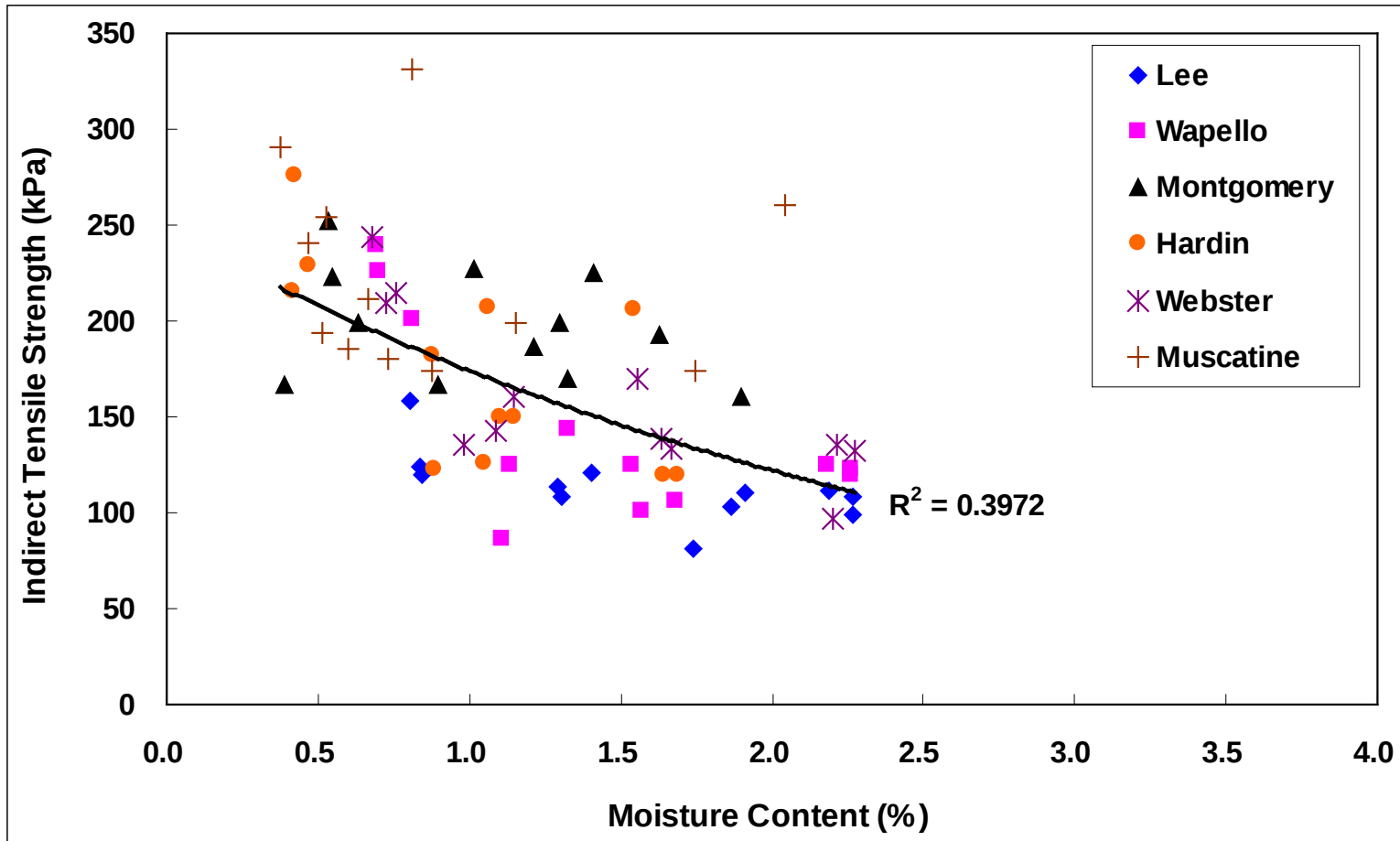
M. THOMPSON
L. GARCIA
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IL 60'S - 80'S:

CONSIDERABALE EAM CONSTRUCTION
GASSER-HUFFINGTON-KOBERLEIN
(EXTENDED "DRYING TIME")

RECENT YEARS:

FOAMED ASPHALT
ENGINEERED EMULSIONS (EE)
REDUCED "DRYING TIME"
EXPEDITE CONSTRUCTION



IOWA – FOAM MOISTURE CONTENT EFFECTS

NOMENCLATURE

FULL-DEPTH:

ALL OF EXISTING HMA

CIR:

ONLY “PART” OF HMA

THE PROJECT

+ INFORMATION/DATA COLLECTION

+ ESTABLISH “BDAT”

+ PROJECT EVALUATIONS

+ FINAL REPORT
(SUMMARY / RECOMMENDATIONS)

Project ID	Location	Construction Date	Surface (inches)	Stabilized Base (inches)	Stabilizers
1	CH-9 Champaign Co.	2005	ST in 2005 3-HMA (2006)	7 (FDR)	2.5 %Foam (PG64-22) + 1% FA
2	CH-1 Christian Co.	2006	3-HMA	8 (FDR)	3.2% SB-EE (160)
3	Pearl City Road Stephenson Co.	2006	3.75-HMA	8 (FDR)	3.5% SB-EE (275)
4	CH-16 Livingston Co.	2005	3.5-HMA	9 (FDR)	2% Foam (PG 58-22) + 1.5% PC
5	Shannon Route Carrol Co.	2005	3-HMA	8 (FDR)	SB-EE (275)

ID	Location	Construction Date	Surface (inches)	Stabilized Base (inches)	Stabilizer
6	CH-47 Sangamon Co.	2003	ST	8 (FDR)	1.5% SB-EE + 2% PC
7	CH-47 Sangamon Co.	2003	ST	8 (FDR)	2% PC + 1% Foam
8	CH-15 Sangamon Co.	2005	ST	8	4.2% SB-EE (160)
9	Dillon Road* Tazewell Co.	1999	1.5-HMA	5 (CIR)	3.5% HFE-300P** (138)
10	Dillon Road*** Tazewell Co.	2003	3-HMA	3 (CIR)	2%-3% CIR-EE****

PROJECT SURVEY

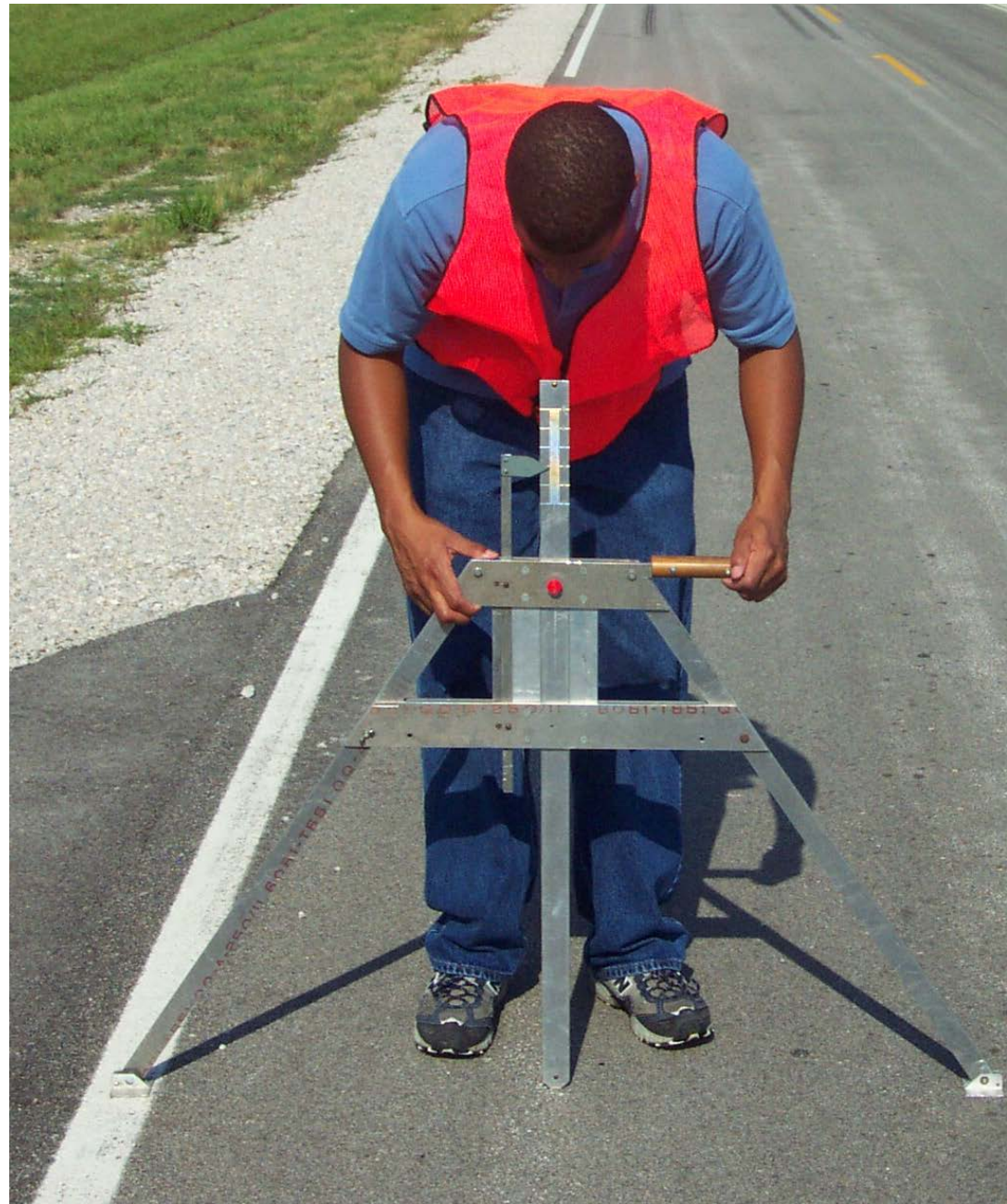
- * RUTTING

- * FATIGUE CRACKING

- * FWD TESTING

- * TFs :~0.1 – 1.49 (Stephenson)
(Christian-08: – 1.9)

AASHO 48-IN RUT-DEPTH GAUGE



A photograph of a person's side, wearing a blue and black horizontally striped long-sleeved shirt and blue denim jeans. A vertical metal ruler is held against the side of the torso. To the left of the ruler, a metal tool with a flat, triangular head and a long handle is positioned. The ruler has markings in inches, with '1', '2', and '3' visible. The metal tool has two screws on its handle. The background is a plain, light-colored surface.

CHRISTIAN CO. / CH-1
PROJECT # 2

RUTTING

ONLY CH-1 (Project 2)

(SOME PROJECTS WITH ST)

CRACKING

T-WELL CO.

NO "FATIGUE"



TAZEWELL COUNTY
PROJECT # 9

L & T CRACKING
T-WELL CO.

A photograph of asphalt pavement showing a network of cracks. A prominent vertical crack runs down the left side, intersecting with a horizontal crack that runs across the middle. Several smaller, irregular cracks are scattered across the surface, particularly in the upper right quadrant. The asphalt is dark grey with visible aggregate.

T-WELL CO. CRACKING PATTERN

06 06 2007

T-WELL CO.
UNSEALED CRACK



06 06 2007

T-WELL CO.

UNSEALED / SEALED CRACK

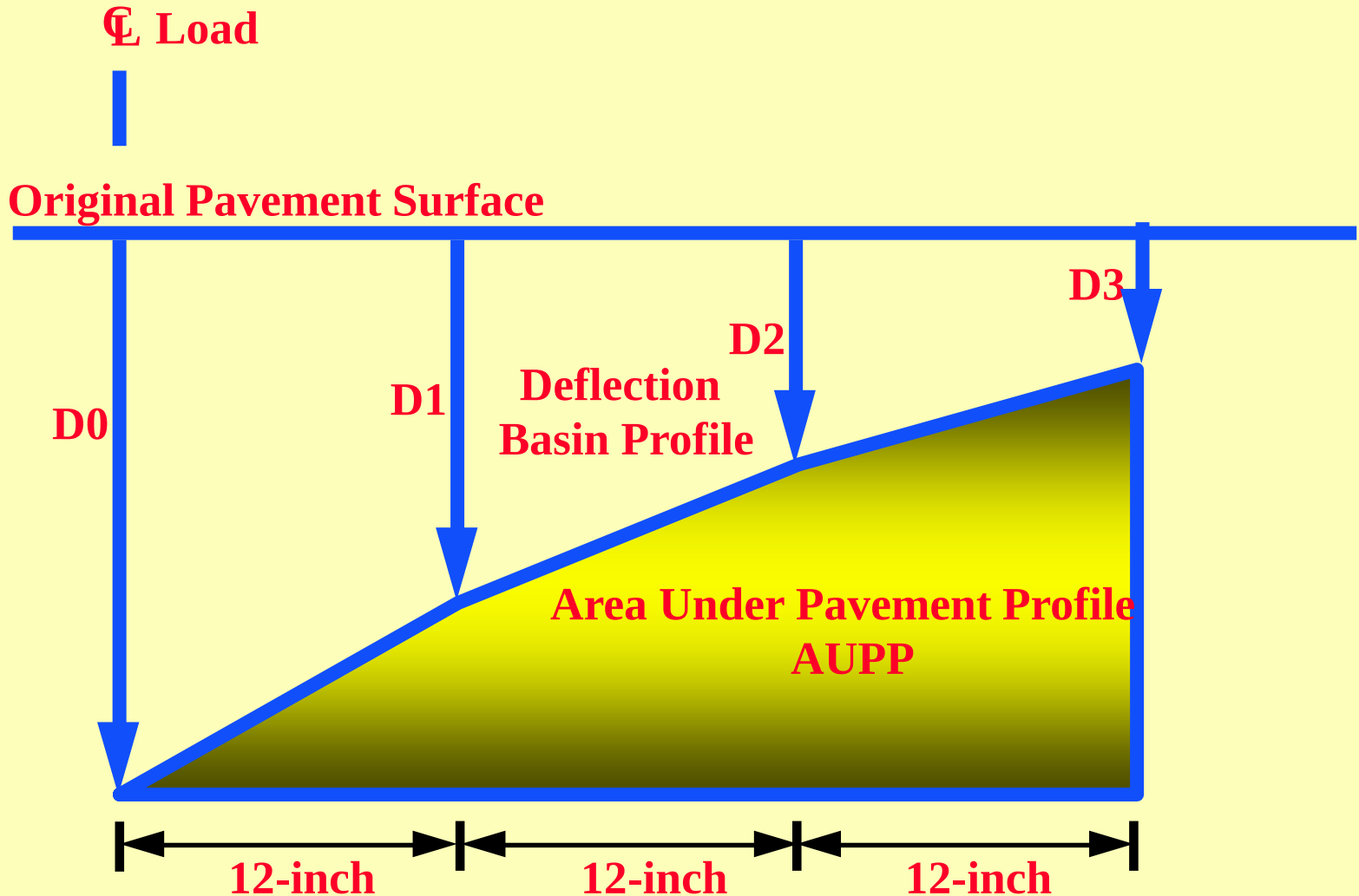


T- WELL SEALED – UNSEALED





IDOT DYNATEST FWD



$$\text{AREA} = 6 * (D0 + 2 * D1 + 2 * D2 + D3) / D0$$

$$\text{AUPP} = (5 * D0 - 2 * D1 - 2 * D2 - D3) / 2$$

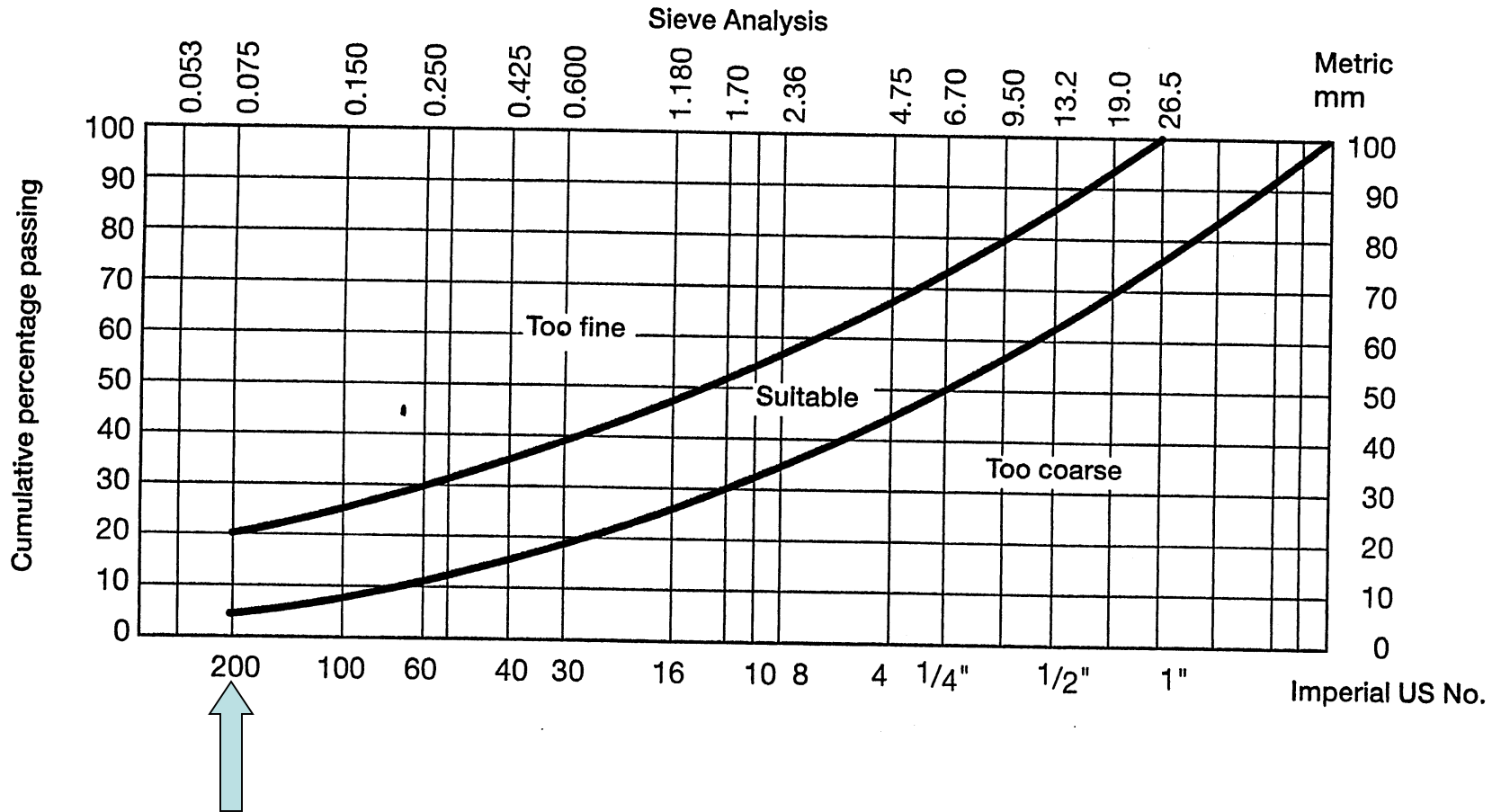
CIRWAP PAVEMENT PERFORMANCE

LITERATURE AND IL EXPERIENCE

“VERY SATISFACTORY”

VARIABLE MATERIAL
PROPERTIES!!!

SUITABLE MATERIALS



WIRTGEN - FOAM

TG-2 / EMULSION

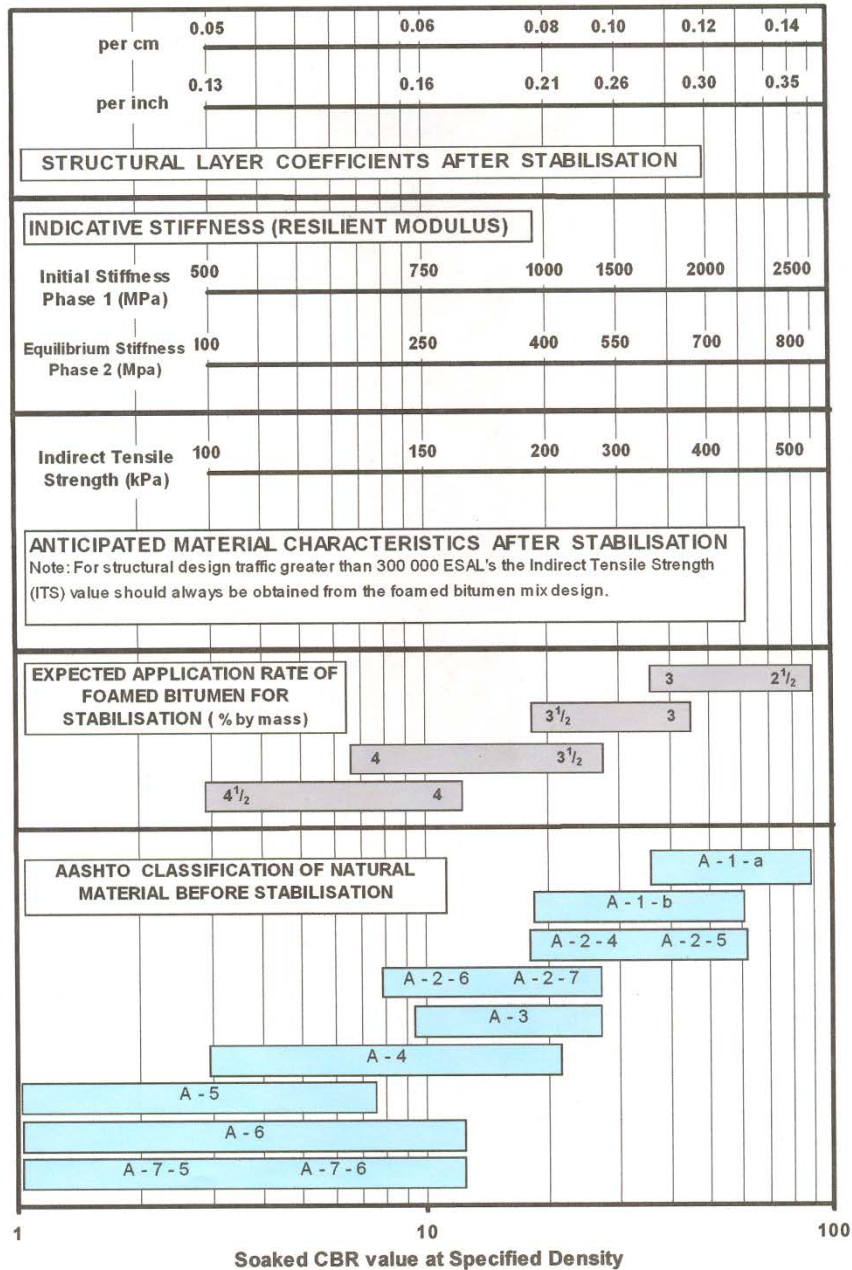
SIEVE	“IDEAL”	“LESS SUITABLE”
1.5 IN.	87-100	100
3/8 IN.	49-74	74-100
# 4	35-56	56-95
# 40	10-24	24-50
# 200	2-9	9-20

TG 2 / FOAM

SIEVE	“IDEAL”	“LESS SUITABLE”
1.5 IN.	87-100	100
3/8 IN.	49-74	74-100
# 4	35-56	56-95
# 40	12-26	26-50
# 200	4-10	10-20

ADD MATERIAL
ON
PAVEMENT SURFACE

**SUGGESTED STRUCTURAL LAYER COEFFICIENTS
FOR FOAMED BITUMEN STABILISED MATERIAL**



WIRTGEN - FOAM

MIXTURE DESIGN

+ ROAD SCIENCE

+ WIRTGEN

+ IOWA

+ TG 2

(Foaming Equipment ??)

“TWEEK” @ PROJECT

OVERLAY ??

OR

NEW CONSTRUCTION ??

LR&S PAVEMENT DESIGN

- * MECHANISTIC-EMPIRICAL
- * CFPs for $TF < 0.25$
(MIN HMA – 3 INCHES)
(MIN TYPE A AGG BASE – 8 INCHES)
- * FULL-DEPTH HMA – $TFs > 0.25$
(MIN HMA – 6 INCHES)
- * NO LR&S PROCEDURE FOR CIR PROCESS!!!!

CURRENT IDOT “PRACTICE”

AASHTO STRUCTURAL NUMBER
(ONLY FOR OVERLAYS)

WHAT IS “a” FOR CIR & FDR ???

“a” COEFFICIENTS LR&S 1st OVERLAY

MS (pounds)	“a”
300	0.12
400	0.14
800	0.17
1000	0.19
1200	0.21
1500	0.23
1700	0.25

1988 LR&S-“ASPHALT STABILIZED”- $a=0.18$

Project	Asphalt	TF	“a”
1. (Ch. Co.)	Foam	0.092	0.25(?)
2. (Chr. Co.)	EE	0.95	0.23
3. (St. Co.)	EE	1.49	0.28
4. (Liv. Co.)	Foam	0.196	0.23
5. (Carrol Co.)	EE	0.28	0.27

“a” COEFFICIENTS



07 27 2005

ORIGINAL SECTION

- + SURFACE TREATMENT(S)
- + 8-INCH AGGREGATE BASE

REHABILITATION:

- + ADD 4 INCHES RAP MILLINGS
- + 1% TYPE C FLYASH
- + 7 INCHES - FOAM STABILIZATION
(2.5% / 64-22)
- + (4 RAP + 3 AGGREGATE)
- + A-2 ST IN 2005
- + 3-INCH HMA OL IN 2006



07 27 2005











07 27 2005







07 27 2005





07 27 2005





07 27 2005



FORSYTH





HOT-MIX MAGAZINE **12** VOLUME 13 NUMBER 3

ROADTEC RX-900 (With Additive System)

GOOFY RIDGE ROAD – MASON CO.



GOOFY RIDGE ROAD

EXISTING SECTION

1100 ADT – 5% MU

3-INCH AC SURFACE + ST + 6-INCH AGG BASE

REHABILITATION

+ 4-INCH COLD-IN-PLACE RECYCLING

+ 2.4 % EMULSION - REFLEX

+ A-2 SURFACE TREATMENT



25 FEET / MINUTE

















CH 16 – TAZEWELL CO.
(Manito NB)

$$TF = 0.617$$

EXISTING PAVEMENT
10-INCH HMA + 10-INCH AGG BASE

REHABILITATION
2.5-INCH HMA SURFACE + 3-INCH CIR
(3% EE – REFLEX)







PROCESS

+ MILL

+ CRUSH

+ SIZE

+ PUG-MILL

+ PAVE





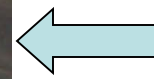




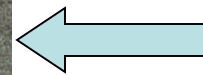








CIR



EXISTING



RT-500 and RX-900

500 TPH (454 MTPH) Cold
Recycling

The Recycling Train

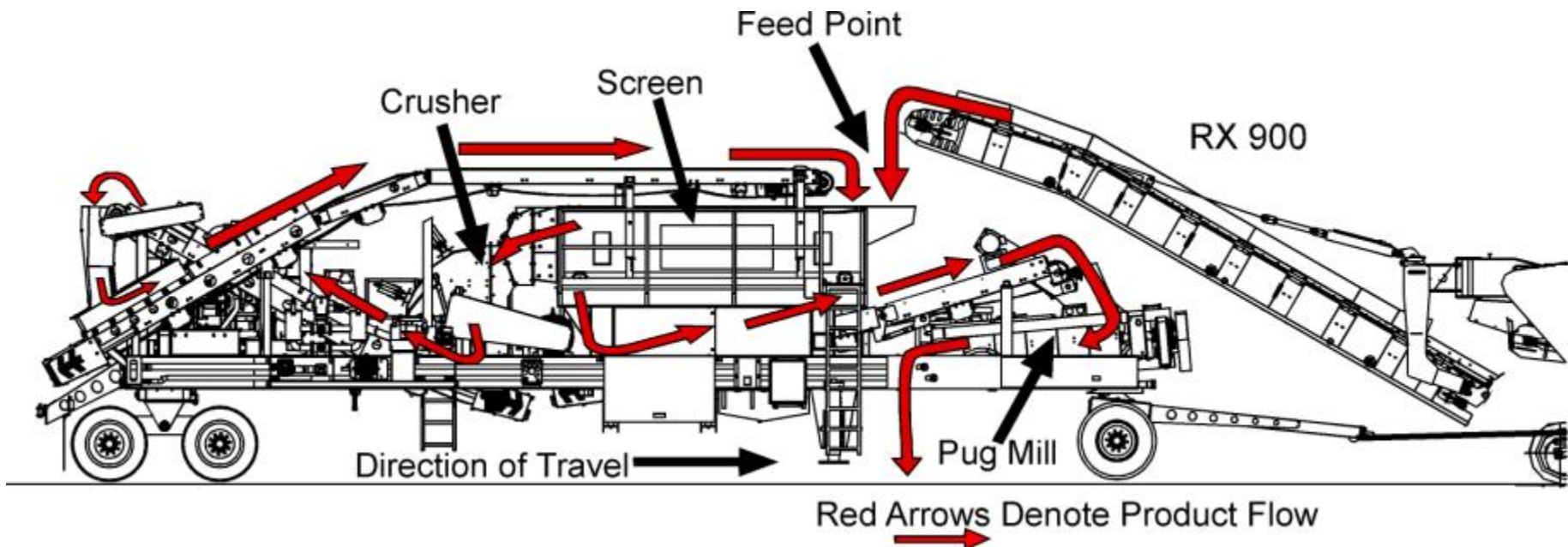


The Recycling Train



The Roadtec RT-500 Mixing Trailer

- The mill's conveyor puts milled material on the screen.
- If oversized, it goes through the crusher and back to the screen via a two conveyor return circuit.
- Material that passes the screen drops onto the 1.2 m (48") weight belt. This sends a signal to the blending computer which adjusts the flow of additives to the pugmill mixer.
- After a full mixing cycle it is discharged onto the roadway.



RX-900 and the Train



LOCAL ROADS & STREETS

MOVING AHEAD TO IMPLEMENT
CIR & FDR

KEVIN BURKE @ IDOT