

Ultra-Thins 2019

CEW

Tim O'Rourke RCRC Manager



History of Michigan's HMA Fine Mixes 1970 to 2020

1976	31A / 35A	Marshall	3/8's v
1984	31A	Marshall	3/8's v
1990	36A / 36B	Marshall	3/8's v
1996	36A	Marshall	3/8's v
2002	5E's	S. Pave	3/8's v
2004	Ultra-thins	S. Pave	#4 v
2006	36A*(new)	Marshall	3/8's v

- 1976 31A & 35A 98-100 on 3/8's, No Crush,
4-9 Dust, 5-9 Bit.
- 1984 31A 98-100 on 3/8's, No #4 or #30,
4-9 Dust. 5-9 Bit.
- 1990 36A & 36B 92-100 on 3/8's, 4-10 Dust,
5-9 Bit. Crush 40-60
- 1996 36A 3-10 Dust, 5.5-8.0 Bit.
3% Air > 2%, 16.5 VMA

2002	5E's	90-100 on 3/8's, <90 on #4, 32-67 on the #8, 2-10 #200
2004	Ultra-thins	99-100, 3-8 Dust, 4.5 Air, 15.5 VMA, 1200 Stab. Low, Medium and High Volume Spec.'s
2006	36A	92-100 on 3/8's, 25-45 #30, 4% Air > 3% Air, 15.0 VMA

	<u>1976</u>	<u>1976</u>	<u>1996</u>	<u>2002</u>	<u>2004</u>
	<u>31A</u>	<u>35A</u>	<u>36B</u>	<u>5E's</u>	<u>Ultra-Thin</u>
3/8's	98-100	100	92-100	90-100	99-100
#4	60-90	65-90	65-90	<90	75-95
#8	50-70	45-70	55-75	32-67	55-75
#30	25-45	20-45	25-50	n/a	25-45
#200	3.0-8.0	4.0-9.0	4.0-10.0	2.0-10.0	3.0-8.0
Bitumen	5.0-9.0	5.0-9.0	5.0-9.0	No Limits	No Limits
Crush	n/a	n/a	60-40	n/a	75 (med.)
Air Voids	n/a	n/a	3.0	4.0	4.5
VMA	n/a	n/a	16.5	15.0	15.5

Sieves & <u>Spec's</u>	<u>1976</u>	<u>2004</u>
3/8's	98-100	99-100
#4	60-90	75-95
#8	50-70	55-75
#30	25-45	25-45
#200	3.0-8.0	3.0-8.0
Bitumen	5.0-9.0	No Limits
Crush	n/a	75 (med.)
Air Voids	n/a	4.5
VMA	n/a	15.5

43 Years Later**

	<u>1976</u>	<u>2019</u>	
	<u>31A</u>	<u>Ultra-Thin</u>	
	3/8's	98-100	99-100
Nominal*	#4	60-90	75-95
	#200	3.0-8.0	3.0-8.0
	Bitumen	5.0-9.0	No Range
	Crush	No Min.	75 (med.)
	Air Voids	n/a	4.5
	VMA	n/a	15.5
Application #	138 #'s/Syd	83#'s/Syd	
Stability	900	1200	

43 Years Later**

		<u>2019</u>	ADT/Com.		
		<u>Ultra-Thin</u>	<u>Low</u>	<u>Med</u>	<u>High</u>
	3/8's	99-100			
Nominal*	#4	75-95			
	#200	3.0-8.0			
Polymer?	Bitumen	PG 64-28P	58-28	64-28	70-28
	Crush	75 (med.)	40	75	90
Regressed?	Air Voids	4.5	4.5	4.5	4.5
	VMA	15.5	16.5 Target		
Application #		83#'s/Syd	90-100		
Stability		1200			

2018 Fed. Aid Projects	2018 Mix	ADT/Com.		
14.7 miles 15,400 Tons	<u>Ultra-Thin</u>	<u>Low</u>	<u>Med</u>	<u>High</u>
	3/8's	98.8	99-100	
Nominal*	#4	79.5	75-95	
	#200	6.1	3.0-8.0	
Polymer	Bitumen	5.41	64-28P	
	Crush	82.8	75	
Regressed/No	Air Voids	4.5	4.5	
	VMA	15.75	15.5 Target	
Application #	90#'s/Syd		83#'s/Syd	
Film Thickness	7.39		n/a	
AWI	277		260	

2018 Fed. Aid Projects

14.76 miles \$1,300,000

5 Locations

	<u>Lengths</u>	<u>Widths</u>	<u>App.</u>
CR103 Robinson Lake Rd.	3.24 miles	32'	7
CR103 E. Higgins Lake Rd.	4.70 miles	30'	30
CR104 Marl Lake Rd.	3.65 miles	34'	16
CR 104 Pine Dr. / US127	0.75 miles	28'	0
CR106 Oakwood Rd.	0.51 miles	40'	1
CR200 W.Higgins Lake Rd.	<u>1.91 miles</u>	<u>30'</u>	<u>9</u>
	14.76 miles		63

2017 Fed. Aid Projects	<u>2017 Mix</u>	ADT/Com.	
11.35 Miles / 7,100 Tons	<u>Ultra-Thin</u>	<u>Low</u> <u>Med</u> <u>High</u>	
	3/8's	98.8	99-100
Nominal*	#4	79.5	75-95
	#200	6.1	3.0-8.0
Polymer	Bitumen	5.75	64-28P
	Crush	82.8	75
Regressed/Yes	Air Voids	3.5	4.5
	VMA	15.62	15.5 Target
Application #	90#'s/Syd		83#'s/Syd
Film Thickness	7.39		n/a
AWI	277		260

2017 Fed. Aid Projects

11.39 Miles / \$490,000

2 Locations

Lengths

Widths

App.

F-97 (Old76 to NCL)

9.35

24'

4

F-28 (F-97 to ECL)

2.04

24'

0

11.39

4

83#'s/Syd Mainline

100#/Syd Approaches

F-97 Wedged in 2015 and 2016 w/13A

8,200 Tons RCRC and Safety Funds at 125 #'s/Syd

Roscommon County has 192 Primary Miles

60 Miles are currently Ultra-thin Paved

31 % of Total

15 Different Primary Roads

27 Roadsoft Segments

Average PASER Rating
Of Primary System is 5.98

The Pre-Primary Rd. PASER Rating

Was 4.41 for the 60 Miles

The Post-Primary Rd. PASER Rating

Is 7.48 for the 60 Miles

Extended Service Life

Primary Roads

Average PASER Gain 4.59

Average Years ESL 10.58 Years

Ranges from .30 to .60 / Year Loss

Average PASER Decline / Year = .44

ESL Ranges = 15.3 Years to 7.7 Years

What Defects are now seen?

Mostly Reflective Cracking

Roscommon County has 231 Local Miles

24 Miles is currently Ultra-thin Paved

10.3 % of Total

96 Different Local Roads

100 Roadsoft Segments

Average PASER Rating
Of Local System is 5.95

The Pre-Local Rd. PASER Rating

Was 4.63 for All 24 Miles

The Post-Local PASER Rating

Is 7.23 for All 24 Miles

First Local Road Application 2005

7 of the 11 Townships

Have Ultra-thin Pavements

Extended Service Life

Local Roads

Average PAsER Gain 4.37

Average Years ESL 9.78 Years

Ranges from .25 to .67 / Year Loss

Average PAsER Decline / Year = .46

ESL Ranges = 17.5 Years to 6.5 Years

What Defects are now seen?

All Cracking

60 Miles of Primary Road at \$65,000/mile

Approximate Gain of 14.6 Years ESL

Yearly Cost/Gain = \$6,200/Yr

24 Miles of Local Roads at \$50,000/mile

Approximate Gain of 13.8 Years ESL

Yearly Cost/Gain = \$5,100/Yr

Add 3 Crack Seal Cycles*

Ultra-thin and Asset Management

Primary 1 Mile Road

Year 1; PASER 3-6 > Crack Seal	\$3,000
Year 1; PASER 3-6 > Dura Patch	\$7,000
Year 2; PASER 3-6 > Wedge	\$10,000
Year 3; PASER 3-6 > Ultra-thin	\$63,000
Years 6-16; PASER 9>4 = 4 Cycles	\$12,000
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	\$95,000

ESL 10 Years = \$9,500

ESL 16 Years = \$5,900

Ultra-thins and Chip Seals

426 Miles Total Paved Roads

Year 1; PASER 3-6 > Crack Seal	\$3,000
Year 1; PASER 3-6 > Dura Patch	\$7,000
Year 2; PASER 3-6 > Wedge	\$10,000
Year 3; PASER 3-6 > U.T. & C.S.	\$43,000
Years 6-16; PASER 9>4 = 4 Cycles	<u>\$12,000</u>
	\$75,000

ESL 10 Years = \$7,500

ESL 16 Years = \$4,700

27 Miles/Year, 1/2 U.T. 1/2 C.S.

\$2,025,000/Year

Experiences with Ultra-thin

84 Miles of RCRC Roads + 12 miles
of US-127 (M-55 to SCL)

Looks Like we can expect
about 13-18 Years of Service
before the next major resurface.

Frost is probably the
Number 1 cause of failure

Experiences with Ultra-thin

84 Miles of RCRC Roads + 12 miles
of US-127 (M-55 to SCL)

Primary ADT's Average 1,270

With 10% Commercial

Local ADT's Average 370

With 4% Commercial

We have had 0 failures on our Ultra-thins

Some Local Low Volume Roads may last 25 Years

Experiments with the Mix

- 1.) Regression to 3.5 **may** = effect of Polymer
- 2.) FRAP expedites cracking but retards rutting and dramatically lowers the cost per ton.
- 3.) FRAP & Shingles has an exponential increase in cracking and surface pop-outs and raveling of close to or exceeding 10 times the normal rate of Virgin Mixtures.
- 4.) Low Volume Mix. Decrease in Crush but little or no effect on mix performance.

CR 105 (Russell Lake Rd)

Test Case in 2009 Cheaper Mix

Starting PASER of 5

We placed 2 Ultra-thin Mixes on a Primary Rd.

Leading to the Local Asphalt Plant.

One Mix Contained 20% FRAP/RAP

Other Mix Contained 20% RAP + 5% Shingles

Both Produced Reduced ESL Numbers

.56/Year around 7 Years

Non-Rutting Related

CR 105 (Russell Lake Rd)

Test Case in 2009 Cheaper Mix

Starting PASER of 5

We Placed Approx. 635 Tons of U.T.

The FRAP Mix at \$6.00/ton V.

The FRAP/Shingle Mix at \$22.00/ton V

Estimated Cost of Virgin Mix = \$45.00

Estimated Savings / Mile = \$3,800

up to \$14,000

Cost of Crack Seal?

W. Pleasant St. / Richfield Township

Test Case . Local Road Poor Condition

2006 PASER Score of 2

We placed 2 Ultra-thin Lifts on Local Rd.

This was a Special Assessment District

First lift was a Scratch Course at 40#'s/syd

Second Course was the Finish at 65#'s/Syd

2015 PASER Score of 7

W. Pleasant St. / Richfield Township
Test Case . Local Road Poor Condition
2006 PASER Score of 2

Originally The RCRC Proposed C/S

Estimated Cost of .5 Miles = \$52,000

U.T. Estimated Cost = \$19,000

This was a Special Assessment District

With 25 Participant Owners

A Savings of \$1,320 Per Owner





Suggestions on HMA

Marshall Mixes on Low
Volume Roads Work Fine

RAP Makes your mix less
expensive up front (BUT)
(Study of 18 Locations)

Super-Pave Mixes tend to
be drier (at least in Michigan)
(Design Gyrations)

Suggestions on HMA

WARM Mix is a Questionable Process
in Michigan Winters (Stripping/Rutting)

Your Customers Have NO Idea
what you have done
or why you do it!

If it Works (and you can afford it)
Keep Doing It!
Think of the SYSTEM!

Questions ??