Micro-surfacing and Slurry Seal Coat Preventative Maintenance Treatment

Micro-surfacing / Slurry Seal Coat

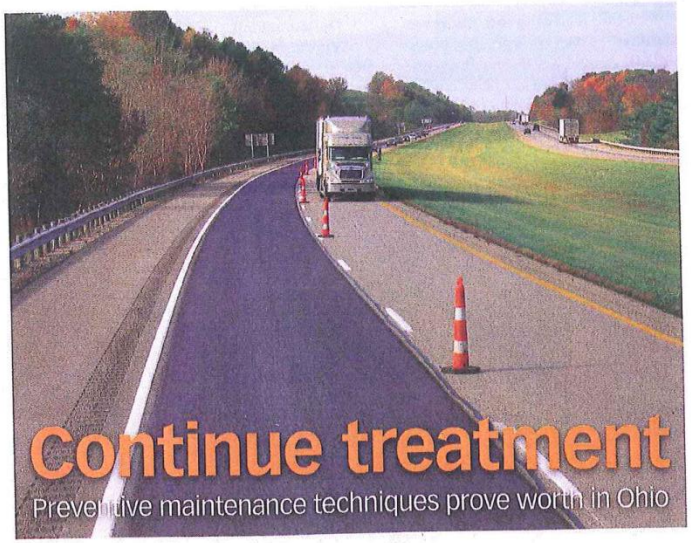
vs.

Traditional Chip Seal Coat

vs.

Thin Lift Overlay

RM-1



Continue treatment

Preventive maintenance techniques prove worth in Ohio

By Jennifer Gallagher, P.E.
Contributing Author

Chip seal and microsurfacing are two of the many preventive maintenance treatments used in Ohio for the preservation of asphalt-surfaced pavements.

The primary intent in using these two treatments is to slow pavement deterioration and defer costly rehabilitation. In Ohio, chip seal is a sprayed application of a polymer-modified asphalt binder covered immediately by washed limestone or dolomite aggregate and rolled with a pneumatic-tire roller to seat the aggregate in the binder. Chip seals are used to provide a new wearing surface on low-volume roadways that is intended to eliminate raveling, retard oxidation, reduce the intrusion of water, improve skid resistance and seal cracks. Microsurfacing is a cold-applied paving mixture composed of polymer-modified asphalt emulsion, crushed aggregate, mineral filler, water and a hardening-controlling additive. A traveling pug mill is used to proportion, mix and apply a thin layer of the mixture to the pavement. No rolling is required, and the finished surface can generally be opened to traffic soon after placement. Like a chip seal, microsurfacing can be used as a blanket cover on pavements suffering from loss of skid resistance, oxidation, raveling and surface permeability. In addition, microsurfacing can be used to fill ruts and improve rideability by removing minor surface irregularities.

Of late, many highway agencies, including the Ohio Department of Transportation (ODOT), are increasing their investment in chip seals and microsurfacing as a means of preserving the system and postponing more costly rehabilitation efforts. Underlying this shift in focus is the widely accepted assumption that these efforts are consistently cost-effective. Nationally, it is estimated that a total of some 950 million sq yd of chip seals and about 1 million tons of microsurfacing are placed each year. In fact, despite the widespread use of chip seals and microsurfacing nationally, very little performance monitoring has been performed to quantify their cost-effectiveness on pavements of different levels of distress.

Thorough understanding of how well these treatments are performing is critical to the nature and extent of their continued use in the future. Currently, there is a lack of objective information on fundamental issues such as the expected improvement in pavement condition resulting from the use of chip seal and microsurfacing, the extent to which the treatments

Preventive Maintenance Treatments Decision Factors

1. 7 to 10 year life extension (future demands)
2. Costs (life cycle analysis)
3. Level of service
4. Existing Roadway Conditions
   (most critical factor)

Micro-surfacing or Slurry Seal Coat
Slurry Seal Coat is parent product

Slurry Seal Coat

CQS-1H Emulsified Asphalt

- newer pavement surface
- single lift
- $2.00 per gallon

Micro-surfacing

CQS-1HP Emulsified Asphalt

- older roadways
- stacking allows scratch/wear
- polymer additive
- $2.25 per gallon

Micro-surfacing Advantages

1. Rut filling
2. Depressed transverse crack repair
3. More “user-friendly”
4. Preferred by counties


08/16/2010

Basic Product Composition

- Emulsified Asphalt (CQS-1H or CQS-1HP)
- Aggregate (Type II or Type III)
- Water (Potable)
- Mineral Filler (Cement)
- Additives (Retardant)

SIEVE SIZE	TYPE II – % PASSING	TYPE III – % PASSING	STOCKPILE TOLERANCE
3/8"	100	100	-
#4	90 -100	70-90	± 5%
#8	65 – 90	45-70	±5%
#16	45 – 70	28-50	±5%
#30	30 – 50	19-34	±5%
#50	18 – 30	12-25	±4%
#100	10 – 21	7-18	±3%
#200	5 – 15	5-15	±2%

After the target gradation has been submitted (which is the gradation that the mix design is based on) the percent passing each sieve shall not vary by more than the stockpile tolerance and still remain within the gradation band.

The aggregate will be accepted at the job location or stockpile. The stockpile shall be accepted based on five gradation tests according to AASHTO T 2. If the average of the five tests is within the gradation tolerances then the material will be accepted. If the tests show the material to be out, the contractor will be given the choice to either remove the material or blend other aggregates with the stockpile material to bring it into specifications. Materials used in blending must meet the quality tests before blending and must be blended in a manner to produce a consistent gradation. This may require a new mix design. Screening shall be required at the stockpile if there are any problems created by having oversize materials in the mix.

The contractor shall perform a gradation test every 500 tons of material produced. The gradation tests shall include the sand equivalency test.

Deleterious Substances
To limit the permissible amount of clay-like fines in an aggregate, a sand equivalency of 60 or higher is required when tested by AASHTO T 176. The sand equivalency test shall be performed during the gradation tests during the production of the stockpile.

Soundness
The aggregate shall have a weighted loss of not more than 15% when the sodium sulfate test is used or not more than 25% when the magnesium sulfate test is used. Soundness shall be tested once during production of stockpile, in

Aggregate Types

	Type II	Type III
Design Specs	12 to 20 lbs/sy	18 to 30 lbs/sy
Actual	16 to 17 lbs/sy	24 to 25 lbs/sy
Scratch Course	Up to 20 lbs/sy	Up to 28 lbs/sy
	Preferred rut fill & cracks	Increased skid resistance
	Lower cost	Higher cost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NDDOT Micro-surfacing/ Slurry Seal Criteria

- No written policy regarding use of micro/slurry
- Slurry Seal Coat and Chip Seal Coat strictly cover-coat application to correct/prevent weathering and offer skid resistance
- Typically use slurry seal = Interregional Highways and above
  Typically use chip seal = All other Highways
- Micro-surfacing considered replacement for TLO that is being planned "early" – correct rutting/depressed cracks with sound pavement structure
- Districts decide on aggregate type and request variance from above general guidelines


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Sept. 13, 2010

Micro-Surfacing Mix Evaluation – Mandan Job, Dralle Pit Aggregate

Gradation Test Results:

Sieve Size	Agg 1853A %Passing	ISSA Type III Specification
3/8"	100	100
#4	85	70-90
#8	62	45-70
#16	42	28-50
#30	28	19-34
#50	15	12-25
#100	9	7-18
#200	8.2	5-15

Sand Equivalency = 71%

Test Results on Micro-Surfacing Mix:

Ingredient	Dosage, % by mass dry aggregate
AGG-1853A (Type III)	100.0
Type 1 Portland Cement (Type 10)	1.0
Potable water	13.0
CQS-1H-P (W-99)	13.0

Test	Result	Specification (ISSA A-143)	Test Method
1. Wet Cohesion, kg-cm			
- Setting Time, 0.5 hr, (10.0°C, outside)	21	12 Min.	ISSA TB-139
- Traffic Time, 1.0 hr, (10.0°C, outside)	20	20 Min.	ISSA TB-139
2. Lateral Displacement, %	1.2	5 Max.	ISSA TB-147A
3. Wet Stripping, % Coated	>95	90 Min.	ISSA TB-114
4. Wet Track Abrasion Test			
- 1 Hour Soak, g/m^2 Loss	217.4	538 Max.	ISSA TB-100
- 6 Day Soak, g/m^2 Loss	Pending	807 Max.	
5. Mix Time at 25°C, s	160	Controllable to a minimum of 120 s	ISSA TB-113


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CALIBRATION PROCEDURE

Obtain mix design from emulsion supplier.

Emulsion Calibration

A. If at all possible calibrate the emulsion pump on the rock belt counter.

B. Use a second container capable of holding 600 to 700 gallons, such as a distributor or mobile support unit.

C. Before pumping from the slurry truck into the second container, obtain an empty weight of the container. Fill hose before taking first weight. Pump from the slurry truck into the second container for a minimum of 50 counts of the *rock* belt. Divide the net weight pumped by the number of counts to obtain weight per count.

D. Run three tests and average the results. If there is a large variance between the three results, re-run the emulsion calibration until the variance is less than 5%.

E. Do not pump the emulsion back and forth between the slurry machine and the test unit as air will become entrained into the emulsion leading to incorrect results.

Cement or Fines Calibration

F. Use a small pan to obtain a cement or fines sample from the machine, calibrating to the cement counter.

G. Weigh the pan prior to collecting the sample from the machine. (Scale range: 0-30 lbs.)

H. Collect three samples for a minimum of 10 counts of the cement counter and determine the weight per count for each test sample. Determine the average weight per count for the three test runs.

Aggregate Calibration

I. Test the moisture of the aggregate.

J. Calculate the moisture factor. Moisture factor is the percent (in decimal format) of moisture in the aggregate + 1.00.

Example: Moisture is 5%, therefore the moisture factor . . .
0.05 + 1.00 = 1.05 Moisture factor

K. Select three gate openings as per graph.

L. Run at least 2 tons of material per gate setting recording the net weight conveyed and the number of counts of the rock belt for three test samples, each a minimum of 50 counts.

WOODWORTH 32.332 Mile
HWY 36

SURFACE COURSE

DATE	WET TONS AGGREGATE	DRY TONS AGGR	% MOISTURE	GAL EMULSION	CEMENT BAGS	RETARDENT BARRELS	ROCK COUNTER AGGREGATE	AGGREGATE	GAL EMULSION	CEMENT COUNTER	CEMENT BAGS	% OIL
7/21/2010	602.78	590.72	2	19411	126	0.0	38202	613.14	20175	80445	130	0.143
7/22/2010	521.62	511.19	2	16798	109	0.0	32732	525.35	17286	68845	111	0.141
7/23/2010	396.48	388.55	2	12768	83	1.0	25160	403.82	13287	52905	86	0.143
7/24/2010	702.3	688.25	2	22616	146	0.0	44020	706.52	23247	92512	150	0.141
7/26/2010	773.48	758.01	2	24908	161	1.0	47396	760.71	25030	99645	161	0.138
7/28/2010	696.54	682.61	2	22431	145	1.0	42523	682.49	22457	89312	144	0.137
7/29/2010	683.9	670.22	2	22023	143	1.0	41960	673.46	22159	88075	142	0.138
7/30/2010	485.36	475.65	2	15630	101	1.0	29880	479.57	15780	62627	101	0.139
Total	**4862.46**	**4765.21**		**156585**	**1014**	**5.00**	**301873**	**4845.06**	**159421**		**1026**	

Total	**Aggregate**	**4765.21**
Total	**Oil**	**159421**
Total	**Cement Bags**	**1026**
Total	**Retardant Barrels**	**5.0**

ND LTAP Micro/Slurry Workshop

Presented By: Thomas J. Wood

Transportation Learning Network

TLN.learnflex.net

Partners: NDLTAP & UGPTI


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HART
MACHINE SHOP
TRUCK SHOP


9-118
MAYO
KENWORTH
GTS 614
08/16/2010


12-048
185
SULLAIR
08/16/2010


08/17/2010


MATO


SULLAIR
185
08/17/2010


CAVALIER
PHONE
MAYO
NORTH DAKOTA
08/17/2010


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STOP
STOP

International Slurry Surfacing Association

Slurry Systems Workshop 2006

PROGRAM

January 31 - February 3, 2006
Las Vegas, Nevada

Workshop Locations:

Equipment Training and Demo	Overflow Parking Lot
All Indoor sessions except Hand Mix	Salons A - B
Hand Mix Tables	Salon D - E
Exhibits — Indoor	Salon C
Exhibits — Outdoor	Parking Lot behind parking garage
Registration	Grand Ballroom Foyer
Breaks and Breakfasts	Inner Hallway
Luncheons	Salons F - G
Receptions	Salons F - G

The Slurry Systems Workshop is made possible by ISSA and the ISSA Development Committee and especially by the generosity of its Sponsors.

WWW.SLURRY.ORG

ISSA

- Non-profit trade associations working together to promote the concept of pavement preservation specializing in micro-surfacing and slurry seal

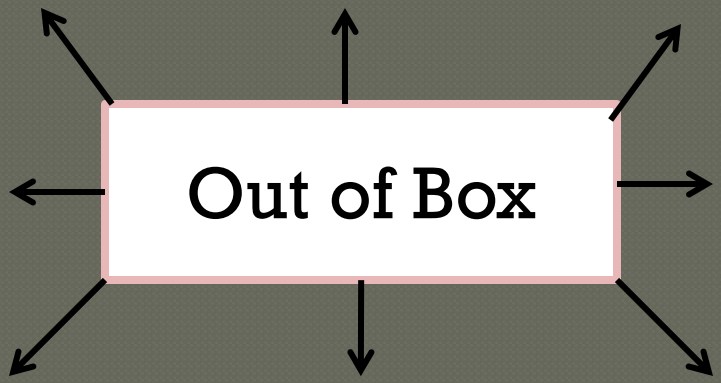
- Annual workshop – 4 day comprehensive training in Las Vegas

- Website: www.Slurry.org


U.S.S. MA

Experience & Knowledge → Improved Results

1. Survey Markings – Preparation
2. Surface Prep – Critical
3. Clean-up – Speed and Frequency
4. Joints – Difficulty
5. City Work – Challenges
6. Traffic Control Issues -



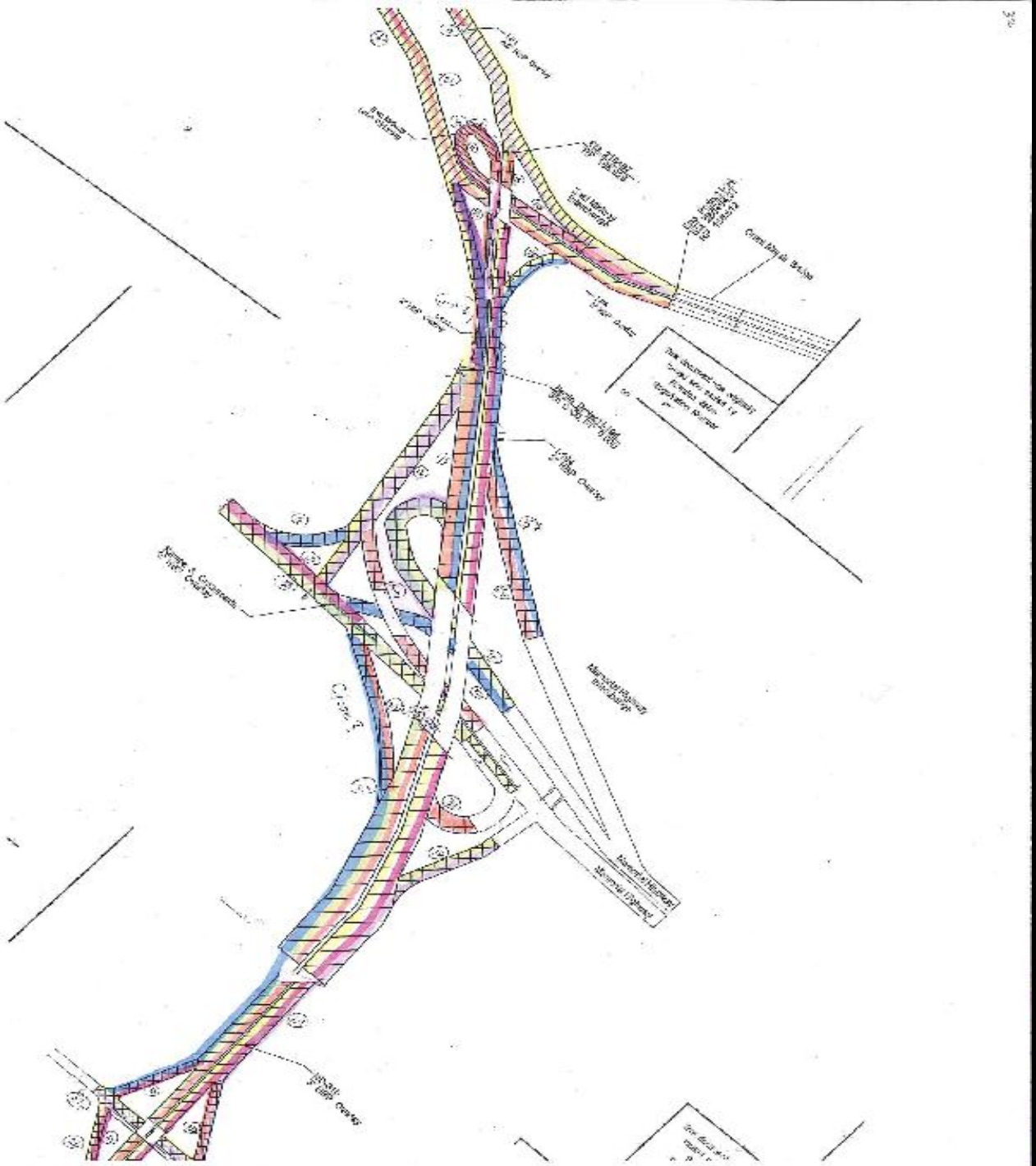

08/17/2010


EXIT
155


NO
PARKING
THIS
BLOCK
09/13/2009


6TH ST E
09/13/2009


LEFT
EXIT 155
94 TO 6
Main St
½ MILE
EXIT ONLY
94 WEST
Billings
SLOW
SLOW



Troubleshooting Failures

- Non-compatible aggregate/oil – electric charge
- Oil temperature – below 100° F
- Oversize aggregates – pre-screen
- Plastic pavement markings – grind off
- Shoulders- tack (SS-1h, CSS-1h or MS-1)
- Fills low areas/depressions – micro
- Learning Curve

Slurry Seal Coat and Micro-surfacing Costs

Type II Aggregate	$28,000 - $30,000 per mile
Type III Aggregate	$34,000 - $38,000 per mile
Scratch/Wear Course	$45,000 - $50,000 per mile

Aggregate Cost Breakdown

- Aggregate
  - Material/crushing
  - Tax & Royalty
  - Load, Scale, Haul
  - Stockpile & Waste
- Laydown
  - Equipment
  - Labor
- Miscellaneous
  - Water
  - Cement
  - Retardant

Cost Factors

- Availability of Aggregate
- Size of Job
- Complexity of Job
- Traffic Control
- Production – radiuses/tapers


Inorganic
Chemistry

- North Dakota Contractor (local)
- Began 2001- 10 years experience
- Over 500 miles of micro/slurry
- 26 projects past 3 years

Micro-surfacing provides cost-effective solution

With limited budgets, three Massachusetts municipalities stretch their road maintenance dollars to maintain quality roads

By Greg Udelhofen, editor

Like many road agencies across the county, Massachusetts' Town of Wilmington, the City of Methuen and the Town of Sutton must address their road maintenance needs with the limited dollars available to do so. With the help of Hingham, MA road contractor, Sealcoating Inc., the Department of Public Works for those three communities rely heavily on a preservation approach in an effort to keep their road networks in good order at a price that allows them to maximize their investment.

Don Onusseit, Wilmington's Public Works Superintendent, Jay Bonanno, Methuen's Highway Department Superintendent, and Mark Brigham, Sutton's Public Works Superintendent, all have become strong proponents of micro-surfacing road preservation primarily because it's a cost-effective approach to extending the life of good quality roads, but more importantly because it works.

Onusseit, who's been taking care of Wilmington's 115 lane miles for the past 10 years, says preservation is key to maintaining the roads under his jurisdiction with the approximate $500,000 annual budget he has to do so. While there is occasional full rehabilitation work required on some roads that have completely deteriorated, Onusseit is trying to follow a 20-year program that targets every lane mile of the road network for some type of improvement.

"We have some roads with particular deficiencies, whether its drainage, or lack of curbs and sidewalks, but

Quotes

"… specified micro-surfacing for last several years on county roads with rutting or depressed cracks – helps improve ride."

"… prefer type III aggregate due to increased skid resistance."

"… no failures, but issues with centerline pavement marking loss."

"We've not experienced any material loss which results in phone calls regarding broken windshields."

"… prefer micro-surfacing to slurry seal – provides better ride with multiple lifts."

QUESTIONS?