



Alaska Department of
Transportation & Public Facilities

Microsurfacing Experimental Feature Minnesota Drive Ramps

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Pavement Management
November 2023

Our mission is to *Keep Alaska Moving* through service and infrastructure.

Why Microsurfacing

- Low
- It



Source: Ingevity – North Dakota Asphalt Conference – Future of Micro Surfacing, 2010



History of Micro

- Approached about using micro 10-15 years ago
 - § But testing showed it would fail under studded tire wear
 - Used the Prall test to simulate wear
- Can't move forward until a formulation does resist stud wear
- Approached again in 2016
- Highly polymerized binders can now be emulsified (PG64-40)
- Tests came back with good results

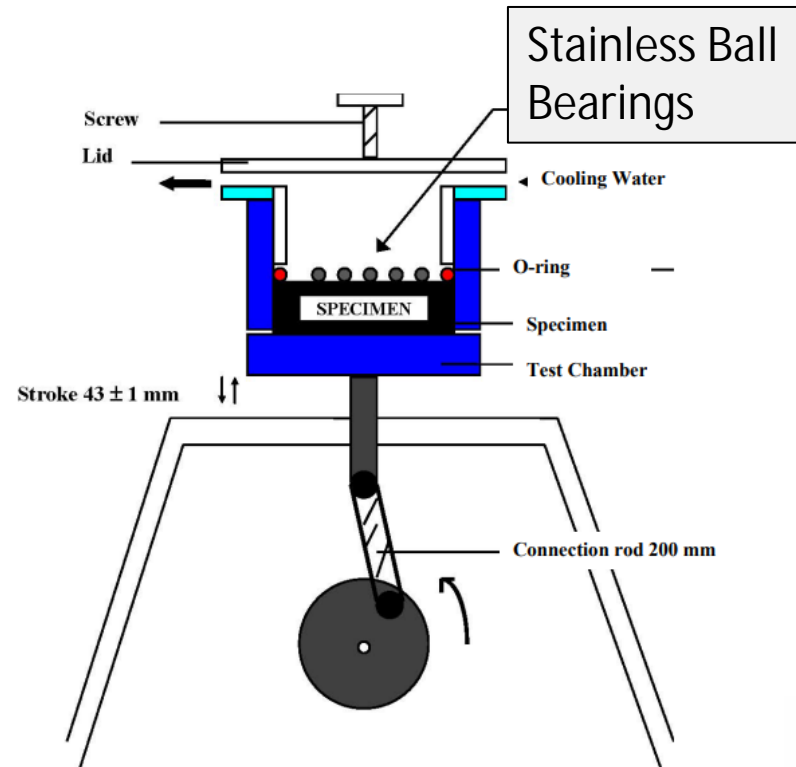


Fig. 1. Abrasion apparatus, in principal



Project Selected - Minnesota Ramps

- Placed on Minnesota Ramps
 - § Ruts had deepened, added a pre-level to rut fill on some ramps (change order)
 - § Did crack filling and then a tack coat prior to microsurfacing application
 - § See Dimond ramp pre-level below



Our Micro Formulation

- Mix Design Performed – September 2019
- Preliminary testing showed the microsurfacing with PG64-40 was prone to rutting. We allowed it to be adjusted to a PG64-34 to reduce binder softness.
- Prall results were not as good but were acceptable.
- Mix design showed the mix was slow set, so a pneumatic roller was planned to help set the micro



Mix Design 1

- The original mix design was performed using the PG64-34 emulsion **September 2019**. Only one piece out of spec:

Test	Lab Result	Spec	Standard
Wet Stripping	95% +	≥ 90%	ISSA TB-114
Wet Track Abrasion loss, 1hr soak	175	≤ 538 g/m ²	ISSA TB-100
Wet Track Abrasion loss, 6 day soak	406	≤ 807 g/m ²	ISSA TB-100
Saturated abrasion Compatability	0.9	≤ 3 g los	ISSA TB-144
Mix Time @ 77° F	140s	Controllable to ≥ 120s	ISSA TB-113
Mix Time @ 100° F		Controllable to ≥ 35s	ISSA TB-113
Wet Cohesion	17	12 kg-cm min @ 30 min	ISSA TB-139
	20	20 kg-cm min @ 60 min	
Lateral Displacement	7.30%	5% max	ISSA TB-147

- We were informed highly modified micros typically perform well even if out on this. This test informational, so allowed it.

Test Strip



Production Day 1

- Started off smooth, then things went south
 - § 3 hours to get roller on micro – slower, not faster than test strip
 - § In curves on ramp started breaking too fast – clogging in spreader box
 - § So, it is becoming unworkable but not hardening
- Lots of testing done to determine what changed
- Informed the binder was different. Oil production shut down – different reaction from original mix design.



Shut Down Production - Testing

- Ramps reopened after about 3 hours – shut down production to investigate
- Shut down for 2 days (also due to weather)
- Additives were changed from **Lime** to **Cement and Aluminum Sulphate**. New Mix Design Performed. This change allowed rollers to get back within 2 hours.
- Now lateral displacement is within spec

Lateral Displacement	SpG	1.70%	5% max	ISSA TB-147
after 1000 cycles of 145 lb			2.10 max	
Excess Asphalt by LWT Sand Adhesion		35.8	50 g/ft ² max	ISSA TB-109

Thought Things Were Good

- Production continued – seemed to be going smooth
- International Airport Ramps Flushed/Damaged



Friction Testing / Removal

- From the flushing distress there was a friction concern
- Performed friction testing – showed loss in flushed areas – mill/fill with 1.5" HMA at 5 ramps with friction loss.
- Most ramps removed were being used to haul gravel to AIA. Heaviest loads.
- Remaining ramps are being monitored. This year the final report going out on for the ramp performance and lessons learned.



Monitoring

- Performance is mixed based on original ramp condition
 - § Cracks reflected through (expected)
 - § Ramps that were in poor condition are back in poor
 - § Ramps that were fair or good are in fair or good condition
- Cored and Prall tested the micro post-construction
 - § Needed value after changing additives
 - § Unfortunately, increased to 30 – not resistant to studs
 - § Cement likely made brittle, prone to wear

100th Avenue - NB Off Ramp



100th Avenue - SB On Ramp



International Cloverleaf





Closing Thoughts

- Think ramp deformation was from slow set mix hit by heavy trucks
- Unsure if raveling is caused by change in additives (aluminum sulphate)
- On the fly changes added uncertainty to project

Questions?

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