Alaska DOT&PF
Northern Region
High Float Surface Treatments
Northern Region
HFST Surfacing 2001 - 2002

- Dalton Hwy - 112 miles
- Taylor Hwy - 41 miles
- Minto Road - 10 miles
- Other Projects - Tok Roads, Tofty Road, Elliott Hwy, Various Gravel to Pavement Projects
How have we done?

• No real total failures, with exception of the Dalton project that we overlayed in 2001

• Varying degrees of success

• We feel that we can do better
High Float Surface Treatments for Gravel Roads

- Project manager - Steve Saboundjian
- Research project - Goal is to formulate mix design procedure for HFST
- Work initiated to date
  - observation and sampling of projects
  - literature search
  - collection of project data
Basic AST Mix Design Theory (McLeod Method)

- Uses Median Particle Size and Flakiness Index to determine Average Least Dimension (ALD).
- Median particle size - size at which half the stones are larger and half smaller.
- ALD is an indication of the expected thickness of the mat in the wheelpaths.
Median Particle Size

![Graph showing the relationship between percent passing and sieve opening, indicating the median particle size of 0.215 inches.](image)
Flakiness Index

- A measure of the aggregates percent, by weight, of flat particles.

- Measured on five different size fractions.

Figure D.6. Flakiness Index testing plate
Why the Flakiness Index?

Figure 4.7. Traffic causes flat and/or elongated aggregate in wheelpath to rotate until long axis is horizontal.
McLeod Theory

- Loose unit weight - determined by loosely filling a cylinder of known volume with aggregate and weighing it.
- Voids in loose aggregate - determined from the loose unit weight and bulk specific gravity of the aggregate.
- These parameters are used to calculate oil and aggregate application rates.
How This Applies to HFST’s

- Although the design equations don’t directly apply, the basics of the theory generally apply.
  - The mat will only be as thick as the largest stones in the aggregate.
  - Particle shape will also determine thickness.
  - The amount of room that is available for the oil is determined by gradation.
Figure D.3. McLeod design: one stone thick and proper embedment.
Areas to Investigate

- Gradations - how do our gradations look in the context of a mix design.
- Which gradations have worked, which haven’t and why (or why not)?
- Oil application rates - Application rates that have worked and the aggregate gradations they worked with?
Gradation

- Plot on 0.45 Power Curve
- Look at relationship to the maximum density line.
Gradation

- Cover Coat - “B”
- 1 inch minus

- Cover Coat - “C”
- 3/4 inch minus

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<th>Grading B</th>
<th>Grading C</th>
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<tr>
<td>#200</td>
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<tr>
<td>0.005mm</td>
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HF - Grading "C"
Gradation on 0.45 Power Scale
HF - Grading "C"
Gradation on 0.45 Power Scale

% Passing vs Screen Size

- LSL
- USL
- Taylor 44-64
HF - Grading "C"
Gradation on 0.45 Power Scale
HF - Grading "B"
Gradation on 0.45 Power Scale

% Passing

USL
LSL

#200
#50
#8
#4
3/8"
1/2"
3/4"
1"

Screen Size

100
90
80
70
60
50
40
30
20
10
0
HF - Grading "B"
Gradation on 0.45 Power Scale
HF - Grading "B"
Gradation on 0.45 Power Scale

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Taylor
23-44
Oil Application Rate

- Our spec - 0.75 gal/yd^2 suggested oil application rate, regardless of gradation
- Canadian - average 0.62 gal/yd^2 when using 3/4 inch cover coat
- A mix design procedure is needed to come up with a realistic beginning application rate for each project
Flushing

- Main mode of failure
- Caused oil application rate too high for gradation
- Can cause oil to be picked up by traffic
- Makes for slippery surface
Potholing

- Mainly occurs along joints due lack of overlap
- Can be the result of soft spots in the base course
- Can occur on steep grades due to tearing of the mat
Taylor Highway 44-64
Lake Louise Road
Where is This Going?

• These are initial observations

• “C” gradation needs work
  – Need to force some gap grading into it
  – Add a 5/8” sieve to the spec
  – Tighter control on the -#200 spec
• “B” Gradation
  – No flushing in projects built using it
  – Mats look tougher, more durable
  – Mats are thicker
  – Seems to be working fine

• Oil Application Rate
  – Needs to be adjusted with gradation
  – Needs to be adjusted for surface (overlays, etc.)
Improvements We Need to Make
The Bump Before the Bridge
The Sandwich Layer

Layer of granular material between bound layers

Can collect water and fail under loading due to increased pore pressures.
Centerline Joints
Unique Challenges in the Northern Region
QUESTIONS?