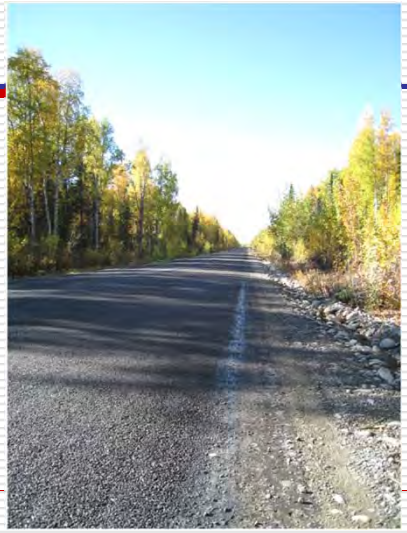
2013 Asphalt Summit



1

Field Evaluation of Crack Sealing of AC Pavements in Alaska

- The AKDOT&PF has promoted routine sealing of cracks in AC pavements for many years.
- Certain cracks (including map/grid cracks) may sometimes be ignored, i.e., left completely unsealed, for the life of the pavement with no negative effects.
- It is economically wise,
  - if possible, to delineate areas of the State where such sealing is (or is not) necessary.
  - to study repair treatments for major transverse cracks to see what does and doesn't work — and where.

2

Lessor and Major Thermal Cracking

3

Field Evaluation of Crack Sealing of AC Pavements in Alaska

- Significant maintenance funds can be saved or redirected by not sealing or by reduced sealing of certain types of thermal cracks in AC pavements.
- The study recommends that lessor thermal cracking receive no maintenance except on delaminating pavements. Maintenance treatment of major transverse thermal cracks can be greatly reduced based on inexpensive, long-term assessments following new pavement construction.
- Assessment of the need to seal thermal cracks should be continued.

4

Characterization of Alaskan HMA Mixtures with the SPT

- Problems
  - mechanistic flexible pavement design requires accurate characterization of paving materials
  - resilient modulus (M_R) can not characterize HMA over temperature and loading frequencies
  - need correlations between SPTs and HMA performance for typical Alaskan HMA mixtures
- Objectives
  - establish a catalog of Dynamic Modulus |E*| for typical Alaskan HMA
  - evaluate the correlations between SPTs results and HMA performance
  - validate the prediction models of the |E*| for local HMA

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Characterization of Alaskan HMA Mixtures with the SPT

No.	Project	Project Number	Region	Label
1	FIA Runway 1L_19R stage 3 (64-34)	3-02-0096-034-2008/61016	Northern	FIA64
2	FIA Runway 1L_19R stage 3 (52-34)	3-02-0096-034-2008	Northern	FIA
3	Glenn Hwy: Hiland to Eklutna Resurefacing	52000/ARA-0A1-6(39)	Central	GH
4	Minnesota Dr Resurfacing: Int'l Airport Rd to 13th	51135/IM-042-1(93)	Central	M
5	Unalakleet Airport Paving	3-02-0309-02/61438	Central	UNK
6	East Dowling Road Extension and Recon.	58592	Central	D
7	Parks Hwy MP 287-305 Rehab	IM-QA4-4(17)/77137	Northern	N
8	HNS Ferry Terminal to Union Street	NH-095-6(18)	Southeast	HNS
9	Chena Hot Springs Rd MP 24-56	BH_NH-STP_0650(50)/61425	Northern	CH
10	Chena Hot Springs	BH_NH-STP_0650(50)/61425	Northern	CH2
11	Rich Hwy North Pole Interchange	ACIM_0A2_4(26)	Northern	NPI
12	Alaska Hwy MP 1267-1314	BR_NH_IM_0A1-1(10)	Northern	TOK
13	Dalton Hwy. MP 175-197 Rehabilitation	62860/ IM-065-4(10)	Central	DH
14	Glenn Highway MP 34-42, parks to Palmer Resurf.	52015/ARA-0A1-5(26)	Central	GPP
15	Old Glenn Hwy.: MP 11.5-18	57039	Central	OGP
16	Fairbanks cowles Sreet Upgrade	STP-0641(2)/60434	Northern	CO
17	AIA runway 7R_25L Rehab.	58540/ Aip 3-02-0016-129-2010	Central	A
18	PSG Mitkof Highway-Scor Bay to Crastal Lake Hatchery	68819	Southeast	Pet
19	Glenn Higway Gambell to airport MP 0-1.5	58800/IM-oA1-6(35)	Central	GGB
20	Glen Why MP 92-97 Cascade to Hicks Creek	NE-0A1-5(17)/52507	Central	GCH
21	Palmer-Wasilla Highway Phase II	50900	Central	PW

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SPT (AMPT later)

During Test

SPT Tester

After Test

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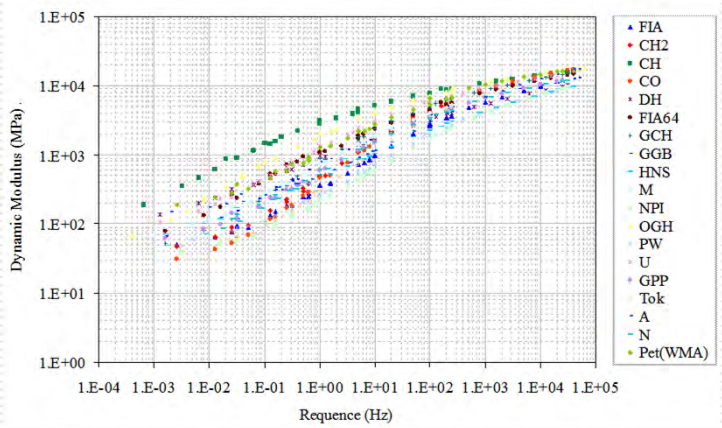
| E*| Master Curve Summary



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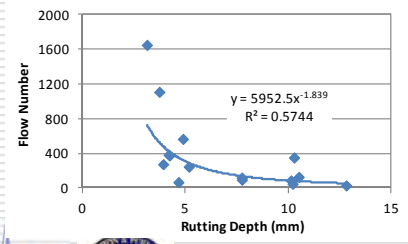
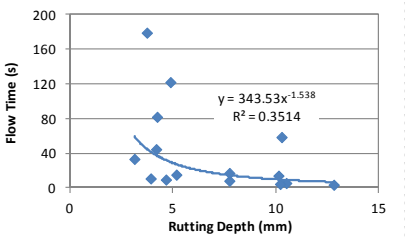
Correlation





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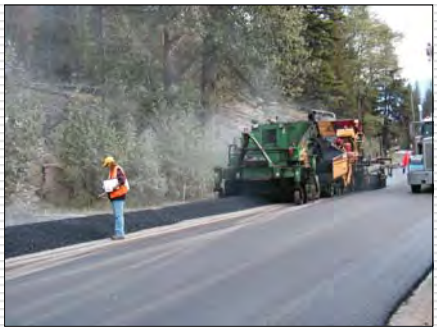
Verification of JMF for Alaskan HMA



- How the quality of HMA is assured is a critical issue
- Variability is inevitable
- to investigate how the properties of HMA mixtures vary due to mixture production
- To verify the HMA JMF, and evaluate how well contractors meet the requirements of mix designs

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Nenana

Anchorage International Airport

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Verification of JMF for Alaskan HMA

- Composition properties
  - Gradation & binder content
  - Performed by DOT&PF, contractor & UAF
- Volumetric properties
  - VTM, VMA & VFA
  - L&L, F&F, F&L & core
- Mechanical properties
  - | E*| @ 4, 21, 37, 54ºC & 0.1, 0.5, 1, 2, 5, 10, 20, 25Hz (L&L, F&L)
  - IDT creep stiffness @ -10, -20, -30 ºC (L&L, F&L, F&F, core)
  - IDT strength @10, -20, -30 ºC (L&L, F&L, F&F, core)
- Influencing factors
  - Sublot, operator, scenario, temperature
- Correlation
  - Composition and mechanical properties
  - Volumetric and mechanical properties

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Findings: Current Practice Works

- Composition properties
  - Variance & error of gradation, affected by operator & sublot
  - Error of binder content, affected by operator
- Volumetric properties
  - Error of volumetric properties, affected by scenario and Sublot
  - Variance of volumetric properties, affected by scenario
- Mechanical properties
  - | E*|: Variance (sublot & temp), Error (sublot & freq & temp)
  - IDT Creep Stiffness: Error (sublot & scenario & temp & loading time)
  - IDT Strength: Error (sublot & scenario & temp)

Impact of Fines in the Unbound Pavement Layers

- Conclusions from previous study
  - A two to three order of magnitude increase in the strength of all materials at subfreezing temperatures
  - Significant loss of stiffness occurs upon thawing of most soils tested
  - Fines content and moisture content co-affect the resilient moduli of D-1 materials before and after the freeze-thaw cycle
  - Under high initial moisture content there is not big difference of resilient moduli before and after the freeze-thaw cycle with the increase of fines content.

Project Background

- Limitations on previous study
  - An open system was used in which the material has free access to water during the freezing process
  - Represents worst scenario that a road structure could possibly experience
- Research needed: behavior of base course materials under other conditions
  - Determine the critical excess fines content (i.e. threshold fines content) allowed in the unbound base course
  - Determine the situations when AKDOT&PF can relax stabilized base policies and/or reduce costs by allowing more fines in base layers for highway construction

Study Objectives

- Evaluate financial impact of allowable fines in the unbound pavement layers,
- Help to determine the situations when AKDOT&PF can relax stabilized base policies and/or reduce costs by allowing more fines in base layers for highway construction.
- Further investigate the impact of fines content when frozen under different temperature gradients and with limited water access

Summary from Results so far

- Moisture content was the factor that most affected the resilient modulus of soils.
- Resilient modulus increases with confining stress and decreases with shear stress.
- Resilient modulus increased after a freeze-thaw cycle. Thermal gradients also influence M_R.
- Soils with 8% fines contents have the best overall performance in the closed system tests. (Be careful, fines contained no clay)

Use of the Micro-Deval Test for Assessing Alaska Aggregates

- Tests for properly characterizing aggregate durability are critical
- AKDOT&PF adopts LA abrasion and Washington degradation tests
- Investigate whether the Micro-Deval test can be a better alternative to the current abrasion and degradation tests

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Micro-Deval Tests

- 16 aggregates from three regions of Alaska
- Conducted and compared Micro-Deval, LA abrasion, sodium sulfate, and Washington degradation tests

Micro-Deval Test

- Micro-Deval test data had lower values of the COV and SD than LA abrasion test
- Micro-Deval test was generally in high agreement with any other testing method
- A best correlation was found between the Micro-Deval and Washington degradation tests
- A rapid, simple test, not “technician sensitive”

Pavement Preservation

- Extend the life of the pavement through a proactive program of minor activities
- Reconstruction Cost $10.50/sq.yd
- Preservation costs $1.80/sq.yd
- Properly timed, preservation improves performance at a lower lifecycle cost.

Example Preservation Activities

- Seal Coats
  - Chip
  - Fog
  - Slurry
- Thin overlays
- Mill and fill

Project Outcomes

- Surveyed International Activities in Cold Regions
- Made Preservation recommendations for Alaska
- Developed Database for Alaska for Pavement Preservation
- DOT staff used to work with FHWA to revise definitions

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