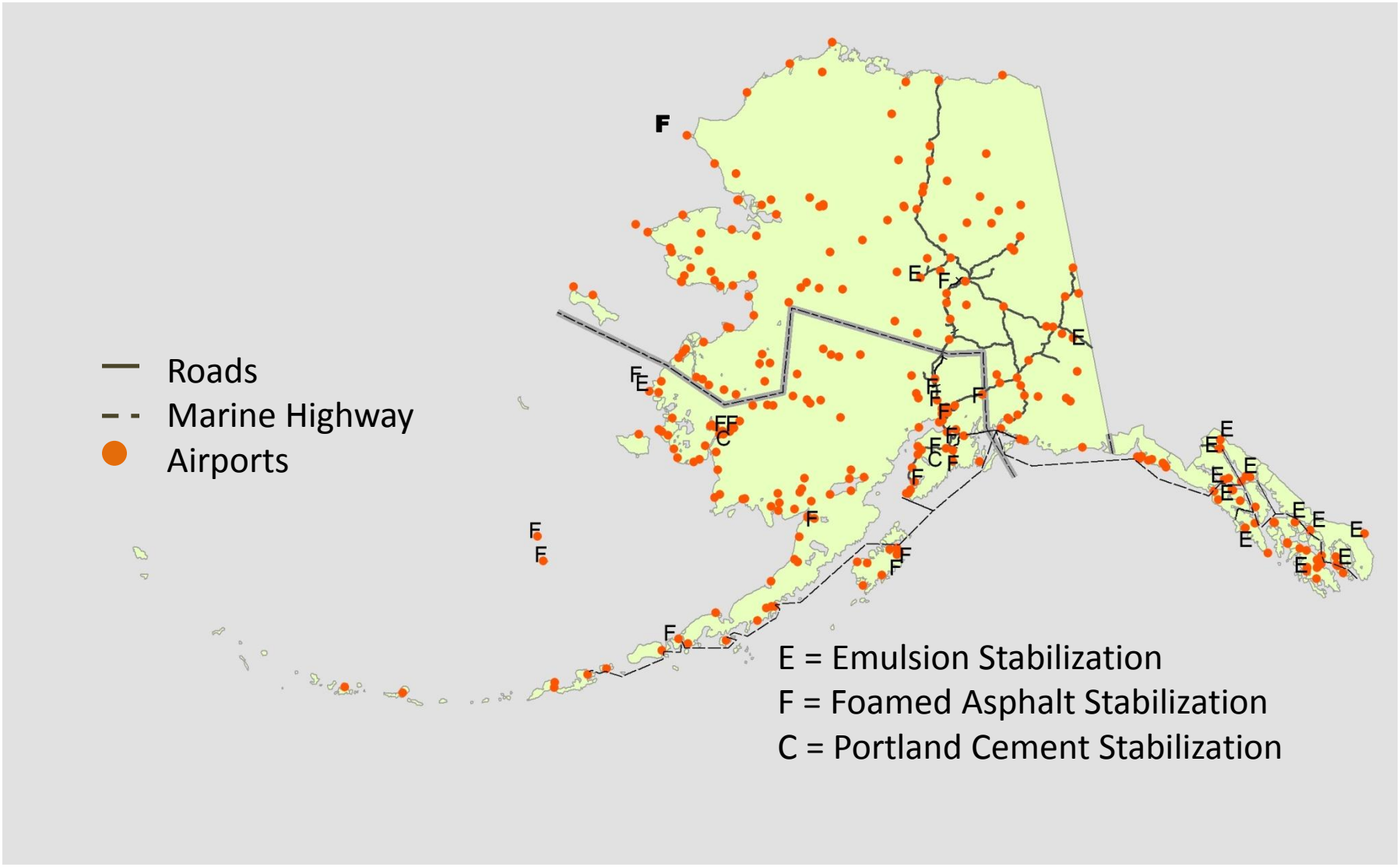
Alaska Department of Transportation & Public Facilities

Western States Regional In-Place Recycling Conference, Sept. 2012 in Ontario, CA

Newton Bingham PE, Regional Materials Engineer CR
Bruce Brunette, PE, Regional Materials Engineer SE

Transportation Demographics



Alaska's Experience in FDR

- **Reclaim** existing pavement (HMA) and crushed aggregate base (CABC)
- **Reclaim** HMA + CABC & **Stabilize** With;
  - Portland Cement
  - Foamed Asphalt
  - Emulsion
  - Chemical Stabilization with Fiber Reinforcing

Roads Selected for FDR and Base Stabilization

Selection Process Elements

- Maximize Use of Local & Existing Materials
- Life Cycle Cost and Initial Cost To Build Structural Section
- Design Vehicle
  - ESALS for Highways – Legal Loads
  - Design Aircraft e.g. Boeing 737-400

Additive Selection

- State has a stabilized base policy due to thaw weakening of unbound bases that require spring weight restrictions
- Mechanistic design considerations of higher M_R for additives that bind RAP & CABC
- Aircraft over 100,000 lbs require stabilized base due to wheel loadings

Additive Selection Factors

- Cost effectiveness allowing use of local materials in embankments;
  - silts
  - material with high moisture contents
- Aggregate Size –Pit Run NFS Embankment With +3” Aggregate is Hard to Process in Place

Portland Cement Stabilization

- RAP & CABC and Embankment Stabilization

- Absorbs Water From Existing Soil
- Rigid Stabilization, More Difficult to Recycle

Portland Cement Stabilization

Stabilized Sub-Base (Local Silt) for Bethel Airport

Bethel Silt Cement Stabilization

- Gradation
  - 100% passing the #30 sieve
  - 97% passing the #50 sieve
  - 26% passing the #200 sieve

- Maximum Dry density
  - 109 pcf @ 13.5 % moisture
- Frost Susceptibility
  - No plasticity Index but high capacity of moisture and permeability

Portland Cement Stabilization

Soil Cement Base Alternative

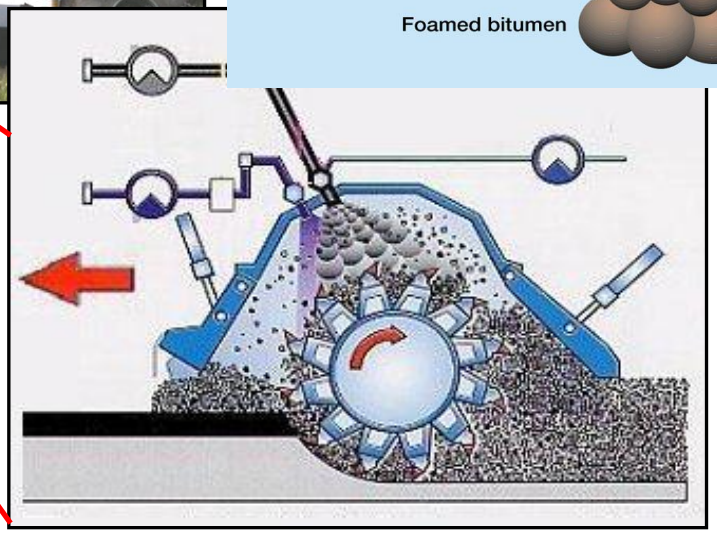
Pay Item Number	Pay Item description	Quantity	Pay Unit	Unit Bid Price	Amount Bid
G-100a	Mobilization and Demobilization	All Req'd	lump sum	$260,000.00	$260,000.00
P-152a	Unclassified Excavation	80,400	cubic yard	$6.00	$482,400.00
P-152h(1)	Borrow Embankment	66,500	cubic yard	$7.00	$465,500.00
P-152h(2)	Type A Borrow Embankment	25,800	cubic yard	$7.30	$188,340.00
P-209b	Crushed Aggregate Base Course	800	ton	$55.00	$44,000.00
P-301a	Soil Cement Base Course	52,700	square yard	$8.60	$453,220.00
P-301b	Portland Cement	1,500	ton	$425.00	$637,500.00
				Total Basic Alternative Bid =	$2,530,960.00

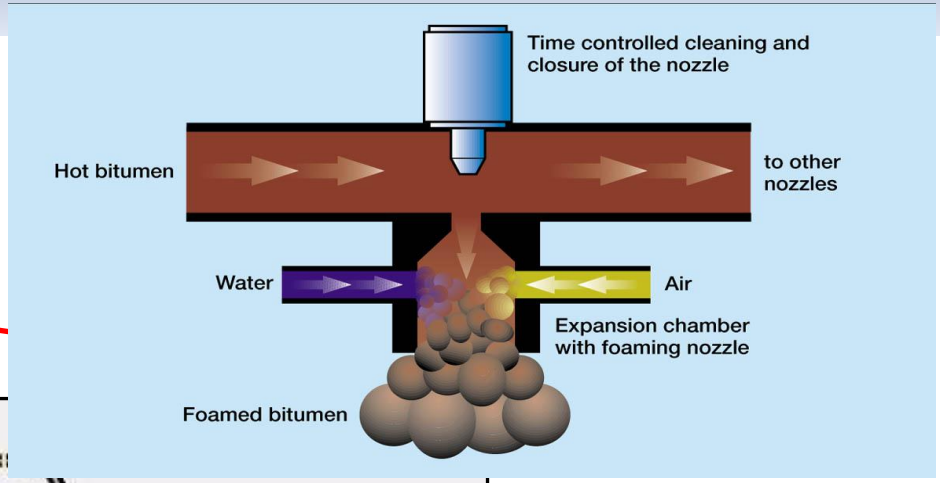
Crushed Aggregate Base Alternative

Pay Item Number	Pay Item description	Quantity	Pay Unit	Unit Bid Price	Amount Bid
G-100a	Mobilization and Demobilization	All Req'd	lump sum	$350,000.00	$350,000.00
P-152a	Unclassified Excavation	85,600	cubic yard	$6.00	$513,600.00
P-152h(1)	Borrow Embankment	64,600	cubic yard	$7.00	$452,200.00
P-152h(2)	Type A Borrow Embankment	25,900	cubic yard	$7.30	$189,070.00
P-209b	Crushed Aggregate Base Course	35,600	ton	$55.00	$1,958,000.00
				Total Basic Alternative Bid =	$3,462,870.00

Difference Between Soil-Cement Alternative and Crushed Aggregate Base Alternative = $931,910.00

Foamed Asphalt Stabilization





Foamed Asphalt Train in Homer, Ak

Foamed Asphalt Stabilization

Highways: Existing Pavement & Base, 6” Total Depth

- Homer, Seward, Soldotna, Wasilla, Fairbanks, Bethel

Airports: FDR 15” Existing CABC & Subase

- St. Paul Airport, St. George Airport

Mine Roads: Stabilize Existing Subbase

- Red Dog Zinc Mine

Red Dog Zinc Mine - Tech Cominco
Knik Construction Co. , 2002

- Haul truck: 240 ton ~ 480k lbs, 11 axles
- 33 trucks/day; 105 psi tire pressure
- Traffic volume: 27M ESALs over a 10-year design period

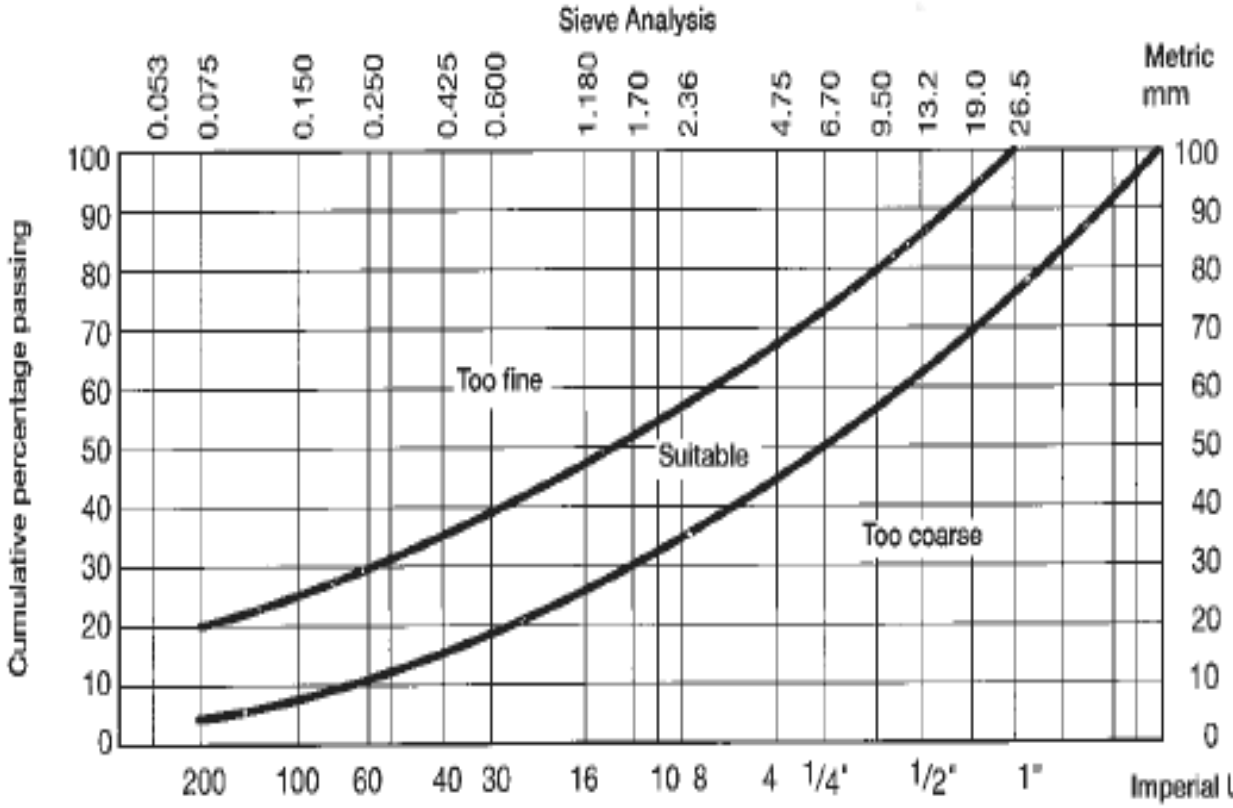
- 5-in crushed rock added
- Stabilization depth: 10”
- 3.0% ± 0.3% foamed asphalt
- AC-2.5 at 330ºF
- 2.5% water

Foam Asphalt Stabilization

- Produces Flexible Bound System in One Pass
- Recycles existing materials
- Restores smoothness,
- Eliminates Reflective Cracking In Existing HMA, Upgrade PG of Asphalt Cement in HMA
- Foamed Asphalt **Agglomerates** Fine Aggregate (Does Not Coat Large Aggregate)
- Increased M_R From 65 ksi to 110ksi

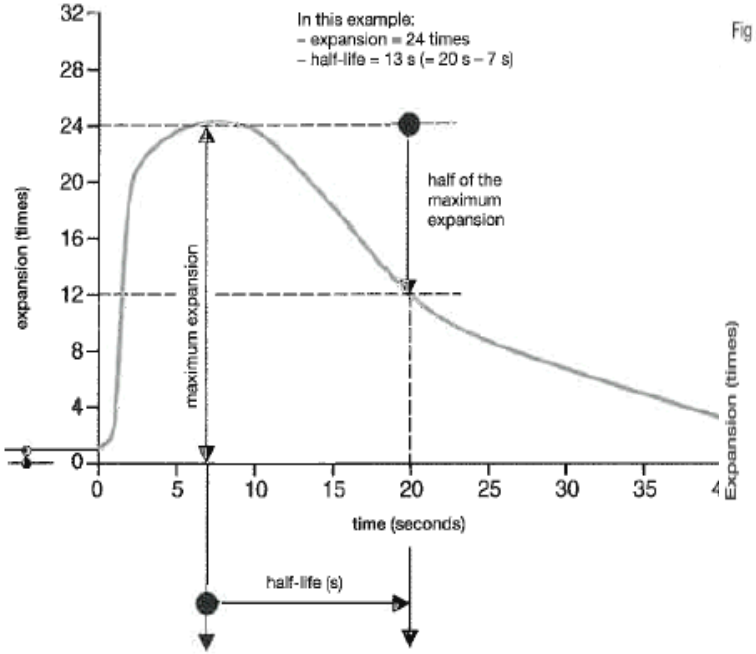
Evaluate Material

Fig 4.11 Suitability of material for foamed bitumen treatment



Foamed Asphalt Will Not Bind Pure Silts or Clay Materials Using CIR

Fig 4.9 Characteristics of foamed bitumen



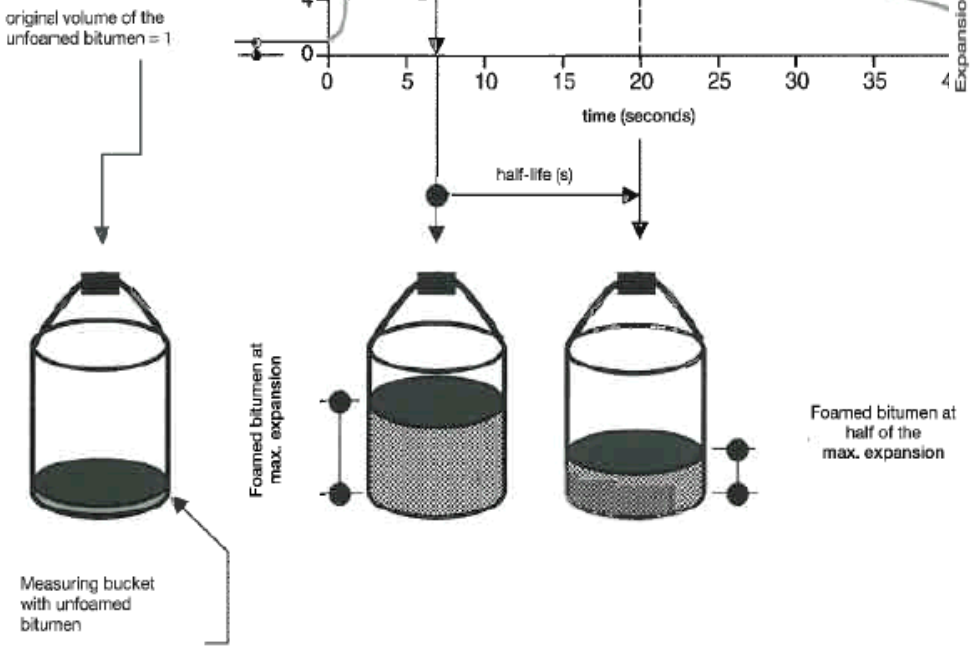
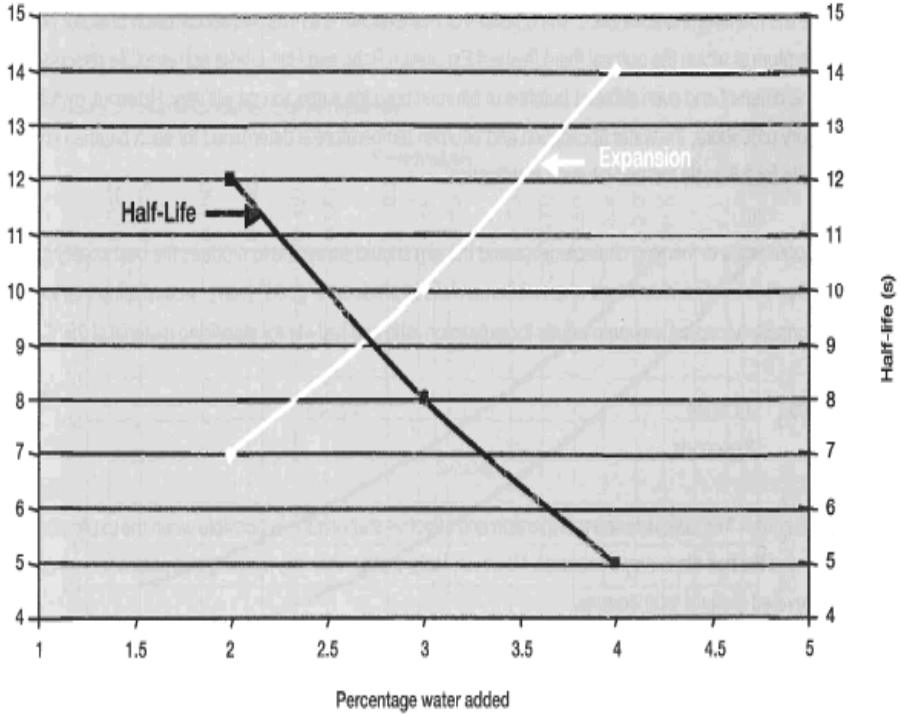


Fig 4.10 Relationship between foaming properties



Indirect Tension Test

Specifications require Field ITS > 85% Lab ITS or Increase HMA Thickness At Contractor's Expense.

Foamed Asphalt Stabilization

- Total Cost of Foaming: Approx $10/sq.yd. (6” deep)
- Cost of Equal Strength of HMA: Approx. $20/sq.yd

Emulsified Treated Base in SE Alaska

- Performance- Has been very successful
- Typical Modulus obtained: 100 to 130 KSI
- Cost has varied over 10 year period, typically

$$\frac{\$1.50 - \$2.50}{yd^2/inch}$$

Includes mixing, asphalt emulsion & cement powder

Construction Issues

- Placement and grading of mixture, time limited
- Compaction based upon control strip
- Curing
- WEATHER!!!!!!!!!!!!!!!
- Placement of final wearing surface, either HMA or BST

FDR w/Emulsified Treated Base


Wirtgen
WR2500
2.66.004
SECON
17,3 t

Deep Compaction with Pad Foot Roller






N264M


N264M

Thank You,
Questions?