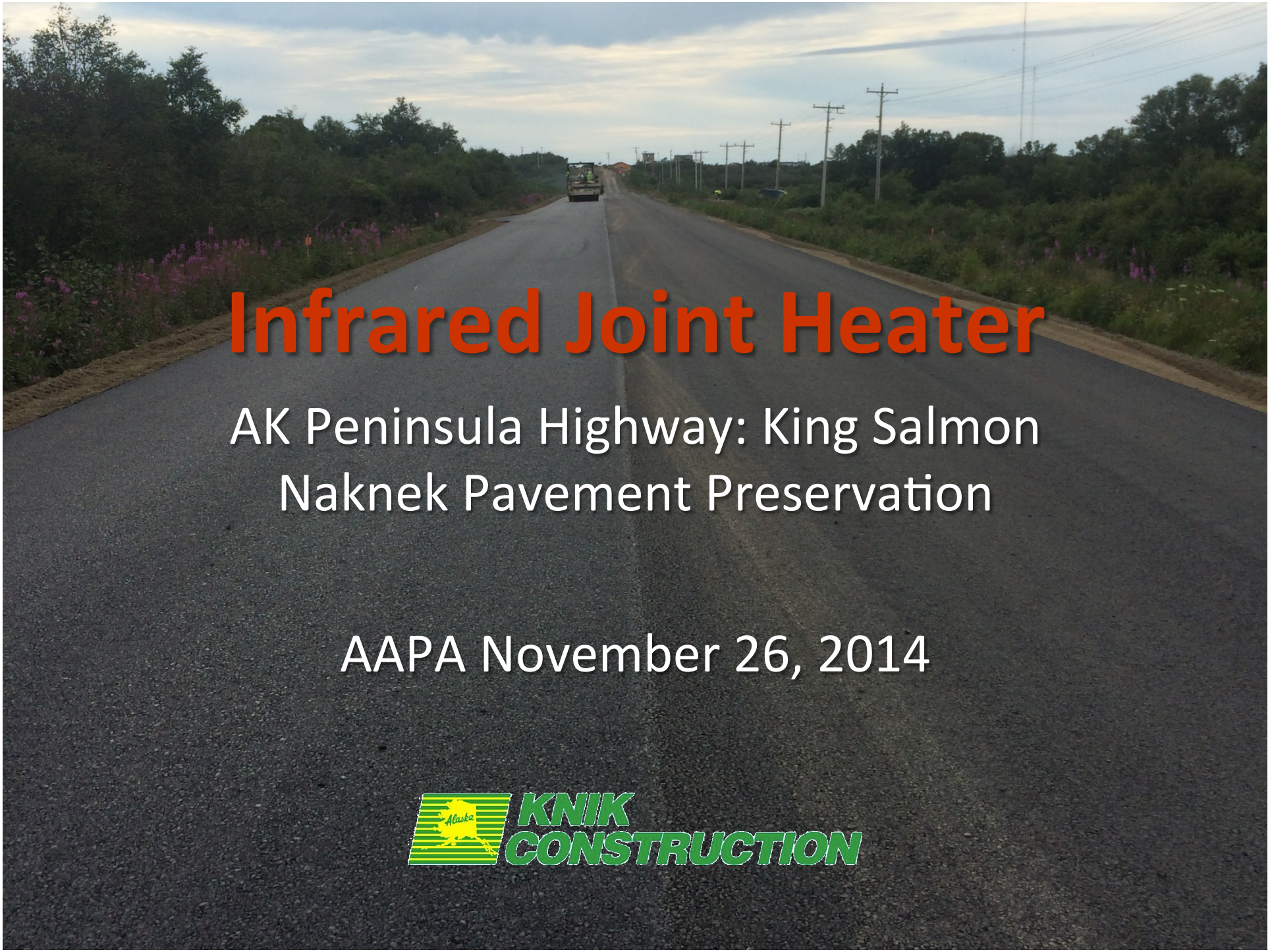


Infrared Joint Heater

AK Peninsula Highway: King Salmon
Naknek Pavement Preservation

AAPA November 26, 2014

KNIK CONSTRUCTION

Overview

- Product general information
- Project info and mix design
- Cost – initial and production
- Training
- Temperature results
- Testing and acceptance
- Joint density results
- Indirect tensile strength (ITS) results
- Benefits
- Limitations

KNIK CONSTRUCTION

General Information

- Heat Design Equipment
  - JMH 500-PA – 20’ 500,000 BTU
- 100% infrared heat
- Five ceramic cartridge heating elements
- Run pressure range from 5-40 psi
- Runs off of liquid propane tanks
- Two point attachment onto paver
- Adjustable paving width (manual)

KNIK CONSTRUCTION

Project Information

- Full depth reclamation
  - No stabilizing
- 2.5 inch lift of HMA
  - Highway IIB
- 40,000 ton HMA
- 15 miles two driving lanes
- Local aggregate mix design
- PG 52-34 modified binder

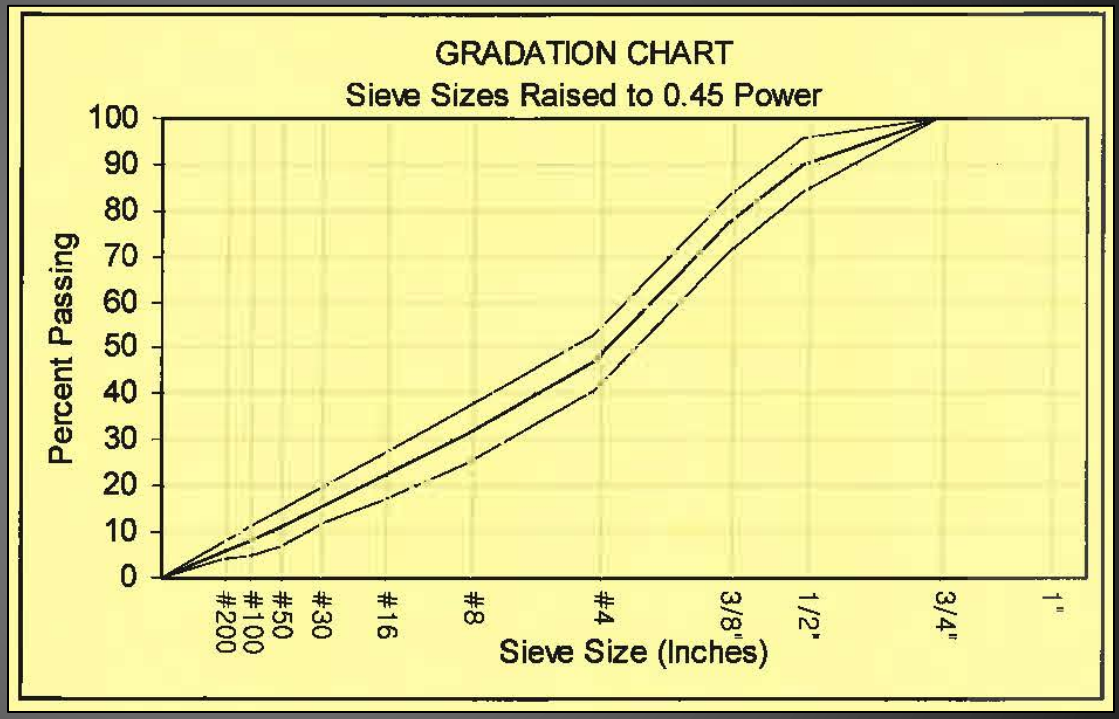
KNIK CONSTRUCTION

Mix Design

Blend Specific Gravity		Bulk	2.630
		Effective	2.680
Sieve	% Pass		Specs
1"			
3/4"	100		100
1/2"	90		84-96
3/8"	77		71-83
#4	47		41-53
#8	31		25-37
#16	22		17-27
#30	16		12-20
#50	11		7-15
#100	8		5-11
#200	6.0		4.0-8.0
FA FM		3.13	
FA Angularity			
CA Absorption		1.7	2.0 max
% Fracture			
Single Face		100	80 min
% Flat / Elongated			
@ 1:3		15	
@ 1:5		1	8 max
Plastic Index		NP	4 max

ASPHALT	
Brand & Typ	US Oil PG 52-34
Specific Gravity	1.009
Mixing Temp. Range	297-310°F
Comp. Temp. Range	273-283°F

ANTI-STRIP ADDITIVE	
Brand & Type	Evotherm
Minimum Required	0.25%



KNIK CONSTRUCTION

Mix Design

ATM 417
50 Blow

Related Tests
2014A-1140
2014A-0975
2014A-1288

ASPHALT CONTENT, %	
@ 4.0% Voids Total Mix	6.1
Approved Optimum	6.3
Specifications	5.9-6.7

PROPERTIES @ OPTIMUM		Specs
Max. SpG (AASHTO T209)	2.427	
Max. SpG Unit Wt., pcf	151.1	
Voids		
Filled	78	65-78
Total Mix	3.5	3-5
In Mineral Aggregate	16.6	12.0+
In Coarse Aggregate		
Stability, lbs	2400	1200+
Flow, 0.01 inches	11	8-16
Unit Weight, pcf	145.8	
Dust/Asphalt Ratio	1.1	0.6-1.4
Rut Index		

KNIK CONSTRUCTION

Cost

- Initial
- Shipping
- Installation
- Training and manufacturer representative
- Production (propane)
- Parts/maintenance

KNIK CONSTRUCTION

Training

- Limited on-site training
- Easy to operate
- Can be automatic or manual
- Must train on adjusting temperature and placement
- Reminding crew it needs adjusting

KNIK CONSTRUCTION

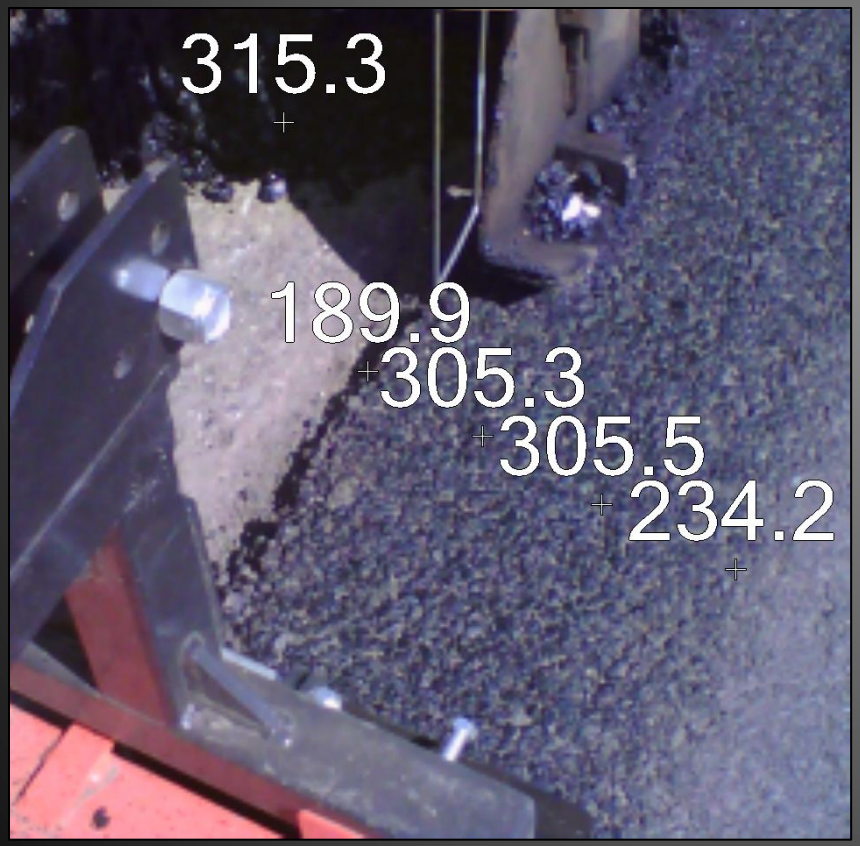
Temperature Results

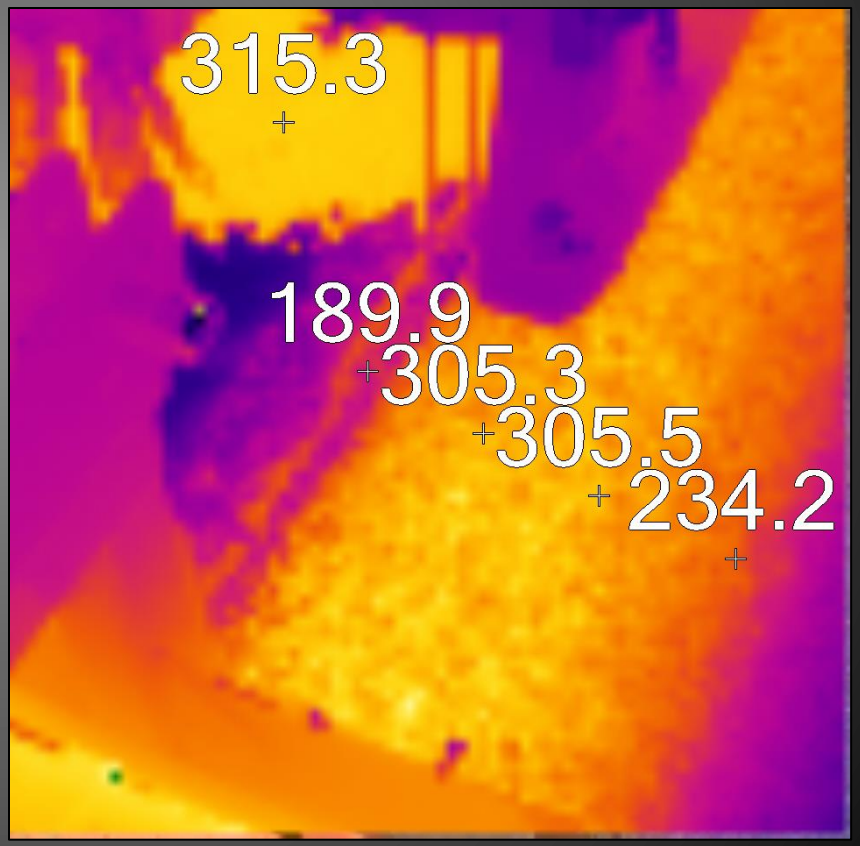
- Measured with Fluke Thermal Imager

KNIK CONSTRUCTION

Temperature Results

- Measured with Fluke Thermal Imager

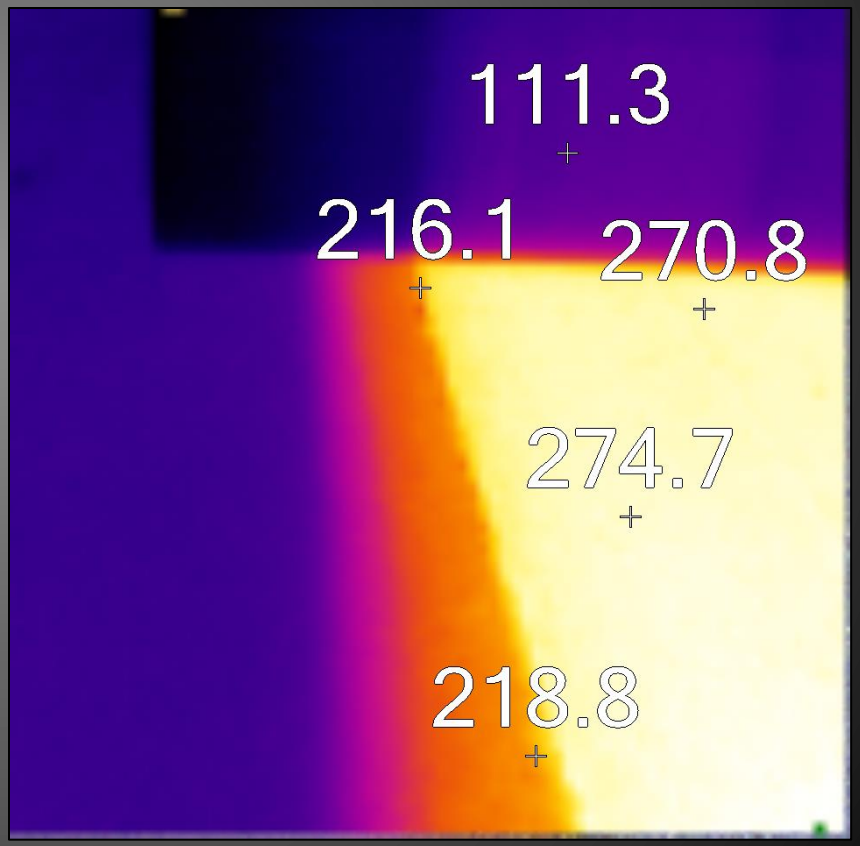




KNIK CONSTRUCTION

Temperature Results

- Measured with Fluke Thermal Imager



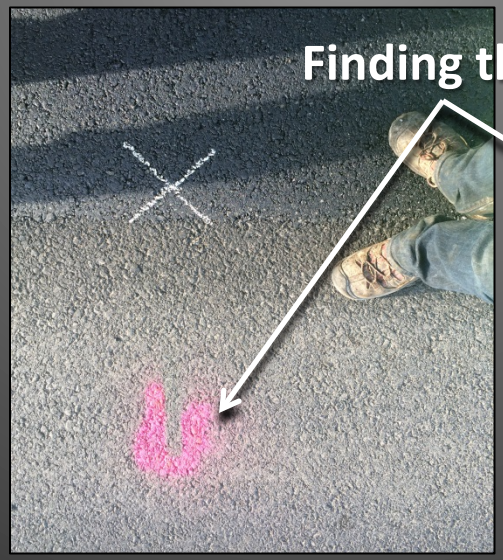
KNIK CONSTRUCTION

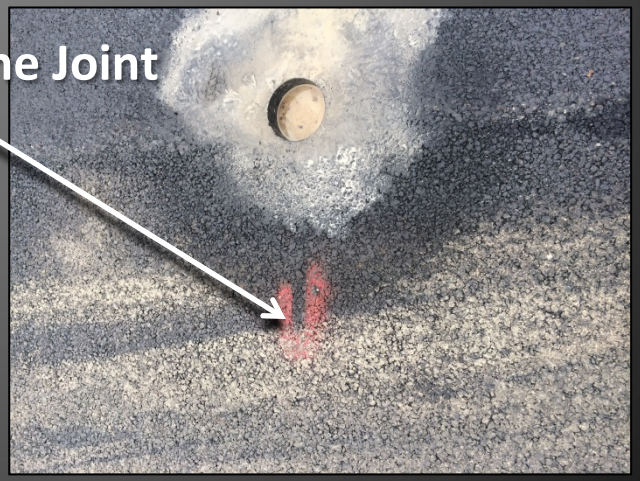
Testing and Acceptance

- AK DOT accepted the use of the joint heater
- No specification change allowed (crafco required – against manufacturer's recommendations)
- No pay for equipment or equipment use (propane)
- Joint location determined in the field

KNIK CONSTRUCTION

Where is the Joint?





KNIK CONSTRUCTION

Joint Density Results

HMA	MAT DENSITY	JOINT DENSITY	HMA	MAT DENSITY	JOINT DENSITY
3	95.6	**91.8**	29	93.7	**95.3**
4	95.8	**91.8**	30	94.0	**91.4**
5	95.8	**91.4**	31	96.1	**93.9**
13	96.5	**92.5**	38	95.5	**90.8**
14	97.5	**91.7**	39	94.1	**92.2**
15	96.0	**95.9**	40	96.5	**94.8**
16	96.4	**92.6**	42	94.7	**91.3**
17	96.2	**91.1**	45	94.0	**91.3**
18	95.1	**92.5**	47	94.2	**93.1**
19	96.5	**92.9**	55	96.3	**94.2**
20	96.8	**93.6**	56	95.8	**94.0**
23	95.2	**93.4**	59	94.3	**92.3**
24	94.1	**94.3**	63	96.4	**93.4**
25	95.6	**91.7**	64	94.4	**93.5**
28	94.6	**94.7**	65	95.2	**90.8**

KNIK CONSTRUCTION

Joint Specification

- Crafco required
- Joint density minimum of 91% MSG
- Areas that fail 91% MSG surface sealed with GSB-88
- Bonus: project average greater than 92% MSG = $1.50 per linear foot
- Penalty: project average less than 91% MSG = -$3.00 per linear foot

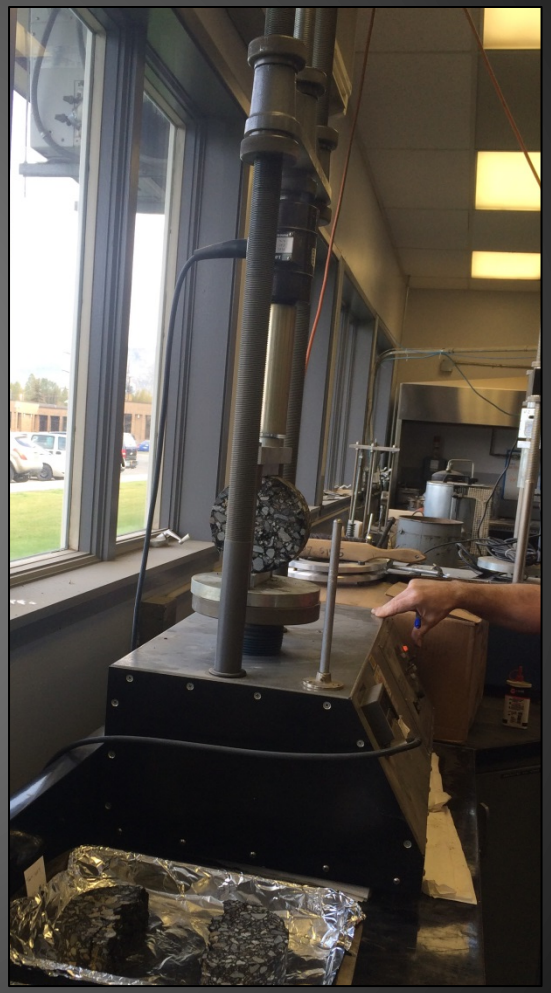
BONUS
Project Average
= 92.9%

KNIK CONSTRUCTION

Indirect Tensile Strength Results

- Test overview
- Goal

	Sample ID	Bulk SpG	PSI	% Comp
Mat	KS A	2.344	**41.8**	97%
	KS B	2.357	**39.2**	97%
Joint (No Crafco)	KS C	2.306	**39.4**	95%
	KS D	2.319	**37.3**	96%
	KS E	2.241	**31.3**	92%
Joint (Crafco)	KS F	2.292	**34.3**	94%
	KS G	2.280	**32.0**	94%
	KS H	2.266	**35.5**	93%



KNIK CONSTRUCTION

Benefits

- No prep work (milling/cutting/ sweeping)
- No waiting for edge to cool
- Excellent joint densities
- Good visual joint
- Interlocking aggregate instead of “gluing” cut surface
- Repairs rolled edges or edge imperfections
- Can be used as a repair tool for failing joint densities

KNIK CONSTRUCTION

Limitations

- Does not work well on wet pavement
- Does not transport well (when off paver)
- Factory lifting device requires mechanics crane
- One more piece of equipment to maintain and haul
- Does not work for very narrow locations
- Must refill propane tanks often
- Not accepted on aviation projects
- Topside operator MUST be consistent

KNIK CONSTRUCTION


SB-2500C
ROADTEC
Ingersoll-Rand
KNIK
Alaska
CONSTRUCTION