Evaluation of Precut Transverse Cracks for an AC Pavement in Interior Alaska

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Outline

- Problem Statement
- Design of field sections
- Field survey results and analysis
- Preliminary conclusions

Problem Statement

- Thermal cracks are perhaps the most noticeable form of crack-related damage in asphalt pavement in cold climates
- Previous experience in Alaska and other northern states demonstrated that using precut technique to reduce thermal cracks is promising
- A systematic approach has not been developed to implement application of precutting in AC pavements
- Development of a precutting technology needs to consider:
  - new pavements placed on new embankments
  - new pavements placed on existing embankments—the latter having already developed thermal cracking in the sub-pavement aggregate.

Field Sections

- Moose creek project
  - Data was collected in June, 2016
  - Previous data was collected in 2013 and 2014
- Healy project
  - Data was collected in June, 2016
  - Previous data was collected in 2015
- Phillips Field Road
  - 32 years old
  - Single evaluation was conducted in June 2016
  - Scheduled to be milled in summer 2016

Moose Creek Project Design

Section No.	Section Type	Precut Spacing (ft)	Precut Depth (in)	Precut Depth Ratio	Pavement Structure
1	Control	-	-	-	Pavement Structure I
2	Precut	25	0.5	1/4	
3		25	1	1/2	
4		25	1.5	3/4	
5		40	0.5	1/4	
6		40	1	1/2	
7		40	1.5	3/4	
8	Cut on existing cracks	-	0.5	1/4	
9		-	1	1/2	
10		-	1.5	3/4	

Note: Precut depth ratio is the ratio of precut depth over the thickness of AC layer

Healy Project Design

Section No.	Section Type	Precut Spacing (ft)	Precut Depth (in)	Precut Depth Ratio	Pavement Structure
1	Control	-	-	-	Pavement Structure II
2	Precut	25	2	3/4	
3		35	2	3/4	
4	Control	-	-	-	Pavement Structure III
5	Precut	25	2	3/4	
6		35	2	3/4	
7	Control	-	-	-	Pavement Structure IV
8	Precut	25	0.625	1/4	
9		25	1.25	1/2	
10		25	2	3/4	
11		35	0.625	1/4	
12		35	1.25	1/2	
13		35	2	3/4	
14	Control	-	-	-	Pavement Structure V
15	Precut	25	2	3/4	
16		35	2	3/4	

Description of Pavement Structure

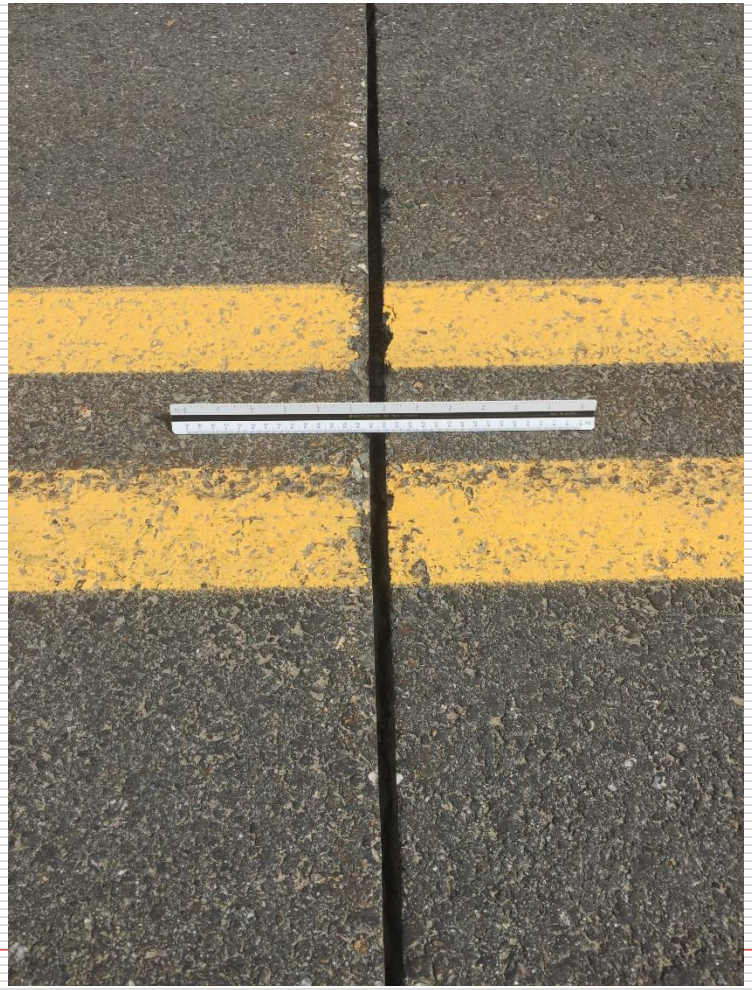
- Pavements structure V is the strongest, most sound structure for the road followed by II, IV, III and I

Pavement Structure	I	II	III	IV	V
Layer 1	2.0" Asphalt Concrete; Type II, Class B. PG 52-28	2.5" Asphalt Concrete; Type II, Class B. PG 52-28	2.5" Asphalt Concrete; Type II, Class B. PG 52-28	2.5" Asphalt Concrete; Type II, Class B. PG 52-28	2.5" Asphalt Concrete; Type II, Class B. PG 52-28
Layer 2	Crushed Asphalt Base Course	3" Asphalt Treated Base	3" Asphalt Treated Base	3" Asphalt Treated Base	3" Asphalt Treated Base
Layer 3		34" Selected Material, Type A	4" Minimum Crushed Asphalt Base Course	16" Selected Material, Type A	26" Selected Material, Type A
Layer 4		Geotextile Reinforcement, Type I		22" Selected Material, Type B	Geotextile Reinforcement, Type I
Layer 5		8" Selected Material, Type A			8" Selected Material, Type A
Layer 6		Geotextile Reinforcement, Type I			Geotextile Reinforcement, Type I
Layer 7					8" Selected Material, Type A
Layer 8					Geotextile Reinforcement, Type I

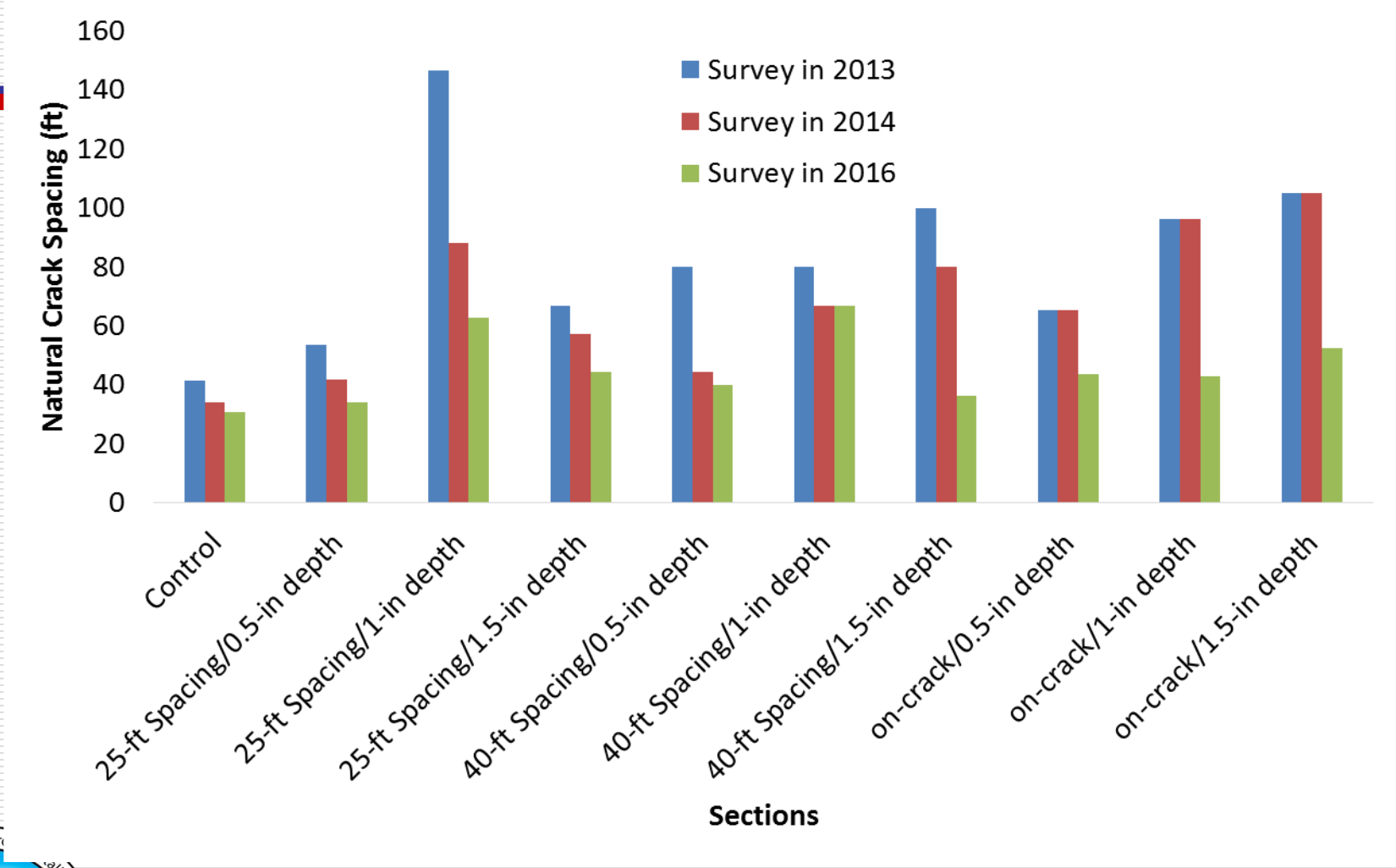
Field Evaluation

- Document the crack amount (the same with previous monitoring)
- Label the crack severity
- Measure the crack width
- Document if precuts are active
- Document each crack on the survey sheet and will keep it for the record
- Number the point of interest (cracks, special surrounding environment, precuts, other pavement deterioration, etc.) and take photos

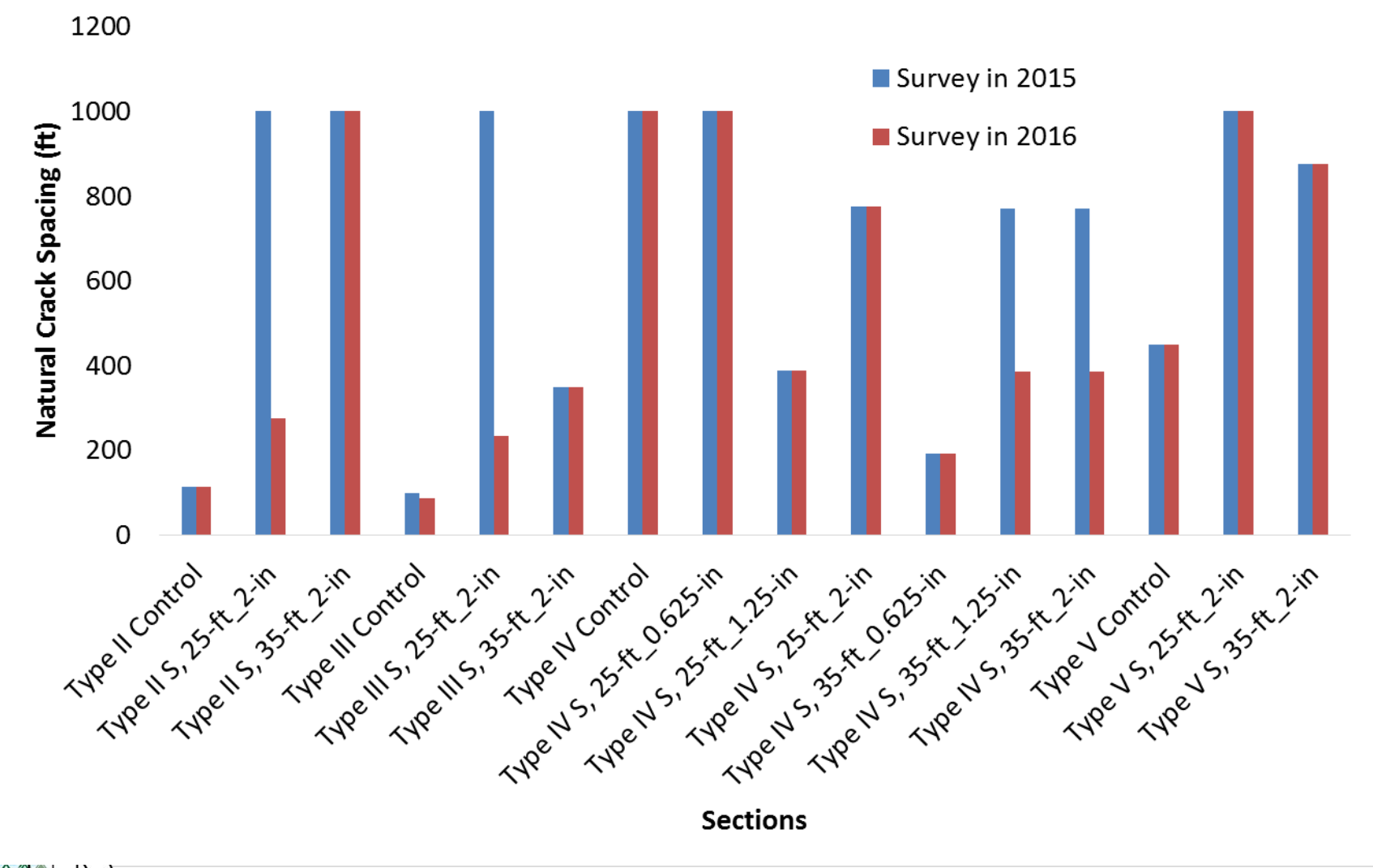
Field Evaluation



Moose Creek Project Survey Results

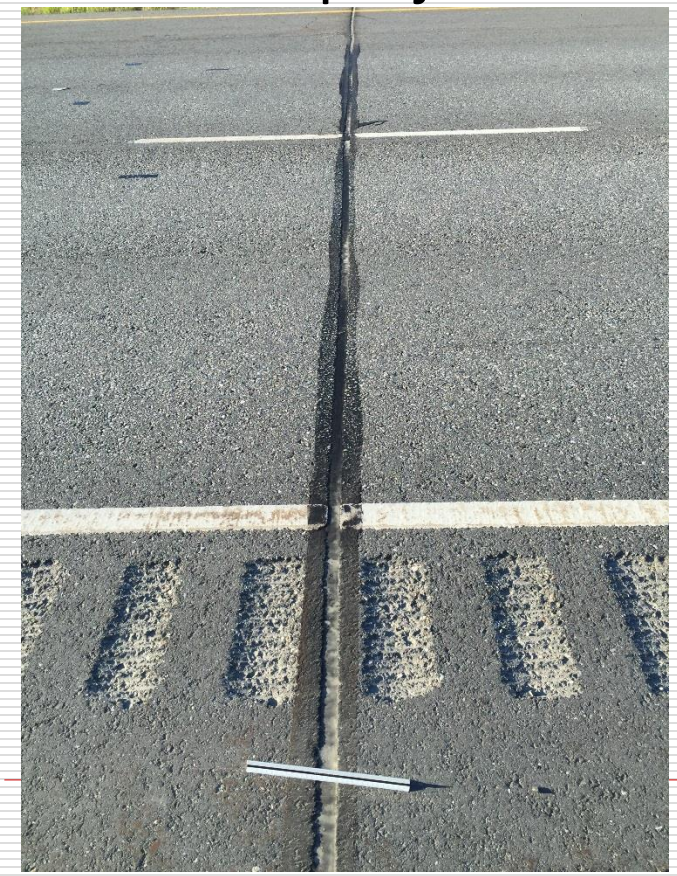


Healy Project Survey Results



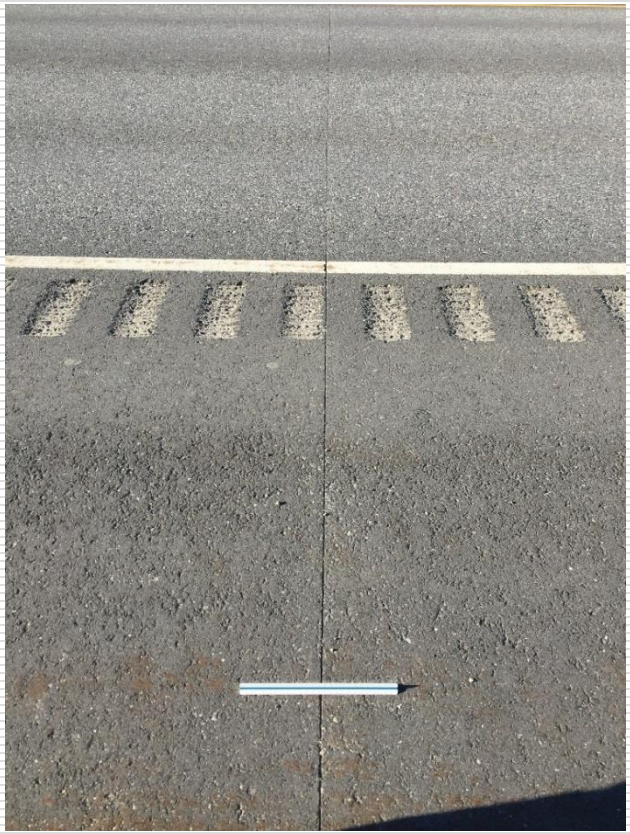
Crack Filling Observed on One Section

- "Cut on existing cracks" section with 1.5 in cut depth from Moose Creek project was maintained with crack filling



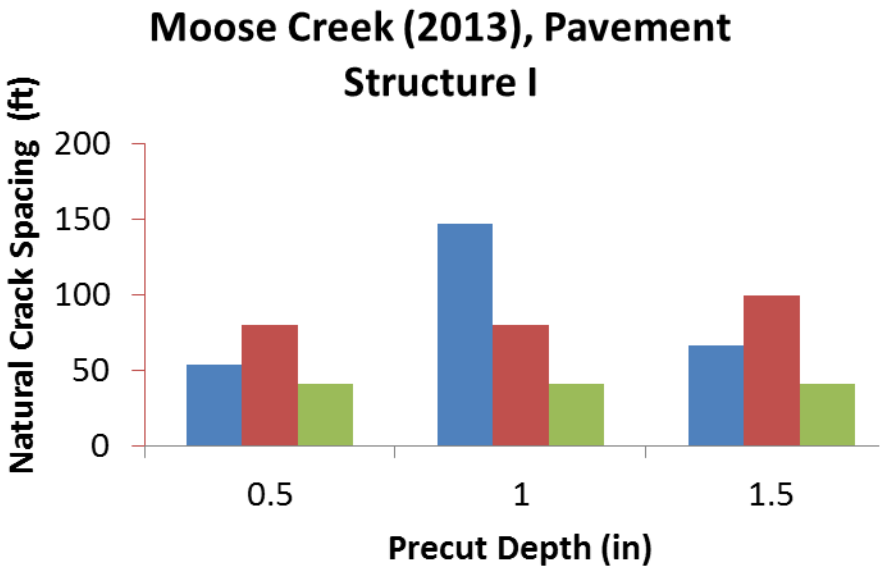
More Observations

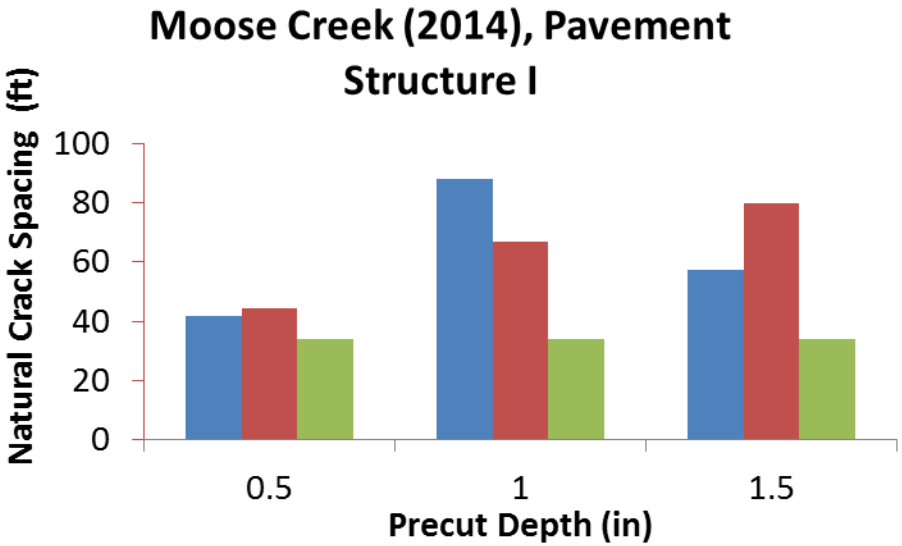
Active Precut

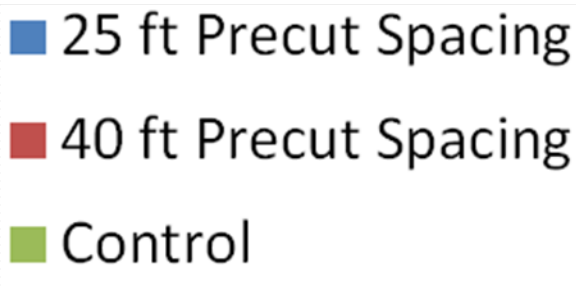


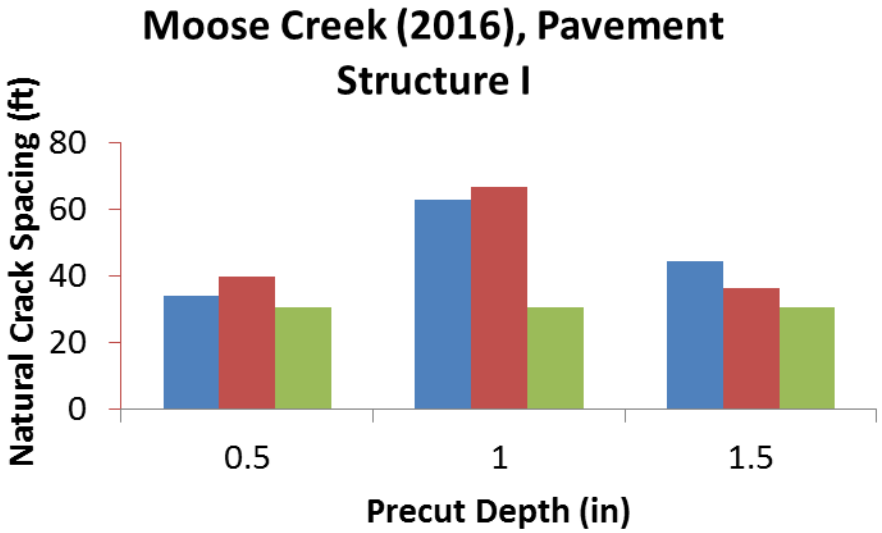
Non-active Precut

Precut Sections vs. Control Sections

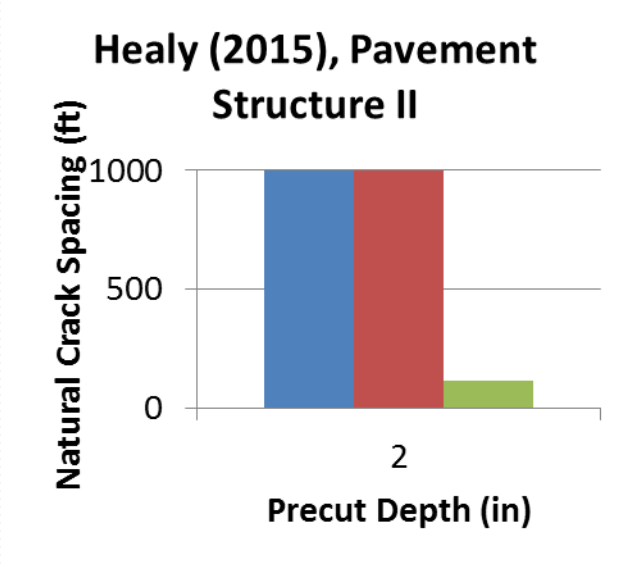


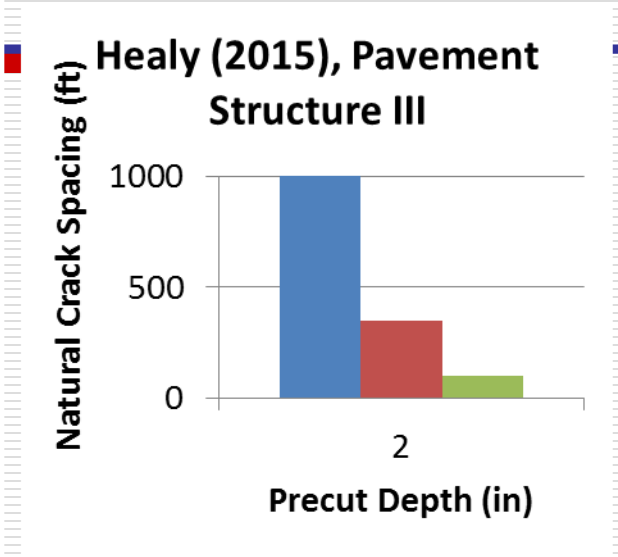


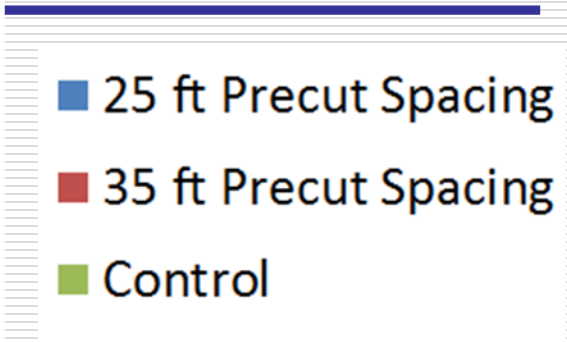


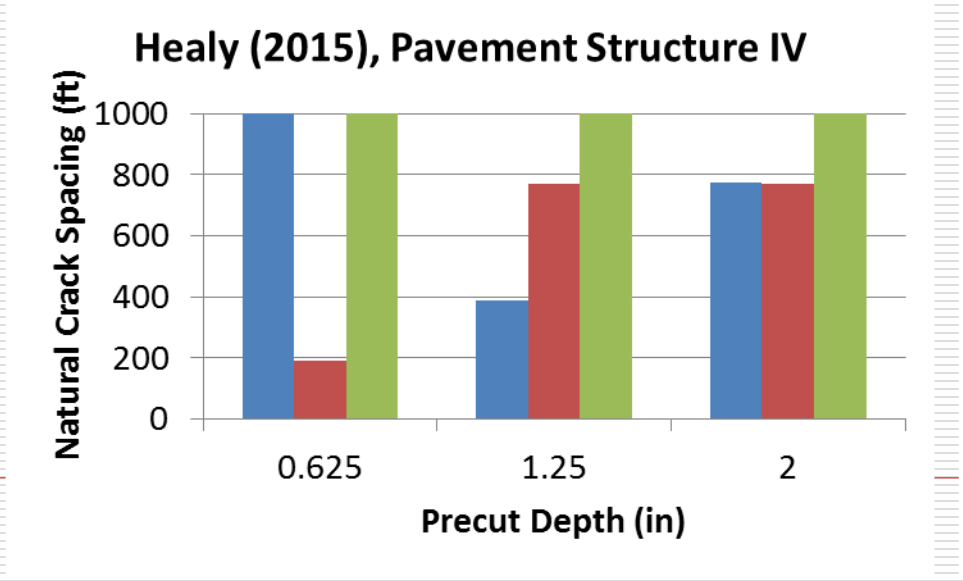


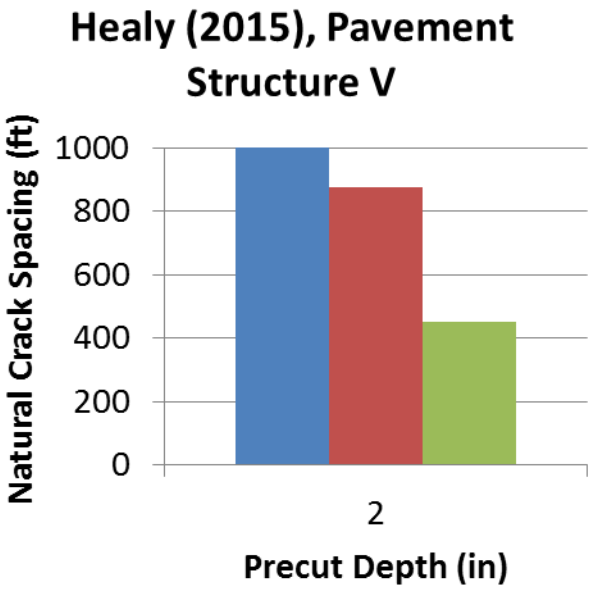
Precut Sections vs. Control Sections





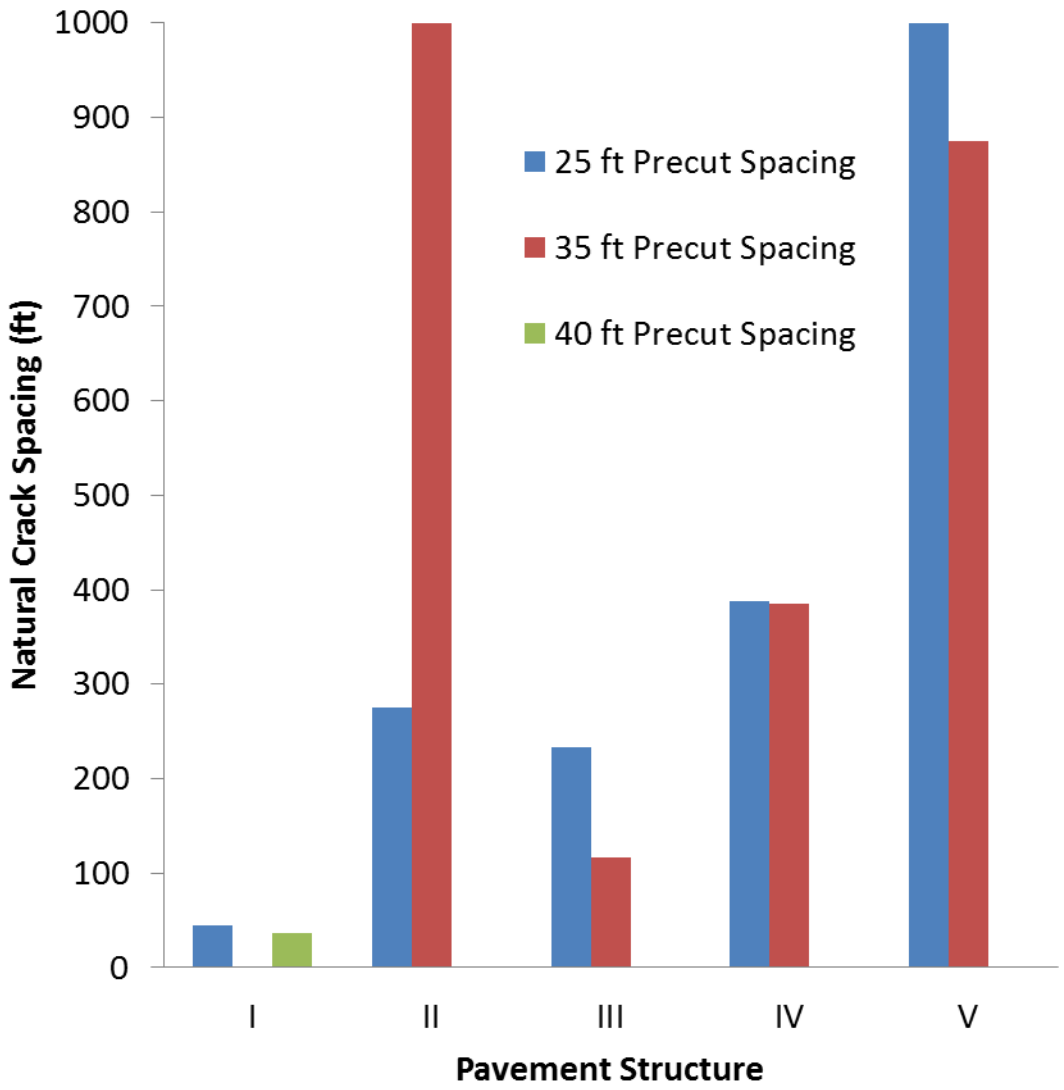






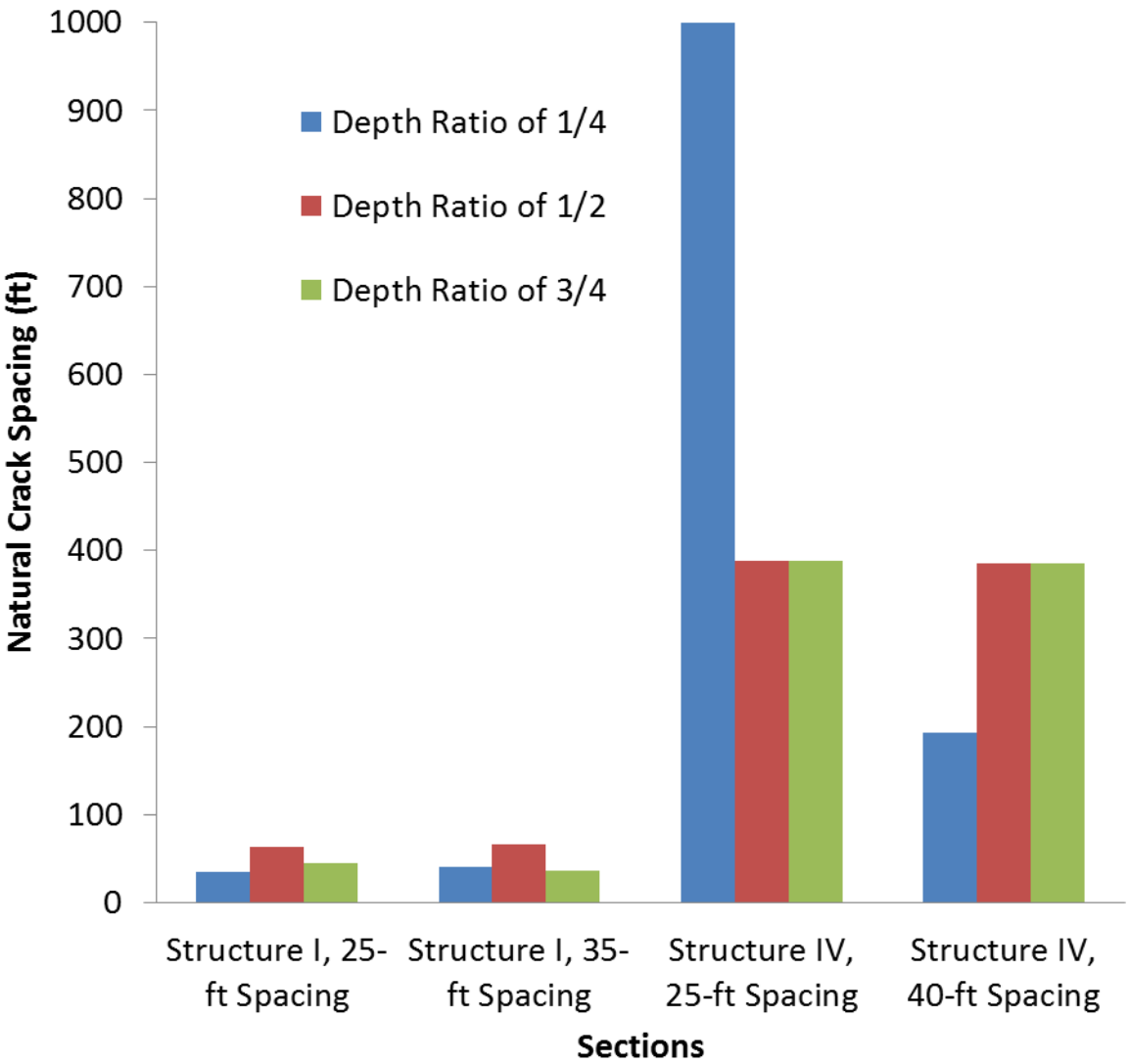
Effect of Precut Spacing

- Using the 2016 survey results and holding the precut depth ratio at 3/4



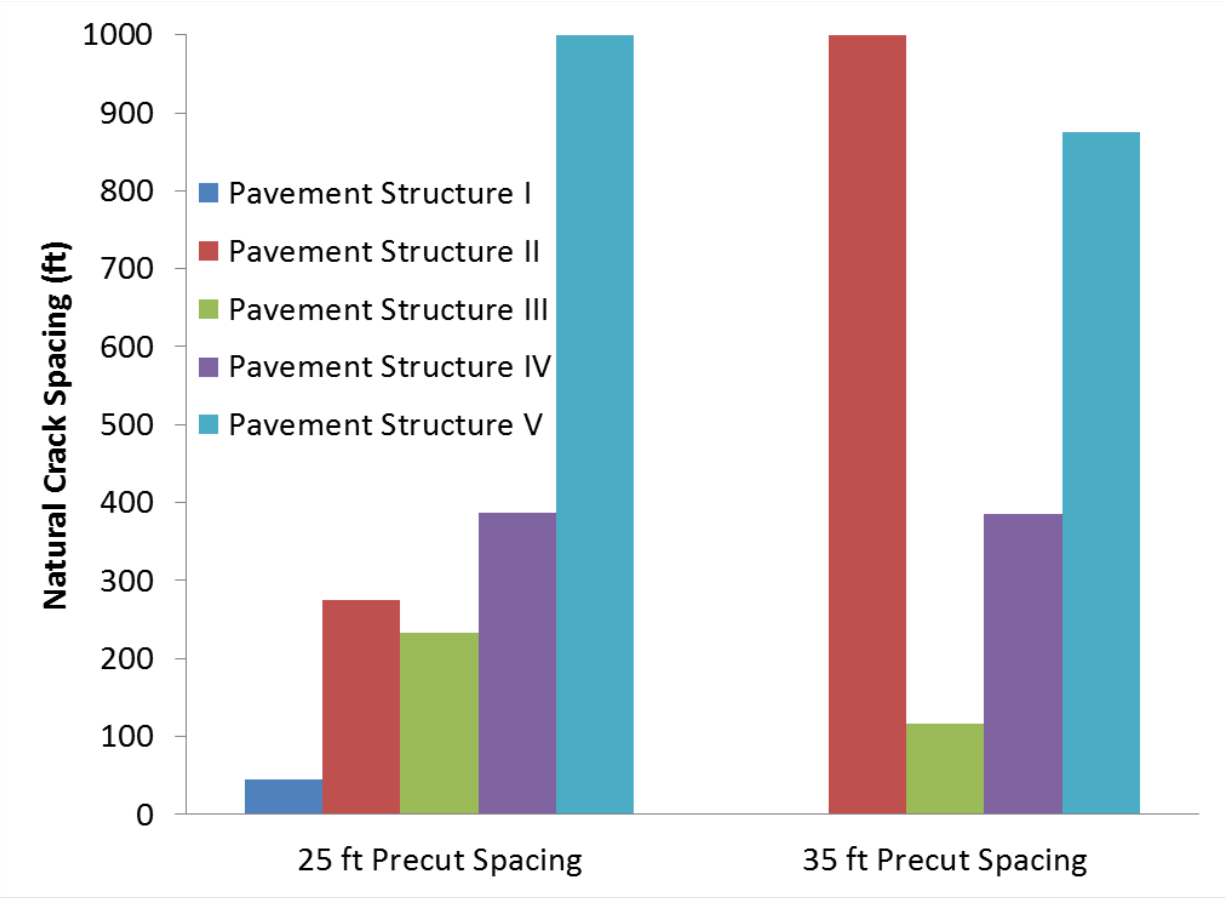
Effect of Precut Depth

- Using the 2016 survey results from structure I and IV sections



Effect of Pavement Structure

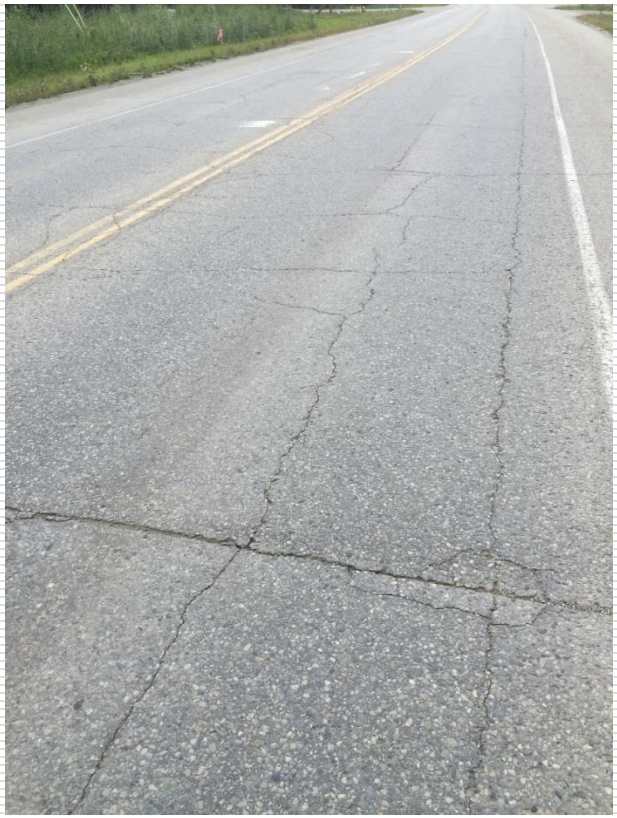
- Using the 2016 survey results and holding the precut depth ratio at 3/4



Phillips Field Road Survey Results

- Many longitudinal cracks were observed
- Many block cracks
- Only 7 transverse cracks were observed, including 2 low severity cracks
- 13 out of 23 precuts were active
- Many potholes were observed when longitudinal cracks meet precuts
- 32 years old, but its general driving condition was found to be pretty good. All the cracks seemed not to deteriorate the pavement condition in a significant level

Philip Field Road Observations

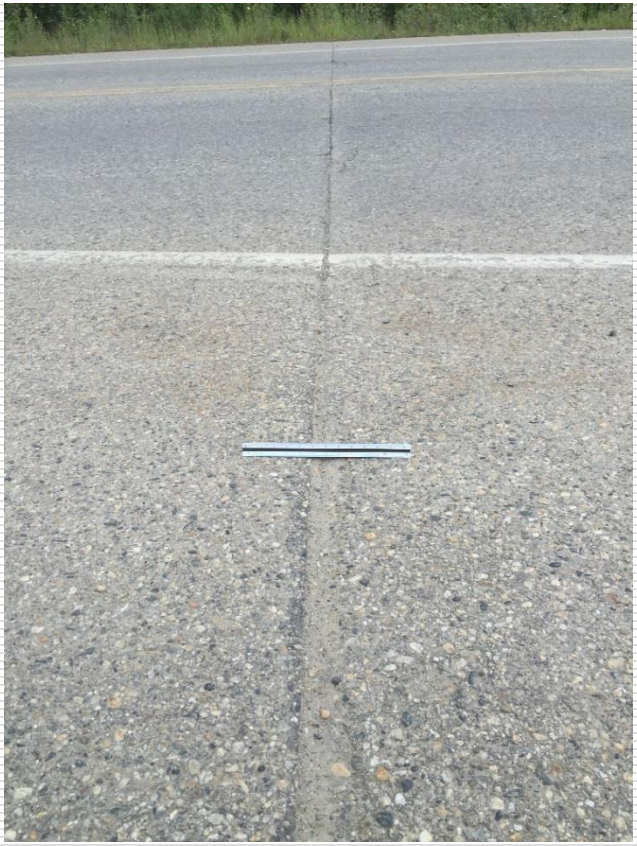


Block Cracks

Longitudinal Cracks

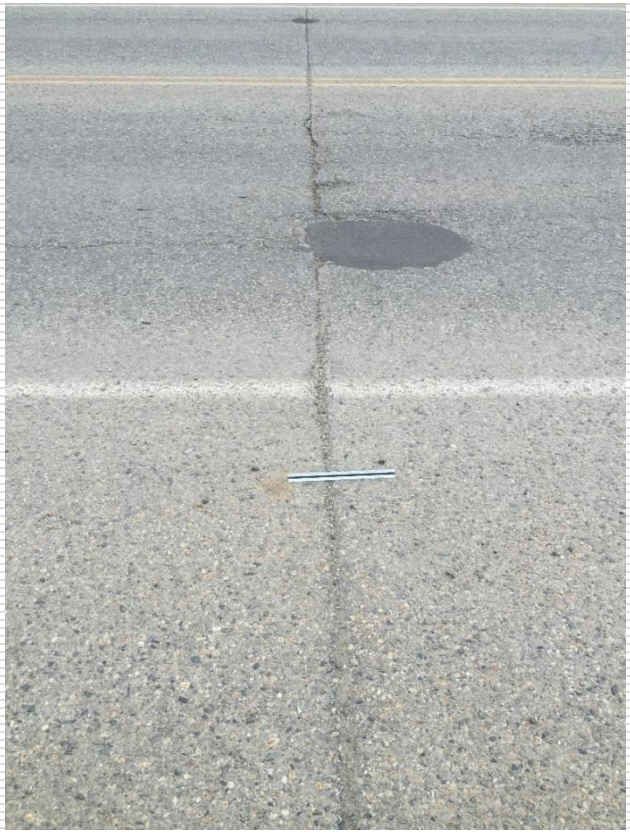
Philip Field Road Observations

Non-active precut



Active precut

Philip Field Road Observations



Potholes

Summary

- Field monitoring status
  - moose creek project, 3 times in 4 years (2013, 2014, 2016)
  - Healy project, 2 times in 2 years (2015, 2016)
- Philip field road, single evaluation 32 years after its construction
- The survey recordings are well documented in text and pictures

Preliminary Conclusions

- Precutting treatment appears promising to control natural thermal cracks.
- Shorter precut spacing and strong pavement structure look promising in crack control according to preliminary results. There may have an optimum precut depth that produces the best crack reduction effect.
- These findings were based on preliminary results from relatively short time periods.
- Continuing evaluation and monitoring of test sections and cost effectiveness analysis are needed to recommend an effective design methodology and construction practice for Alaska and cold areas of other northern states.

Thank you