Evaluating the Necessity for Sealing Thermal Cracks in Alaska’s AC Pavements

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Outline

- Introduction
- Research Approach
  - Literature Review
  - Site Selection
  - Data
  - Analysis
- Summary and Recommendations

Intelligent Highways Signage
(Alaska Research)
Introduction - Background

- Crack Sealing is the most common preservation technique, according to survey (Zubeck 2012).
- Much M&O funding is spent on sealing cracks
- Effective sealing of cracks is difficult in Alaska’s environment.
Two Kinds of Typical Thermal Cracks
Introduction - Objectives

- Define areas where sealing is best done or avoided.
- Collect data with photo’s, qualitative data, and quantitative data.
- Provide recommendations on which thermal cracks to seal or not seal and for what situations.
Research Approach

- Literature review
- Selection of Sites
- Data
- Analysis

Glenn Hwy, towards Glennallen
Literature Review

- Many - fracture mechanics
- Few – frozen ground interaction
- Many – discuss procedures and longevity
- Few – cost effectiveness related to ride quality

Richardson Hwy
not sealed vs
sealed
Selection of Sites

- Hot mix asphalt concrete
- Minimum of 20 years
- Summer 2012
- Interconnected network of roads
- Non-urban
- 91 sites, 0.1 mile long
- Alaska, Elliot, Glenn, Parks, Richardson, Steese, Sterling, Tok Cutoff
General Area of Study

Source of Alaska Map: Larry Pearson, Alaska Scenes
Site Selection - continued
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Data

Three Collection Methods:

- PASER – qualitative
- LTPP – quantitative
- Special Thermal Crack Evaluation (STCE) – photos and expert opinion
Data - PASER

- Rating from 1 to 10
- 10 – newly constructed road
- 1 – failed road, total reconstruction
- University of Wisconsin, Madison (2002)
Data - LTPP

- Count the number of thermal cracks at low, medium, and high severity.
- Measure the lengths of thermal cracks at low, medium, and high severity.
- Measure the length of effectively sealed thermal cracks at low, medium, and high severity.
Data – LTPP, continued  (0.1 mile)

Quantity:
   med – 12

Length:
   med – 432ft
   sealed – 215ft

(Section 6a – Richardson Hwy)
Data - STCE

- Major thermal cracks and lessor thermal cracks.

- Does traffic affect thermal cracking – wheel path vs. non-wheel path?

- Does thermal cracking cause other pavement distresses such as fatigue cracking and potholes?

- Is the overall condition of the pavement maintained or improved by sealing thermal cracks?
Data – STCE, continued

Major

Lessor
How was Data From the 3 Methods of Evaluation Integrated for Analyses?

- They weren’t!

- As it turned out, only the transverse cracking data from the LTPP and PASER were directly “integrate-able” into the study of thermal cracking.

- However, LTPP & PASER methods did characterize the general health of the 91 sections—which was quite variable.
NEVERTHELESS
LTPP & PASER Data was Valuable!

- It became obvious during the study:
  1. There was large variation in pavement condition indicators for old pavements according to LTPP & PASER and casual observation.
  2. There was little variation in the characteristics of thermal cracks in old pavements according to both STCE and casual observation.

Therefore, regardless of the general condition of an old pavement, the condition of the thermal cracking was usually similar.
Analysis – PASER and LTPP

Total PASER Transverse Crack Data

Level of Severity

No of Sections

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Total (91 Sections), LTPP Transverse Crack Data

Severity, S - eff sealed, A - avg # of ft/section

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Analysis - STCE

Examples of lessor thermal cracks with no difference between wheel path vs non-wheel path
Analysis – STCE, continued

Examples of major thermal cracks causing no other pavement distresses.
Interpretation of Field Data
Figure V.6  Condition of major transverse cracks (wp Vs non-wp*)
(* wheel path versus non-wheel path)
Figure V.7  Condition of lessor thermal cracks (wp Vs non-wp)
Figure V.8 Maximum observed width of major transverse crack zone
Figure V.9  Maximum observed width of lessor thermal crack zone
Figure V.10  General pavement deterioration due to major transverse cracking
Figure V.11 General pavement deterioration due to lessor thermal cracking
Figure V.12  Presence of crack sealant
Figure V.13  Present condition of sealant
Implementation

1. Educate (need to be able to recognize thermal crack types)
2. Do not seal lessor thermal cracks
Implementation, cont.

3. Major thermal cracks on old pavements – do not seal if degradation is not apparent.
4. Major thermal cracks on newer pavements – seal every other crack.

Anchorage; 1yr, thin HMA overlay thermal cracks spaced 40ft
Implementation, cont.

5. Major thermal cracks with severe bumps – apply band patch/seals, aids with leveling.
6. Areas showing signs of delamination – apply sealant if the section will not be reconstructed within the current construction season.
Implementation, cont.

7. New sealing methods – use a control section.

8. Areas of poor drainage - Do not seal if section is routinely submerged from poor drainage or blocked during the thawing season. This allows relief for pore water pressure.
Precutting Major Transverse Cracks
A good Idea or Not?

Figure VI.1 25+ year old major transverse thermal cracks, precut (left) natural (right)
Based on observations on a single (aforementioned) section of Alaska road that was precut, it appears that vehicle ride smoothness is significantly improved. Also, unless the driver is paying close attention to details of the pavement surface, there is something of an impression (coupled with the benefit of a smoother ride) that transverse cracks hardly exist at all. The synergistic combination of a positive visual perception plus actual smoother ride suggests that there may be real economic value associated with precutting.
Thank You

Questions?

Impressions?

Good?        Bad?