How to Build Successful Crack Sealing & Filling Treatments on High Traffic Volume Roadways

SHRP R26 Workshop for the preservation of High Traffic Volume Roadways
The Most Important Thing with High Traffic Situations is the Crack Treatment Should Preform Properly Extending the Pavement Life for as Long as Possible.
Crack Treatment Design Process

- Pavement Evaluation
- Temperature Ranges
- Process Selection
- Installation Geometry
- Sealant Selection
- Installation
Step 1 - Pavement Evaluation

• Cracks occur as the AC mix ages and can no longer resist stress and strain from temperature changes and traffic loadings. They fall into two categories:

• High Movement
  – Transverse
  – Reflective

• Low Movement
  – Longitudinal
  – Fatigue
  – Construction
  – Block
Step 1 - Pavement Evaluation

Guidelines for determining if reservoir usage is appropriate include:

1. Cracks density shouldn’t exceed approximately 10-15% (linear feet of cracks per square feet of pavement area).
2. The pavement should be sound enough to resist significant spalling during reservoir cutting.

(Final reservoir width shouldn’t exceed 1½” max.)
Step 2 – Pavement High/Low Temperature Range

FHWA LTPPBIND is the best system for indicating temperatures that could be used for design.

- Indicates 7-day average maximum and minimum pavement surface temperatures, with consideration of statistical reliability.
- High pavement temperatures range from approximately 52-70°C at a 98% reliability.
- Low temperatures range from approximately 0°C-40°C, at a 98% reliability.
Step 2 – Pavement High/Low Temperature Range

LTPPBIND program determines high and low pavement temps thus determining appropriate asphalt cement grade for use in asphalt concrete paving mixtures.

Typical asphalt grades include
- 58–40 for very cold climates
- 64–22 for moderate climates
- 70–10 for very hot climates

* For increased traffic loadings, increases in high temp grades are performed to require asphalts with greater rutting resistance

Crack sealant or filler materials need to function at both the high and low temps they will be exposed to.
Crack sealant materials need to function at both the high and low temps they will be exposed to.

The Process used for the sealing project should be adjusted to function within the temps the pavement will experience.

LTPPBIND provides the high to low pavement temperature range used for these decisions.
Step 3 - Cracks Sealing Process Types & Selection (SHRP H106)

Different treatments for high and low movement cracks.

- **Crack Seal** – “Rout & Seal”
  High Movement cracks require highly extensibility sealants in reservoirs.

- **Crack Fill** – “Blow & Go”
  Low movement cracks require a flexible but stiffer materials placed in a reservoir or overband installation.
Step 3 - Cracks Sealing Process
Types & Selection

If cracks are wide enough, generally greater than ¼ inch wide, cracks may be cleaned and filled, without reservoir cutting. This type of application can be used when life expectancy does not exceed 2-3 years, or when the pavement/cracking type is not a widened reservoir candidate.

For longer lasting results are generally achieved with the use of a cut reservoir.
SHRP H-106 Best Performance

• **Crack Seal** -- High Movement Cracks
  Rubberized asphalts installed in reservoirs with cap, 5-7 year life

• **Crack Fill** -- Low Movement Cracks
  Rubberized asphalt installed in overband, +2 year life
Step 4 - Installation Geometry Selection

Crack Movement

Crack Fill

Crack Seal

Unsealed cracks grow larger because of the intrusion of water and debris entering and then the compressive forces on the debris during the summer months.

Simple crack filling exposes the sealant to traffic wear during the warm summer, the reduced amount of sealant results in cohesion failure during the winter season.

A routed crack reservoir allows for seasonal expansion and contraction of the pavement movement protecting the integrity of the sealant.
Step 4 - Installation Geometry Selection

Based on LTPPBIND 98% Temperature Range (difference from high to low) Asphalt Grade.

Minimum Reservoir Recommended

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<tr>
<th>Range</th>
<th>Width</th>
<th>Depth</th>
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<tr>
<td>80°C or less</td>
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<td>86°C</td>
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<td>92°C</td>
<td>1 1/8”</td>
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<tr>
<td>98°C or greater</td>
<td>1 1/2”</td>
<td>3/8”</td>
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Note: These recommendations are applicable for thermal crack spacing up to approximately 75 feet. For greater spacing, the next wider width can be used for improved results. Reservoir width should not exceed 1 1/2”. 
Step 4 - Installation Geometry Selection

Regardless of reservoir width, the cut needs to be centered in the crack.

If the crack is not followed correctly, and the reservoir is not centered over the crack, intermittent edge sealant adhesive separations will occur during winter crack opening cycles.

The depth to width ratio of the installed sealant influences its extensibility. The wider the reservoir (sealant) is in relation to depth the greater the extensibility of the seal.
Step 4 - Installation Geometry Selection

Widened reservoir cutting can be easily performed using commercially available pavement routers or cutters. These devices quickly and efficiently cut reservoirs, of the desired width and depth and can follow meandering cracks.
The future of cutting a reservoir is cleaner.
Step 5 – Sealant Selection

Sealant materials installed in cracks needs to be able to withstand hot summer pavement temps as well as cold winter low temps. Throughout the world climate and temp extremes vary widely. Different climates require sealant materials with differing properties, and may require different installation procedures.
Step 4 – Sealant Selection

Using the LTPP Bind temp. range select a sealant suited for your climate.

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<th>FHWA LTPPBIND Filler Temperature Rating</th>
<th>Crafco Recommended Filler Products by Climate</th>
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Crafco Recommended
Step 5 – Alternative Sealant Selection Process

- Look to the approved products list for your State.
Step 6 - Installation

Loose debris must be removed and bonding surfaces cleaned.

There are 3 recommended cleaning methods that can be used:

1. CLEAN Compressed Air
2. Hot Air Lance – Warms & Dry
3. Vacuum – NO DUST
Step 6 - Installation

Sealant must be prepared according to manufacturers instructions.

**Proper Application Temperature**
**Proper Weather**

Cracks should be filled from the bottom up.

Three final sealant configurations/finishing can be used:
1. Under fill - *Before Overlay*
2. Flush fill – *Squeegee Excess*
3. Overband cap. – *Sealant on top of pavement*
Step 6 - Installation

Sealant Blotting/Detackifing: Toilet Paper
Step 6 - Installation

Sealant Blotting/Detackifying: Spray Applied Solutions
Toilet Paper
Blotting

Blotting the sealant allows for a smaller work zone.
Cracks Wider than 2” Require Crack Patching
New Hot Applied Mastic Repair Materials

- Flexible
- Water Proof
- Highly Adhesive
- Aggregate Filled
- No Compaction
- Ready for Traffic Quickly
- Good Skid Resistance
New Hot Applied Mastic Repair Materials
High Traffic Volume

Extremes