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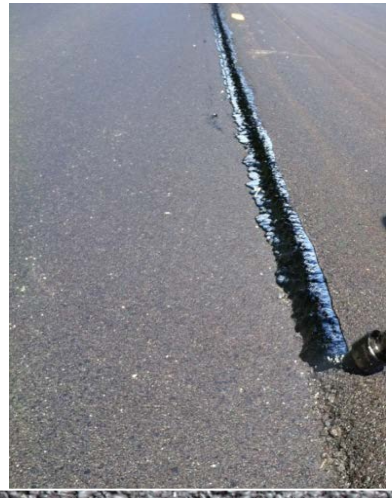

Crack Sealing Best Practices

Rocky Mountain Pavement Preservation Partnership

Greg Sharp

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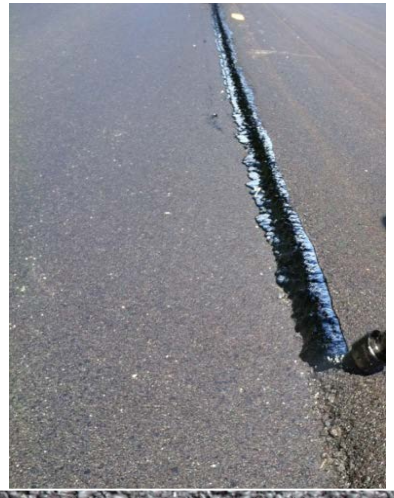

Factors Influencing Sealant Selection

- ***Specifications***
- ***Sealant Properties***
- ***Climate***
- ***Pavement Conditions***
- ***Installation Configuration***

Project Specifications - ASTM

- ASTM = American Society for Testing and Materials
- AASHTO = American Association of State Highway Transportation Officials
- Agency, State, and Local Specifications
- Manufacturer Specifications

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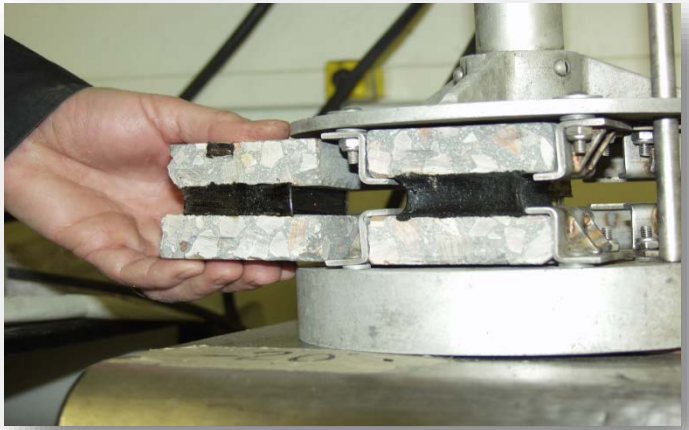
Sealant Properties Influencing Selection

These general property requirements can be separated into nine specific characteristics which are important for crack sealants as follows:

1. **Adhesion**
2. **High Temperature Stability**
3. **Low Temperature Flexibility/Elongation**
4. **Elasticity**
5. **Viscosity/Application Consistency**
6. Aging Resistance
7. Curing
8. Pot Life
9. Compatibility with Asphalt Concrete

Properties 1-5 are the most common to be found in a crack treatment specification (spec)

Sealant Properties - Adhesion



Bond Test

- Evaluates the ability of the material to remain adhered to concrete test block when extended multiple times.
- Temperature, # of cycles, block conditions, specimen size, and extension % can vary with the specification and grade of tested material.
- Failure shows as adhesive or cohesive separations when extended.

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Sealant Properties - Adhesion

Tensile Adhesion

This test measures the amount of elongation a sealant can withstand when cast between two concrete test blocks (73° F).

Higher results indicate greater elongation capabilities of the sealant.

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Sealant Properties - Adhesion

Adhesive Failure

Adhesive failures occur when the sealant pulls away from the sides of the crack

Cohesive Failure

Cohesive failure occurs when the sealant remains adhered to the sides of the crack and the sealant itself pulls apart

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Sealant Properties – Adhesion

Troubleshooting

Commons reasons for sealant to pull up:

- Dirty / wet pavement at application
- Pavement temperature too cold at application
- Weak / deteriorated pavement
- Oil, moisture, de-icing chemicals present on the pavement
- Cracks previously sealed and not cleaned sufficiently
- Incorrect application
    - Sealant overheated / under-heated

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Sealant Properties in High Temperatures

Softening Point

Indicates the temperature at which the material changes from a solid to viscous liquid. The higher the softening point, the more resistant to tracking the material is.

Materials that meet 176 F° minimum, generally can be heated up to 185 F° to 190 F° before softening and is effective for reservoir-type applications

Overbands require higher minimum softening temps. Best materials can be heated to 45 F° above pavement before softening.

For example, in the Phoenix, AZ area pavement temperatures can get to 145-150 F°, so the overband material should have a 200-210 F° softening point to resist tracking. In colder areas, the minimum softening temperature should ideally be 160-170 F°.

Sealant Properties in High Temperatures

Tracking

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Sealant Properties – Tracking

Troubleshooting

Common reasons for Sealant tracking

- Excessive application
- Traffic opened too soon
- Pavement temperature higher than sealant is designed to withstand
- Incorrect sealant for traffic conditions
- Sealant overheated / under-heated
- MORE IS NOT BETTER!

Excessive Application

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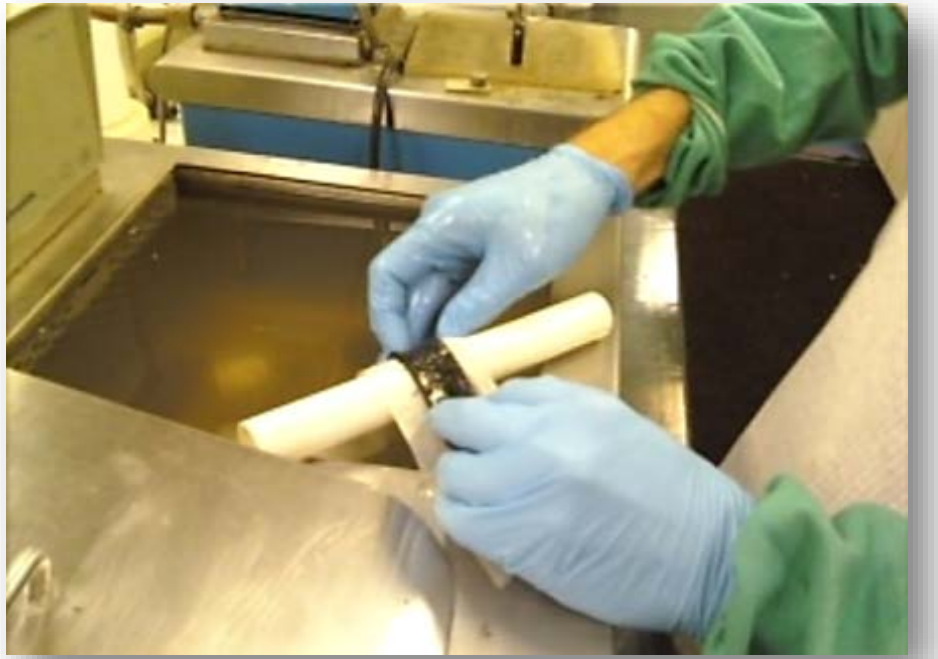
Sealant Properties in Low Temperatures

Flexibility Test

- Often called the bend or fracture test
- Indicates the ability of an 1/8” x 1”x4” specimen to be bent around a mandrel at specific temperatures without cracking
- Indicates the temperature at which sealant stiffens and loses flexibility



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Sealant Properties in Low Temperatures

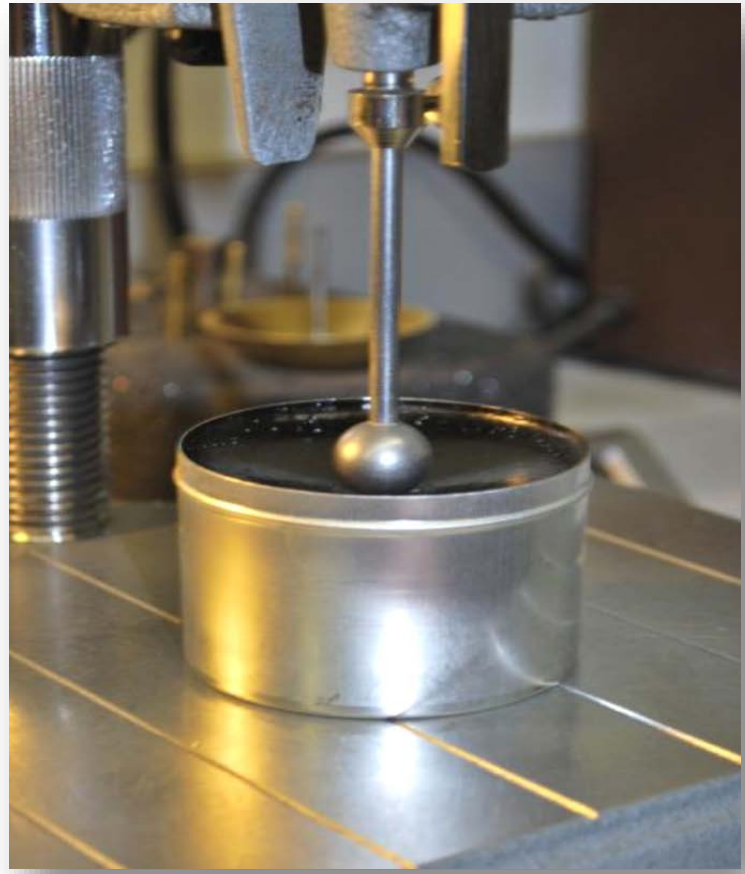
Cone Penetration

- Indication of material hardness or stiffness at a specified temperature (77°F is standard).
- Measures the amount of indentation of a specified cone with a specific weight (150 grams is standard) for a specific time (5 seconds is standard).
- Higher penetration indicates softer material.

Sealant Properties - Elasticity

Resilience test measures the elastic rebound of material

- Higher resilience = higher elastic rebound and strength
- Lower resilience = less elastic rebound and resistant to elongation



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Sealant Properties - Viscosity

Viscosity is measured in units of centipoise with rotational Brookfield-type viscometers.

<1500 cp -- Very flowable, very self leveling

1500-4000 cp -- Self leveling

4,000-10,000 cp -- Moderate high

10,000cp - 15,000 cp -- High

Asphalt Rubber, High Fiber materials

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Factors Influencing Sealant Selection

Climate

- Location High temperatures
- Location Low temperatures
- Installation time of the year
- LTPPBind tool

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Climate

Climate Considerations

- Sealant is subjected to the extreme high and low temperatures
  - Warmer climates require material stiffness to resist flow and tracking.
  - Cooler climates require a softer material for flexibility to allow pavement movement without sealant cracking-debonding.

Sealant material performance is controlled by the relationships and interactions of:

- **low temperature**
- **high temperature**
- **adhesive and elastic properties over the entire range of temperatures and strains experienced.**

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Factors Influencing Sealant Selection

Pavement Conditions – High Moving Cracks

- Defined as annual movement greater than or equal to 1/8” (3mm)
- High Moving Cracks:
  - Transverse are always moving
  - Other moving cracks:
    - Reflective
    - Thermal
    - Longitudinal
    - Edge
- May move up to 1” each year

- Can open up to 100% of original width as the pavement temperature changes from summer to winter extremes

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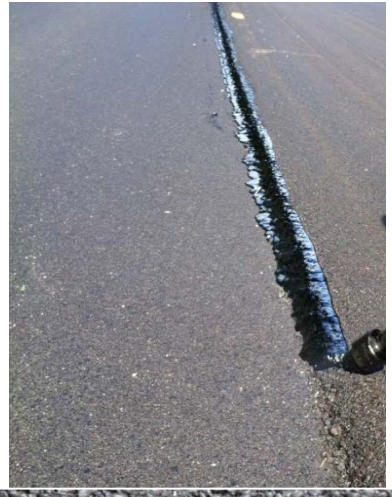

Installation Techniques

- ***Safety***
- ***Routing***
- ***Cleaning***
- ***Application***
- ***Finishing***

Techniques - Equipment

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- Oil-jacketed
- Thermostatic heat controls
- Continuous agitation
- Over-heating safety controls
- Right size for operation

Always follow the equipment manufacturer's recommendations

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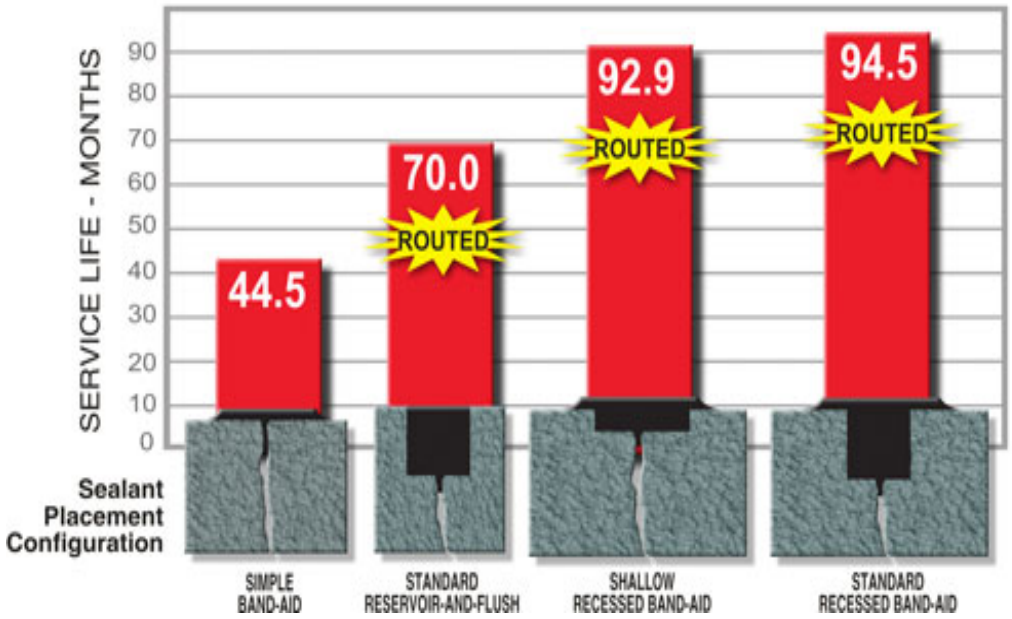
Techniques - Routing

Routing should be considered in areas with increased thermal movement or when a high performance product is preferred.

Crack Routing & Treatment Is Proven To Extend Service-Life 7+ Years



- Independent studies prove Crafco router and high performance sealant provide unsurpassed performance (7+ yrs)[1,2,3,4]
- Labor is 80% of the cost of crack sealing, so routing and selecting the best sealant for the job are very important!

Cracks routed and sealed achieve over 100% (2x) the service life vs. non-routed and sealed cracks[1,2]

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Techniques - Cleaning

- Surfaces Need To Be *DRY*
- Dry pavement surface and crack interior
- *NO* dampness
- *NO* darkening or discoloration due to moisture
- *NO* frost or dew

Moisture will prevent
proper adhesion and
guarantee sealant
FAILURE

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Techniques - Application

- **Pavement** Temperature 40°F minimum
  - CAUTION should be observed when applying products below the dew point.
- **Sealant** Temperature
  - Material should be heated according to manufacturer's recommended application range
  - Under-heating or over-heating can lead to decreased sealant performance or failure

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Techniques - Cleaning

Heat Lance

Heat Lances should be used to dry slightly moist pavement or heat pavement up to 40°F (4°C)

One pass is usually sufficient - go slow enough to heat the joints without burning the asphalt

Techniques - Cleaning

Vacuuming is an alternative to blowing out cracks. This will contain dust and can be PM10 compliant.

PM10 is a EPA air quality standard for particles with a diameter of 10 micrometers or less.

Techniques - Application

Applicator
Straight Tip

Flush Fill

Techniques - Application

Applicator Disk

Overband

Techniques - Application

Squeegee

Overband width should be approximately one inch beyond both crack edges.

Techniques - Finishing

In traffic areas and intersection, the use of a blotter or specialized release agent may be required to keep the fresh sealant from adhering to car tires.

Questions?

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