Arizona Chapter AGC Pavement Preservation Series

Crack Sealing and Crack Filling Guide for Application and Construction

Presented by the Pavement Preservation Committee through the Arizona Chapter Associated General Contractors

Developed by the

Pavement Preservation Committee
Last Update: December 2013

Building Arizona Since 1934
1825 W. Adams, Phoenix, AZ 85007 • Phone (602) 252-3926 / Fax (602) 252-5870

Forward

This guide is a collection of crack sealing and crack filling best practices and recommendations for the state of Arizona. There will be instances were conditions or materials dictate that the contractor or supplier may need to deviate from these recommended ranges. It is important that the contractors, suppliers, and agencies work together and use common sense to modify these recommendations as needed.

The committee is comprised of contractors, material suppliers, aggregate producers and agency personnel. Special thanks to our partners in the Arizona Department of Transportation: Bill Hurguy, State Materials Engineer, and Janet Doerstling Pavement Materials Testing Manager for their contributions to this revision.

Table of Contents

1 - Introduction

The intent of these guidelines is to aid in the design, testing, quality control, measurement and payment procedures for the application of Crack Sealing and Crack Filling.

The sealant shall be a hot–applied, asphalt based, Polymer Modified or Rubber Modified product used to seal and fill crack and joints in asphalt or Portland cement concrete pavements. This material is supplied in solid form, which when melted and properly applied, forms a resilient, adhesive and flexible compound that resists cracking in the winter and resists tracking at summer temperatures

2 - Surface Preparation

2.1 Cleaning

During the cleaning of cracks, the Contractor shall protect against damage to items such as, but not limited to, cars, people, driveways, walkways, landscape materials, etc. in the work area. Cracks may be cleaned and filled without routed reservoirs, but studies suggest longer life is achieved with reservoirs. The joint and crack cleaning, equipment shall be capable of producing compressed air at a minimum of 90 psi at the tip. Functioning water and oil separators must be utilized on the compressor unit. Immediately prior to applying the sealant, cracks shall be thoroughly cleaned to remove loose particles of grass, grass roots, weeds, dirt, dust, and other deleterious substance.

2.2 - Routing

2.2.1 Routing should be considered in areas with increased thermal movement or when a more high performance crack seal or crack fill job is preferred.

2.2.2 Routing operation should be used to create a sealant reservoir. Cutting should remove at least 1/8" (3 mm) from each side and produce vertical, intact surfaces with no loosely bonded aggregate. Joints and cracks should be routed to a ¾" (19mm) W x ¾" (19mm) D configuration for a typical application. A low profile configuration of 1 ½" (40mm) W x 3/8" (10mm) D may be used in colder climates however studies also suggest a 2:1 maximum ratio for enhanced thermal movement performance. If crack sealing is performed on a previously chip sealed, microsurface or slurried surface, the low profile configuration depth should be 5/8" (15mm) D. The pavement should be sound enough to resist significant spalling during cutting. Final reservoir width should not exceed twice the cutter width or 1 ½" (38mm) maximum.

3 - Materials

3.1 Specifications

Sealants are manufactured to meet many different federal, state, local, ASTM or AASHTO specifications. If specifications are not supplied, it is best to contact a local supplier to find out what is being used in your area.

3.2 - Crack sealants and crack fillers

3.2.1 Crack sealants are used more commonly in areas with more freeze thaw cycles. This material is a softer more flexible sealant to withstand the colder temperatures and greater pavement movements.

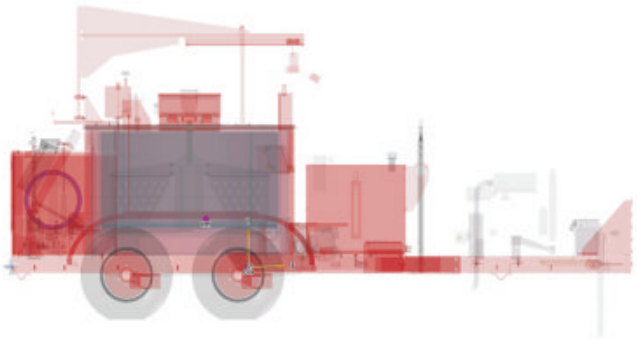
3.2.2 Crack Fillers are used in areas that have warmer conditions and may have minimal if any movement. These are generally longitudinal crack and cold joints in the pavement. This material is a harder material designed to handle hotter temperatures and heavier traffic loading.

4 - Laboratory Evaluation

Sealant manufactures will warranty and certify that their products meet applicable ASTM, AASHTO, Federal or State specifications at time of shipment.

4.1 Sealant Design

Several State and local agencies have sealant design specifications and require manufacturer certification or 3rd party testing. Agencies may require pre-approved sealant, verification to specifications and batch or lot numbers before any project can be started
.



5 - Equipment

All equipment, tools and machines used in the application of crack sealant shall be maintained in satisfactory working condition at all times.

5.1 Melter Applicator

The melter applicator unit shall be a self-contained double boiler device with the transmittal of heat through heat transfer oil. It must be equipped with an on board automatic heat controlling device to permit the attainment of a predetermined temperature, and then maintain that temperature as long as required. The unit shall also have a means to vigorously and continuously agitate the sealant. The sealant shall be applied to the pavement under pressure supplied by a gear pump with a hose and wand and direct connecting applicator tip. The pump shall have sufficient pressure to apply designated sealant at a rate of at least three (3) gallons (11.4 L) per minute. Melter applicators shall be approved for use by the sealant manufacturer.

5.2 Auxiliary Equipment

Suitable surface preparation equipment, traffic control equipment, hand tools, and other support and safety equipment necessary to perform the proper sealant application, work shall be provided by the contractor.

5.3 - Calibration

Calibration of thermostats and gauges should be performed routinely to assure correct temperature of heat transfer oil and sealant.

6.0 - Application

6.1 - Clean and Dry

No sealant material shall be installed until joints and cracks to be sealed have been cleaned, inspected and approved. Sealant manufacturer's heating and application instruction shall be followed for heating and applying the hot pour sealant.

6.2 - Weather

The sealant material shall not be applied when the weather is foggy or when rain threatens. When the atmosphere or pavement temperature is below 40°F (5°C), a heat lance should be used to warm the pavement just prior to sealing operations. The pavement surface must be clean and dry. The polymeric asphalt rubber sealant temperature, when applied, shall be in accordance with the manufacturer's recommendations.

6.3 - Flush Fill

Joints and cracks shall be sealed with hot pour material as designated. The sealant shall be applied in the crack or joint reservoir uniformly solid from bottom to top and shall be filled without formation of entrapped air or voids. The sealant shall be heated in accordance with manufacturer's recommended procedures.

6.4 - Overband

Many joints and cracks in concrete have weakened or spalled surfaces on the sides. It is recommended that the crack or joint be slightly overfilled then leveled with a 3" sealing disk or v-shaped squeegee to create a neat band aid extending 1" on each side of the crack or joint for surface strength and waterproofing.

6.5 - Recessed Fill

If the pavement being sealed will be overlaid within six months of sealant application, it is recommended that the cracks be routed with a pavement cutter and sealant placement shall be recessed ¼" (6 mm) in the crack or joint reservoir with no over band. If routing is not used, the sealant over band thickness and width should be kept as narrow and thin as possible.

6.6 - Blotter or Detackifyer

On two lane roads or where traffic may be likely to come in contact with the hot sealant before it cures, a blotter or specialized detackifying material may be required to prevent asphalt bleed and/or pickup of sealant by vehicular traffic. Said material should be compatible with crack sealant and any surface treatment being used.

7 - Construction Procedures

7.1 - Weather Limitations

Lower temperatures may result in reduced adhesion due to the presence of moisture or ice. If the pavement temperature is lower that 40°F (4°C), it may be warmed using a heat lance that puts no direct flame on the pavement. If installing at lower pavement temperature.
that 40°F (4°C), extreme care should be used to insure that cracks or joints are dry and free from ice and other contaminates. Product temperatures should be maintained at the maximum heating temperature recommended by the manufacture. If installing at night, ensure that dew is not forming on the pavement surface. Applied product should be checked to ensure that adhesion is adequate.

7.2 Notification

Homeowners and business affected by the crack sealing operation shall be notified at least one day in advance of the sealing. Should work not occur on the specified day, a new notification will be distributed. The notification shall be posted in written form, stating the time and date that the crack sealing will take place. If necessary, signs alerting traffic to the intended project should be posted.

7.3 Traffic Control

Traffic control devices shall be carried out in accordance with agency requirements and, if necessary, conform to the requirements of the Manual on Uniform Traffic Control Devices. Opening to traffic does not constitute acceptance of the work.

7.4 Clean Up

Old material and other debris that result from cleaning and sealing cracks shall be picked up and disposed of prior to release to traffic. If melters require clean out, follow manufacturer's instructions. If solvent is used, ensure it does not contaminate product as dilution and flash problems may occur.

7.5 Precautions

In certain situations, additional consideration needs to be given to product selection and application geometries.

7.5.1 Parking lot, slow moving traffic and pedestrians

Products used in these areas must be stiff enough at summer temperatures to resist pick up. It is recommended that the sealant used be designed for this type of application.

7.5.2 Overlay, Surface Treatment or Seal coat over sealant

Sealants will be subject to overlay heat effects and carriers for surface treatments and seal coats. If product is applied on top of the pavements, and an overlay is then placed, bumps may occur during compaction. Refer to Appendix A “Bump Formation & Prevention in Asphalt Concrete Overlays”

7.5.3 High Severity Cracked Areas

Highly cracked areas (Fatigue cracks in wheel paths) should not be treated by covering cracks because pavement friction may be affected. These cracks can be filled if followed by a surface treatment or overlay to restore friction.

7.5.4 Fuel or Oil Spill Area

Crack sealants should not be used in a fuel or oil spill areas due to softening of the sealant that may occur. Sealant will not adhere to asphalt or concrete pavements surfaces that are contaminated with oil spills.

Quality Control

8.1 Inspection

The inspector assigned to projects must be familiar with the materials, equipment and application of crack sealant. Local conditions and specific project requirements should be considered when determining the parameters of field inspection

8.2 Method of Measurement

The cleaning and sealing of joints and cracks shall be paid for by the actual number of lineal feet, pounds of sealant, or pavement surface of joints and cracks cleaned and sealed and accepted by the Inspector.

8.3 Payment

This item will be paid for at the contract unit prices per lineal foot, pounds of sealant or pavement surface area of cleaning and sealing cracks and joints in the pavement. Price and payment shall constitute full compensation for all traffic control protection, routing, preparation and disposal of loose materials; and for the materials, labor, equipment, tools, supervision and incidentals necessary to complete this item.

Checklist Materials & Construction

Techniques/Application

	YES	NO
1. Is the area clean and dry?	☐	☐
2. Is the ambient asphalt temperature 40 degrees and rising?	☐	☐
3. Should cracks be routed?	☐	☐
4. Is area free of debris, cars, people, or equipment?	☐	☐
5. Is proper traffic control in place prior to starting application?	☐	☐
6. Is the sealant heated to proper application temperature?	☐	☐
7. Do you have the appropriate application tip for the job?	☐	☐
8. Do you have blotter or detackifyer if you need to open to traffic?	☐	☐

Appendix A

Bump Formation & Prevention In Asphalt Concrete Overlays Which Have Been Crack Sealed

Sealing cracks in asphalt concrete pavements is a widely used effective procedure for extending pavement life. Crack sealing limits water entry into underlying base and subbase layers thereby reducing the rate of pavement deterioration. At some point in most asphalt concrete pavements life spans, overlays are placed to rehabilitate and further extend pavement life. Bumps have been known to form in the mat above areas where crack sealant is present during the compaction process of the hot mix asphalt concrete overlay. They have also formed where there is no crack sealant present at all.

"Bumps" in asphalt concrete overlays is an industry wide concern. With more focus on ride quality and pavement smoothness; paving contractors, asphalt concrete providers, paver manufacturers, and roller manufacturers, engineering firms and agencies have all researched ways to prevent bumps. It is the consensus that there is not one singular reason or cause for bumps. Pavement design, field conditions, paving and compaction equipment and general construction practices are all suspect and have been known factors for bumps in overlays. Crack sealing may also contribute to bump formation in certain overlay projects, however, the presence of crack sealant alone does not predetermine that bumping will occur.

Bump Formation:
In the process of overlay compaction, the rollers tend to shove the mix forward. If this happens on an underlying pavement surface which has uniform restraining characteristics, a smooth finished surface can be achieved. However, if the underlying pavement surface varies significantly due to irregularities or conflicting materials, uneven shoving results in unwanted bumps.

When the hot mix asphalt concrete overlay is placed, the underlying pavement will absorb the heat and expand due to the temperature change. The cracks present will then become more narrow due to the thermal expansion causing the crack sealant to be pushed upwards. Typical crack sealants have adhesive and elastic properties and when pushed upwards may stick to the overlay and limit overlay displacement during the compaction process.

Crack Sealant Bump Formation Factors:

These factors relate to whether or not the sealant can adhere to the overlay to limit mix shoving during compaction.

Hard, stiff sealants may not adhere to the overlay while soft, low melt temperature sealants may soften enough when heated by the overlay to not restrain the mix if it displaces during compaction. Medium stiffness sealants with elastic properties may have a tendency to soften, adhere and restrain the overlay.

As sealant ages, it has a tendency to form an oxidized, non-tacky surface which resists overlay adherence.

Exposure to traffic tends to wear away sealant in pavement surfaces and smooth it level with the pavement surface.

When sealant is applied in a recessed configuration it may not contact the overlay.

Solutions To The Bump Formation Problem:

Procedures to be followed to reduce or eliminate overlay bumps are those that reduce shoving during compaction and/or prevent sealant from adhering to the overlay. Following is a list of solutions that have been found to help reduce or eliminate bumps:

Overlay Construction Related:

Use of rollers with power driven

1. Use of 2 course paving with a thin leveling course.
2. Use of stiffer tack coats.
3. Waiting one or more years after sealing before overlaying.
4. Modifying rolling patterns and temperatures based on operator experience to reduce mix shoving and mix designs.
5. Slowing roller speed during compaction, especially for intermediate and final rolling
6. Rolling to achieve compaction with the minimum number of passes. Do not “over roll”

Crack Sealant Related:

1. Install sealant in routed cracks leaving approximately 3/8 inch 1 cm) low in the crack with no sealant in the surface. (When sealing just prior to the overlay)
2. Apply an isolation or non-stick layer or material over the sealant to prevent adherence. (i.e. lime, sand or other coating)
3. Remove excess sealant and/or avoid excessive sealant applications.

These above listed actions have been found to prevent or reduce shoving and bump formations in overlays. If bumps occur, use of the above procedures should assist in successful overlay construction.