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TranSafety,
Inc.
(360) 683-6276
Fax: (360)
683-6719

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Crack Sealing Benefits and Techniques

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WATER IS THE MOST DESTRUCTIVE element to our pavements. If it rained and snowed everywhere but on our roads and bridges, 90 percent of highway and street work would be eliminated. Since that is not likely to happen any time soon, we need to prevent water intrusion into our pavements. **Filling or sealing pavement cracks to prevent water from entering the base and subbase will extend the pavement life by three to five years.** Filling cracks and joints with asphalt materials (such as AC 20 or asphalt emulsions) is not new. These pavement repair techniques have been commonplace practices for decades. The asphalt materials are intended to fill the crack and keep most of the water out of the pavement. When water is kept out, pavement deterioration is slowed.

DURABLE AND ECONOMICAL PAVEMENTS EXPAND and contract with seasonal temperature changes. Consequently, cracks and joints are expanding and contracting when the pavements move. **Fillers do not expand or contract. Sealing the cracks with a flexible rubberized asphalt that bonds to the crack walls and moves with the pavement will prevent water intrusion. Sealing is better than filling. Sealing will last longer and cost less. As part of a pavement management system, crack sealing can reduce pavement deterioration by restricting water penetration into underlying base and subbase layers.** This restriction helps to maintain pavement structural capacity and limits future degradation. Simply stated, sealing cracks and joints in pavements extends the service life of the surface treatment and the pavement. Crack sealing will not improve initial pavement rideability. The benefits are realized in three to five years when it becomes obvious that the pavement has not deteriorated. In fact, roads that have been crack sealed have better rideability five years later than other surface treatments, such as chip seals, micropaving, thin overlays and slurry seals. In five years these other treatments have come to the end of their life cycle. Roads and bridges that are crack sealed last longer than those that are not. Sealing prior to

surface treatments enhances the treatment and further extends the pavement life. At a time when highway crew manpower is shrinking, along with the funds to support road maintenance, crack sealing stands out as an economical maintenance technique. The overall success of pavement maintenance systems that include crack sealing, combined with the generally low cost, make crack sealing a desired maintenance program. Crack sealing provides the most cost-effective use of dollars over time compared to other pavement maintenance techniques.

TO ENSURE A MINIMUM STANDARD for sealant performance, the American Society of Testing and Materials, the American Association of State Highway and Transportation Officials and federal agencies have developed test specifications for polymer-modified and asphalt rubber sealants. Although most of these tests originally were designed as joint sealing standards in concrete pavements, these standards now are widely used in asphalt pavements as well. Performance specifications are written for different movement conditions and pavements. One specification will not cover all crack sealing situations. Before you purchase a sealant, speak with a manufacturer's representative to find out how the sealant was designed to perform. Today's sealants are highly engineered products formulated to perform in some of the most difficult climatic conditions. The ability to produce a material that will not be soft and track in the summer and still be flexible in freezing temperatures requires research. The Strategic Highway Research Program, or SHRP tested crack sealing materials, equipment and applications extensively. The five-year evaluation begun in 1991 found:

- Not all sealants meeting the same specification requirements perform the same. The overall performance differs from manufacturer to manufacturer. Over time this difference may be significant.
- The best performing sealant is a polymer-modified sealant that actually "relaxes" during full extension. This technique places less tension or stress on the bond of the sealant to the side walls of the crack and results in longer-lasting sealant bonds. These products may be the next generation in sealants. This next generation of polymer-modified sealants may exceed current test minimums established by ASTM, AASHTO and federal agencies. In coming years these materials could replace familiar sealants used today. Polymer sealants last longer and continue to perform.

USING THE RIGHT EQUIPMENT is an important part of any crack sealing program. There are two major areas of consideration: crack preparation and sealant application. In the same way that a dentist prepares a tooth before filling a cavity, crews must prepare cracks to receive sealants. The better the preparation, the better the chance that the sealant will last and perform. Cracks must be free of all dirt, dust and debris. The sealant must have a clean, dry bonding surface. Surface preparation

can be accomplished with compressed air and a simple blow pipe. This technique works well when the dirt is dry and not packed hard. If the cracks are filled with wet dirt, the dirt needs to be removed and the crack must be completely dried. An air compressor or a hot air lance generating temperatures in excess of 2,000 degrees F is the best tool. In simple terms a heat lance uses hot, compressed air that blows cracks clean while drying them out. Results from the SHRP study showed there is almost a 40 percent greater chance of sealant success if cracks are routed prior to sealing. Cutting a reservoir above the crack allows adequate sealant expansion and contraction. The reservoir also ensures that the proper amount of sealant penetrates the crack. An operator passes the pavement cutter or router over the crack and cuts a reservoir into the crack. Modern routers can follow even the most random pavement cracks. Once the rout is complete, simply use compressed air (hot or cold) to remove the dust created by the router. Engine-powered steel wire brushes also can be used to clean routed and non-routed cracks. (Note: Older-aged asphalt pavements and thin asphalt pavements may not be suitable for routing.) Although tar pots are still used for applying mineral-filled materials, they will burn or destroy crack and joint sealants that utilize polymers or rubbers. Melters eliminate this problem by using a high-temperature heat-transfer medium, such as oil. These types of melters are known as "oil jacketed" melters or "double boilers." Hot pour sealants are effectively applied through a delivery hose and wand. These materials are commonly applied at 375 degrees F. To prevent sealant cooling, set up and clog, the hose is placed under constant pressure and the sealant constantly circulates back into the main tank. Crew members therefore must be trained not only in proper safety procedures but also in proper operation of the melter. Recent innovations in melter designs have greatly improved melter safety. Melters with "on demand" pumping and thermostatically controlled delivery hoses reduce the chances of mistakes and improve productivity. These newly designed melters also reduce operator confusion. Digital temperature controls, the absence of flush clean up systems and perplexing timing of valves and rapid heat up times have given operators more precise control over sealing. This ease reduces costs, increases productivity and greatly improves safety. Many melter manufacturers claim superior features and benefits for their equipment. It is in your best interest to fully examine individual features and keep in mind not only the manufacturer's general reputation but the availability of parts and services. Product and service support often is important to on-time job completion.

SEALANT APPLICATION can be accomplished in a variety of ways. Twelve methods are outlined in the SHRP publication *Materials and Procedures for Sealing and Filling Cracks in Asphalt-Surfaced Pavements*. The success of each method is not only determined by configuration but also by cleaning technique and sealant selection. Sealants applied in routed cracks performed longer. A recessed configuration dispenses material into the confines of a routed crack. The sealant can be placed flush

with the pavement, slightly below the surface of the pavement or slightly overfilled on the surface. In an over-band configuration, the sealant is placed onto and over an unrouted crack. The sealant can be shaped into a band over the crack using a rubber blade squeegee or a sealing shoe that flattens the sealant over the crack.

PAVEMENT SELECTION is often a forgotten element in determining the success or failure of a crack sealing program. If the road has alligator cracking, high-density multiple cracking, poor subbase drainage or structural damage, crack sealing will not solve the problem. In these cases the damage is too severe. If you try to save a pavement with too much cracking, you will be disappointed with your efforts. The best candidates for crack sealing are newer pavements that are beginning to form cracks. You certainly can extend the life of these roads. More sealant is not always better. The new sealants are not designed to be "road glue." They are very sticky and have tremendous bonding power, but they are not made to "hold the road together." Crack sealing has one objective: to prevent water from further damaging roads. Sealing buys time and saves money by delaying the expense of major reconstructive pavement work.