

Pavement joints that last 5 years?

With good materials and strict procedures a warranty can be given

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Increasing numbers of engineers and architects are asking for 5-year warranties on field-molded elastomeric joint sealants in portland cement concrete highway and airport pavements. Such a warranty against any type of failure under normal usage and conditions usually provides that the sealant

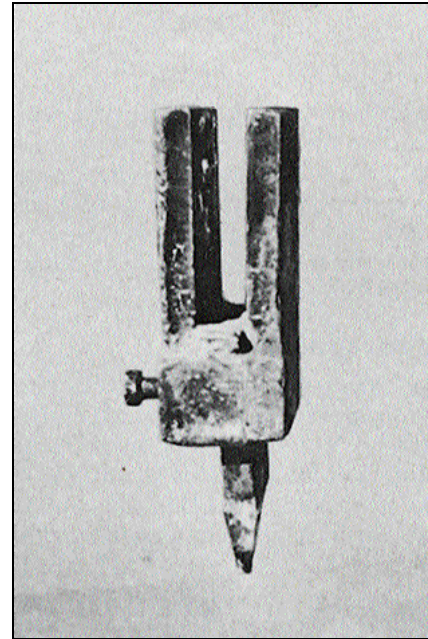
- shall prevent infiltration by water, jet fuel and any other foreign materials, including incompressibles
- shall not have loss of bond nor develop a cohesive failure
- shall not flow, blister, bubble, crack or lose its rubberlike qualities
- shall not pick up on tires

Any manufacturer who provides this kind of long-term warranty must have full confidence in his joint sealant, in the design features of the joint system and in the procedures and techniques of installation. A close working relationship between the manufacturer of the sealant material and the specialty contractor who installs it is mandatory.

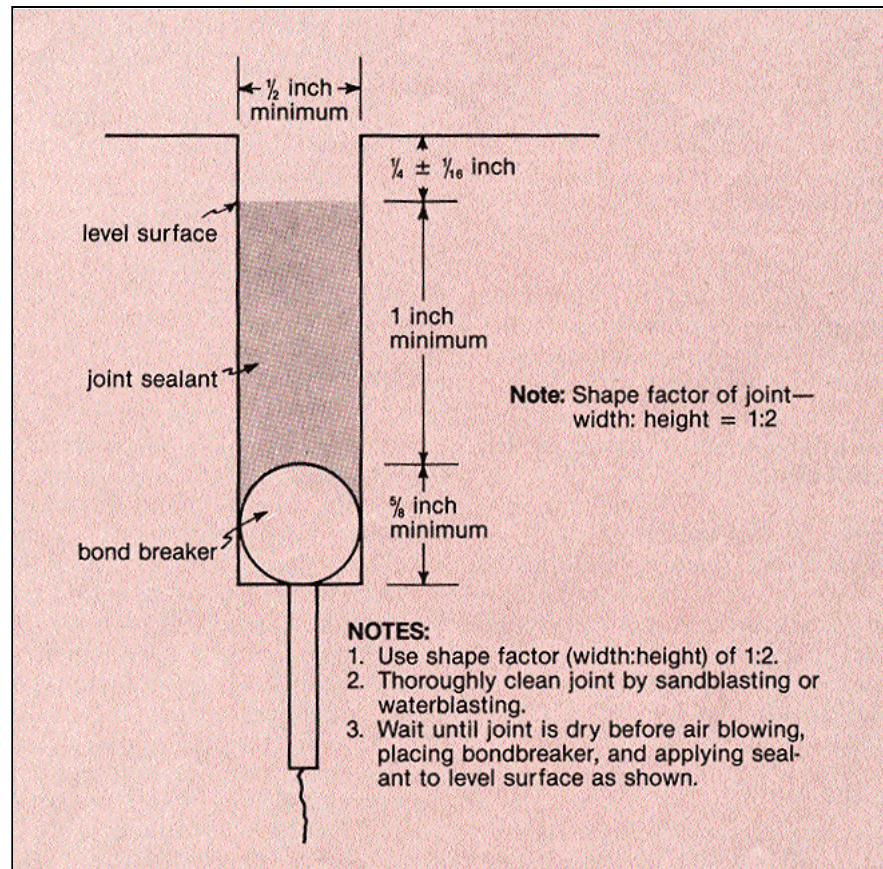
Material to be used

For this kind of warranted installation the joint sealant should meet the requirements of ASTM D 3406 for highway service or ASTM D 3569 for airport pavements. Both speci-

cations are for single-component sealants, hot-applied with pressurized equipment. They are based on polyvinyl chloride-coal tar sealants which have proved, in wide use since 1964, highly resistant to weathering under all climatic conditions. The specifications contain an artificial weathering test in which one cycle represents 5 years of exposure to field weathering. The D 3569 type sealant has also proven to be very resistant to jet blast under nor-



The cutting tool used to plow joints should have straight, untapered sides. The tool can be mounted on the rear of a small tractor, or, for better vision by the operator, near the center of the tractor undercarriage.



Detail of typical hot-applied elastomeric joint sealant installation qualifying for 5-year warranty, using sealant conforming to ASTM D 3406 for highways or ASTM D 3569 for airports.

mal usage and conditions. For successful long-term performance it is essential that the procedures described here be followed.

Joint spacing

Closer spacing of joints limits joint movement to a range which can be readily accommodated by



The bond breaker is inserted into the clean joint just before sealing.

the sealant. It also provides a margin of safety should any of the joints undergo extra movement because some others fail to function. Hence the manufacturer must adopt the policy of providing the 5-year warranty only if the spacing between joints in new construction is 15 feet or less and in old pavement to be resealed is 25 feet or less.

Joints to be sealed

It is imperative that all joints be sealed. This applies to both transverse and longitudinal joints and particularly to shoulder joints, whether the adjacent pavement is portland cement or asphalt concrete.

Shape factor

A shape factor of 1:2, the ratio of joint width to sealant depth, is required, provided the joint width is a minimum of $\frac{1}{2}$ inch. Moreover, the joint sealant should be positioned in the joint so that its bottom surface rests on a bond breaker and its top surface lies at least $\frac{1}{4} \pm \frac{1}{16}$ inch below the pavement surface. The diagram illustrates a typical arrangement for a $\frac{1}{2}$ -inch-wide joint. Joints

wider than $\frac{3}{4}$ inch should have a shape factor of 1:1 for the sealant.

Joint preparation

Whether sealing new joints or re-sealing old ones, foreign materials should be removed from joint surfaces by conventional sandblasting or by use of a water jet that produces at least 23 gallons of water per minute under a pressure of 8500 psi. Before resealing, it is usually necessary to plow out the old sealant before sandblasting or waterjetting. This should be carefully done without tapering the joint walls or spalling its edges. Finally, should the joint require widening, the work should be done using an up-cut concrete saw with diamond blades. When water is used in preparing the joint, one should wait at least two days under favorable drying conditions before proceeding with installation of the joint sealant.

All loose debris and fines should be air-blown out of the joint just before installing the backing material and sealant.

Bond breaker

A round cotton or cellulose upholstery cord, or a heat-resistant, premolded urethane foam, slightly larger in diameter than the width of the joint should be used. The bond breaker is inserted in the joint to the proper depth before installing the hot-applied sealant. It prevents the bottom surface of the sealant from bonding to the concrete, supports the sealant and prevents sag until it cools. This joint backup also allows the sealant freedom to assume a parabolic surface when the joint opens.

Installation of sealant

The sealant should then be hot-applied into the joint to the specified depth (see diagram), to produce a flat and level top surface. Work should be done by well-trained, experienced workmen, using equipment and techniques recommended and approved by the joint sealant manufacturer.

Application of the joint sealant should be stopped at a point which assures a space of at least $\frac{1}{4} \pm \frac{1}{16}$ inch below the pavement surface.



To seal properly, the operator holds the sealing tip at the bottom of the joint and fills the joint with sealant to a level $\frac{1}{4}$ inch below the pavement surface.

This will protect the sealant from vehicle and aircraft wheel wear and abrasion, which could eventually cause loss of bond to the joint side-wall.

Acknowledgement

This article is based on a paper presented October 1, 1981 by the author at the World Congress on Joint Sealing and Bearing Systems in Niagara Falls, New York. The complete original paper, F.D. Gaus, "Essential Elements for High Performance Joint Sealing and Resealing Portland Cement Concrete Pavements," has been published in the conference proceedings, Joint Sealing and Bearing Systems for Concrete Structures, Volume 2, ACI Special Publication SP-70, 1982, pages 1233 to 1247.

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