MATERIALS & RESEARCH





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RESEARCH UPDATE

U 1998-2

SILICOFLEX STRIP SEAL JOINT SYSTEM

Reference Initial Report U95-10, Update U97-3

Product Description

The Silicoflex system is a bridge deck expansion joint consisting of a V-shaped, preformed, silicone strip seal which is bonded with a silicone adhesive directly to concrete, elastomeric concrete, or steel. The bead of silicone adhesive is formed into serrations on the top of the seal and adheres to the vertical faces of the joint to create a waterproof bond. The seals can be spliced as needed and connected with a splicing compound for use on directional changes and curbs. The Silicoflex System is marketed by R.J. Watson, Inc., P.O. Box 85, East Amherst, NY 14051.

Background

In August, 1995 the Silicoflex Bridge Deck Expansion Joint System was installed on Bridge No. 1 on the Berlin State Highway. The Silicoflex replaced a ten year old neoprene joint which failed to return to shape after compression from joint movement. The failed joint allowed salt intrusion which corroded the steel girder ends. Because of this failure, it was decided that the neoprene joint was not appropriate for this location and instead a silicone joint system was installed and studied as an experimental feature.

The first post-installation inspection was conducted in May, 1997 by the Research and Development Unit. At that time the V joint was found to have lost bond with the steel plate on at least three points of contact, the most serious being a six inch delamination at the curb on the downspout end. Two other bond losses were found in the travel lanes. The failures were attributed to rust creeping under the silicone adhesive, compounded by an accumulation of debris in the joint.

When notified of the bond failure, the distributor (R.J. Watson, Inc.) sent a representative to examine the joint and make the necessary repairs. The debonded areas were cleaned with a grinder, primed, and reattached with silicone adhesive. A new technique was used to reattach the seal which involved placing an additional bead of sealant on the underside of the joint. This reportedly gives the joint a stronger bond with the joint face.

Material Cost

When installed in 1995 the cost of the seal was \$40.00 per lineal foot. The sealant cost was \$10.00 per tube, which covers approximately 5 feet of joint. The overall cost of the materials was \$42.00 per linear foot.

Performance Evaluation

The Silicoflex System was inspected again on May 26, 1998, after two years and nine months of service. The full length of the joint was packed with debris, primarily sand from winter maintenance, as was the case during the previous year's inspection. Again, the downspout end of the joint was blocked with debris, impeding drainage.

The wrapped curb, downspout end, and four locations in the travel lanes were cleaned of debris and checked for bond failures. The wrapped curb side has remained bonded and the repairs made on the downspout end last year have held.

A five inch debonded site in the wheel path which was repaired last year has again lost bond with the steel. The double bead of adhesive did not sufficiently anchor the joint.

At another location in the travel lane a fourteen inch bond failure was discovered. This break was so long that the V joint has buckled and become so misshaped that it no longer is in contact with the angle plate. The result is an opening of three inches by 1/2 inch where water can freely drain down onto the girder ends. Towards the downspout end another five inch bond loss was found.

Similar conditions were discovered during this inspection as were found last year. Accumulation of sand and debris in the recesses of the joint seal, aggravated by rust on the steel angle plates, are the direct cause of the failures. The inevitable rust on the uncoated steel has spread underneath the adhesive and weakened the bond. Loading from vehicles crossing the debris laden joint has put pressure on the weakened adhesive and caused it pull away from the angle steel.

Since the rust over the entire length of the angle plate is beginning to flake, it is expected that debonding will continue rapidly. It is estimated that by next spring at least another two feet of joint will have lost bond. In spite of the bond failures noted, the compression afforded by the V joint itself has at least kept the seal in contact with the angle steel, and even though it is not securely attached, it is offering some degree of protection to the underlying bridge members.

Conclusions

After two years and nine months of service, the Silicoflex system has lost approximately two feet of bond with the angle steel, representing approximately 6% of the total joint length. Currently, the Silicoflex joint is in contact with the steel throughout most of its length and is offering a fair degree of protection, although some chloride intrusion is certain.

Based on these findings, it is the opinion of the researchers that the Silicoflex Bridge Expansion Joint System is not suitable for applications where it is required to bond with uncoated steel.

Follow Up

The Silicoflex system will be inspected next spring to ascertain the extent of further bond loss and the findings will presented in an update report.

Photo Addendum

Silicoflex Strip Seal Joint Bridge # 1 Berlin State Highway View towards downspout before cleaning

Strip seal deformed from bond failure

14 " bond failure

