X.J.S. Expansion Joint System
Winooski, Vermont

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Reporting on Work Plan 93-R-21

State of Vermont
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Materials and Research Section

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16. Abstract

The Vermont Agency of Transportation is investigating the performance of a silicone sealant bridge joint on Bridge No. 72N, Interstate 89, in the City of Winooski. The X.J.S system uses rapid curing materials which are relatively simple to install. If successful, this system could prove to be a useful addition to the state's inventory of approved expansion joint products.

This report details the X.J.S. system and describes the installation procedures.

The product will be periodically inspected for bond strength and durability. Conclusions will be presented in update reports.

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Introduction

This investigation evaluates the performance of the X.J.S. Expansion Joint System which was installed on Interstate 89 Bridge No. 72N in the City of Winooski. The X.J.S. system is one of several bridge joint systems under study by the Vermont Agency of Transportation in an effort to rate the merits of various systems currently available.

This study was initiated because of the disappointing performance of asphaltic plug joints, where several sites developed large cracks after three years, or less, of service. Unlike asphaltic plug joints, which require hot kettles, extreme care in mixing materials, and an ambient temperature of 60° F for placement, the X.J.S. system is cold mixed, can be troweled in by hand, and may be placed at 45°F.

If successful, the X.J.S. system offers several advantages over asphaltic plug joints, and could prove to be a useful addition to the Agency's inventory of bridge expansion joint materials.

Product Description

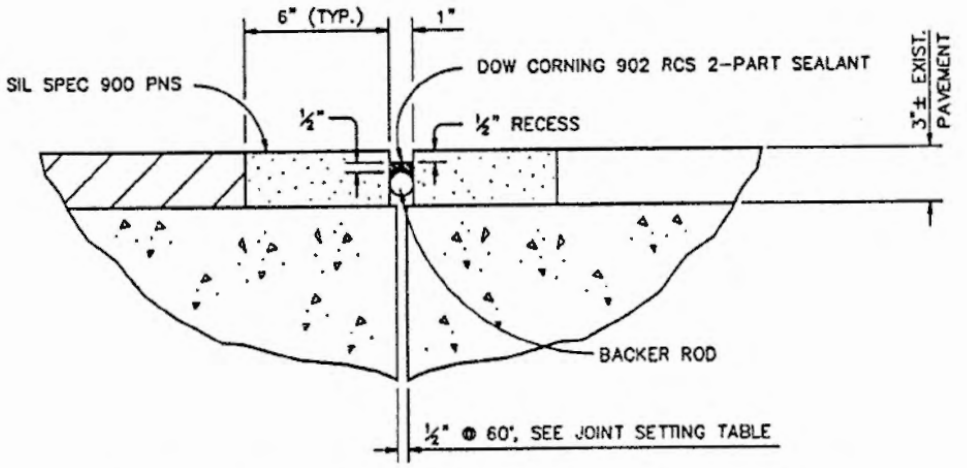
The X.J.S. Expansion Joint is a multi-component system combining products from Dow Corning Corporation and Silicone Specialties, Inc. Dow Coring manufactures the 902 RCS Joint Sealant and Prime Coat. Silicone Specialties, Inc. manufactures the Silspec 900 PNS Polymer Nosing System. In combination, these products are suitable for use in construction or rehabilitation of armor joints, T-joints, elastomeric devices, strip seals, and asphalt overlays.

Dow Corning 902 RCS Joint Sealant is a two-component, rapid curing, 100% silicone rubber which provides a high movement, waterproof seal between the two sections of nosing material. The sealant is self-leveling and requires no troweling. The components are packaged in plastic tube "sausages" which are compatible with the Albion Engineering air gun, a compressor driven application tool. The two components (base and reactor) mix when extruded and flow directly into the prepared joint. The sealant is reported to have a tack free time of 30-60 minutes at 77°F.

The Silspec 900 PNS Polymer Nosing System is a two-component liquid polymer, which when mixed with the proprietary blended aggregate, forms a polymer concrete that will bond with steel or concrete faces. The material is troweled in place and cures within 2 to 4 hours. Temperature must be 45°F and rising and all bond surfaces must be clean and free of oils and solvents. In a "neat" form (without aggregate) the polymer can be used as a protective coating for steel or as a curb sealer.

Project Description

The X.J.S. system was installed on Bridge No. 72 northbound on joints located at piers 1 and 2, as part of the Winooski-Colchester IM- DECK (31) project, Interstate 89, Exit 15. The structure is a simple girder bridge constructed in 1964, spanning 94' between piers. The concrete deck has a 3" asphalt cement overlay covering 30' between curbs. The X.J.S. joint was installed in two phases. The easterly lane was placed on July 8, 1997 and the westerly lane was placed on August 8, 1997. Design called for pier 1 to be saw cut for a 1/2" gap at 60° and pier 2 to be cut for a 1 1/2" gap at 60°.



SECTION @ EXPANSION JOINT OVER PIER 1

SCALE: 3" = 1'-0" (X.J.S. EXPANSION JOINT)

Silicone Sealant Expansion Joint Section per Plans and Specifications
Winooski -Colcherster IM Deck (31) Project
(components are shown in the attached photo addendum)

On hand to perform the application was a representative from Garvin Construction Products, the regional supplier of the X.J.S. system. Assisting in the operation was a crew from A.D. Rossi, Inc., subcontractor on the project, who did the joint preparation (cutting and sandblasting).

The installation started with cutting the asphalt pavement 6" on either side of the joint to expose the concrete deck for application of the polymer concrete. The manufacturer's technician stated that it was essential to create a 2:1 ratio of width to depth for the nosing so that a strong bond would form with the deck slab, preventing the nosing from toppling over under traffic loading.

The saw cut was sandblasted and blown clean, then polystyrene foam board was placed in the joint to act as a bond breaker. Polymer concrete was mixed in a portable drum mixer and troweled into place. After the material was troweled smooth and level with the road surface, it was covered with loose aggregate and left to cure. The material requires four hours of curing before opening to traffic, but need only be firm to touch before proceeding with preparation for the silicone sealant.

After approximately one hour of curing, the bond breaker was sawn out and removed. A beveled edge was saw cut into the nosing and then sand blasted to remove any polystyrene foam still adhering to the inside of the joint. Care was taken that the nosing was sand blasted flush with the adjoining asphalt pavement so that it would not get pulled up during plowing. Dow Corning 1205 Primer was applied and backer rod inserted into the joint to a depth of one inch.

The Dow Corning 902 RCS silicone sealant was then applied using an Albion Engineering air gun. A 1/2 inch bead of the sealant was extruded into the joint to a depth 1/2 inch from the road surface. Three pairs of the sausages were used to complete 15 feet of roadway plus the curb. After cleaning the site and packing equipment (which took roughly 45 minutes), the lane was opened to traffic. Total time for the installation was approximately 8 hours.

Material Cost

As of the date of installation, the costs of the materials were as follows:

Silspec 900 PNS Polymer Concrete	$ 45.23 /LF
Backer Rod and Primer	$ 7.00 /LF
Dow Corning 902 RCS Silicone Sealant	$ 52.00 /LF
	$104.23 /LF

Evaluation

The X.J.S. system has some obvious advantages in terms of installation. Because both the nosing and silicone sealant will bond with each other after curing, travel lanes can be done separately, maintaining traffic flow. The separate applications can then be spliced together simply by overlapping the materials.

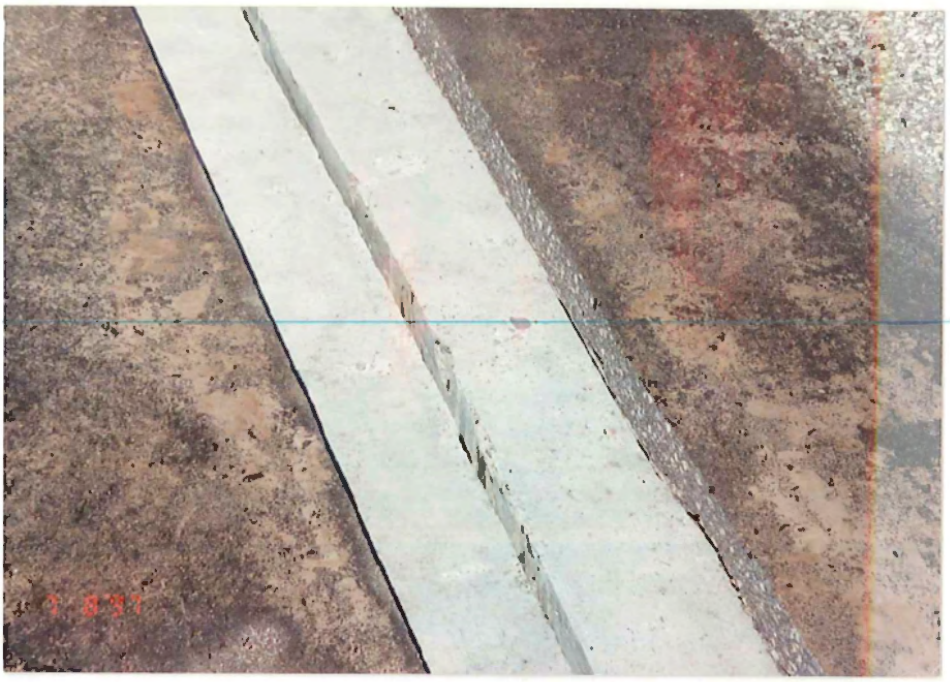
The X.J.S. system was applied on two lanes in two days. Given a curing time of four hours for the nosing material, it is likely that an experienced crew working on a less heavily traveled roadway could complete a similar two lane application in one day. The relatively fast curing time allows the roadway to be opened very soon after installation.

Equipment required to complete the installation included a portable drum mixer, compressor, and an electrical generator for hand tools. The entire operation can be completed by four trained workers.

Follow up

Periodic inspections will be made to evaluate the product's performance. An acceptable product will provide a watertight, durable seal, free from undue traffic wear, remain completely bonded, and provide good ride quality. Points of focus will be the bond between the silicone sealant and the nosing, the bond between the nosing and the bridge deck, and the overall durability of the materials. In the spring of 1998 the joint will be inspected for wear from exposure to freeze-thaw, compression, and plowing. Findings and conclusions will be reported.

Sawn pavement at
expansion joint
ready for application of
polymer concrete nosing



Polymer concrete
covered with loose aggregate
after 1 hour of curing

Applying silicone sealant