EVAZOTE 50 EXPANSION/CONTRACTION JOINT SEAL SYSTEM

FINAL REPORT 80-3
MAY 1980

REPORTING ON
WORK PLAN NO. 79-R-13

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION

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Date: Jan. 19/81

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ABSTRACT SUMMARY OF FINDINGS

On September 5, 1979, an Evazote 50 expansion/contraction joint seal system was installed at a selected site as a field demonstration project. All materials and technical assistance were furnished at no charge by the distributor. Installation procedures were exceedingly simple requiring neither special training nor equipment. Installation time was minimal. Bond formations between the substrate and Evazote 50 via the Eva-Pox bonder appeared strong. Clean-up operations were conducted quickly and with minimal effort. Furthermore, cost information supplied by the distributor indicated that the Evazote 50 system was cost competitive.

On January 31, 1980, personnel from the Materials & Research Division conducted a field inspection of the aforementioned demonstration project. After 5 month's exposure to natural environmental conditions, no noticeable deterioration in the Evazote 50 could be detected. However, visual inspection of the Evazote 50/substrate bond via the Eva-Pox bonder revealed that over 50% of the bond failed. Therefore, it must be concluded that the overall effectiveness of the Evazote 50 expansion/contraction joint seal system was greatly reduced for this installation.

LOCATION

In the City of Montpelier on Interstate 89 Southbound Bridge 42-S over US-2, Winooski River and M & B Railroad at a point 300 feet south of mileage marker 53/60.

DISTRIBUTOR'S DESCRIPTION

Evazote 50 is a closed cell, cross linked ethylene vinyl acetate material developed for use in new construction, or maintenance of concrete pavements, bridges and other structures requiring expansion-contraction joints. Evazote 50 being both cellular and elastic will operate within the range of 25% tension and 50% compression without leaking or cracking.

DISTRIBUTOR'S RECOMMENDED APPLICATION PROCEDURE

The following procedure is applicable for the preparation and use of Eva-Pox bonder and Evazote 50 in a steel nosing joint system. Slight modifications are required where other types of nosing joint systems are encountered.

All existing joint material should be removed and all areas to which the Eva-Pox bonder will be applied should be thoroughly sandblasted and blown clean. Components A and B of the Eva-Pox bonder should be thoroughly mixed individually prior to being mixed together according to either of the following mixing ratios:

Component	By Wt.	By Vol.
A	80%	78%
B	20%	22%

Component B should be mixed into Component A.

The Eva-Pox bonder can then be applied by hand using rubber gloves to both the vertical faces of the nosing joint system and the Evazote 50 material.

The Evazote 50 is then installed 1/8" below the wearing surface under slight compression. All joints in the material should be heat welded together and must be kept parallel to the wearing surface. Clean-up is facilitated with the use of methyl ethyl ketone or xylene. Any excess bonder should be removed immediately as the set up time for the bonder is rapid.

Evazote 50 is available in a wide range of standard sizes. Where joint widths vary, custom fits are available. For maintenance applications, sheets measuring 1" x 18" x 50" could be stocked, cut, and sectionally spliced as needed.

TECHNICAL BACKGROUND

At the selected site, the existing steel nosing joint system had been designed to admit the passage of water. Water which passes through the open joint is subsequently collected in a trough and discarded away from exposed surfaces of the associated pier. The Evazote 50 joint seal system was installed without modification of the in-place joint system. Therefore, complete or partial failure of the Evazote 50 system would not unduly effect the integrity of the existing joint system.

Beforehand knowledge of the anticipated or measured range of joint movement is a prerequisite for selecting the correct size of Evazote 50. According to the field representative, the Evazote 50 material should be placed in a properly prepared joint at 10-30% compression. The degree of compression is primarily determined by the ambient temperature. In high ambient temperatures, joint separation should normally be minimum requiring a compression fit of about 30%. For lower ambient temperatures,

lower percentage compression fits would be required. However, in either case, the distributor's stated limits for maximum/minimum permissible amounts of expansion and contraction for the material should not be exceeded. A design chart for determining the correct width of Evazote 50 is included as Appendix A in this report. Additional product data and cost information can be seen in Appendix B, pages 11-13.

OBSERVATIONS MADE DURING FIELD INSTALLATION

After closing the travel lane to traffic, it took State personnel approximately 30 minutes to prepare the existing joint system, sandblasting from the right-hand curbline to the center line. The Eva-Pox bonder was mixed in 5 minutes and applied to all specified surfaces in about 15 minutes. At this point in time, the unused Eva-Pox bonder started to smoke due to thermal reaction rendering the remaining material unusable.

For this section of the joint, the average separation distance was measured at one inch. Accordingly, the field representative selected a strip of Evazote 50 with the following dimensions, width = 1 1/4", depth = 1 1/2", and length = 26'. Thus, a compression fit of 25% was achieved. Ambient temperature was recorded at 75^{0} F with sunny, clear skies prevailing. Under the direction of the field representative, State personnel (2 men) began installing the Evazote 50 material starting at the right hand curb-face. The material was placed into the joint by hand approximately 1/8" below the wearing surface. Care was taken to insure that the Evazote 50 material was not installed in a stretched condition longitudinally. The material must be worked into the joint by pushing down and back toward the starting point. Since the material is elastic, placement in a stretched condition longitudinally would tend to reduce the anticipated

degree of compression fitting across the joint. Total installation time for placement of the Evazote 50 material was 15 minutes.

Clean up operations commenced immediately using methyl ethyl ketone. At the request of the field representative, all excess Eva-Pox bonder was removed from the exposed surface of the Evazote 50. If the Eva-Pox bonder is allowed to set up (45 minutes), it becomes rigid and tends to minimize the flexibility of the Evazote 50. Clean-up operations were completed in 30 minutes. The travel lane was open to traffic 1 hour later.

A similar installation procedure was followed for the passing lane. Joint separation distances were considerably more varied ranging from 1 inch to 1 3/8 inches. Accordingly, a strip of Evazote 50 with the following dimensions: width = 1 5/8", depth = 1 1/2", and length = 26', was selected by the field representative. An in-field splice was performed with a heating iron set at 400^{0} F. The ends of the two individual sections were held on the heating iron for 7-10 seconds, removed, and held pressed together for 20-30 seconds. A sound joint was achieved. Installation time was reduced as State personnel developed a familiarity for the Evazote 50 system. However, it was observed that the material had been stretched longitudinally 12$\pm$ inches. It was later determined that a force applied inadvertently away from the starting point was the cause.

FOLLOW-UP INSPECTION TO MONITOR PERFORMANCE

On January 31, 1980, personnel from the Materials & Research Division conducted an on-site inspection of the Evazote 50 demonstration installation project. The inspection program consisted of measuring joint separation

distances at selected points, photographing selected sections of the installation, and evaluating (visual observation) performance according to criteria outlined in Work Plan No. 79-R-13.

The following measurements were recorded:

1) Joint separation distance for the travel lane increased by 25% (1" to 1 1/4" - single measurement).

2) Joint separation distance for the passing lane increased by an average of 20% (average of six measurements).

3) Measurements were recorded at 9:00 AM under clear skies (Temp. = 0^{o} F)

Criterion B: "Determine material's ability to reject foreign material from exposed surfaces."

After 5 month's exposure to natural environmental conditions, no noticeable deterioration in the Evazote 50 could be detected. No cuts, tears, or loss of Evazote 50 material were observed.

Criterion D: "Determine adequacy of joints formed between individual sections of Evazote 50."

The single fabricated joint showed no signs of distress or failure.

Criterion C: "Determine adequacy of the Evazote 50/substrate bond."

Visual inspection of the Evazote 50/substrate bond revealed that over 50% of the bond failed. Photograph #1 (Page 9) illustrates that the Evazote 50 material separated from the steel facing plates in an alternating pattern longitudinally along the bond (i.e. separating from one side for several inches and then from the other side for several inches).

Photograph #2 (page 9) illustrates that complete separation occurred (i.e, the ruler has been inserted down thru the gap between the steel nosing and the Evazote 50). The Eva-Pox bonder did not adhere to the steel facing plates.

Criterion E: "Determine response to adverse substances."

Salt treatment during the aforementioned time period was minimal. No other adverse substances were detected during the inspection. Therefore, valid conclusions with regard to Criterion E can not be made.

Criterion A: "Determine water absorption and/or intrusion characteristics."

Valid conclusions with regard to Criterion A could not be reached because of the Evazote 50/substrate bond failure described earlier.

Criterion F: "Determine effect on future performance if portions of the installation become partially damaged."

Since over 50% of the Evazote 50/substrate bond failed, it must be concluded that the overall effectiveness of the Evazote 50 expansion contraction joint seal system was greatly reduced for this installation. Furthermore, no corrective action short of complete replacement will rectify the situation.

SUMMARY OF FINDINGS

Installation of the Evazote 50 joint seal system was performed quickly with only minor difficulties. The mixing of the Eva-Pox bonder is the most critical aspect of the entire installation. Only the correct amount should be mixed as unused material must be wasted. State maintenance personnel indicated that the bonder was easy to apply, but expressed concern over the heat generated by the epoxy mass. Mixing in a flat shallow pan (as opposed to the gallon container used on this installation) would extend the pot life by reducing excessive generation of heat during mixing.

Installation of the Evazote 50 material was facilitated by the lubricating effect of the Eva-Pox bonder. However, in sections with a low percentage of compression fit (due primarily to the variability of joint separation distance) some difficulty was experienced in keeping the Evazote 50 material from sliding down into the joint. An inspection of the joint system on January 31, 1980, revealed that the Evazote 50 had separated from the steel plates along over 50% of the contact area.

Although the joint separation distances measured at the time of inspection did not exceed the manufacturer's stated limit of 25%, it must be realized that maximum joint separation may not have occured at that date. The exact cause of the bond failure was not determinable. However, the adequacy of the Eva-Pox bonder in applications such as this demonstration project is questionable.

RECOMMENDATION

Although Evazote 50 displayed promising characteristics as a joint seal material, further use of the system would only be recommended following modifications in the bonding agent used with the material.

Evazote 50 separated from the steel plates in an alternating pattern.

Evazote 50 separated from the steel plate for the full depth of the material.

E-Poxy Industries, Inc.
EVAZOTE, PLASTAZOTE, EPOXIES
14 WEST SHORE STREET, RAVENA, NEW YORK 12143
518-756-6193

GUIDE FOR DETERMINING WIDTH FOR EVAZOTE JOINT SYSTEM

MINIMUM Joint Opening (Inches)	MAXIMUM Joint Opening (Inches)																
	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2
1/2	1/2	3/4	1	1													
3/4		3/4	1	1 1/4	1 1/2	1 1/2											
1			1	1 1/4	1 1/2	1 3/4	2	2	2								
1 1/4				1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 1/2	2 1/2						
1 1/2					1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3	3	3			
1 3/4						1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 1/2	3 1/2	3 1/2	
2							2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4	4
2 1/4								2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2
2 1/2									2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2
2 3/4										2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2
3											3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2
3 1/4												3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2
3 1/2													3 1/2	3 3/4	4	4 1/4	4 1/2
3 3/4														3 3/4	4	4 1/4	4 1/2
4															4	4 1/4	4 1/2

NOTE 1 The above table is intended to be a guide for determining the width of material required based on the anticipated or measured range of joint movement. Other factors, such as time of installation and type of application, may affect joint size recommendation to facilitate the installation. (i.e., material should be installed under 15% to 25% compression)

NOTE 2 Once the width is determined, the depth should approximate the width (i.e., 2" width should have a 2" depth) EXCEPTION: Hydrostatic head--general rule: Depth three times (3 X) the width.

NOTE 3 Width dimensions not contained in the above chart may be obtained by contacting E-Poxy Industries, Inc.

APPENDIX - B

PRODUCT INFORMATION

DISTRIBUTOR

Epoxy Industries, Incorporated
14 West Shore Street
Ravena, New York 12143

FIELD REPRESENTATIVE

Stanley Zosite
Account Manager
Epoxy Industries, Incorporated
Phone: (518)-756-6193

COST INFORMATION (9/79)

1) Evazote 50

Size 1" x 1" = $1.33/LF
Size 2" x 2" = $4.77/LF

Other dimensional sizes are available including custom fits for special applications and sheets (1"x18"x50") for maintenance applications. Approximate costs can be determined by volume comparisons using prices quoted above.

2) Eva-Pox Bonder

1 Gal. Comp. A
1 Qt. Comp. B
Combined Price = $29.80

One quart of component B mixed with one gallon of component A is sufficient material to install 120 LF strip of 1"x1" Evazote 50. Application rates will vary for other sizes of Evazote 50.

evazote 50®

Physical properties of **evazote 50,** a closed-cell, foamed, cross-linked ethylene vinyl acetate

Introduction

This technical information sheet details the physical properties of EVAZOTE 50 closed-cell, foamed, cross-linked ethylene vinyl acetate / low-density polyethylene copolymer, capable of handling movement of 50% Compression, 25% Tension.

Grades

PO71 White. PO72 Gray. PO74 Blue. PO81 Orange.

Dimensions

Nominal sizes ½" x ½", ¼" x ¾", ¾" x ¾", 1" x 1", 1" x 2", 2" x 2", 1" x 12", 1" x 18", 2" x 12", 2" x 18", 4" x 3", 4" x 4"

Density

2.61 - 3.43 lbs / Ft^3

Solids content

100%

Tolerances

Length and width: 4%-2% (corners of sheets may not be square)
Thickness .12" to .24" + 15%-5%
Thickness over .12" + 10%-2%
Sheets with process skin intact: + 10%-2%

Compression set on samples 1" thick (average figures)

20% compression for 48h at 68°F; ½h recovery, 13%
40% compression for 70h at 68°F; ½h recovery, 16%

The degree of compression set is dependent on the time under compression, degree of compression, temperature, and recovery time. The values quoted apply to the conditions of test. The Evazote material is bonded to the substrate with Eva-Pox adhesive and therefore does not rely on its memory-recovery capabilities to maintain a watertight seal.

Maximum static loading at room temperature

15.40 lbs/½ psi

Lowest recommended working temperature -94°F

Highest continuous temperature resistance 160°F

Modulus of elasticity in compression

825 Kn/m^2 = 119.66 psi
Loading range 2.17 - 7.98 $lb./in^2$ 27.58 $lb./in^2$
Loading range 10.16 - 20.32 $lb./in^2$

Water vapor transmission

At 100°F and 1-95% Relative Humidity
Gradient is .04502/Ft^2/24HR/2in.

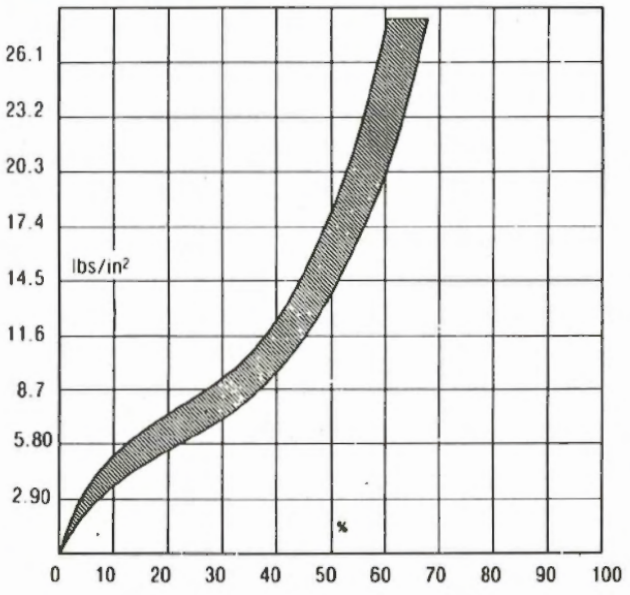
Water absorption after 6 weeks' total immersion

3% vol/vol

Tensile strength 345 kN/m^3 = 50 lb/in^2

Elongation at break 200%

Compression/deflection



e-poxy industries, inc.
Epoxies, Joint Seals, Membranes, Evazote
14 West Shore Street, Ravena, New York 12143 (518) 756-6193

Power factor 0.003 at 1 Mc/s: 0.004 at 16 Mc/s

Weathering After 5 years' exposure to natural environmental conditions no noticeable deterioration occurs.

Chemical resistance Resistance to common acids and alkalis. Concentrated oxidizing acids may cause some deterioration. Moderately resistant to lubricating oil. Light hydrocarbon solvents generally cause swelling, which in the case of aromatic and chlorinated hydrocarbons can be severe.

Storage life Indefinite.

Durability 10 years in exposed applications. Indefinite in buried joints.

UV Resistance Excellent.

K Factor
.25 to .32

Adhesives for foamed plastics

Introduction

This information is intended to give a general guide to types of adhesives and their uses.

General recommendations

Two basic types of adhesive have been found suitable for EVAZOTE and PLASTAZOTE. These are the heat-weld method and the epoxy resin adhesive method.

General use of adhesives

- Eva-Pox Bonder

Preparation of surfaces to be bonded

If an adhesive is to perform its function efficiently, it must completely cover the joint surfaces.

A good bond can be achieved only if the surfaces are perfectly clean. It is important in all cases that grease, oil and loose surface deposits are removed before using adhesives.

Techniques for use

Where necessary, mix the parts together thoroughly. Apply by brush or scraper or other recommended means to one or both surfaces, depending on the substrate. Leave for the recommended open time. Bring the surfaces together and apply pressure.

The table below indicates various adhesives recommended for bonding our products to different materials.

Substrate	EVAZOTE	PLASTAZOTE
Itself	1	1
Metal	2	2
Wood	2	2
Concrete	2	2
Other Substrates - please contact Epoxy Industries	3	3

Adhesive Code

1. Heatweld
2. Eva-Pox Bonder
3. E-P Specialized Applications; brass, zinc, aluminum, fiberglass, etc. must be approved by E-poxy Industries Inc.

Distributed By

Prepared By: R. Blanchette
Date: Sept. 4, 1979
Sheet 1 of 2

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION

PRODUCT EVALUATION

Work Plan No. 79-R-13

Product Evazote 50 Joint Seal System

Manufacturer Information not available

Distributor or Representative Epoxy Industries, Inc.
14 West Shore St.
Ravena, New York 12143

Evaluation Requested By In House Date

Date Evaluation Required Date Product Information Received April 1978

Date and Quantity of Samples Received N/A

Purpose of Evaluation To ascertain the effectiveness of Evazote 50 as a watertight expansion/contraction joint system. Installation Location: I 89 SB/US 2 and Winooski River (MM 53/40*) BR. #42S.

Proposed Tests Evaluation Outline

I) Observe and record key points of the installation process:

A) Preparation of existing structure.

B) Workability of the Evazote 50 material, epoxy resin and/or epoxy bonder individually and as an integral system.

C) Manpower requirements, time necessary to complete the project, unanticipated problem areas, clean-up procedures.

D) Sociotechnical effects due to the installation (i.e. Impedance of normal traffic flow-how severe, etc.)

(con't. on next page)

Proposal Discussed With R. Frascoia Projected Manpower Requirements 1 manday-field obs. 3 manday-RPT Prep.

Evaluation To Be Conducted By R. Blanchette

Proposed Starting Date Sept. 5, 1979 Estimated Completion Date May 1, 1981

Approval/Disapproval by Materials Engineer R. H. Nicholson 12/14/79

Comments by Materials Engineer

II) Practical Features Subject to Consideration:

A) Availability of material (color and dimensions)
B) Cost information.

1) Cost per individual item (Evazote 50, Epoxyresin, Epoxy Bonder, etc.)

2) Cost per integral system.

C) Any special installing equipment? If so, cost and where available.

III) Follow-up Periodic Inspections to Monitor Performance:

A) Determine water absorption and/or intrusion characteristics.
B) Determine material's ability to reject foreign material from exposed surface.
C) Determine adequacy of Evazote 50/substrate bond.
D) Determine adequacy of joints formed between individual sections of Evazote 50.
E) Determine material response to adverse substances.
F) Determine effect on future performance if portions of installation become partially damaged.