EXPERIMENTAL USE OF REINFORCED CRACK SEALING SYSTEM ON ROUTE 14, SOUTH BARRE, VERMONT

INITIAL REPORT 85-2
January, 1985

REPORTING ON WORK PLAN 83-R-32

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION

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Date: 02-04-'85

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ABSTRACT

Approximately 740 linear feet of Owens Corning Roadglas crack repair system was placed on a portion of the Williamstown-Barre RS 0147(10) paving project. The experimental product was placed beneath the bituminous concrete overlay in the southbound lane of Vermont Route 14 between milemarker 1.70± and 2.00± in the town of Barre on October 3, 1983. This roadway had severe transverse cracking due to a pavement structure which included Portland Cement concrete roadway. The experimental system was applied, utilizing District forces familiar with crack filling procedures. No significant problems were encountered with the placement.

Mays Ride Meter readings taken on the project after construction averaged 71 inches/mile on the southbound lane (experimental system) and 61 inches/mile on the northbound lane.

Crack survey results through 10 months of service show a reflection rate of 13% for the cracks treated with Roadglas, 47% for cracks treated with the standard crack filler meeting Federal Specification #SS-S-001401, and 61% for untreated cracks.

INTRODUCTION

The Vermont Agency of Transportation was offered, at no cost, 800 linear feet of Roadglas with sufficient Roadbond Binder and the assistance of an Owens Corning field representative for a field evaluation. With the cooperation of the local bituminous concrete producer, Cooley Asphalt Paving Corporation, the experimental system was placed prior to paving on September 10, 1983.

This report describes the observations during placement of the experimental system and performance during the first 10 months of service.

PRODUCT INFORMATION AND APPLICATION PROCEDURES PROVIDED BY SUPPLIER (ABRIDGED)

Roadglas system for spot repair consists of two components: Roadglas high strength reinforcement and Roadbond binder.

The Roadglas system is an engineered repair system combining the high strength of Roadglas reinforcement with the elastomeric properties of asphalt polymer. Together this combination protects new overlays from reflective cracking.

The Roadglas system is applied only where needed - in areas of localized distress. It can often lower first costs by reducing the need for excavation. No highly specialized equipment is required and disruption of traffic is reduced.

Roadglas reinforcement is a high strength fiberglass fabric that overlaps the crack. Roadbond binder, a compatible asphalt polymer, provides a tough, flexible interface with high bonding strength to base and overlay. This two-component system performs in a wide variety of temperature conditions and provides a non-tracking, non-bleeding, low-tack surface of exceptional durability.

Heating of Roadbond binder is similar to the standard crack filler. The material comes in plastic bags which will safely melt in the kettle without affecting the binder.

Preparation and application involves removing dirt, gravel, grass, etc., from cracks by sweeping or, preferably, blowing with compressed air.

The apron area must be free of dirt and must be dry for a width exceeding reinforcement fabric width by several inches. Note: PCC pavements retain moisture longer than bituminous concrete pavements. Both ambient and pavement temperatures must be above 40°F. When weather is overcast or windy, ambient temperature should be above 50°F to allow reinforcement placement

while binder is still molten.

Using a bucket, fill cracks to slightly above level with 375°F ± 25°F Roadbond binder. Squeegee immediately. An "apron" should be provided on either side of the crack or joint, two or three inches wider than the Roadglas reinforcement being used.

Immediately lay desired width of Roadglas reinforcement on the molten binder the length of the crack, centered on the crack as closely as possible, before the binder has set. Avoid wrinkling.

Apply additional Roadbond binder on top of the fabric and cover completely, using a squeegee.

COST INFORMATION

Cost of materials quoted in October of 1983 F.O.B. Montpelier, Vermont was $1.20/linear foot for the 12 inch wide reinforcement and $2.00/linear foot for the 24 inch wide reinforcement. The price includes Roadbond binder but does not include labor.

PROJECT DESCRIPTION & ROADWAY CONDITION

The RS 0147(10) overlay project consisted of two sections in the towns of Williamstown & Barre on Vermont Route 14. The

experimental test area is located in Section II of the project between MM 1.686 and MM 2.319 in the town of Barre. The test area is shown on the Location Map on page 6.

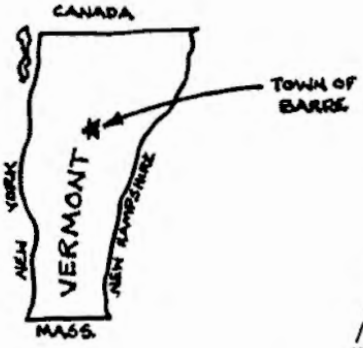
The existing roadway in the area of the test section was constructed in 1931 of Portland Cement concrete. Additional overlays have been placed including 1 1/2 inch in 1953, 3/4 inch in 1961, 1/2 inch in 1972 and 1 inch in 1976. The average daily traffic for this section of Vermont Route 14 in 1984 was 7750 with 7% consisting of truck traffic.

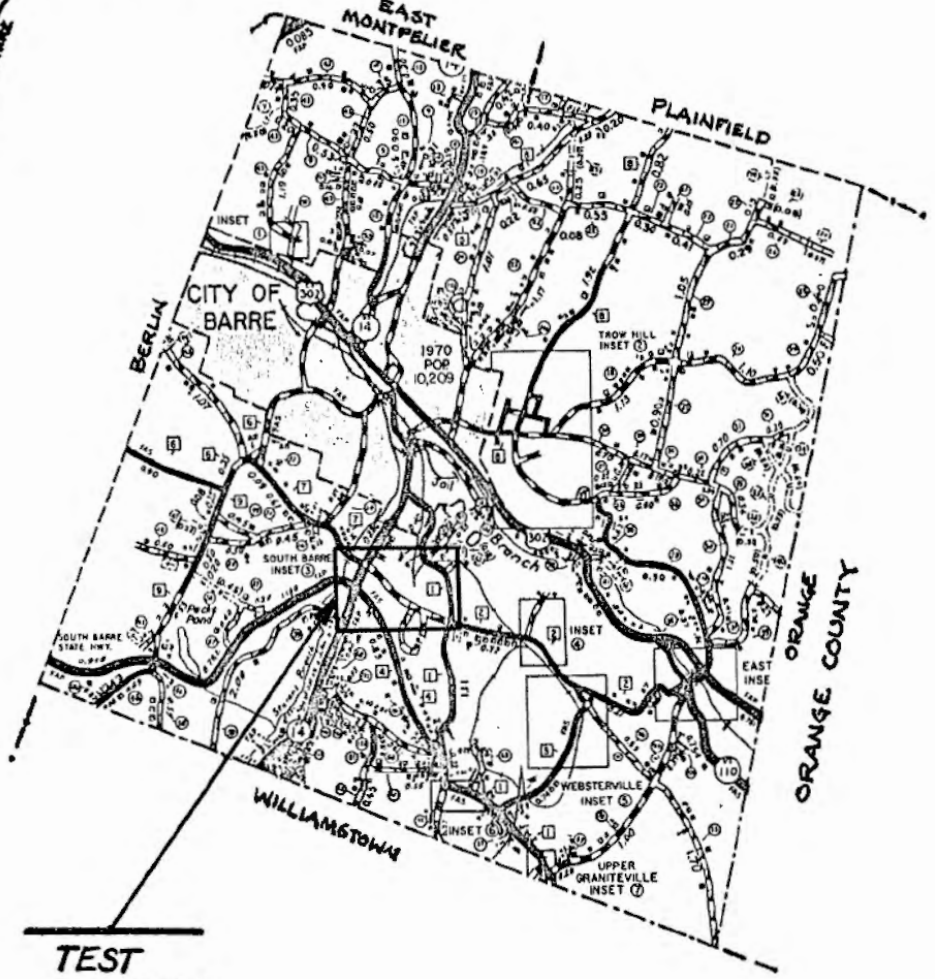
Detailed crack counts were made over an area of 1000 feet in length approximately three weeks prior to paving the roadway. Cracks within the test area totaled 2351 linear feet. Approximately 79% of the cracks were longitudinal and 21% were transverse. The crack pattern revealed the rectangular shape of the underlying Portland Cement concrete roadway with many full width transverse cracks present. See Plan View Sketch on page 11.

Each of the full width transverse cracks were numbered from 1 to 20 north to south and given the letter designation "T" in the test section.

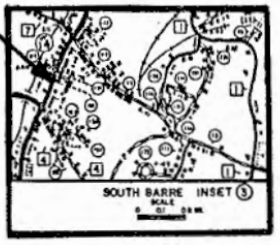
Examples of typical transverse cracks are shown in the following photographs. The photos were taken in September of 1983 prior to application of any treatment and represent the existing condition of the roadway.

LOCATION MAP





TEST AREA



OWENS CORNING ROADGLAS
SPOT REPAIR SYSTEM

WILLIAMSTOWN - BARRE
RS 0147(10) RTE. 14

TOWN OF BARRE
GENERAL HIGHWAY MAP

0.5 0 1 MILE
SCALE APPROX.

WASHINGTON COUNTY
VERMONT

RESEARCH & DEVELOPMENT

Photo #1 - shows a typical full width transverse crack prior to treatment with 24 inch wide fabric.

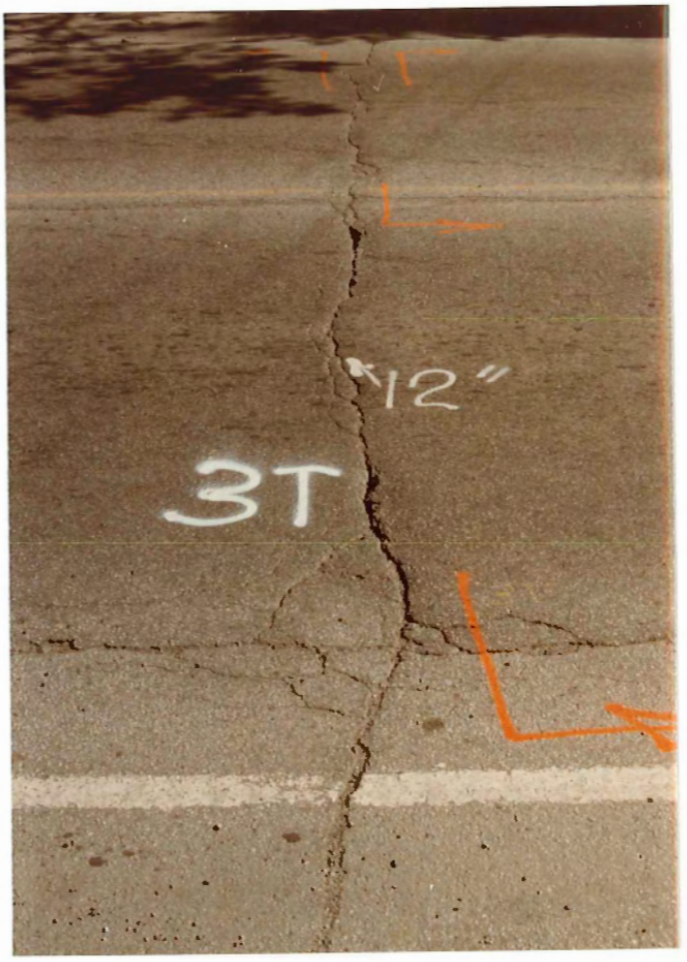


Photo #2 - shows a typical full width transverse crack prior to treatment with 12 inch wide fabric.

Note: Unless otherwise noted, all photos in this report were taken from the shoulder of the southbound lane.

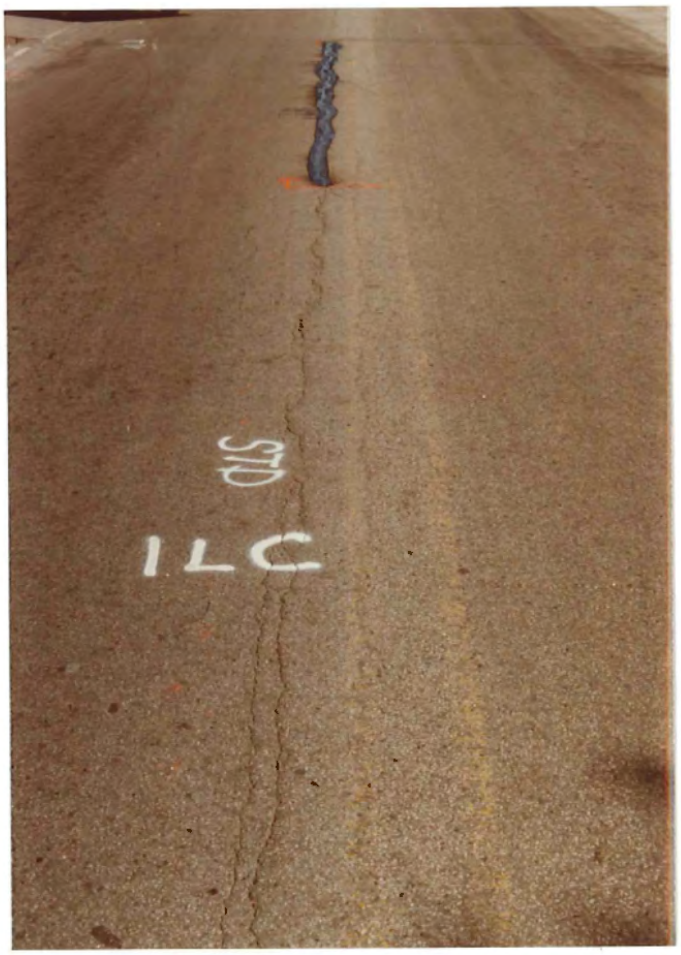


Photo #3 - Example of longitudinal crack prior to treatment with standard crack filler.

Note: This photo was taken while standing on centerline.

There were two longitudinal cracks approximately nine feet apart for the full length of the test section. Each of the longitudinal cracks were labeled in a similar manner to the transverse cracks. Letter designation consists of "LC" and "LR" which stands for longitudinal-center and longitudinal-right. The longitudinal-right, designates the crack located near and parallel to the edge line of the southbound lane. A numerical designation was also given to each set of longitudinal cracks between two transverse cracks. For example, between transverse cracks 1T and 2T the longitudinal cracks are labeled 1LC and 1LR etc. An example of the longitudinal crack along centerline is shown above.

Both the transverse and longitudinal cracks had some adjacent parallel cracking surrounding the main cracks, these cracks were not included in the crack count.

APPLICATIONS & INITIAL OBSERVATIONS

Standard crack filler meeting Federal Specification SS-S-001401 was applied under clear skies with a pavement surface temperature of 40°F and rising on September 29, 1983. A District crew of seven men applied the material (two men were utilized for traffic control) using a Crafco Crack Sealer machine. Material was extruded through a hose and wand attached to the kettle, into the cracks and then leveled with a small metal squeegee. Standard procedures were used, including cleaning of cracks with forced hot air using a high power propane torch. Traffic was kept off of the crack filler for approximately 30 minutes so the material could set up enough to prevent vehicles from tracking it. Cracks which received treatment were pre-selected and spaced along the test section, allowing room for the experimental feature. A total of four transverse cracks and eleven longitudinal cracks were treated with standard crack filler.

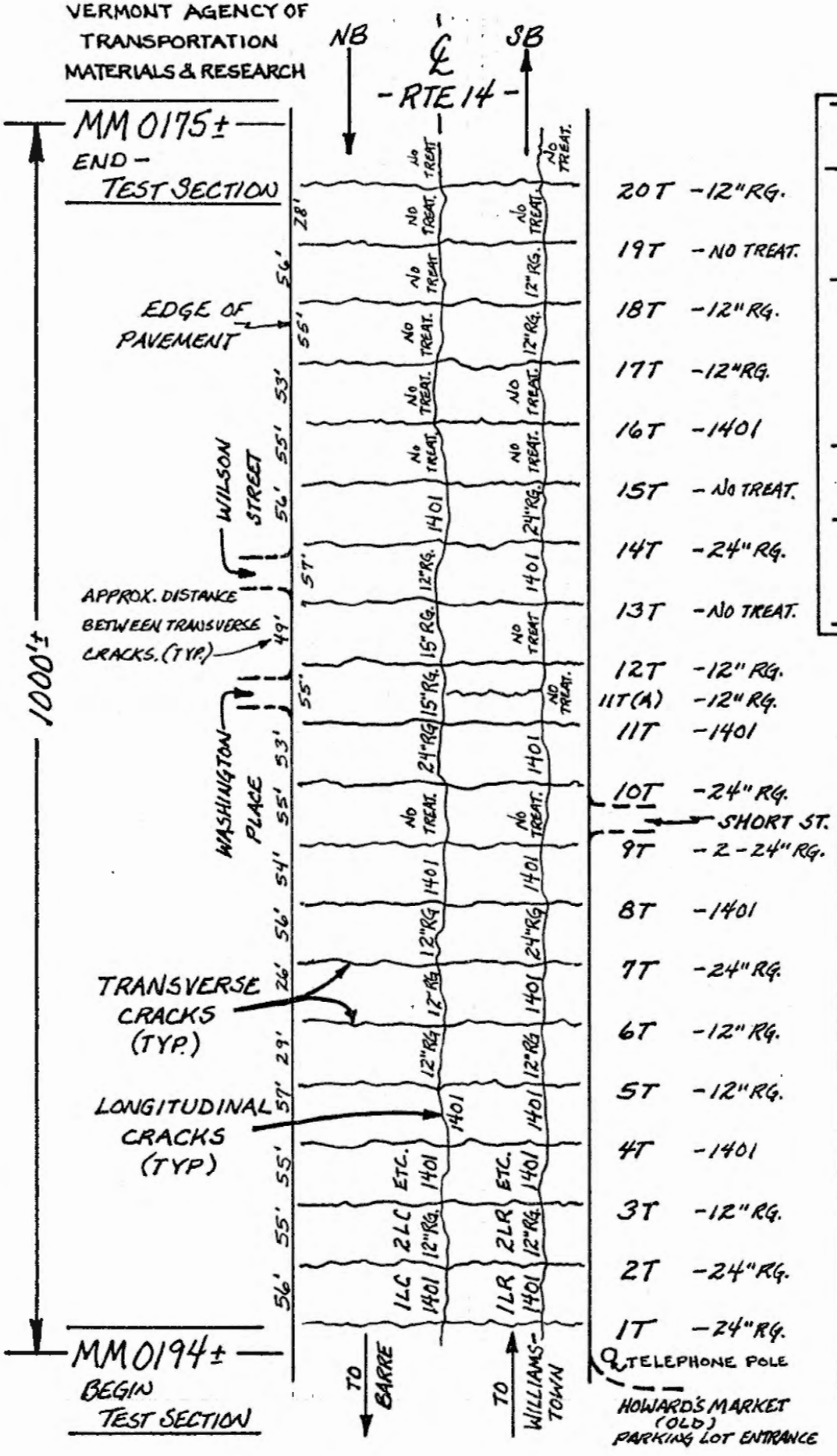
The application of the Owens Corning Roadglas System took place on October 3, 1983 and was performed as directed by Richard E. Ainsworth, P.E., a representative of Owens Corning Fiberglas Corporation. A Crafco Crack Sealer machine was used to heat and apply the material. To accomodate the more viscous Roadglas Binder material, a larger diameter wand tip was needed and installed.

Nine men were utilized for the application. This was two more than were required for the standard crack filling operation. The two additional men were needed to cut and place the Roadglas reinforcement fabric. Special squeegees had been made as requested by Mr. Ainsworth; they consisted of a wooden broom handle with a 12 inch wide rubber squeegee attached.

Pavement surface temperature was 54°F and rising, skies were overcast with heavy fog and relative humidity was 74%. Mr. Ainsworth commented that the cooler temperatures and lack of sun causes the Roadglas to set up very quickly and the crew would have to work faster in order to prevent premature set of the binder. Therefore, several Roadglas strips were pre-cut for the first cracks to be treated. With a roadway width of 24 feet, it was decided to treat 13 feet of each transverse crack in the southbound lane extending the treatment one foot over the centerline into the northbound lane. This was done so that the material would extend approximately one foot beyond the width of the mat after one pass with the paver. The northbound part of the transverse crack would be left untreated for a side-by-side comparison.

VERMONT AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH

BY: E.C. Houston
DATE: 1/85



LOCATION OF TREATMENTS

- PLAN VIEW -
- SKETCH -
NOT TO SCALE

- EXPERIMENT: OWENS CORNING ROADGLAS SPOT REPAIR SYSTEM AS COMPARED TO STANDARD TREATMENT AND NO TREATMENT.
- LOCATION: VERMONT RTE. 14 IN SOUTH BARRE
- PROJECT: WILLIAMSTOWN - BARRE RS 0147 (10).

ALL ROADGLAS TREATMENT OF TRANSVERSE CRACKS IS IN SOUTH-BOUND LANE ONLY.

- LEGEND -

10T - NUMBER DESIGNATION "T" = TRANSVERSE CRACK

7LC - NUMBER DESIGNATION "LC" = LONGITUDINAL CRACK ALONG CENTER LINE.

4LR - NUMBER DESIGNATION "LR" = LONGITUDINAL CRACK ALONG RIGHT SIDE OF LANE

12" RG - WIDTH IN INCHES OF 24" & 15" ROADGLAS APPLIED TO CRACK.

1401 - STANDARD CRACK FILLER

NO TREAT - CRACK DID NOT RECIEVE ANY TREATMENT.

NOTE: IN SOME CASES TREATMENT OF LONGITUDINAL DOES NOT RUN FULL LENGTH OF CRACK.

RESEARCH & DEVELOPMENT
1985

The Roadglas reinforcement was supplied in 12 inch and 24 inch widths. Mr. Ainsworth directed the use of the varying widths with the 24 inch used on the locations with multiple parallel cracks, making for a wide area of cracking. The 12 inch was used on single cracks or small sections of parallel cracks which did not exceed approximately half the width (6 inch). One location required two 24 inch pieces side by side.

The Roadbond binder was placed on the roadway before laying down the Roadglas and a second coat covered the reinforcement. Each coating was extruded in an "S" pattern, crossing back and forth over the crack. The binder was then squeegeed evenly over the area being treated to form a uniform surface two to three inches wider than the Roadglas reinforcement. A total of 14 transverse cracks and 12 longitudinal cracks were treated with Roadglas fabric. There were 3 transverse cracks and 15 longitudinal cracks which did not receive any treatment.

The treatment was allowed to cure for approximately 30 minutes before traffic was allowed to drive over it. Paving began in the area of the first treatment approximately two hours after it had been placed. The paving crew eventually caught up to the crack repair operation and had to stop in order to allow the Roadbond binder time to set up.

During the rolling operation distress in the form of bumps occurred at seven locations. All were located over transverse cracks, six in the southbound lane and one in the northbound. It is unclear as to

why this problem occurred. A possible explanation may be that, as the roller crossed over the transverse cracks, the hot mix apparently would not adhere to the smoother treated surface. This caused a build-up of hot mix in front of the roller, then, when the mix cam in contact with the rougher texture of the existing pavement, the mix would grab and stop, causing a humped effect. The worst of these was at 16T, which was treated with standard crack filler where a bump approximately one foot wide and one inch high formed across the southbound lane. Of the six remaining locations with distress, four had been treated with Roadglas, one with standard crack filler, and one did not have any treatment. The latter occurred in the northbound lane. The photograph below shows distress at two locations, one with the standard crack filler treatment and one with Roadglas treatment. The picture was taken approximately 20 minutes after rolling.

Photo #4 - shows an example of the problems encountered during the rolling operation.

POST CONSTRUCTION OBSERVATIONS

The project has been surveyed for reflective cracks three times since it was completed. Results can be seen on the crack summary charts below:

CRACK SUMMARY CHARTS

ALL CRACKS				
CHART #1 TYPE	8/17/83 PRECONSTRUCTION (LINEAR FEET)	1/26/84 % REFLECTION	3/21/84 % REFLECTION	8/8/84 % REFLECTION
Roadglas	723	7%	11%	13%
Standard Crack Filler	597	14%	47%	47%
No Treatment	1031	23%	25%	61%

TRANSVERSE CRACKS ONLY				
CHART #2 TYPE	8/17/83 PRECONSTRUCTION (LINEAR FEET)	1/26/84 % REFLECTION	3/21/84 % REFLECTION	8/8/84 % REFLECTION
Roadglass	172	28%	44%	49%
Standard Crack Filler	90	89%	91%	91%
No Treatment	230	87%	95%	95%

LONGITUDINAL CRACKS ONLY				
CHART #3 TYPE	8/17/83 PRECONSTRUCTION (LINEAR FEET)	1/26/84 % REFLECTION	3/21/84 % REFLECTION	8/8/84 % REFLECTION
Roadglas	551	1%	1%	2%
Standard Crack Filler	507	1%	1%	39%
No Treatment	801	4%	4%	51%

There are several locations where transverse cracks treated with Roadglas have not reflected through and the opposite lane is cracked to or near the centerline as can be seen in the photograph below.

Photo #5 - example of Roadglas performing well. Crack was treated with 12 inch Roadglas.

At the locations where Roadglas treated cracks have reflected through, the cracks are significantly tighter than the opposite lane, but in most cases do not run the full width of the lane. The transverse

cracks with standard crack or no treatment, have reflected through for the full width of the lane. The following photographs show examples of performance after 5 months of service.

Photo #6 - Roadglas has reflected through but crack is tight and does not run full width of the lane. Crack was treated with 12 inch Roadglas.

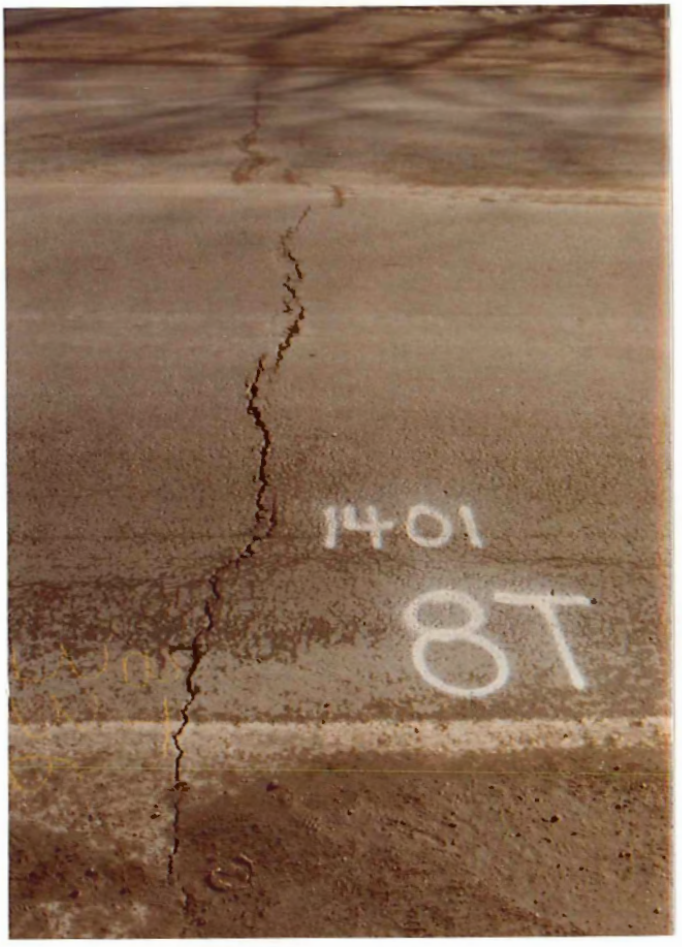


Photo #7 - Standard Crack filler failure.

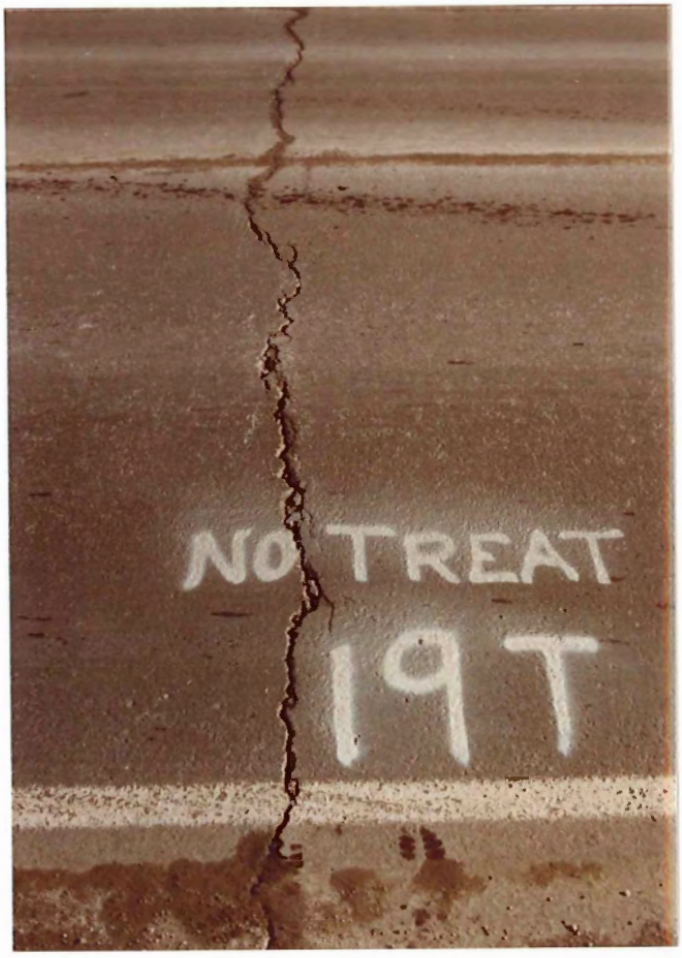


Photo #8 - Example of untreated crack - failure.

On August 8, 1983 and October 13, 1983, a Mays Ride Meter surface tolerance run was made over the project area. Readings in inches per mile for the test section were as follows:

LANE		PRECONSTRUCTION 8-8-83	POST CONSTRUCTION 10-13-84
Control	(NB)	131"	61"
Experimental Treatments	(SB)	84"	71"

The higher readings in the southbound lane are no doubt due to the bumps which formed during the rolling operation. These areas flattened only slightly in the wheel paths after exposure to traffic.

SUMMARY

Field surveys conducted through the first eleven months of service reveal the following results:

1) Roadglas has been effective in suppressing reflection of longitudinal cracks.

2) Roadglas has demonstrated marginal performance in preventing reflection of transverse cracks. It should be noted that the conditions are among the most severe that could be encountered due to the underlying Portland Cement concrete roadway design.

3) Transverse cracks which have reflected through the Roadglas system are significantly tighter than cracks treated with the Standard 1401 and the untreated cracks.

4) Roughness values were higher than expected, due in part to distress (bumps) which developed over some of the treated cracks in the experimental section.

FOLLOW UP

The long term performance of the experimental reinforced crack sealing system will continue to be monitored with emphasis on the following areas:

- reductions in reflective cracks
- retention in ride values

Prepared By: R.I. Frascoia
Date: July 21, 1983

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION

WORK PLAN FOR CATEGORY II EXPERIMENTAL PROJECT

REINFORCED CRACK SEALING SYSTEM

WORK PLAN 83-R-32

OBJECTIVE OF EXPERIMENT

To evaluate the performance of a reinforced crack sealing system in preventing reflective cracking and related surface distress in a bituminous pavement placed over a P.C. concrete base.

PROJECT

Williamstown-Barre RS 0147(10)

PROJECT LOCATION

On Section II of the Williamstown-Barre project, Vt. Rte. 14 beginning at MM 1.686, the intersection with Route 63, and extending northeasterly 0.633 miles to MM 2.319, the Barre City line.

EXPERIMENTAL WORK LOCATION

The experimental material shall be applied over 1300 linear feet of cracks at test locations to be selected by Materials & Research and Maintenance personnel.

MATERIALS TO BE USED

The Roadglas Spot Repair System manufactured by Owens-Corning Fiberglas Corp., Highways Systems, Box 415, Granville, Ohio 43023. New England Office phone (203) 243-8936.

APPLICATION PROCEDURE

Application of the spot repair system shall be as recommended by the manufacturer.

CONTROL SECTION AND TREATMENT

The control section shall consist of areas adjacent to the test section which will be treated with standard crack filler and also areas left untreated.

COST

Materials for the test installation will be donated by Owens-Corning Corporation. The estimated cost for materials is $1.20 per linear foot which includes 12 inch wide, 24 ounce per square yard fiberglas and polymer asphalt binder. The application shall be made by District 6 maintenance forces.

DATE OF INSTALLATION

Prior to October 15, 1983.

DURATION OF STUDY

The project will be evaluated for the length of time required to obtain valid conclusions on the performance of the material.

SURVEILLANCE

The experimental project will be monitored at least twice a year for the duration of the study. The long term performance of the treated section will be compared with that of the control areas with emphasis on the following areas:

1) Reductions in reflective cracking

2) Retention of initial ride values

REPORTS

An initial report covering the application and initial observations, and a final report showing conclusions on the effectiveness of the experimental material, shall be submitted to the Federal Highway Administration.

Materials Division
Agency of Transportation
July 26, 1983

Reviewed By:
R. F. Nicholson
R. F. Nicholson, P.E., Materials Engineer
Date: July 27, 1983

Approved FHWA 9-6-83