

**ASPHALT CEMENT CONCRETE
LONGITUDINAL JOINT ADHESIVE
CRAFCO PN 34524
(IOWA DOT NEW PRODUCT C-98-7)**

**Construction Report
for
Iowa DOT Research Project
HR-2084**

March 2000

Highway Division



**Iowa Department
of Transportation**

**Asphalt Cement Concrete
Longitudinal Joint Adhesive
Crafco PN 34524
(Iowa DOT New Product C-98-7)**

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**By
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March 2000

TECHNICAL REPORT DOCUMENTATION PAGE

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Longitudinal Joint Adhesive
Crafco PN 34524
(Iowa DOT New Product C-98-7)

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5. AUTHOR(S)

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7. ACKNOWLEDGMENT OF COOPERATING ORGANIZATIONS

8. ABSTRACT

The joint between two lanes of asphalt pavement is often the first area of a roadway which shows signs of deterioration and requires maintenance. As the final lift of hot asphalt is being placed in a construction project, it is being forced up against the adjoining lane of cold asphalt, forming the longitudinal joint. The mating of the two lanes, to form a high quality seal, is often not fully successful and later results in premature stripping or raveling as water enters the unsealed joint.

The application of a hot poured rubberized asphaltic joint sealant along the joint face in the final stage of construction should help to form a watertight joint seal.

A new product, especially formulated for the longitudinal joint in asphalt pavements was proposed to improve joint sealing. The following describes the experimental application of the new product, Crafco, PN 34524.

9. KEY WORDS

ACC
Longitudinal
Joint sealer

10. NO. OF PAGES

18

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DISCLAIMER

The contents of this report reflect the views of the author and do not necessarily reflect the official views of the Iowa Department of Transportation. This report does not constitute any standard, specification or regulation.

INTRODUCTION

In some ACC construction projects, the joint between adjoining lanes of asphalt pavement does not develop into a durable, well-sealed joint. For various reasons the contractor often cannot make the joint between lanes meet the high level of quality as does the mainline portion of the pavement. Therefore, premature deterioration along the joint often occurs and leads to joint sealing and resealing or repair operations for the Maintenance Department.

LITERATURE SEARCH

The New Products Evaluation Committee received literature on a new product (see Appendix B). The literature included a number of testimonials of product use by other states as well as product promotional literature.

OBJECTIVE

The objective of this research is to evaluate the performance of a new joint adhesive, Crafcro PN 34524, for longitudinal joints in asphaltic pavement. The Iowa DOT new product identification number is C-98-7. For comparison, there will be a test section with a tack coat sprayed on the joint face and a test section left as a control. After the evaluation period, a decision will be made to accept or reject use of the new product on a statewide basis.

EVALUATION

Laboratory analysis of the new product will be done following AASHTO methods (see Appendix D). Product samples will be taken from cold, virgin material and also from heated material as it comes out of the applicator wand, all from the project site. Follow up field evaluation will be done by visual inspections and comparisons.

PROJECT LOCATION

The research is on US 30 west bound lanes in the Boone County ACC resurfacing project NHSN-30-4(58)-2R-08. The project extends from 0.8 km to 2.2 km east of IA 17 (see map, Appendix A). The new product joint sealant was applied from Station 1205 to Station 1215. The tack coat, as a comparison product, was applied from Station 1185 to Station 1195. The control section, with no joint treatment, is from Station 1195 to Station 1205. The sealant was applied only in the surface course joint.

Jcbb 515-432-5411

CONSTRUCTION NOTES

Specific construction data are given in Appendix C. The joint sealant, the applicator and the equipment operator were all provided, at no cost for this research, by the product manufacturer and supplier. The applicator photo is shown in Appendix E.

The joint sealant was applied along the top of the vertical face of the joint and allowed to flow downward, covering the face. Some excess sealant remained on top of the pavement and some ponded at the bottom (see photos in Appendix E). There were also some small areas of joint face which were not covered by the sealant. From this observation, it appears that a more precise method for uniform application of the sealant and one which would produce less waste would be beneficial. Also, the areas with excessive sealant may contribute, in a negative way, toward the load bearing strength of the ACC along the joint.

After the final rolling operations of the asphalt were completed, there was evidence of some of the sealant having been pushed upward and out of the joint. This extrusion of sealant to the surface should verify that any voids in the joint are completely filled and the joint is well sealed.

In the area where the tack coat was sprayed onto the vertical joint face, as a joint sealant, there was also evidence of over spray on the roadway surface along the joint.

ESTIMATED COST

Cost estimates provided by the product supplier and applicator were \$0.56 per pound of material or \$0.24 per linear foot. These prices include material and installation costs.

RESEARCH PERIOD

The research began on May 3, 1999, the date of sealant application. The proposed time for this study is to continue for five years after this date.

MAINTENANCE

Specific communications have been established with the Maintenance Department to avoid any general centerline joint sealing in this project area during the research period, without first consulting with the Materials Research Section.

REPORTS

Construction notes and annual evaluation notes will be filed and a final report will be done after the proposed five years of study.

PRINCIPAL INVESTIGATORS

The Materials Research Section
Robert Steffes, phone 515-239-1392

and

State Bituminous Materials Engineer
Mike Heitzman, phone 515-239-1003

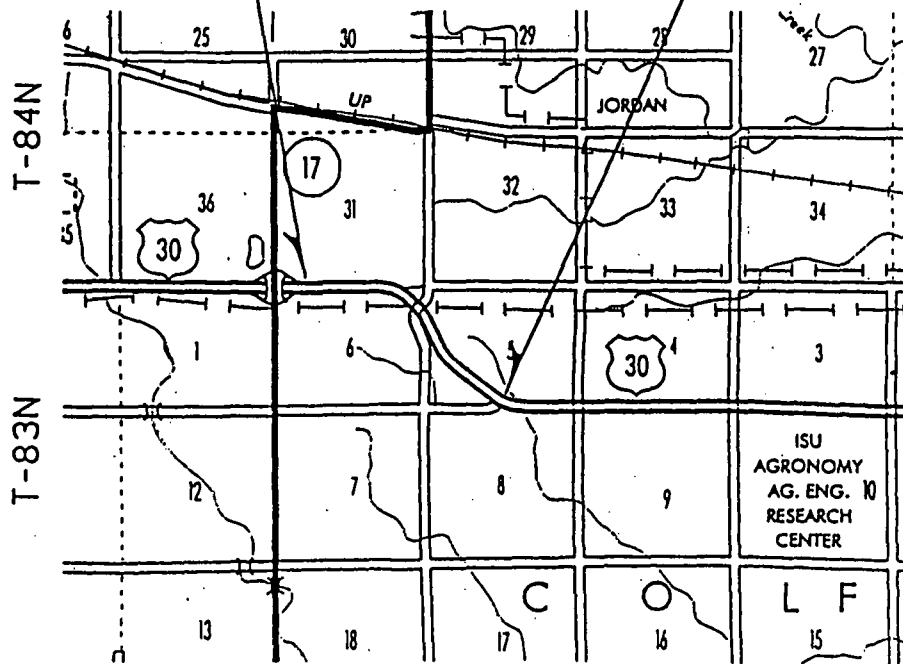
IMPLEMENTATION

Depending on the new product performance, it will be proposed for the Iowa DOT acceptance or rejection. This will take place by the end of the test period (or possibly before).

**APPENDIX A
PROJECT MAP**

BEGIN PROJECT
STA. 1123+96.78 (E)
STA. 342+58.60 (M)

END PROJECT
STA. 1222+00 (E)
STA. 372+46.63 (M)



US Highway 30
Westbound Lane
Centerline Sealant

Crafco P/N 34524
Sta. 1215+00 to Sta. 1205+00
Control
Sta. 1205+00 to Sta. 1195+00
Tack
Sta. 1195+00 to Sta. 1185+00

Project Map - Boone County

APPENDIX B
PRODUCT INFORMATION

Crafco Pavement Joint Adhesive Reduces Crack Formation and Raveling Cold Joints



Crafco Pavement Joint Adhesive

Crafco Pavement Joint Adhesive increases pavement performance with lower maintenance requirements and less traffic interruptions to public travel

CRAFCO PAVEMENT JOINT ADHESIVE has been developed over several years and is designed to address the most common and troubling problem in the pavement industry, longitudinal cold joints. Correcting the problem of opening, raveling and failing of the pavement at the cold joint has been a focus of the entire pavement industry. Much attention in the industry has centered around density and compaction at the joint. Crafco looked at the problem and addressed water infiltration, thermal movement and adhesion between paving passes. These items are what accelerate pavement deterioration and cause many of the pavement defects at the cold joint. Placement of CRAFCO PAVEMENT JOINT ADHESIVE will bond the paving passes together, which maintains a watertight seal during the thermal movements eliminating crack deterioration and adverse effects of water infiltration.

Simple Application

No Special Preparation

No Paving Operation Delays

Fast, Easy to Use

NCAT Research Summary

1996 Visual Evaluation of Pennsylvania Test Site

	CRACKING at the JOINT	RAVELING of the JOINT	RAVELING of the ADJACENT COLD MAT	COMMENTS	RATING
Crafco 34524 Joint Adhesive	None	None to slight, 1%	None	Joint is not visible at most places	10

1996 Visual Evaluation of Colorado Test Site

	CRACKING at the JOINT	RAVELING of the JOINT	RAVELING of Mat on Cold Side	COMMENTS	RATING
Crafco 34524 Joint Adhesive	4% (3mm)	None to slight	None to Slight	Good Joint	8.4

* Average of five evaluators on a scale of 1 -10, (1=poor, 10=good)

Contact your Crafco local Distributor or call:

CRAFCO INC

800-528-8242

Product Data

GENERAL

CRAFCO Pavement Joint Adhesive is a hot-applied modified asphalt composition which is used as an adhesive and tacking material for longitudinal cold construction joints in asphalt concrete pavements. Application of Pavement Joint Adhesive serves to increase durability and life of joints by increasing bonding and providing waterproofing at the joint.

Research has shown that asphalt concrete is usually less dense at longitudinal construction joints due to unconfined compaction at the edge of the first pass. The adjoining mat is usually denser at the joint due to the lateral confinement provided by the first pass. The result is a joint containing the wedge shaped area of the first mat which is lacking in compaction. This area is weaker under traffic, and permits intrusion of water and air which can cause premature deterioration of the asphalt concrete at the joint. Various methods of constructing joints with improved performance have been studied and are used. Several of these include using hot joints from side-by-side paving, cutting the edge of the first pass and removing the low density material, and use of rolled low slope wedge joints. These methods are time consuming and costly.

Crafco Pavement Joint Adhesive is applied in a thick 1/8 inch (3mm) thick band over the surface of the edge of the first paving pass prior to placing the adjoining mat. This application serves to waterproof the underlying area of low density asphalt concrete and permits a high degree of adhesive bonding between the adjoining mats. Moisture and air intrusion into the low density asphalt concrete are reduced and durability of the joint is increased.

Crafco Pavement Joint Adhesive is supplied as a ready to use solid material which is simply removed from its container, heated to application temperature, and applied to the joint face prior to construction of the adjacent asphalt concrete mat. When the adjacent lane is placed and compacted, the heat from the asphalt concrete and the roller pressure causes the joint adhesive to adhere strongly along the joint face resulting in strong bonding between overlay passes and waterproofing of the joint.

Crafco Pavement Joint Adhesive can also be used for waterproofing exposed edges of asphalt concrete pavements such as at curb and gutter or shoulder interfaces. Additionally, waterproofing can be assured where manhole covers and hand valves (gas, water, etc.) are installed in asphalt concrete pavement.

The physical characteristics of Crafco Pavement Joint Adhesive have been designed to produce a material which has appropriate application consistency, adhesion, flow, bleeding resistance, and flexibility for use at construction joint faces.

SPECIFICATION CONFORMANCE

Recommended specification limits for Pavement Joint Adhesive are:

<u>Test</u>	<u>Specification</u>	<u>Crafco Recommended</u>
Brookfield Viscosity, 400°F (ASTM D3236)		4,000 - 10,000 cp
Cone Penetration, 77°F (ASTM D 5329)		60-100
Flow, 140°F (ASTM D 5329)		5 mm maximum
Resilience, 77°F (ASTM D 5329)		30% minimum
Ductility, 77°F (ASTM D 113)		30 cm minimum
Ductility, 39.2°F (ASTM D 113)		30 cm minimum
Tensile Adhesion, 77°F (ASTM D 5329)		500% minimum
Flexibility, 0°F (Crafco Procedure)		Pass
Softening Point (ASTM D 36)		170°F minimum
Asphalt Compatibility (ASTM D 5329)		Pass
Recommended Pour Temperature		380°F
Safe Heating Temperature		410°F

Additional properties of Crafco Pavement Joint Adhesive are:

<u>Property</u>	<u>Typical Result</u>
Unit weight at 60°F	9.3 pounds per gallon
Coverage 1/8" x 2" joint tacking band	8 feet per pound

APPLICATION

Prior to use, the user must read and follow Application Instructions for Pavement Joint Adhesion (December 1997) to verify proper product selection, heating methods, application geometry and safety precautions. These instructions are provided on each pallet of adhesive.

PACKAGING

Packaging consists of individual boxes of sealant which are palletized into shipping units. Boxes contain a nonadherent film which permits easy removal of the sealant. Each pallet contains 72 boxes which are stacked in six layers of 12 boxes per later. The weight of sealant in each box does not exceed 40 lbs. (18kg) and pallet weights do not exceed 2,880 lbs. (1310 kg). Pallets of sealant are weighed and product is sold by the net weight of product. Sealant boxes are manufactured from double wall kraft board producing a minimum bursting test certification of 350 psi (241 N/cm²) and using water resistant adhesives. Boxes use tape closure and do not contain any staples. Boxes are labeled with the product name, part number, lot number, specification conformance, application temperatures and safety instructions. Palletized units are protected from the weather using a two mil thick plastic bag, a weather and moisture resistant cap sheet and a minimum of two layers of six month UV. protected stretch wrap. Pallets are labeled with the product part number, lot number and net weight. Application Instructions are provided with each pallet in a weather resistant enclosure.

WARRANTY

Crafco, Inc. warrants that Crafco sealants meet applicable ASTM, AASHTO, Federal or State specifications at time of shipment. Techniques used for the preparation of the cracks and joints prior to sealing are beyond our control as are the use and application of the sealants; therefore, Crafco, Inc. shall not be responsible for improperly applied or misused sealants. Remedies against Crafco, Inc., as agreed to by Crafco, Inc., are limited to replacing non-conforming product or refund (full or partial) of purchase price from Crafco, Inc. All claims for breach of this warranty must be made within three (3) months of the date of use or twelve (12) months from the date of delivery by Crafco, Inc., whichever is earlier. There shall be no other warranties expressed or implied. For optimum performance, follow Crafco recommendations for sealant installation.

Application Instructions

GENERAL: Crafcro Pavement Joint Adhesive is a hot applied modified asphalt composition which is used to provide a waterproofing and bonding membrane at the construction joint between adjacent asphalt concrete pavement mats. The material is supplied as a ready to use solid material which is removed from the container, heated to application temperature and then applied to the joint face prior to placing the adjacent mat.

MELTING: Pavement Joint Adhesive must be melted in a jacketed double boiler type melting unit which is equipped with both agitation and recirculating systems. The temperature of the heat transfer oil in the melting unit should not exceed 525° (274C) when melting Pavement Joint Adhesive. The melting unit must be capable of safely heating the sealant to 400°F (204C).

CAUTION: Do not agitate when adding new blocks of sealant because splashing may occur. Prior to applying the adhesive, it should be between the recommended pour temperature of 380°F (193C) and the safe heating temperature of 410°F (210C). Temperatures exceeding the safe heating temperature reduce application life.

APPLICATION METHODS: Pavement Joint Adhesive is best applied using pressure feed wand applicator systems. Application with pour pots is possible, but control of the applied geometry may be difficult. The joint face on which the Pavement Joint Adhesive is to be applied should be dry, free from loose material, dust, or other debris which could interfere with the adhesion.

PAVEMENT TEMPERATURES: For best performance, Pavement Joint Adhesive should be applied when the pavement surface temperature exceeds 40°F (4C). The adhesive should be applied within 4 hours of the time that the adjacent asphalt concrete mat is constructed.

APPLICATION CONFIGURATIONS: The application configuration for Pavement Joint Adhesive consists of a band of material being applied over the entire face of the longitudinal edges of an asphalt concrete mat where an adjacent asphalt concrete mat will be constructed. The recommended thickness of the band is 1/8 inch (3mm). Application is most easily performed with an applicator shoe attached to the end of the application wand. The Joint Adhesive is simply pumped from the melter applicator through the wand and onto the joint face. The applicator shoe simultaneously levels the adhesive to the appropriate thickness as application proceeds. Application excesses should not exceed an overlap of more than 2 inches (5cm) at the bottom of the joint, or more than 1/2 inch (1.2cm) at the top of the joint. Pavement Joint Adhesive should not be used with open graded pavements because of interference with drainage characteristics.

ASPHALT CONCRETE PLACEMENT AND COMPACTION: Following application of the Pavement Joint Adhesive, the adjacent asphalt concrete mat can be placed. Paving can occur using normal procedures. Compaction at the joint for the second pass should occur with the roller positioned on the hot mat with 4 to 8 inches (10-20cm) of the roller overlapping onto the cold mat. The first pass should be made in this manner to obtain compaction at the joint from the hot side to provide greatest density. The pavement should then be compacted using normal rolling patterns.

APPLICATION LIFE: Application life of CRAFCO Pavement Joint Adhesive at application temperatures is approximately 12 to 15 hours. Application life may be extended by adding fresh blocks as adhesive is applied and quantity in the kettle decreases. The adhesive should be agitated while being applied. The adhesive may be reheated to application temperature once, after the initial heat up. Additional reheating of the material may result in degradation of properties or jelling in the melter unit. When the application life has been exceeded, CRAFCO Pavement Joint Adhesive will begin to thicken, become "stringy" and may then gel. If this should occur, the material should immediately be removed from the kettle and discarded.

CLEAN OUT: If the equipment being used is a type that requires clean out of pumps and plumbing, follow the manufacturer's clean out procedure instructions. If solvent is used for clean out, insure that the solvent does not contaminate the adhesive because of dilution and flash problems which may occur.

STORAGE: Pallets of boxed product are protected with a weather resistant covering. During storage, the protective wrap must be kept on the pallets to prevent boxes from getting wet. If boxes are subjected to moisture, they may lose strength and crush resulting in pallet leaning. If rips in the pallet covering occur during handling, they should be repaired to help maintain packaging integrity. Pallets should be stored on a level surface which is dry and has good drainage. Pallets should not be stacked because crushing of bottom layers may occur. Adhesive material properties are not affected by packaging deterioration.

SAFETY PRECAUTIONS: Since this product is heated to elevated temperatures, it is essential that operations be conducted in manners which assure safety of personnel. All associated with use of the material need to be aware of the hazards of using hot applied materials and safety precautions. Before use, the crew should read and understand all sections of the product MSDS. This sheet which is supplied with each shipment, describes the characteristics of the product as well as any potential health hazards and precautions for safe handling and use.

HAZARDS ASSOCIATED WITH HOT APPLIED MATERIALS: Skin contact with hot applied materials causes burns. Additionally, over exposure to fumes may cause respiratory tract irritation, nausea, or headaches. Therefore, appropriate precautions need to be taken to prevent contact with the hot material, and to avoid inhalation of fumes for everyone in the vicinity of the sealing operation. Safety precautions should include: 1. protective clothing to prevent skin contact with hot material. 2. Care when adding blocks of product to melters to reduce splashing. 3. Careful operation and control of wands or pour pots which are used to apply product. 4. Traffic and pedestrian control measures which meet or exceed local requirements to prevent access to work areas while product is still in a molten state. 5. Avoidance of material fumes. 6. Proper application configurations with a minimum amount of excesses of material. 7. Appropriate clean up of excessive applications or product spills.

ADDITIONAL INFORMATION: Additional information regarding these products is available by contacting your distributor or Crafcro, Inc. This information includes 1) Product Data Sheets, 2) Material Safety Data Sheets, 3) Safety Manual.



**APPENDIX C
CONSTRUCTION DATA**

Construction Data

New Products

C-98-7

Crafco ACC Joint Sealer - Centerline

Maintenance Project: NHSN-30-4(58)-2R-08

	Research	Control	Tack
Station: Start	1215+00	1205+00	1195+00
End	1205+00	1195+00	1185+00
Date:	Sealant Placed - 5/3/99		Paved - 5/4/99
Contractor:	Manatt's Inc.		
Seal installer:	Bruce Logan, Scott Dyvad, Logan Contractor Supply		
Sealant provider:	Crafco P/N 34524		
Sealant temp:	370-390°F		
Sealant thickness:	1/16"-1/8"		
Sealant height:	2"-Full Face		
Sealant volume/ft:	0.15 gal/ft		
Sealant wt/vol:	9.3 lbs/gal		
Sealant cost/wt:	\$0.56/lb		
Sealant cost/ft installed:	\$0.24/ft		
Sealant usage:	7 ft/lb or approx. 150 lbs/1000 ft		

Notes

Weather: Windy 15-20 mph, Sunny, 70°F

Appearance of Centerline Joint: See photos

General Notes: Shoving @ joint approx. 20 ft west of Sta. 1200

Longitudinal crack at 1197+58

Sealant flows down off joint face

Sealant appears mastic like

Some small spots not covered by sealant

APPENDIX D
LABORATORY DATA

ABS9-0038
BS

IOWA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS
TEST REPORT - JOINT SEALER
LAB LOCATION - AMES

LAB NO.....:ABS9-0038

MATERIAL.....:HOT POUR JOINT SEAL (EXPERIMENTAL)
PRODUCER.....:CRAFCO INC
PROJECT NO.....:DEPT. INFO
SOURCE.....:6975 W CRAFCO WAY, CHANDLER, AZ 85226
UNIT OF MATERIAL:CRAFCO JOINT ADHESIVE 34524 (VIRGIN MATERIAL)
SAMPLED BY.....:STEFFES SENDER NO.:
DATE SAMPLED: 05/13/99 DATE RECEIVED: 05/21/99 DATE REPORTED: 06/01/99

LAB NO.	ABS9-0038
BATCH NO.	34524
TEMP. MATERIAL WAS POURED, F.	370
CONE PENETRATION, 77 F. 150 GMS. 5 SEC.	58
RESILIENCE TEST 77 F. RECOVERED	59
FLOW TEST, 140 F. 5 HOURS. (MM)	2

COPIES TO:
CENTRAL LAB

B STEFFES

YOUNKIN

DISPOSITION: DEPT. INFO

SIGNED: KEVIN B. JONES
TESTING ENGINEER

ABS9-0039
BS

IOWA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS
TEST REPORT - JOINT SEALER
LAB LOCATION - AMES

LAB NO.....:ABS9-0039

MATERIAL.....:HOT POUR JOINT SEAL (EXPERIMENTAL)
PRODUCER.....:CRAFCO INC
PROJECT NO.....:DEPT. INFO
COUNTY.....:BOONE
SOURCE.....:6975 W CRAFCO WAY, CHANDLER, AZ 85226
UNIT OF MATERIAL:CRAFCO JOINT NEW PRODUCT #C-98-7
(COOKED MATERIAL)

SAMPLED BY.....:STEFFES

SENDER NO.:

DATE SAMPLED: 05/13/99

DATE RECEIVED: 05/26/99

DATE REPORTED: 06/01/99

LAB NO. ABS9-0039
BATCH NO. C-98-7
TEMP. MATERIAL WAS
POURED, F. 370
CONE PENETRATION,
F. 150 GMS. 5 SEC. 60
RESILIENCE TEST 77 F.
% RECOVERED 66
FLOW TEST, 140 F.
5 HOURS. (MM) 2

COPIES TO:
CENTRAL LAB

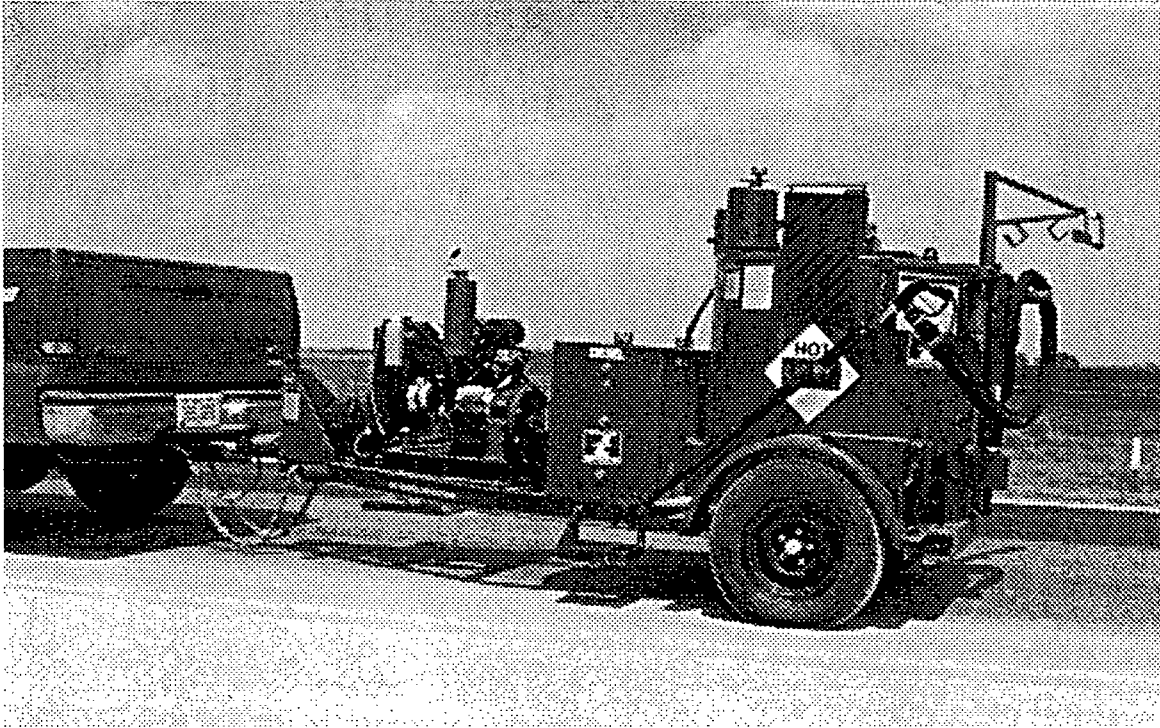
B STEFFES

YOUNKIN

DISPOSITION: DEPT INFO

SIGNED: KEVIN B. JONES
TESTING ENGINEER

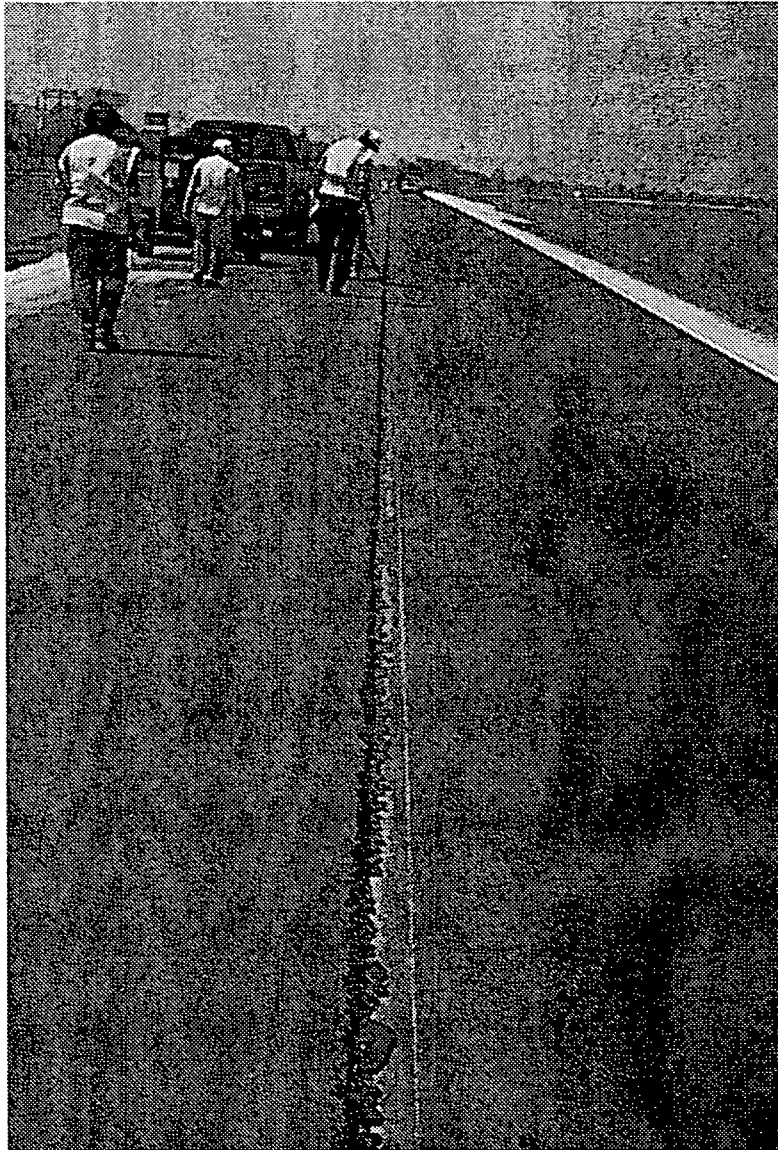
APPENDIX E
PROJECT PHOTOS



Joint Sealant Applicator



Excess Sealant Ponding



Sealant Applied to Joint Face