POLYMER ADDITIVE DUCTILAD D1002 IN A BITUMINOUS SEAL COAT

FINAL REPORT FOR
IOWA DOT PROJECT
HR-2035

JULY 1994

Project Development Division

Iowa Department of Transportation

Final Report
for
Iowa Department of Transportation
Project HR-2035

Polymer Additive Ductilad D1002 in a Bituminous Seal Coat

by

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July 1994

TECHNICAL REPORT TITLE PAGE

1. REPORT NO.	2. REPORT DATE
HR-2035	July 1994

3. TITLE AND SUBTITLE	4. TYPE OF REPORT & PERIOD COVERED
Polymer Additive Ductilad D1002 in a Bituminous Seal Coat	Final report 7-87 to 7-94

5. AUTHOR(S)	6. PERFORMING ORGANIZATION ADDRESS
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7. ACKNOWLEDGEMENT OF COOPERATING ORGANIZATIONS

8. ABSTRACT

Seal coat and chip seal treatments are commonly used as an economical treatment to provide a new surface to a old asphalt roadway. To be successful, the aggregate or chips must be held in place on the roadway by the asphalt binder over a long period of time. It is common, over time, that the binder becomes aged and brittle and loses its ability to be flexible and hold the aggregate in place. Modifiers have been introduced to extend the life and adhesion characteristics of asphaltic binders.

9. KEY WORDS		10. NO. OF PAGES
Ductilad Seal coat Modifier Asphalt cement	Chip Seal	33

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DISCLAIMER

INTRODUCTION

Seal coats are commonly used in the state of Iowa to renew the surface of an asphalt roadway. The seal coat can fill and seal minor cracks on the road surface, provide a good wearing surface for low traffic volume roadways, improve friction characteristics, and seal and preserve the underlying asphalt. However, with time, seal coats deteriorate in quality and performance. As the asphalt begins to age, the bonding to the chips weakens or fails and cracks begin to open.

A liquid polymeric additive, Ductilad D1002, has been formulated and promoted to enhance the life and durability of asphalt cements when added to binders and seal coats.

A test section of a seal coat treatment was applied on a two-lane road with one lane having the additive Ductilad D1002 and the opposing lane being conventional. The performance of the test section was observed over a five-year period.

OBJECTIVE

The objective of the research is to compare field performance of a test section of seal coat treatment containing the asphalt modifier, Ductilad D1002, with a conventional section of seal coat without Ductilad under the same roadway conditions.

PROJECT LOCATION

The project MP-415-1(1)15--76-77 is located in Polk County on IA 415 and runs from near the north city limit of Polk City north 9.8 km (6.1 mi.) to near the junction with IA 17. The research section containing Ductilad D1002, within the maintenance project, is in the southbound lane, starting near IA 17. The section extends from Station 1074+80 to Station 936+47, 4.22 km (2.62 mi.). The adjacent opposing lane is used as the conventional section. The average daily traffic (ADT) on this road was 700 in 1990. The project was done in July 1987.

MATERIAL

Ductilad D1002 is a liquid, styrene-based polymer. It is easily mixed with asphalt cement. It may be added directly to certain asphalt emulsions. The product is designed for use in roadway surface treatments such as a seal coat.

The recommended addition rate for Ductilad D1002 to asphalt cement was 3% by weight. The blended material may then be used as is, cut-back with petroleum distillate, or emulsified to form cationic emulsions, anionic emulsions, or high-float emulsions.

Application to the pavement should proceed in a normal manner, as if polymer were not present.

When added to an AC-5 asphalt cement, the following properties are changed:

1. Penetration at 25°C (77°F) will be increased.
2. Viscosity at 60°C (140°F) will be decreased.
3. Viscosity at 135°C (275°F) will be increased or unchanged.
4. Ductility is improved.

The character of the AC is changed. It becomes sticky or stringy. Properties of adhesion and cohesion are improved.

Additional information on Ductilad D1002 can be found in Appendix A.

CONTRACT

Contractual arrangements for the project were made between the Iowa Department of Transportation Maintenance Department and the contractor, Commercial Asphalt Paving Company. An additional agreement was made with the supplier of Ductilad D1002 to provide the product and coordinate its application at no cost for the test application.

Additional information on project arrangements are in Appendix B.

COST COMPARISON

As the Ductilad D1002 was provided on an experimental basis, no product or application charges were applied.

If charges were applied, the basic cost of Ductilad was estimated to be $1.99/kg ($0.90/lb). With freight and processing, the estimated cost of the emulsion, based on the recommended use of 3% of Ductilad by weight of asphalt residue, would be $0.06/L ($0.21/gal) of asphalt cement. Total cost of asphalt containing 3% Ductilad was estimated to be $0.18/L ($0.68/gal), a 45% cost increase over the $0.12/L ($0.47/gal) for conventional asphalt cement (see Appendix C).

EVALUATION

The evaluation of the seal coat emulsion polymer additive, Ductilad D1002, was done by applying it in one lane of a test section of a roadway and comparing its performance to the conventional material applied in the adjacent opposing lane.

Samples of the Ductilad seal coat materials and the conventional seal coat materials were obtained over a five-year period, starting immediately after the application. They were obtained by heating and removing a 0.3 m x 0.9 m (1 ft. x 3 ft.) area of the seal coat from both wheelpaths at two sites on the roadway, for the Ductilad section and for the conventional section. By laboratory methods, the aggregate chips were separated from each

sample and the weight of the aggregate was then determined. The decrease in weight from each year's sample would indicate the loss of aggregate on the roadway due to deterioration of bond or insufficient adhesion. A comparison of aggregate weight loss over the years between the Ductilad D1002 lane and the conventional lane indicates asphalt binder performance. The results of the tests are given in
Tables 1 and 2 and graph 1. There was not a consistent decrease in aggregate chip loss recorded over the years. Although the same sample collection equipment and methods were used each year, there were different personnel collecting the samples. Due to this change, there is some variation in the aggregate chip weight collected. It is quite evident that sample collection was more intense in 1989, as shown by the higher values in both sections. If the sample weights collected in 1989, which appear abnormal, are ignored, then it becomes obvious there is a general decline in sample weight collected over the years.

There was some damage to the seal coat surface from snowplow blades. However, this occurred mainly away from or between the wheelpaths. Research samples for aggregate retention analysis were always taken in the wheelpath where no snowplow blade damage was visually evident.

CONCLUSIONS

From Tables 1 and 2 and from the graph in Figure 1, it can be seen that there was a general decrease in the weight of aggregate chips collected as the years passed by.

It is obvious there was a large variation in sample weight from year to year. This is likely due to the degree of accuracy in scraping the seal coat layer off of the old underlying asphalt surface.

Based upon initial and final sample weights only, it appears as if the Ductilad D1002 did show a small benefit in chip retention compared to the conventional section. The Ductilad section loss was calculated to be 12% and the conventional section loss was 20%. However, the actual differences would likely be less than that based upon the assumption that the 1992 value of the Ductilad weight obtained is questionably high as seen in Figure 1.

Cost increase for Ductilad is estimated to be $0.06/L ($0.21/gal), a 45% increase for asphalt cement used. The use of Ductilad in this test is considered to not be cost effective.

ACKNOWLEDGEMENTS

Research project HR-2035 was established as a nonfunded, evaluation only project. Appreciation is expressed, especially

to Glen H. Blythe and LBD Asphalt Products Company, for their part in providing the product Ductilad D1002 at no cost. In addition, appreciation is expressed to the consultant, James A. Scherocman, and to the DOT Maintenance personnel for their part in this project. Finally, sincere thanks goes to the Materials - Research and Laboratory personnel who helped collect the samples and perform the laboratory analysis.

FIGURE CAPTIONS

1. Grams of Aggregate Chips Recovered From the Seal Coat Each Year

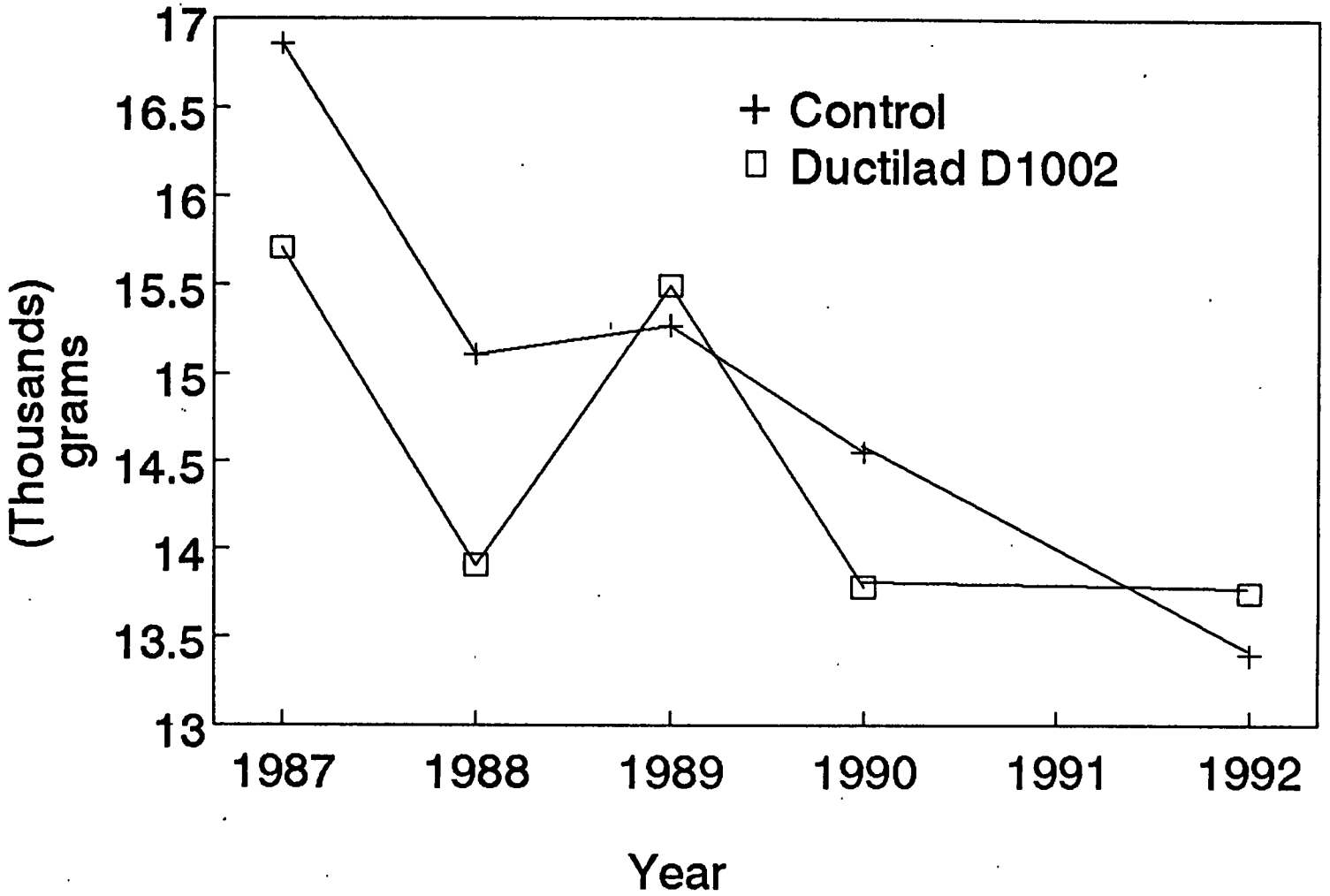


Figure 1
Grams of Aggregate Chips Recovered From the Seal Coat Each Year

TABLE CAPTIONS

1. Weight of Ductilad D1002 Aggregate Chips Recovered (gms)

2. Weight of Conventional Asphalt Aggregate Chips Recovered (gms)

Table 1

Ductilad D1002
Weight of Aggregate Chips Recovered (gms)

Year	Eastbound Lane West End Outside Wheelpath	Eastbound Lane West End Inside Wheelpath	Eastbound Lane East End Outside Wheelpath	Eastbound Lane East End Inside Wheelpath	Total
1987	3887	3903	3903	4016	15709
1988	3532	3539	2942	3893	13906
1989	3889	4332	3383	3893	15497
1990	3400	3751	2927	3706	13784
1992	3844	3529	3166	3210	13749
TOTAL	18552	19054	16321	18718	72645

Table 2

Conventional
Weight of Aggregate Chips Recovered (gms)

Year	Westbound Lane West End Outside Wheelpath	Westbound Lane West End Inside Wheelpath	Westbound Lane East End Outside Wheelpath	Westbound Lane East End Inside Wheelpath	Total
1987	3942	3791	4605	4522	16860
1988	3630	3553	4009	3917	15109
1989	3528	3732	4020	3991	15271
1990	3322	3676	3693	3861	14552
1992	2926	3152	3600	3718	13396
TOTAL	17348	17904	19927	20009	75188

Appendix A
Material

LBD ASPHALT PRODUCTS COMPANY

A Lubrizol Company

Ductilad™ D1002

A High Performance Liquid Additive Containing Polymer To Enhance The Life And Durability Of Asphalt Cements

Innovative Asphalt Technology/Ductilad Products Group

DUCTILAD™ D1002 is a liquid polymeric additive formulated to enhance the life and durability of asphalt cements and asphalt paving mixtures. DUCTILAD D1002 is particularly valuable when added to asphalt binders used in chip-seals or other surface treatments. DUCTILAD D1002 improves the initial "stickiness" of the asphalt cement and provides the binder with better long-term aged properties.

Primary factors affecting the durability and service life of a chip-seal or surface treatment are the amount of hardening of the asphalt binder during construction and the rate of age-hardening that the binder later displays during its service life. Throughout the United States, chip-seals have suffered premature failures due to the rapid oxidative aging of the asphalt binder and the attendant lack of chip adhesion.

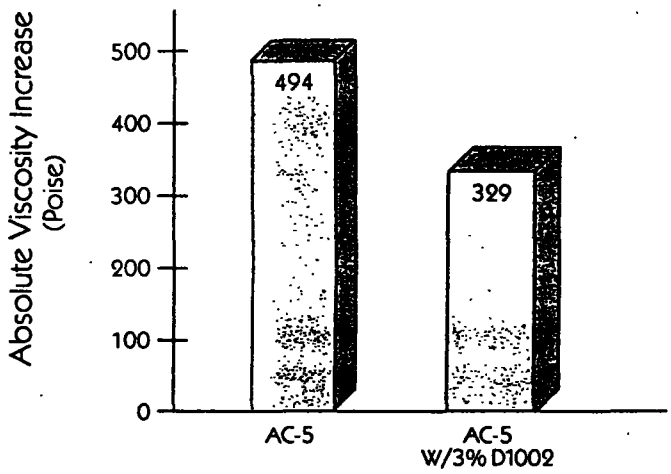
Many physical characteristics of a surface seal, such as asphalt film thickness, aggregate properties, and environmental factors, affect the rate at which the asphalt cement will age and harden during the seal's service life. Consequently, an accelerated laboratory test to accurately predict the actual in-service aging and hardening is not available. However, a binder's tendency to age may be evaluated through some common laboratory tests.

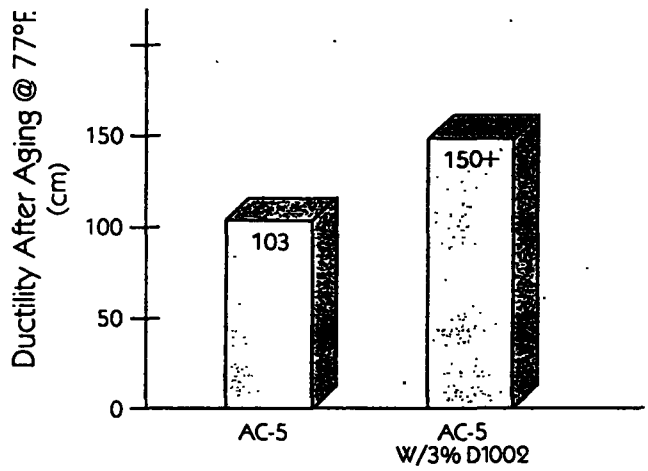
Thin film oven tests of asphalt cements are widely used to measure changes in properties when asphalts are exposed, as thin films, to air at high temperatures. The relative changes in the asphalt cements' properties are used to judge expected field performance. The effectiveness of DUCTILAD D1002 can be evaluated in these thin film oven tests. The ASTM D1754 procedure exposes a static film of asphalt cement to heat and air while the ASTM D2872 procedure exposes a moving or rolling film. The California Department of Transportation has developed a modified rolling thin film oven test to simulate the severe aging that an asphalt binder faces in the California deserts.

DUCTILAD D1002 when added at 1-4% by weight to asphalt cement dramatically changes the character of the asphalt cement. Additionally, DUCTILAD D1002 allows the asphalt binder to better maintain its' initial characteristics after aging. On the facing page, the results from several thin film oven tests are shown. The results offer strong evidence that DUCTILAD D1002 reduces the aging of asphalt cements when exposed to severe conditions. The lowered viscosity increase and improved retained ductility means that the asphalt binder still has much of its original life and "stickiness" left, and this translates to longer chip-seal life.

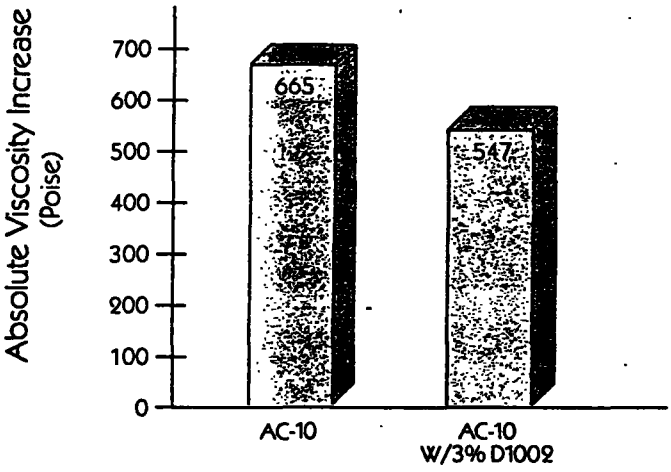
DUCTILAD D1002 is designed for use in all surface seals and will not affect the design or placement of these seals. More detailed information about DUCTILAD D1002 is available upon request.

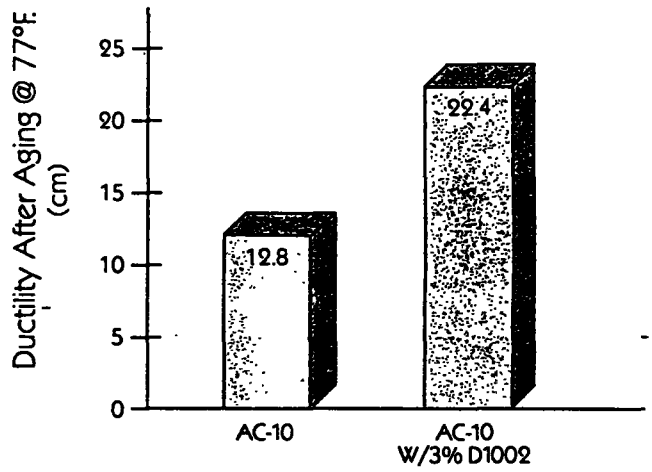
A. Thin Film Oven Tests (ASTM D1754)





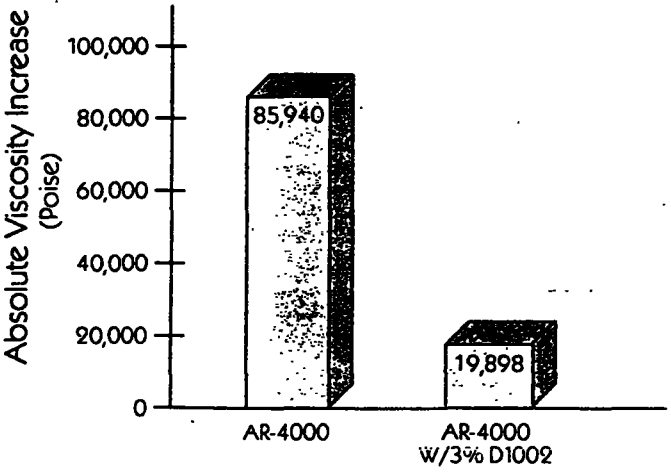
DUCTILAD D1002 treated asphalt binders display improved aged characteristics.

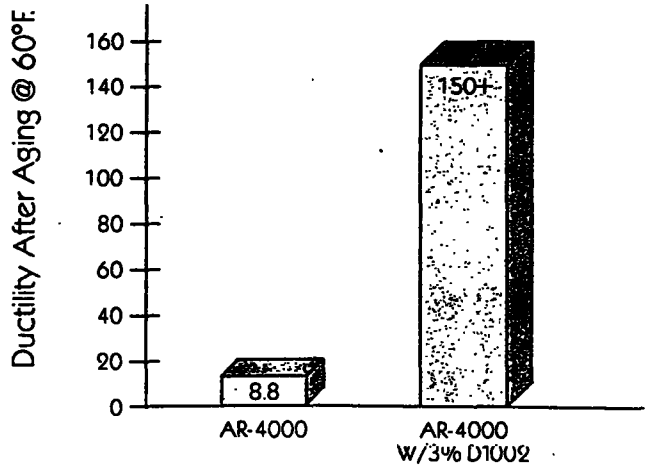




DUCTILAD D1002 retains more of the AC's original viscosity and ductility under laboratory aging tests.

B. California Tilt Oven Asphalt Durability Test





Under simulated desert conditions, DUCTILAD D1002's improvements are dramatic.

DUCTILAD™ D1002 ASPHALT ADDITIVE

Description:

DUCTILAD D1002 asphalt additive is an easy to handle liquid containing polymer for use in chip-seals and other surface seals. DUCTILAD D1002 improves the tackiness of the asphalt binder while improving the aged properties of the binder.

Typical Properties:

Form:	Liquid
Appearance:	Clear, Amber
Viscosity (104°F):	6,000 cSt
(212°F):	750 cSt
LBS/GAL:	7.56
Flash Point (C.O.C):	310°F
Pour Point:	23°F

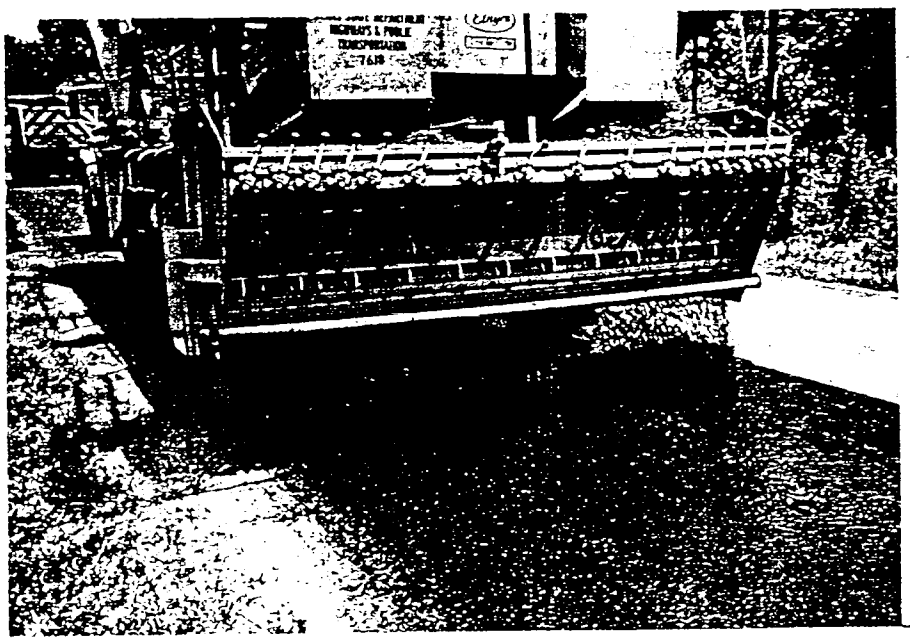
Availability:

Bulk (tank car or tank truck),
55 gallon non-returnable drums.
FOB Painesville, Ohio; Deer Park, Texas

Contact:

LBD Asphalt Products Company
29400 Lakeland Blvd.
Wickliffe, Ohio 44092
Phone: (216) 261-2681

New Additive Improves Chip Seal Performance



COMPARED to rebuilding a section of road, chip seal resurfacing is relatively fast and inexpensive: crews are much smaller, equipment requirements are less, and comparatively little material is required. Still, budget conscious state and county road administrators are looking for ways to make the treatments hold up for longer periods. The properties of the asphalt binders, the thickness of the coating, weather conditions, and heavy vehicle traffic all combine to limit the effectiveness of the chip seal.

A major cause of short service life is the tendency of the asphalt to harden shortly after being applied and then age rapidly thereafter. When this happens, the asphalt separates from the aggregate and the chips fly out as traffic moves over the road.

Now there is a new approach that has shown promise in lab tests and field trials. A liquid polymer additive has been designed to improve initial chip adhesion and maintain the stick consistency of the asphalt for much longer periods. Only three percent of the material — Ductilad® D1002 asphalt additive from LBD Asphalt Products Company, Wickliffe, Ohio — is required to give asphalt the desired properties.

■ AFTER the asphalt binder is applied, aggregate spreader lays down a uniform coating of chips. Four passes by a heavy duty roller work the chips into the asphalt layer. Then crew supervisors inspect the work, looking for loose chips, incomplete chip seals, or places where the roller lifted out chips.

There were several field trials conducted with the new material during the summer and fall of 1986. These roadbeds are being periodically checked to determine how long the additive will provide the benefits of a superior chip seal.

The district maintenance engineer of the Tyler District for the Texas State Department of Highways and Public Transportation has already made a favorable judgment about the material. "You can usually tell right after the chip seal is applied whether or not it will hold up," comments Gene Adams. "Just pick up some of the chips and see how long an asphalt stringer you can produce. With the Ductilad material, some of the stringers were as tall as the men. That's a good indication."

Test Site

The test site consisted of 3,600 ft of straightaway on Farm Road 2330 near Montalba, Texas. Resurfacing was only done on one lane of the two-lane road so that comparative evaluations could be made over the next few years.

Normally, the material is added at the asphalt batch plant, but for the Tyler District test, the material was transported to the job site and pumped into the distributor tank from a 55-gal drum. About three percent additive was mixed into the AC-10 asphalt. The mix was then applied to the roadbed at a shot rate of 0.41 gal per sq yd, creating a surface thickness of about ⅜ in.

This part of the operation is critical and underscores the importance of applying the chip seal properly. With too thin a coating, even a good chip seal will not have enough contact surface on the chips to retain them. Too thick a coating will bury the chips, producing two undesirable results: A roadbed that is slick in rain and snow, and one that wears rapidly. The aggregate is needed for both traction and wearability, so it must lie on top of the road surface.

Asphalt distribution in the Tyler District test was followed by the spreading of PB 3 precoated natural rock. Then a heavy duty roller worked in the chips, eventually making four passes at about five mph. There was very little aggregate pickup on the roller. Road crews at the site also verified that there was very little chip slinging from the new surface when the dump trucks passed over it, much less than they see when unmodified asphalt is used for chip seals.

The road was resurfaced in September 1986 and inspected in January 1987 by John Harraid of the Texas State Department of Highways and Public Transportation, the construction supervisor on the job. He found the resurfaced area much more stable than the unrepaired half of the road, with good coverage of aggregate.

Adams rates the new additive on a par with latex enriched asphalts the district has been using for chip seals, and much better and more consistent than unmodified asphalt.

■ ONE indication of additive performance is the length of the asphalt stringer produced when a single chip is lifted. Long stringers like this indicate desirable adhesive qualities.

The additive does offer specific advantages, however, when compared to latex. Since it is a liquid polymer material at ambient temperature, it does not require preheating before blending. No special equipment is necessary because it mixes easily with asphalt at normal processing temperatures. It can be added at the refinery or in tanks on distributor trucks in the field, as it was in test programs, and shot after only 30 minutes of mixing. This means the same equipment can be used whether the asphalt has the additive or not. Greater care and sometimes specialized equipment are required for mixing in latex material because it contains large amounts of water.

The additive can be shot at the same temperature as unmodified AC-5 or AC-10, about 330° to 350°F. Latex additives usually require higher temperatures for application, although this is highly dependent on weather conditions.

Laboratory Tests

Several variables, including asphalt film thickness, aggregate properties, and environmental factors, affect the rate at which the asphalt cement will age and harden. Consequently, an accelerated laboratory test to accurately predict the actual in-service aging and hardening is not available. However, a binder's tendency to age may be evaluated through some common laboratory tests.

One group of tests conducted by LBD Asphalt Products involved the exposure of thin films of asphalt in a heated oven. This procedure, described under ASTM D1754, is a generally accepted test for measuring changes in the properties of asphalt cements. In the tests, the Ductilad enriched material demonstrated lower increases in viscosity and much better ductility after aging.

AC-5 asphalt with three percent additive showed a third less viscosity increase than the control asphalt mixture, and was 50 percent more ductile at 77°F. AC-10 with the same amount of additive showed almost 20 percent less viscosity increase and was almost twice as ductile as the control mix.

LBD also uses a rolling thin-film oven test devised by the California Department of Transportation to simulate the severe aging that asphalt binders face in the state's desert areas. Although LBD tested at slightly lower temperatures than specified to simulate desert heat, the tests showed dramatic differences between the asphalt mixtures with additives and those without. AR-4000 asphalt with three percent additive exhibited only 25 percent of the viscosity increase of the control mixture, and was ten times more ductile at 60°F.

The lowered viscosity increase and the improved retained ductility shown in these tests indicate that the additive can help asphalt binders maintain the sticky consistency for significantly longer periods of time. □□□

IOWA DEPARTMENT OF TRANSPORTATION . 20
Highway Division
Ames, Iowa

PRELIMINARY INFORMATION FOR PRODUCT EVALUATION

1. Date: April 20, 1987

2. Product (Trade name): DUCTILAD D1002

3. Manufacturer: LBD Asphalt Products Company, Inc.

   Address 29400 Lakeland Blvd. Wickliffe, Ohio 44092 Telephone no. (216) 261-268

4. Representative or Distributor: Glen H. Blythe

   Address 29400 Lakeland Blvd. Wickliffe, Ohio 44092

5. Product description: DUCTILAD D1002 is a polymer additive used at 3% by weight of asphalt cement to improve the performance of chip-seals. The additive will enhance initial chip adhesion and improve the long term aging characteristics of the seal.

6. Recommended use: DUCTILAD D1002 is for use in asphalt chip-seals and slurry seals.

7. Material composition: DUCTILAD D1002 is an oil solution of a styrene - malan based liquid co-polymer and is water-free.

8. Manufacturer's Specifications: Attached X Available

9. Information from manufacturer:

   Plan drawing, picture, sketch; Attached N.A. Available N.A.

   Instructions for use; Attached Available X

   Other; Material Safety Data Sheet is attached.

10. Free sample can be furnished: Yes

11. Availability: Seasonal Non-seasonal X

    Is available quantity limited? No

    Delivery time 2-4 Weeks

12. Product supplied in what units: Pounds

13. Cost of product: $1.00 per pound

4. Product patented: Yes X No _____ Applied for _____

5. Product guaranteed: Yes _____ No X

Guarantee terms _____

6. Meets following specifications: AASHTO N.A.

ASTM N.A. Federal N.A.

7. Approved by Federal Highway Administration:

For regular use _____ For experimental use only _____

8. Approved for use by following agencies:

Texas SDHPT - Tyler District	Regular	X	Experimental	
Maricopa County, AZ.	Regular	X	Experimental	
	Regular		Experimental	

9. Agencies which have used product:

Texas SDHPT	Date	1986	Regular		Experimental	X
Phoenix, AZ	Date	1986	Regular		Experimental	X
St. Louis, MO. County	Date	1986	Regular		Experimental	X

10. Comments by Department employee submitting this information report:

Submitted by Glen H. Blythe

Title Product Engineer

This information report should be signed by a Department employee, regardless of whether it is prepared by the employee or by a manufacturer's or distributor's representative.

Submit one copy to: T. E. McElhenne, Secretary
Products Evaluation Task Force

LBD ASPHALT PRODUCTS COMPANY
24750 Lakeland Boulevard
Euclid, Ohio 44092
216/261-2681

MATERIAL SAFETY DATA SHEET

PRODUCT TRADE NAME: DUCTILAD® D1002
REVISION DATE: 03/17/87
TRANSPORTATION EMERGENCY PH NO (CHEMTREC): (800) 424-9300
CHEMICAL NAME: CONFIDENTIAL
NFPA CODE: Health: 0 Fire: 2 Reactivity: 0

SECTION 1 - HAZARDOUS INGREDIENTS

- This material does not contain any chemical listed as a carcinogen or potential carcinogen by OSHA, IARC Monographs or National Toxicology Program.
- None

SECTION 2 - FIRE AND EXPLOSION HAZARDS

FLASH POINT:	320°F (COC)
UPPER FLAMMABLE LIMIT:	Not Determined
LOWER FLAMMABLE LIMIT:	Not Determined
EXTINGUISHING MEDIA:	CO_2, dry chemical, foam
SPECIAL FIREFIGHTING PROCEDURES:	None
UNUSUAL FIRE & EXPLOSION HAZARDS:	None

SECTION 3 - HEALTH HAZARD DATA

ORAL TOXICITY:	Greater than 5000 mg./Kg. in rats. Based on actual data.
EYE IRRITATION:	Not expected to cause eye irritation. Based on actual data.
SKIN IRRITATION:	Not expected to cause skin irritation. Based on actual data.
OTHER:	Unknown
TLV:	None established. Oil mist = 5 mg./cu.meter

Emergency First Aid Procedures

SKIN:	Wash with soap and water.
EYE:	Flush with water for 15 minutes.
INHALATION:	Remove to fresh air. If unconscious, call physician and apply artificial respiration.
ORAL:	Call a physician. Do not induce vomiting.
ADDITIONAL:	None

SECTION 4 - SPECIAL PROTECTION INFORMATION

VENTILATION PROCEDURE:	Mechanical ventilation recommended
GLOVES PROTECTION:	Neoprene or nitrile rubber gloves recommended
EYE PROTECTION:	Safety Glasses
OTHER PROTECTION:	None

SECTION 5 – PHYSICAL DATA

VAPOR PRESSURE:	Not Determined	pH: Not Determined
SPECIFIC GRAVITY:	0.915 @ 15.6°C	
WATER SOLUBILITY:	Insoluble	
PERCENT VOLATILE:	Not Determined	
VAPOR DENSITY:	Not Determined	
EVAPORATION RATE:	Not Determined	
ODOR:	Mild	
APPEARANCE:	Light Colored Liquid	

SECTION 6 – STABILITY

STABILITY:	Stable
INCOMPATIBILITY:	Oxidizing agents
POLYMERIZATION:	Will not occur
THERMAL DECOMPOSITION:	Oxides of carbon and nitrogen.

SECTION 7 – SPILL OR LEAK PROCEDURES

SPILL PROCEDURES:	Prevent entry into sewers and waterways. Pick up free liquid for recycle/disposal. Absorb small amounts on inert material for disposal.
WASTE DISPOSAL:	If disposed of, this material is believed to be non-hazardous. Disposal should be in compliance with federal, state and local laws.

SECTION 8 – SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS: Store at temperatures below 45°C

SECTION 9 – TRANSPORTATION AND LABELING

DOT PROPER SHIPPING NAME:	(Bulk-Tankcar)-Petroleum oil, n.o.i.b.n (Bulk-Truck)-Combustible Liquid, n.o.s.
DOT HAZARD CLASS:	Combustible Liquid
DOT ID NUMBER (UN NO.):	NA 1270(Bulk-Tankcar), NA 1993(Bulk-Truck)
IMO CLASS:	None
ICAO CLASS:	None
EPA HAZARDOUS SUBSTANCES:	None
PRECAUTIONARY LABELS:	Combustible

U.S. TSCA INVENTORY:	All components are included on the U.S. TSCA Inventory.
EEC EINECS:	All components are in compliance with the EEC Sixth Amendment Directive 79/831.
JAPAN MITI:	Not Determined

Appendix B
Contract

Iowa Department of Transportation
800 Lincoln Way, Ames, Iowa 50010 515/239-1589

May 15, 1987

Ref. No. 650
Polk County
Project MP-415-1(1)15--76-77
HR-2035

James A. Scherocman, P.E.
Consulting Engineer
11205 Brookbridge Drive
Cincinnati, Ohio 45249

Dear Mr. Scherocman:

The Iowa Department of Transportation would be very interested in cooperating with you and LBD Asphalt Products Company with respect to incorporating a test strip of Ductilad D1002 into a bituminous seal coat project.

The project selected for the test strip is located in Polk County, Project No. MP-415-1(1)15--76-77. The project contractor is Commercial Asphalt Paving Co., Box 3029, Des Moines, Iowa, 50316, Ph. No. 515/263-6363, contact person Steve Howard. Department contact personnel follow:

Project Administering Engineer Ron DeBok, Ph. No. 515/386-8166

District 1 Materials Engineer, Richard Mumm - Ph. No. 515/239-1488

Central Materials Bituminous Engineer Rod Monroe, Ph. No. 515/239-1003

The ground rules for the proposed test strip follow:

- Since we are dealing with a project which has already been let to contract, LBD Asphalt Products Company will be expected to stand all additional costs associated with the test strip, and provide coordination with the emulsion supplier, contractor, and the Department.
- We request the Department be provided with performance information documented by LBD Asphalt Products Company concerning this test strip.
- LBD Asphalt Products Company should contact the contractor directly to make initial arrangements. Coordination with respect to placement should be made directly with Mr. DeBok who in turn will advise other interested Department personnel.

James A. Scherocman, P.E.
Page 2
May 15, 1987

- The vertical and horizontal geometrics of Iowa 415 are such that only two areas near the north end of the project are suitable for test strip placement. The Department, when contacted, will designate the test strip location. These areas should provide for adequate sight distance for testing purposes.

Attached for your information is a copy of the project proposal and specifications associated with bituminous seal coat placement. Please advise this office concerning your intentions with regard to test strip placement as proposed above.

Sincerely,

Dwight M. Rorholm
Maintenance Operations Engineer

DMR:fmh
Enclosure

cc :Rod Monroe, Central Materials Bituminous Engineer
Ron DeBok, Resident Construction Engineer
Richard Mumm, District 1 Materials Engineer
Steve Howard, Commercial Asphalt Paving Co.
Glen H. Blythe, Products Engineer, LBD Asphalt Products Company, 29400 Lakeland Blvd., Wickliffe, OH 44092

bcc:Leland D. Smithson
Vern Marks, Research Engineer
Kenneth Meeks, District 1 Engineer
P. J. McGuffin - For information only

JAMES A. SCHEROCMAN, P.E.
CONSULTING ENGINEER

11205 BROOKBRIDGE DRIVE
CINCINNATI, OHIO 45249

513-489-3338

MAY 26, 1987

Mr. Dwight M. Rorholm
Maintenance Operations Engineer
Iowa Department of Transportation
800 Lincoln Way
Ames, Iowa 50010

Dear Dwight:

This letter is in regard to your letter on May 15, 1987, concerning a test section for Ductiled D 1002 on Polk County Project No. MP-415-1(1)15--76-77. We greatly appreciate the willingness of the Iowa Department of Transportation to incorporate this polymer additive into this bituminous surface treatment job.

It is understood that LBD Asphalt Products Company, for whom I work as a consultant, will be responsible for all additional costs associated with the construction of the test strip. It is further understood that the company will work with the Department, the asphalt emulsion supplier, and the contractor to advance the project in an efficient manner.

LBD Asphalt Products Company will make available to the Department all date gathered for this project, including both laboratory test information as well as field performance data. It is requested, in return, that any data obtained by the Department be made available to the Company.

Contact will be made shortly either by myself, or by Mr. Glen H. Blythe or Mr. Charles R. Oehler of the LBD Asphalt Products Company, with contractor, the materials supplier, and the Department project personnel to check on the schedule for the job and to determine any special requirements for the test section construction. We will assure that the polymer additive is properly added to the asphalt emulsion and that the treated material is available on the jobsite when needed by the contractor to build the test section at the location selected by the Department.

Again, I thank you for your interest in Ductiled D1002. We look forward to working with your personnel in the construction of the test section on this project.

Sincerely yours,

Jim Scherocman

James A. Scherocman, P.E.
Consultant to LBD Asphalt Products Co.

cc: H. Richard Miller
Glen H. Blythe
Charles R. Oehler
John F. Sisk

COMM. ASPHALT & KAY HOWARD
MP-415-1(1)15--76-77

Thurs. 9:00 A.M.
June 18, 1987

PRECONSTRUCTION MEETING

EXTRA WORK ORDERS: Send to Office

STOCKPILED MATERIALS: None

SUB-CONTRACTORS:
Dennis Parking Lot Maintenance - Pavement Markings

PROJECT SUPERVISORS:
Contractor Foreman - Ronnie Hill
State Inspector - Jerry Deluhery

SAFETY INSPECTIONS:
Safety Policy submitted. A safety inspection is made by company safety director. The insurance company makes random inspection.

WATER POLLUTION: Company policy submitted.

EEO: Poster board will be at office.

WORK START DATE:
Start patching operation 6-22-87. Will do 2 days of sawing before actual patching starts. Estimated time - 6 days.

Contractor will start at north end of project with patching.

Anticipate starting the seal coat the 6th or 7th of July.

TRAFFIC CONTROL:
Traffic control for patching will be 2 flaggers for sawing and pilot car with 2 mile lane closure.

SIGNING:
Some signs will be furnished by state maintenance as per bid propose

Question from John Rusty:
Will the fog seal be needed for gravel? R.C.E. will check with Dwight Rorholm of Central Maintenance.

ANSWER: Dwight Rorholm said it was up to the state.
THE PROJECT ENGINEER, RON DE BOK, DECIDED TO HAVE FOG SEAL APPLIED.

MATERIALS:
John Rusty will notify Dist. #1 Materials to get samples for aggregate compatibility test.

CRS-2 will come from Koch
Cover Aggregate from Hallett's at Johnston

One load of CRS-2 will come from Koch of Dubuque because of experimental oil additive.

(Cont'd)

ASPHALT MIX FOR PATCHING:

It is being used on another job and Dist. Materials has been asked to transfer job mix to this project. Approved by Materials as per Mark Trueblood, Dist. #1 Materials Tech. In fact, two 1/2" Type A mixes have been approved by District and they are transferring the job mixes to this project.

OIL ADDITIVE:

An experimental oil additive will be used in one tanker of CRS-2. The additive will be supplied by LBD Asphalt Products Co. of Wickliffe, OH. There will be NO COST TO THE D.O.T. OR THE CONTRACTOR.

The experimental oil will be shot in one lane (to be determined later) starting at Jct. of IA. 17 & IA. 415, going south approx. 2.92 miles.

OVERDEPTH PATCHES:

If the pavement removed in patching is over 12 inches deep the contractor submitted price for filling extra depth with asphalt.

Bid Price of $2.25/Sq. Yd./Inch

RD/ab

cc:
cc: Bob Younie, Dist. Constr. Engr., Ames
Dick Mumm, Dist. Materials Engr., Ames
Dwight Rorholm, Central Maintenance, Ames
Vernon Marks, Ctrl. Materials Office, Ames
Comm. Asphalt & Kay Howard
Cy Quick, Des Moines

CONTRACT NO. 27365

30

County POLK Project No. MP-415-1(1)15--76-77
Type of Work BITUMINOUS SURFACING Miles 6.0900
Cost Center 651400 Object Code 457
ON IOWA 415 FROM NEAR THE N.C.L. OF POLK CITY, NORTH TO THE JCT OF IOWA 17.

This agreement made and entered by and between the IOWA DEPARTMENT OF TRANSPORTATION AUSTIN TURNER, DAVID L. CLEMENS, DOUGLAS SHULL, DEL VAN HORN, MOLLY SCOTT, C.ROGER FAIR & ROBERT H. MEIER Contracting Authority, and KAY HOWARD OF DES MOINES, IOWA 00019971 Contractor.

It is agreed that the notice and instructions to bidders, the proposal filed herein, the general specifications of the Iowa Department of Transportation for 1984, together with supplemental specifications and special provisions, together with the general and detailed plans, if any, for said project MP-415-1(1)15--76-77, together with Contractor's performance bond, are made a part hereof and together with this instrument constitute the contract. This contract contains all of the terms and conditions agreed upon by the parties hereto. A true copy of said plans and specifications is now on file in the office of the Contracting Authority under date of MARCH 26, 1987.

Contractor, for and in consideration of $ *****98,500.30, payable as set forth in the specifications constituting a part of this contract, agrees to construct various items of work and/or provide various materials or supplies in accordance with the plans and specifications therefor, and in the locations designated in the Notice to Bidders.

Contractor certifies by his signature on this contract, under pain of penalties for false certification, that he has complied with Iowa Code Section 324.17(8) (1985) as amended, if applicable.

In consideration of the foregoing, Contracting Authority hereby agrees to pay the Contractor promptly and according to the requirements of the specifications the amounts set forth, subject to the conditions as set forth in the specifications.

It is further understood and agreed that the above work shall be commenced or completed in accordance with the following schedule:

START. DATE	COMPL. DATE	WORK. DAYS
(APPROX) 07/13/87		25

Time is the essence of this contract.

To accomplish the purpose herein expressed, Contracting Authority and Contractor have signed this and four other identical instruments as of the _____ day of APR 20 1987.

IOWA DEPARTMENT OF TRANSPORTATION

By _____
Contracting Authority

KAY HOWARD OF DES MOINES, IOWA

By _____
Contractor

Form 650031
-67 H-4687

CONTRACT PRICES CONTRACT NO. 27065

Proposal I.D. No. 870145 Bid Order No. 518

Contractor's No. 1,9,9,7,1 County POLK Page No. 1

Project No. MP-415-1(1)15--76-77 Type of Work BITUMINOUS SURFACING

Line No. Item No.	Item	Item Quantity and Units	Unit Price Dollars X,XXX.XXX	Unit Price Cents XXXX	Amount Dollars XX,XXX,XXX	Amount Cents XX
0010	PATCHES, FINISH BY COUNT	168 ONLY	45.0000		7,560.00	
0020	PATCHES, FULL-DEPTH, FINISH, A.C.C., TYPE 2	958 SQ. YDS.	50.0000		47,900.00	
0030	BINDER BITUMEN, FURNISH & APPLY CRS-2	29366 GALLONS	0.7500		22,024.50	
0040	AGGREGATE, COVER, FURNISH & APPLY 1/2 IN.	1101 TONS	11.0000		12,111.00	
0050	ASPHALT EMULSION FOR DUST CONTROL	918 GALLONS	3.0000		2,754.00	
0060	PAVEMENT MARKINGS AS PER PLAN	1094 STAS.	4.7000		5,141.80	
0070	SYMBOLS, AS PER PLAN	4 ONLY	30.0000		120.00	
0080	TRAFFIC CONTROL	1 LUMP SUM	450.0000		450.00	
0090	FLAGGERS	30 DAYS	1.0000		30.00	
0100	PILOT CAR	9 DAYS	1.0000		9.00	
0110	MOBILIZATION	1 LUMP SUM	400.0000		400.00	
			TOTAL		$98,509.30	

LAST PAGE

Appendix C
Ductilad Cost

J. Y. WELBORN, JR.
428 MAUREEN LANE
SEVERNA PARK, MD 21146
(410) 544-8565

December 10, 1993

Iowa DOT
Mr. Bob Steffes
800 Lincoln Way Ames, IA 50010

Dear Bob:

In reply to your inquiry regarding current costs of the asphalt modifier Ductilad D1002 which was used in an experimental chip seal project on State Route 415 in August 1987, the following would apply:

Cost of Ductilad D1002, less than truck load drums	$0.893/lb.
Freight, approximate	$0.040/lb.
Total product cost	$0.933/lb.
Cost of Ductilad per gallon of emulsion, based on 3.0% by weight of the asphalt residue. 0.175 lb/gal	$0.163/gal
Cost of processing, approximate	$0.050/gal
Total cost increase	$0.213/gal

If you have any further questions or need additional information, I can be reached at the above phone/fax number.

Best regards,

Jerry Welborn