ASPHALT STABILIZATION
(ASPHADUR)
FINAL REPORT
IOWA DOT PROJECT HR-511
FHWA EXPERIMENTAL PROJECT 79-04

Asphalt Stabilization (Asphadur)

Final Report

Introduction

Asphadur (now called 3M Additive 5990) was incorporated into asphaltic concrete on a lane delineation, AC resurfacing, project in Council Bluffs. The experimental feature was included in the eastbound lanes of Interstate 480, beginning at the bridge over the Missouri River and ending at the bridge over North 41st Street. The project was constructed in October 1979.

Objective

The objective of the project was to investigate the manufacturer's claims of improved strength, stability and durability of an asphalt mix.

Construction

The asphaltic concrete was mixed in a Barber Greene batch plant The Asphadur was added in the pugmill. To successfully incorporate the Asphadur, the mix was heated to 400°F to 410°F. The mix was a 1/2" Type A mix laid 2-inches thick.

The intended asphalt cement content was 5.25% of AC-20 and the Asphadur content was 6% of the asphalt cment. Twelve samples of the mix were taken from the project. The average asphalt cement content was 5.16% and the average Marshall stability was 3925 pounds.

Evaluation

Within two years after construction there was one patch and six square feet of alligator cracking had developed. Most of the joints in the portland cement concrete pavement had reflected through the surface. After three years all the underlying joints and cracks had reflected through the surface and some random cracking was present. After four years of service a large increase in the random cracking and large areas of map cracking were observed. The surface had no rutting or shoving after four years of service.

Conclusions

Asphadur is an effective agent for increasing the stability of asphaltic concrete.

Increased strength and durability were not proven by this project.

REDUCTION OF REFLECTION CRACKS
(MONSANTO BIDIM SYNTHETIC FABRIC)
FINAL REPORT

IOWA DOT PROJECT HR-511

FHWA EXPERIMENTAL PROJECT 79-01

REDUCTION OF REFLECTION CRACKS

(Monsanto Bidim Synthetic Fabric)

Final Report

Introduction

A lane delineation project was constructed in the eastbound lanes of Interstate 480 in Council Bluffs. A synthetic fabric, Monsanto Bidim C-28, was placed between the portland cement concrete and two inches of Type A asphaltic concrete resurfacing containing Asphadur. The experimental feature began at the bridge over the Missouri River and ended at the bridge over North 41st Street. The project was constructed in October 1979.

Objective

The objective of this experimental project was to determine the effectiveness of the fabric in reducing reflective cracking in an asphaltic concrete overlay.

Construction

The special provisions for the project specified either Petromat or Bidim C-28 fabric. Due to the high mixing temperature required to incorporate Asphadur into the asphaltic concrete, Bidim C-28 was used. The asphaltic concrete with AC-20 was mixed between 400°F and 410°F and Petromat cannot tolerate a temperature that high.

Cracks wider than 1/4" in the portland cement concrete were filled with asphaltic concrete before placement of the fabric. The surface was tack coated with 0.20 to 0.25 gal/sq yd of AC-20 and the fabric was placed on the coated surface.

During placement of the asphaltic concrete, wrinkles developed when truck wheels slid when being pushed by the laydown machine. The wrinkled fabric was removed and replaced.

Evaluation

Evaluation was by visual observation. Within the first year after construction, 14 cracks had reflected full width and 8 cracks had reflected partial width through the surface. There was one patched area. Two years after construction there were 16 full width cracks, 15 partial width cracks, and six square feet of alligator cracking.

After four years of service all of the joints and cracks including the random cracks have reflected through the surface. There is considerable map cracking in the surface.

Conclusion

The fabric did not prevent reflection cracking through asphaltic concrete containing Asphadur.

Reduction of Reflection Cracks
(Monsanto Bidim Synthetic Fabric)

The project is located on the eastbound lane of I-480 beginning at the east end of the bridge over the Missouri River. The project was resurfaced in 1980 using Monsanto Bidim fabric between the portland cement concrete and the asphaltic concrete containing Asphadur.

The project was visually inspected November 15, 1983, and it appeared that all of the cracks and joints in the p.c.c. have reflected through the asphaltic concrete surface. There is also a large amount of random and map type cracking in the surface. The asphaltic concrete appears to have aged prematurely and with two variables, fabric and Asphadur, it may not be possible to properly evaluate the effectiveness of the fabric.

Asphalt Stabilization (Asphadur)
I-480-1(114)0

The project is located on the eastbound lane of I-480 beginning at the east end of the bridge crossing the Missouri River. The project was resurfaced in 1980 using Bidim fabric between the portland cement concrete and the asphaltic concrete resurfacing containing Asphadur.

As of November 15, 1983 there was no rutting or other type surface distortion. It appeared that all of the cracks in the portland cement concrete have reflected through the surface.

There is also considerable random cracking and large areas of map cracking.

Asphalt Stabilization (Asphadur)
I-480-1(114)0

The project was completed in 1979. The most recent visual inspection, August 24, 1981, did not observe any rutting or other type surface deformation. There were 16 full width cracks, 15 partial width cracks, and an area of about 6 square feet of alligator cracking. There was one patch.

IOWA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS
ASPHALT CONCRETE MIX DESIGN
LAB LOCATION AMES

MIX, TYPE AND CLASS: TYPE A SURFACE LAB NO. ABD9-190

INTENDED USE: ASPHADUR

SIZE 1/2" SPEC. NO. 841 & 248 DATE REPORTED 10/16/79

COUNTY POTTAWATTAMIE PROJECT I-IR-480-1(114)0--14-78

CONTRACTOR DELTA

PROJ. LOCATION IN COUNCIL BLUFFS OVER NORTH 41ST STREET

AGG. SOURCES 1/2" CR. GRAVEL - AVOCA PIT - POTTAW. CO.; SAND - VALLEY, NEBR.;
1/2" COVER AGG. - AVOCA PIT - POTTAW. CO.
JOB MIX FORMULA AGGREGATE PROPORTIONS: 65% AAT9-713, 30% AAT9-715, 5% AAT9-714

JOB MIX FORMULA - COMBINED GRADATION

1-1/2"	1"	3/4"	1/2"	3/8"	NO.4	NO.8	NO.16	NO.30	NO.50	NO.100	NO.200
			100	94	66	50	37	26	15	8.2	5.9
TOLERANCE:			98/100	7	7	5		4			2

75 BLOW MARSHALL DENSITY 2.36
ASPHALT SOURCE AND APPROXIMATE VISCOSITY PHILLIPS - 2020 POISES
PLASTICITY INDEX

% ASPH. IN MIX	4.0	5.0	6.0
NUMBER OF MARSHALL BLOWS	50	50	50
MARSHALL STABILITY - LBS.	2053	2157	2460
FLOW - 0.01 IN.	7	8	10
SP.GR. BY DISPLACEMENT(LAB DENS.)	2.29	2.33	2.37
BULK SP. GR. COMB. DRY AGG.	2.702	2.702	2.702
SP. GR. ASPH. @ 77 F.	1.017	1.017	1.017
CALC. SOLID SP.GR.	2.55	2.51	2.47
% VOIDS - CALC.	10.1	7.1	4.0
RICE SP. GR.	2.51	2.47	2.43
% VOIDS - RICE	8.7	5.5	2.4
% WATER ABSORPTION - AGGREGATE	0.44	0.44	0.44
% VOIDS IN THE MINERAL AGGREGATE	18.6	18.1	17.6
% V.M.A. FILLED WITH ASPHALT	45.8	60.7	76.9
CALCULATED ASPH.FILM THICKNESS(MICRONS)	6.2	8.0	9.7

A CONTENT OF 5.25% ASPHALT IS RECOMMENDED TO START THE JOB.
ASPHADUR SHALL BE ADDED TO THE MIXTURE IN THE AMOUNT OF 6% BY WT.
OF THE ASPHALT.
COPIES:
ASPH. MIX DESIGN
I-IR-480-1(114)0--14-78, POTTAW.
V. R. SNYDER
R. SHELQUIST
D. JORDISON
L. ZEARLEY
DELTA
C. JONES
D. HINES

SIGNED: BERNARD C. BROWN
TESTING ENGINEER

REDUCTION OF REFLECTIVE CRACKING - I-480-1(114)0

(Monsanto Bidim Synthetic Fabric)

The project was completed and reported in 1979. As of November 1980 there is no visible deformation from shoving or rutting. There are 14 full width and eight partial width reflective cracks. There is also one patch.

Reduction of Reflective Cracking I-480-1(114)0
(Monsanto Bidim Synthetic Fabric)

The project was completed in 1979. It was visually inspected August 24, 1981 and there were 16 full width cracks and 15 partial width cracks. One star crack with 3 rays 2' to 4' long and one area of alligator cracking about 1½' x 4' were observed. There was one patch.

0020
.5078

IOWA DEPARTMENT OF TRANSPORTATION

ifice Materials

ition Vernon J. Marks

Thomas J. McDonald

:e Council Bluffs Construction

ject

Date December 5, 1979

Ref. No. Pottawattamie County
I-IR-480-1(114)0

As per your request, the following information was prepared by our inspector, Harley McCoy, regarding the experience gained on this project.

The Bridge Repair project in Council Bluffs on I-480 included a 2" overlay of approximately 950' of the #.B.L. from the east end of the Missouri River Bridge easterly. The mix used was a 1/2 inch Type "A" Surface Course, with Grade AC-20 Asphalt Cement at a basic asphalt content of 5.25%. The mix also included a special polymer additive, Asphadur, added at the rate of 6% of the A.C. content. The Asphadur was pre-weighed according to mix batch size, then added by hand to the mixer at the proper time. Mixing was done according to SP-248. Representatives from 3M were available to the contractor on an advisory basis to help with placement of the Asphadur and to monitor mixing temperatures. The mixing temperature did not seem to be a problem for the contractor. Mix temperatures, on an average, ran on the high side of specification. The following are grade temperatures taken during placement: 380°, 375°, 370°, 395°, 400°, 385°, 388°, 400°, 395°, 400°, 390°, 405°, 385°, 400°. The plant was located approximately 10 miles from the project. The mix was placed over an R.C. 70 tack coat.

The representatives of 3M and an advisor to 3M from Austria were quite concerned about initial rolling of the mat, recommending to apply initial rolling as soon as possible while Asphadur was still in a plastic state. We found, with temperatures on the high side of specifications, that pushing and tearing of the mat occurred if vibration was used on initial pass. Vibration was later eliminated on the initial pass, but used on second and third passes and density requirements were met under this rolling procedure. Adjustment of vibration was also accomplished.

The special provisions stated that either Petromat or Bidim C-28 could be used. Due to high temperature requirements of the mix, Bidim C-28 was used. R. E. Belden, P.E. from Monsanto Textiles Co. at St. Louis, Missouri, stated that the Bidim C-28 had never been exposed to temperatures exceeding 325 under lab testing of material. We exposed the fabric several minutes after the mix had been placed over it and the fabric visibly had no apparent damage due to high temperature of mix, which averaged 390° F.

Form 000020
2-75 H-1507

IOWA DEPARTMENT OF TRANSPORTATION

To Office: Materials

Date: December 5, 1979

Attention: Vernon J. Marks

Ref. No.: Pottawattamie County
I-IR-480-1(114)0

From: Thomas J. McDonald

Office: Council Bluffs Construction

Subject:

The fabric was placed over A.C. 20 tack applied at the rate of .20 to .25 per s.y. The contractor did not encounter any problems with placement of the fabric except in handling the very large rolls of material. One area of concern occurred when trucks were dumping mix into the laydown machine hopper. The truck drivers have a tendency to ride their brakes, sometimes, locking the rear dual tires. This caused the tires to skid as the laydown machine moved forward. The fabric was wrinkled in nearly every case to the point it had to be removed and replaced, causing considerable delays. The project plans also required fabric to be placed over expansion joints. All such joints that were covered with fabric failed almost immediately and the product representative recommended that the fabric not be used for this purpose. Some of the random cracks that were covered with fabric were 1/4" or less in width. We attempted to place mix into these cracks prior to placement of fabric to add stability. Due to tackiness of the mix, it was difficult to fill cracks flush with the pavement and a few failures resulted. Representatives from Monsanto stated any crack over 1/4" in width should be filled flush with pavement prior to fabric placement.

Due to heavy A.C. tack coat used with the fabric and R.C. 70 tack coat adjacent to fabric, it is nearly impossible to keep batch truck tires clean. We experienced some picking up of the fabric from sticky tires.

None of the problems enumerated here with either the Asphadur additive or the Bidim C-28 fabric are thought to be serious or the solution insurmountable.

TJM/jmv

cc: James E. Klein
Harley McCoy

WORK PLAN

For

SYNTHETIC FABRICS TO REDUCE REFLECTION CRACKING IN ASPHALT OVERLAYS

I. Introduction

This Work Plan relates to the use of synthetic fabric on Pottawattamie I-IR-480-1(114)0--14-78 to reduce reflection cracking. The first Iowa research on this application was constructed in 1971 and the final report entitled "Prevention of Reflection Cracking in Asphalt Overlays with Structofors, Petromat and Cerex" was distributed in May 1977.

II. Objective

The objective of this project is to determine the performance of the fabric in reducing reflection cracking.

III. Preliminary Investigation

A complete crack and patch survey will be documented just prior to resurfacing.

IV. Construction Records

Placing of the fabric shall be documented by notes and photographs.

V. Post Construction Performance

The performance of the overlay shall be evaluated annually by visual observation. General condition shall be noted and documented. A complete crack and patch survey shall be made three years after construction.

VI. Reporting

A brief summary report covering construction shall be submitted within 90 days after construction. A report in letter form shall be submitted annually during the follow-up period. A final report shall be submitted within three years and six months after construction.

IOWA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS
ASPHALT CONCRETE MIX DESIGN
LAB LOCATION AMES

MIX, TYPE AND CLASS: TYPE A SURFACE LAB NO. ABD9-190

INTENDED USE: ASPHADUR

SIZE 1/2" SPEC. NO. 841 & 248 DATE REPORTED 10/16/79

COUNTY POTTAWATTAMIE PROJECT I-IR-480-1(114)0--14-78

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			100	94	66	50	37	26	15	8.2	5.9
TOLERANCE:			98/100	7	7	5		4			2

75 BLOW MARSHALL DENSITY 2.36
ASPHALT SOURCE AND APPROXIMATE VISCOSITY PHILLIPS - 2020 POISES
PLASTICITY INDEX

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SP. GR. ASPH. @ 77 F.	1.017	1.017	1.017
CALC. SOLID SP.GR.	2.55	2.51	2.47
% VOIDS - CALC.	10.1	7.1	4.0
RICE SP. GR.	2.51	2.47	2.43
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% WATER ABSORPTION - AGGREGATE	0.44	0.44	0.44
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OF THE ASPHALT.
COPIES:
ASPH. MIX DESIGN
I-IR-480-1(114)0--14-78, POTTAW.
V. R. SNYDER
R. SHELQUIST
D. JORDISON
L. ZEARLEY
DELTA
C. JONES
D. HINES

SIGNED: BERNARD C. BROWN
TESTING ENGINEER

IOWA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS
AMES LABORATORY
TEST REPORT - BITUMINOUS MATERIALS

MATERIAL UNCOMPACTED MIX 5.25%
INTENDED USE TYPE A ASPHALT ASPHADOR
CONTRACTOR DELTA ASPHALT
PRODUCER DELTA ASPHALT
PLANT CRESCENT, IA
UNIT OF MATERIAL ONE BOX
SENDERS NO 4JC9-112
SAMPLED BY J. CONN
DATE SAMPLED 10-17-79 DATE RECD 10-26-79 DATE REPORTED 11-6-79

LAB NO ABC9-439
PROJECT NO I-IR-480-1(114)0--14-
COUNTY: POTTAW.
CONTRACT NO

SIEVE ANALYSIS PERCENT PASSING

SIEVE	GM.RET	% RET	% PSG
1-1/2	0.0	0.00	0.00
1.05	0.0	0.00	0.00
3/4	0.0	0.00	0.00
1/2	0.0	0.00	100.00
3/8	96.0	6.52	93.48
4	361.5	24.55	68.93
8	232.0	15.75	53.18
16	190.5	12.93	40.25
30	181.0	12.29	27.96
50	219.0	14.86	13.10
100	98.5	6.69	6.41
200	33.5	2.27	4.14
WASH	20.0	4.14	0.00
PAN	41.0	0.00	0.00

DRY WT. 1474.500
SUM OF RETAINED WTS. 1473.000

% AGGREGATE BY EXTRACTION 94.700
% BITUMEN BY EXTRACTION 5.300
SPECIFIC GRAVITY 2.320
MARSHALL STABILITY 3375.000
MARSHALL FLOW 0.01 IN. 9.000
FINE MATERIAL CAKED UP AND
WOULD NOT PASS SIEVES, RESULTING IN LOW - 200

COPIES TO:

ASPH. CONCRETE
VAN SNYDER
TOM MCDONALD
I-IR-480-1(114)0--14-78, POTTAWATTAMIE

BY BERNARD C. BROWN
TESTING ENGINEER

IOWA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS
AMES LABORATORY
TEST REPORT - BITUMINOUS MATERIALS

MATERIAL ASPHALT MIX UNCOMPACTED 5.25% LAB NO ABC9-478
INTENDED USE TYPE A SURFACE WITH ASPHADUR
PROJECT NO I-IR-480-1(114)0--14-78 COUNTY POTTAWATTAMIE
CONTRACTOR DELTA ASPHALT
PRODUCER DELTA ASPHALT CONTRACT NO
PLANT CRESCENT, IOWA
UNIT OF MATERIAL 12 BOXES OF MIX
SENDERS NO 4JC9-126
SAMPLED BY J. CONN
DATE SAMPLED 10-17-79 DATE RECD 11-26-79 DATE REPORTED 12-3-79

SIEVE ANALYSIS PERCENT PASSING

SIEVE	GM.RET	% RET	% PSG
1-1/2	0.0	0.00	0.00
1.05	0.0	0.00	0.00
3/4	0.0	0.00	0.00
1/2	0.0	0.00	100.00
3/8	63.0	5.30	94.70
4	300.5	25.27	69.43
8	195.0	16.39	53.04
16	157.0	13.20	39.84
30	146.0	12.27	27.57
50	180.0	15.13	12.44
100	81.5	6.85	5.59
200	27.5	2.31	3.28
WASH	31.0	3.28	0.00
PAN	8.0	0.00	0.00

DRY WT. 1189.500
SUM OF RETAINED WTS. 1189.500

% AGGREGATE BY EXTRACTION	94.700
% BITUMEN BY EXTRACTION	5.300
SPECIFIC GRAVITY	2.320
MARSHALL STABILITY	4030.000
MARSHALL FLOW 0.01 IN.	9.000

COPIES TO:

ASPH. CONCRETE
VAN SNYDER
TOM MCDONALD
R. SHELQUIST
L. ZEARLEY
I-IR-480-1(114)0--14-78, POTTAWATTAMIE BY BERNARD C. BROWN

IOWA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS
AMES LABORATORY
TEST REPORT - BITUMINOUS MATERIALS

MATERIAL ASPHALT MIX UNCOMPACTED 5.25% LAB NO ABC9-479
INTENDED USE TYPE A SURFACE WITH ASPHADUR
PROJECT NO I-IR-480-1(114)0--14-78 COUNTY POTTAWATTAMIE
CONTRACTOR DELTA ASPHALT
PRODUCER DELTA ASPHALT CONTRACT NO
PLANT CRESCENT, IOWA
UNIT OF MATERIAL 12 BOXES OF MIX
SENDERS NO 4JC9-126
SAMPLED BY J. CONN
DATE SAMPLED 10-17-79 DATE RECD 11-26-79 DATE REPORTED 12-4-79

SIEVE ANALYSIS PERCENT PASSING

SIEVE	GM.RET	% RET	% PSG
1-1/2	0.0	0.00	0.00
1.05	0.0	0.00	0.00
3/4	0.0	0.00	100.00
1/2	8.5	0.59	99.41
3/8	81.0	5.60	93.81
4	375.0	25.93	67.88
8	222.0	15.35	52.53
16	184.5	12.76	39.77
30	175.0	12.10	27.67
50	208.0	14.38	13.29
100	94.0	6.49	6.80
200	33.5	2.31	4.49
WASH	33.5	4.49	0.00
PAN	31.5	0.00	0.00

DRY WT. 1447.500
SUM OF RETAINED WTS. 1446.500

% AGGREGATE BY EXTRACTION	94.900
% BITUMEN BY EXTRACTION	5.100
SPECIFIC GRAVITY	2.300
MARSHALL STABILITY	4093.000
MARSHALL FLOW 0.01 IN.	9.000

COPIES TO:

ASPH. CONCRETE
VAN SNYDER
TOM MCDONALD
R. SHELQUIST
L. ZEARLEY

I-IR-480-1(114)0--14-78, POTTAWATTAMIE BY BERNARD C. BROWN

IOWA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS
AMES LABORATORY
TEST REPORT - BITUMINOUS MATERIALS

MATERIAL ASPHALT MIX UNCOMPACTED 5.25% LAB NO ABC9-480
INTENDED USE TYPE A SURFACE WITH ASPHADUR
PROJECT NO I-IR-480-1(114)0--14-78 COUNTY POTTAWATTAMIE
CONTRACTOR DELTA ASPHALT
PRODUCER DELTA ASPHALT CONTRACT NO
PLANT CRESCENT, IA
UNIT OF MATERIAL 12 BOXES OF MIX
SENDERS NO 4JC9-126
SAMPLED BY J. CONN
DATE SAMPLED 10-17-79 DATE RECD 11-26-79 DATE REPORTED 12-4-79

SIEVE ANALYSIS PERCENT PASSING

SIEVE	GM.RET	% RET	% PSG
1-1/2	0.0	0.00	0.00
1.05	0.0	0.00	0.00
3/4	0.0	0.00	0.00
1/2	0.0	0.00	100.00
3/8	88.0	6.12	93.88
4	360.0	25.07	68.81
8	220.5	15.35	53.46
16	182.5	12.71	40.75
30	173.5	12.08	28.67
50	215.5	15.00	13.67
100	100.0	6.96	6.71
200	38.5	2.68	4.03
WASH	43.0	4.03	0.00
PAN	15.0	0.00	0.00

DRY WT. 1437.500
SUM OF RETAINED WTS. 1436.500

% AGGREGATE BY EXTRACTION	95.100
% BITUMEN BY EXTRACTION	4.900
SPECIFIC GRAVITY	2.320
MARSHALL STABILITY	3815.000
MARSHALL FLOW 0.01 IN.	9.000

COPIES TO:

ASPH. CONCRETE
VAN SNYDER
TOM MCDONALD
R. SHELQUIST
L. ZEARLEY
I-IR-480-1(114)0--14-78, POTTAWATTAMIE BY RENALD C. BROWN

IOWA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS
AMES LABORATORY
TEST REPORT - BITUMINOUS MATERIALS

MATERIAL ASPHALT MIX UNCOMPACTED 5.25% LAB NO ABC9-481
INTENDED USE TYPE A SURFACE WITH ASPHADUR
PROJECT NO I-IR-480-1(114)0--14-78 COUNTY POTTAWATTAMIE
CONTRACTOR DELTA ASPHALT
PRODUCER DELTA ASPHALT CONTRACT NO
PLANT CRESCENT, IOWA
UNIT OF MATERIAL 12 BOXES OF MIX
SENDERS NO 4JC9-126
SAMPLED BY J. CONN
DATE SAMPLED 10-17-79 DATE RECD 11-26-79 DATE REPORTED 12-3-79

SIEVE ANALYSIS PERCENT PASSING

SIEVE	GM.RET	% RET	% PSG
1-1/2	0.0	0.00	0.00
1.05	0.0	0.00	0.00
3/4	0.0	0.00	100.00
1/2	10.0	0.69	99.31
3/8	69.0	4.76	94.55
4	295.5	20.38	74.17
8	205.0	14.13	60.04
16	185.0	12.75	47.29
30	203.5	14.03	33.26
50	264.0	18.20	15.06
100	115.5	7.96	7.10
200	40.0	2.75	4.35
WASH	37.5	4.35	0.00
PAN	25.5	0.00	0.00

DRY WT. 1453.000
SUM OF RETAINED WTS. 1450.500

% AGGREGATE BY EXTRACTION	94.400
% BITUMEN BY EXTRACTION	5.600
SPECIFIC GRAVITY	2.310
MARSHALL STABILITY	3688.000
MARSHALL FLOW 0.01 IN.	8.000

COPIES TO:

ASPH. CONCRETE
VAN SNYDER
TOM MCDONALD
R. SHELQUIST
L. ZEARLEY

I-IR-480-1(114)0--14-78, POTTAWATTAMIE BY BERNARD C. BROWN

IOWA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS
AMES LABORATORY
TEST REPORT - BITUMINOUS MATERIALS

MATERIAL ASPHALT MIX UNCOMPACTED 5.25% LAB NO ABC9-482
INTENDED USE TYPE A SURFACE WITH ASPHADUR
PROJECT NO I-IR-480-1(114)0--14-78 COUNTY POTTAWATTAMIE
CONTRACTOR DELTA ASPHALT
PRODUCER DELTA ASPHALT CONTRACT NO
PLANT CRESCENT, IOWA
UNIT OF MATERIAL 12 BOXES OF MIX
SENDERS NO 4JC9-126
SAMPLED BY J. CONN
DATE SAMPLED 10-17-79 DATE RECD 11-26-79 DATE REPORTED 12-3-79

SIEVE ANALYSIS PERCENT PASSING

SIEVE	GM.RET	% RET	% PSG
1-1/2	0.0	0.00	0.00
1.05	0.0	0.00	0.00
3/4	0.0	0.00	0.00
1/2	0.0	0.00	100.00
3/8	102.0	7.08	92.92
4	370.0	25.65	67.27
8	230.5	15.99	51.28
16	183.0	12.70	38.58
30	166.5	11.55	27.03
50	199.0	13.81	13.22
100	91.5	6.35	6.87
200	36.0	2.50	4.37
WASH	31.5	4.37	0.00
PAN	31.5	0.00	0.00

DRY WT. 1441.500
SUM OF RETAINED WTS. 1441.500

% AGGREGATE BY EXTRACTION	95.000
% BITUMEN BY EXTRACTION	5.000
SPECIFIC GRAVITY	2.350
MARSHALL STABILITY	3898.000
MARSHALL FLOW 0.01 IN.	10.000

COPIES TO:

ASPH. CONCRETE
VAN SNYDER
TOM MCDONALD
R. SHELQUIST
L. ZEARLEY

I-IR-480-1(114)0--14-78. POTTAWATTAMIE BY BERNARD C. BROWN

IOWA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS
AMES LABORATORY
TEST REPORT - BITUMINOUS MATERIALS

MATERIAL ASPHALT MIX UNCOMPACTED 5.25% LAB NO ABC9-483
INTENDED USE TYPE A SURFACE WITH ASPHADUR
PROJECT NO I-IR-480-1(114)0--14-78 COUNTY POTTAWATTAMIE
CONTRACTOR DELTA ASPHALT
PRODUCER DELTA ASPHALT CONTRACT NO
PLANT CRESCENT, IOWA
UNIT OF MATERIAL 12 BOXES OF MIX
SENDERS NO 4JC9-126
SAMPLED BY J. CONN
DATE SAMPLED 10-17-79 DATE RECD 11-26-79 DATE REPORTED 12-3-79

SIEVE ANALYSIS PERCENT PASSING

SIEVE	GM.RET	% RET	% PSG
1-1/2	0.0	0.00	0.00
1.05	0.0	0.00	0.00
3/4	0.0	0.00	0.00
1/2	0.0	0.00	100.00
3/8	96.0	6.60	93.40
4	373.5	25.72	67.68
8	236.5	16.28	51.40
16	190.5	13.12	38.28
30	169.5	11.67	26.61
50	205.5	14.15	12.46
100	93.0	6.40	6.06
200	35.0	2.41	3.65
WASH	25.5	3.65	0.00
PAN	27.5	0.00	0.00

DRY WT. 1453.500
SUM OF RETAINED WTS. 1452.500

% AGGREGATE BY EXTRACTION 94.900
% BITUMEN BY EXTRACTION 5.100
SPECIFIC GRAVITY 2.330
MARSHALL STABILITY 3608.000
MARSHALL FLOW 0.01 IN. 9.000

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IOWA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS
AMES LABORATORY
TEST REPORT - BITUMINOUS MATERIALS

MATERIAL ASPHALT MIX UNCOMPACTED 5.25% LAB NO ABC9-484
INTENDED USE TYPE A SURFACE WITH ASPHADUR
PROJECT NO I-IR-480-1(114)0--14-78 COUNTY POTTAWATTAMIE
CONTRACTOR DELTA ASPHALT
PRODUCER DELTA ASPHALTG CONTRACT NO
PLANT CRESCENT, IOWA
UNIT OF MATERIAL 12 BOXES OF MIX
SENDERS NO 4JC9-126
SAMPLED BY J. CONN
DATE SAMPLED 10-17-79 DATE RECD 11-26-79 DATE REPORTED 12-3-79

SIEVE ANALYSIS PERCENT PASSING

SIEVE	GM.RET	% RET	% PSG
1-1/2	0.0	0.00	0.00
1.05	0.0	0.00	0.00
3/4	0.0	0.00	0.00
1/2	0.0	0.00	100.00
3/8	60.0	4.18	95.82
4	303.5	21.13	74.69
8	229.0	15.96	58.73
16	207.5	14.46	44.27
30	205.5	14.32	29.95
50	248.0	17.27	12.68
100	111.5	7.77	4.91
200	35.0	2.44	2.47
WASH	22.0	2.47	0.00
PAN	13.5	0.00	0.00

DRY WT. 1435.000
SUM OF RETAINED WTS. 1435.500

% AGGREGATE BY EXTRACTION 94.800
% BITUMEN BY EXTRACTION 5.200
SPECIFIC GRAVITY 2.300
MARSHALL STABILITY 3930.000
MARSHALL FLOW 0.01 IN. 9.000

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IOWA DEPARTMENT OF TRANSPORTATION
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TEST REPORT - BITUMINOUS MATERIALS

MATERIAL ASPHALT MIX UNCOMPACTED 5.25% LAB NO ABC9-485
INTENDED USE TYPE A SURFACE WITH ASPHADUR
PROJECT NO I-IR-480-1(114)0--14-78 COUNTY POTTAWATTAMIE
CONTRACTOR DELTA ASPHALT
PRODUCER DELTA ASPHALT CONTRACT NO
PLANT CRESCENT, IOWA
UNIT OF MATERIAL 12 BOXES OF MIX
SENDERS NO 4JC9-126
SAMPLED BY J. CONN
DATE SAMPLED 10-17-79 DATE RECD 11-26-79 DATE REPORTED 12-3-79

SIEVE ANALYSIS PERCENT PASSING

SIEVE	GM.RET	% RET	% PSG
1-1/2	0.0	0.00	0.00
1.05	0.0	0.00	0.00
3/4	0.0	0.00	100.00
1/2	14.5	1.01	98.99
3/8	66.0	4.59	94.40
4	320.5	22.29	72.11
8	218.0	15.15	56.96
16	188.0	13.07	43.89
30	180.5	12.55	31.34
50	217.0	15.08	16.26
100	101.0	7.02	9.24
200	36.0	2.50	6.74
WASH	59.5	6.74	0.00
PAN	37.5	0.00	0.00

DRY WT. 1441.000
SUM OF RETAINED WTS. 1438.500

% AGGREGATE BY EXTRACTION 94.900
% BITUMEN BY EXTRACTION 5.100
SPECIFIC GRAVITY 2.340
MARSHALL STABILITY 4058.000
MARSHALL FLOW 0.01 IN. 9.000

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P. SHELQUIST

BY RICHARD C. BROWN

IOWA DEPARTMENT OF TRANSPORTATION
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TEST REPORT - BITUMINOUS MATERIALS

MATERIAL ASPHALT MIX UNCOMPACTED 5.25% LAB NO ABC9-486
INTENDED USE TYPE A SURFACE WITH ASPHADUR
PROJECT NO I-IR-480-1(114)0--14-78 COUNTY POTTAWATTAMIE
CONTRACTOR DELTA APSHALT
PRODUCER DELTA ASPHALT CONTRACT NO
PLANT CRESCENT, IOWA
UNIT OF MATERIAL 12 BOXES OF MIX
SENDERS NO 4JC9-126
SAMPLED BY J. CONN
DATE SAMPLED 10-17-79 DATE RECD 11-26-79 DATE REPORTED 12-4-79

SIEVE ANALYSIS PERCENT PASSING

SIEVE	GM.RET	% RET	% PSG
1-1/2	0.0	0.00	0.00
1.05	0.0	0.00	0.00
3/4	0.0	0.00	0.00
1/2	0.0	0.00	100.00
3/8	61.0	4.24	95.76
4	332.0	23.12	72.64
8	224.0	15.60	57.04
16	196.5	13.68	43.36
30	189.0	13.15	30.21
50	228.5	15.91	14.30
100	104.0	7.24	7.06
200	37.5	2.61	4.45
WASH	51.0	4.45	0.00
PAN	13.0	0.00	0.00

DRY WT. 1438.000
SUM OF RETAINED WTS. 1436.500

% AGGREGATE BY EXTRACTION	94.700
% BITUMEN BY EXTRACTION	5.300
SPECIFIC GRAVITY	2.340
MARSHALL STABILITY	4225.000
MARSHALL FLOW 0.01 IN.	9.000

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IOWA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS
AMES LABORATORY
TEST REPORT - BITUMINOUS MATERIALS

MATERIAL ASPHALT MIX UNCOMPACTED 5.25% LAB NO ABC9-487
INTENDED USE TYPE A SURFACE WITH ASPHADUR
PROJECT NO I-IR-480-1(114)0--14-78 COUNTY POTTAWATTAMIE
CONTRACTOR DELTA ASPHALT
PRODUCER DELTA ASPHALT CONTRACT NO
PLANT CRESCENT, IOWA
UNIT OF MATERIAL 12 BOXES OF MIX
SENDERS NO 4JC9-126
SAMPLED BY J. CONN
DATE SAMPLED 10-17-79 DATE RECD 11-26-79 DATE REPORTED 12-4-79

SIEVE ANALYSIS PERCENT PASSING

SIEVE	GM.RET	% RET	% PSG
1-1/2	0.0	0.00	0.00
1.05	0.0	0.00	0.00
3/4	0.0	0.00	100.00
1/2	8.5	0.59	99.41
3/8	62.0	4.31	95.10
4	334.0	23.24	71.86
8	225.0	15.65	56.21
16	189.5	13.18	43.03
30	193.0	13.42	29.61
50	238.0	16.55	13.06
100	107.5	7.47	5.59
200	36.5	2.53	3.06
WASH	24.0	3.06	0.00
PAN	20.0	0.00	0.00

DRY WT. 1440.500
SUM OF RETAINED WTS. 1438.000

% AGGREGATE BY EXTRACTION	95.000
% BITUMEN BY EXTRACTION	5.000
SPECIFIC GRAVITY	2.320
MARSHALL STABILITY	4238.000
MARSHALL FLOW 0.01 IN.	9.000

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IOWA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS
AMES LABORATORY
TEST REPORT - BITUMINOUS MATERIALS

MATERIAL ASPHALT MIX UNCOMPACTED 5.25% LAB NO ABC9-488
INTENDED USE TYPE A SURFACE WITH ASPHADUR
PROJECT NO I-IR-480-1(114)0--14-78 COUNTY POTTAWATTAMIE
CONTRACTOR DELTA ASPHALT
PRODUCER DELTA ASPHALT CONTRACT NO
PLANT CRESCENT, IOWA
UNIT OF MATERIAL 12 BOXES OF MIX
SENDERS NO 4JC9-126
SAMPLED BY J. CONN
DATE SAMPLED 10-17-79 DATE RECD 11-26-79 DATE REPORTED 12-4-79

SIEVE ANALYSIS PERCENT PASSING

SIEVE	GM.RET	% RET	% PSG
1-1/2	0.0	0.00	0.00
1.05	0.0	0.00	0.00
3/4	0.0	0.00	100.00
1/2	5.0	0.35	99.65
3/8	64.0	4.44	95.21
4	326.0	22.61	72.60
8	234.5	16.26	56.34
16	193.0	13.38	42.96
30	176.0	12.20	30.76
50	211.0	14.62	16.14
100	95.5	6.62	9.52
200	36.0	2.49	7.03
WASH	58.0	7.03	0.00
PAN	43.5	0.00	0.00

DRY WT. 1445.000
SUM OF RETAINED WTS. 1442.500

% AGGREGATE BY EXTRACTION 94.900
% BITUMEN BY EXTRACTION 5.100
SPECIFIC GRAVITY 2.370
MARSHALL STABILITY 4142.000
MARSHALL FLOW 0.01 IN. 10.000

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