ULTRA THIN PCC OVERLAYS

Construction Report
Iowa Department of Transportation
Project HR-559

In Cooperation With The
Federal Highway Administration
as
Work Order #DTFH71-94-TBO-IA-37

April 1995

Project Development Division

Iowa Department of Transportation

Construction Report
for
Iowa Department of Transportation
Project HR-559

ULTRA THIN PCC OVERLAYS

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7. ACKNOWLEDGEMENT OF COOPERATING ORGANIZATIONS

Federal Highway Administration

8. ABSTRACT

A 11.6 km (7.2 mi.) portion of IA 21 in Iowa County from the junction of US 6, north to the junction of IA 212, was selected for the research project.

The project was divided into 65 different test sections of a PCC overlay of an existing asphalt concrete (AC) surface with thicknesses of 50 mm (2 in.), 100 mm (4 in.), 150 mm (6 in.), and 200 mm (8 in.). The joint spacings for these sections were 0.6 m (2 ft.), 1.2 m (4 ft.), 1.8 m (6 ft.), 3.7 m (12 ft.), and 4.6 m (15 ft.). Joints were sealed if the thickness of the pavement was over 100 mm (4 in.), unless specified. Two types of polypropylene fibers, monofilament and fibrillated, were added to the conventional PCC mix for designated sections. Three additional sections consisted of an asphalt overlay for comparison with the concrete overlay. Three different base preparations were used on the project, consisting of: patching and scarifying, patching only, and cold-in-place recycling.

Sensors were placed in various test sections to measure the temperature and strain during and after construction of the overlay. Pullout tests were also conducted at various locations. Beams cylinders were made for each of the PCC mixes and tested for flexural and compressive strengths. Evaluation of the performance will be conducted through December 31, 1999.

9. KEY WORDS
PCC overlay, contraction joints
thin PCC, fibrous concrete
Pavement Management,
life cycle cost, PCC sawing

10. NO. OF PAGES
85

TABLE OF CONTENTS

TABLE OF CONTENTS (Con't)

DISCLAIMER

INTRODUCTION

In 1991 a thin Portland Cement Concrete (PCC) overlay using 50 mm (2 in.) and 87.5 mm (3.5 in.) thicknesses and unconventional 0.6 m (2 ft) and 1.8 m (6 ft) joint spacing was placed over a landfill access road in Louisville, Kentucky. It was used to evaluate the feasibility of concrete overlays (less than 100 mm (4 in.) thick) of asphalt concrete for residential streets, parking, and other low volume applications. The HR-559 Ultra-Thin Whitetopping is a follow up evaluation of the Kentucky project. The type and size of fiber along with the joint patterns for the different thicknesses of this project were based on the Kentucky project.

The evaluation of this research project is the Iowa DOT participation in Section 6005 of the Intermodal Surface Transportation Efficiency Act (ISTEA).

OBJECTIVE

The objective of the project is to evaluate the life and performance of various thicknesses of PCC overlay with and without the use of polypropylene fibers and with the use of various joint spacings.

PROJECT LOCATION AND CONTRACTOR

The research project is located in Iowa County on Iowa 21 from the junction of US 6, north 11.6 km (7.2 mi.) to the junction of

Iowa 212. The location is shown in Figure 1 of Appendix A. The existing pavement was constructed in 1961 of a 88 mm (3.5 in.) asphalt surface, 7.3 m (25 ft.) wide, placed on a 175 mm (7.0 in.) cement treated base with a 150 mm (6.0 in.) granular subbase. The estimated ADT is 1,350 vehicles with 13% trucks and 300,000 ESAL's.

The contract for this project was awarded to Manatt's, Inc. of Brooklyn, Iowa. A copy of the contract is found in Appendix B.

PROJECT CONCEPT

The project was divided into 65 different test sections. One section was entirely reconstructed. Sixty-one sections, including transition sections, consisted of 50 mm (2 in.), 100 mm (4 in.), 150 mm (6 in.), and 200 mm (8 in.) thick PCC overlay of an asphalt concrete (AC) surface with joint spacings of 0.6 m (2 ft.), 1.2 m (4 ft.), 1.8 m (6 ft.), 3.7 m (12 ft.), 4.6 m (15 ft.). Joints were not sealed if the thickness of the pavement was 100 mm (4 in.) or less unless specified. Two types of polypropylene fibers, monofilament and fibrillated, were added to the conventional PCC mix for designated sections. Three other sections consisted of an asphalt overlay for comparison with the concrete overlay.

Three different base preparations were utilized on the project, which consist of: patching and scarifying, patching only, and cold in-place recycling. A table of summarizing this information can be found in Appendix A.

PRECONSTRUCTION

Prior to construction, Road Rater structural ratings were obtained which can be found in Appendix E. A photolog and a detailed crack survey were also made.

SURFACE PREPARATION

There were three different types of base preparations used on the overlay. The first type of base preparation was patching and scarifying, which was from STA 2340+00 to STA 2460+00. The next type of preparation was patching only, which was from STA 2460+00 to STA 2585+00. The final type of preparation was 94 mm (3.75 in.) of cold in-place recycled AC, from STA 2585+00 to STA 2704+00.

The full depth patches were placed on April 21 through April 25. From June 3 through June 6, the cold in-place recycle was laid. Milling was from June 6 to June 7 and also on June 20. Surface patching was on June 21.

At first, the AC subgrade was broomed and sprayed with water prior to placement of the concrete. After 4 days of paving, it was decided to stop wetting the AC prior to placing the concrete, believing that it would create a better bond between the asphalt and the concrete.

MATERIALS AND MIX PROPORTIONS

Portland Cement Concrete

A Class C PCC was required for the project. The mixes used were C-3WR-C and C-3WR. Maintenance mixes were used at the intersections. The materials used in these mixes were:

Fly Ash: American Fly Ash, Louisa and Muscatine
Cement: Lafarge Type I/II
Fine Aggregate: Marengo Ready Mix T-203 No. A48508
Coarse Aggregate: Vulcan, Montour T-203 No. A86002
Water: City of Belle Plaine
Water Reducer: Protex, PDA 25 DP
Fibers: Industrial Systems, Ltd. (Durafiber), Lakemoor, IL

The mix was produced in a central mixer. When fibers were used, three pounds of fibers per cubic yard of concrete were added and evenly distributed throughout the mix. Copies of plant reports can be found in Appendix C.

Asphalt Concrete

Type B AC was used on the binder and Type A was used on the surface of the three AC sections. The materials used in the mixes were:

Crushed Aggregate Source: Malcom, No. A79002
Sand Source: Mannatt Flint Pit, No. A86502
Asphalt Source and Grade: Bituminous Supply AC-10

Copies of the plant reports can be found in Appendix C.

CONSTRUCTION

The plant was at the north end of the project. Here, the materials were mixed in the central mixer and then transported in agitators and dump trucks to the paving location.

A Gomaco Paver was used on the project. Sof-Cut saws were used to cut all joints.

On June 24, 1994, reconstruction of Section 1 began at the south end of the project at STA 2335+64 and proceeded northward. A conventional mix was used. The overlay started with Section 2 at STA 2340+00. The fibrillated fibers were added to the mix during the paving of Section 2 at STA 2341+02. The tining pulled the fibers up, forming clumps on the surface of the pavement. There were problems trying to get the slab to be only 150 mm (6 in.) thick. The thickness was closer to 175 mm (7 in.) or 200 mm (8 in.). The first work joint was at STA 2345+27.

On June 25, the depth of the slab was still running deep. In order to get 150 mm (6 in.) in certain places, the depth was up to 300 mm (12 in.) in others. As the header was being placed, it started to rain lightly. On the second day, paving proceeded from STA 2345+27 to STA 2369+34.

On June 27, paving started at STA 2369+34. Twenty minutes after starting, work was delayed for ten minutes because of a problem with the paver. There were still problems with the pavement being thicker than designed. The survey crew lowered the grade to try and get it closer to 50 mm (2 in.). A header was placed at STA 2386+75.

On June 28, monofilament fibers were added to the mix, beginning at STA 2386+75, just at the end of Section 10. The texture of the fiber made it difficult to finish the slab, more difficult than for the fibrillated. The contractor raised the pan on the paver to go over the slab a second time to try and improve it. The paver was originally set the same as paving with the fibrillated fibers the day before. The tining didn't pull the monofilament fibers up as much as it did the fibrillated fibers. However, there was still some clumping. The air had to be lowered at the plant several times. At STA 2412+75, Section 14, the use of the monofilament fibers was discontinued and fibrillated fibers were used throughout the remainder of the day. Also in Section 14, the contractor ran out of American Louisa fly ash, so American Muscatine was used in place of it. A header was placed at STA 2415+00.

On June 30, the AC subgrade was not sprayed with water before the placement of the concrete. This was believed to provide a better bond between the asphalt and the concrete. This began at STA 2425+00, Section 17. In Section 21, the frequency of the paver vibrators were recorded. This information can be found in Appendix D. The conventional mix was being used.

On July 1, an early morning rain made the AC wet when paving began at STA 2448+35, the start of Section 22. The pavement was running thicker than the design.

On July 5, paving began at STA 2459+88. STA 2460+00, Section 26, was the beginning of the patch only surface. A header was placed at STA 2488+82.

On July 6, paving began at STA 2488+82. Light rain occurred when placing the header at STA 2505+00.

On July 7, paving started at STA 2515+00, Section 35, with conventional mix. A header was placed at STA 2531+10 due to a heavy rain shower. The contractor had to refinish the concrete a second time due to the damage from the rain.

On July 11, twenty minutes after starting in Section 36, paving was stopped. While the tie bars were being placed, one jammed in the paver and the contractor had to stop the paver so no bars would be omitted. While trying to remove the tie bar, one of the hydraulic lines was disconnected. This happened twice. They also couldn't get the paver to start again. Work started again twenty minutes later. The depth of the pavement was inconsistent. Where the slab was suppose to be 150 mm (6 in.) in thickness, it was measuring 89 mm (3.5 in.) to 114 mm (4 in.) in places, and 178 mm (7 in.) to 216 mm (8.5 in.) in other places. A header was put in at STA 2536+10, Section 36, and a 75.5 m (18 ft.) gap was left for an intersection. The start of fibrillated fibers was in Section 37 at STA 2539+09. The frequencies of the vibrators were recorded in Section 41.

Information can be found in Appendix D. The source of fly ash was changed back to American Louisa which was used throughout the remainder of the project. At the end of the day, a header was put in at STA 2561+18.

On July 12, paving began at STA 2561+18, Section 40. Section 46, STA 2585+00, was the beginning of the cold in-place recycle base preparation. The mix was also changed to C-3WR in this section. The slab depth was approximately what was specified for the sections. The end-of-day working joint was at STA 2597+65.

On July 13, the survey crew rechecked the grade. This delayed paving. At STA 2598+50, Section 48, the mix was changed from C-3WR-C to C-3WR. The contractor ran out of cement, therefore, paving was stopped at STA 2612+07.

On July 14, paving began at STA 2612+07 using the C-3WR-C mix. While paving section 52, the paver was forced up by the concrete resulting in a thickened area on the west side of the slab. The contractor went back over that part of the slab. At STA 2625+50, Section 53, the mix was changed to C-3WR, which was used throughout the remainder of the day. The use of fibrillated fibers was discontinued at STA 2632+25, Section 54. A header was put in at STA 2641+97.

On July 15, paving began at STA 2642+21, leaving a 24-foot gap at an intersection. The mix used on this day was C-3WR-C. During the paving of Section 58, the stringline came loose and had to be re-strung. As the day progressed, the amount of cure and grade stakes became short; therefore, a header was put in at STA 2672+30.

On July 18, the AC had to be thoroughly cleaned before the concrete could be laid due to the mud from the trucks as they left the plant. The contractor washed the asphalt concrete surface and then broomed it well. There was another problem with the stringline in Section 61. It came loose as it had on July 15 and it had to be re-strung again. At STA 2693+00 to 2393+50, Section 62, the pan on the paver was forced up by the concrete and the stringline broke. A lot of handwork was required to finish the slab and this resulted in a rough surface. The surface was rough. A header was put in at STA 2703+95 which was the end of the last section of PCC.

On July 25, construction of the asphalt sections began. Each section was laid in three lifts. A 75 mm (3 in.) binder, consisting of two 37.5 mm (1.5 in.) lifts, was laid for Section 16 and 34 from STA 2415+04 to 2425+00 and from STA 2505+00 to 2515+00.

A 37.5 mm (1.5 in.) AC surface was laid for Section 16 and 34 on July 26. A 75 mm (3 in.) binder, laid in two 37.5 mm (1.5 in.) lifts, was also placed from STA 2703+95 to 2713+03 in Section 65.

On July 27, a 37.5 mm (1.5 in.) AC surface for Section 65 was laid. From July 28 to August 2, grinding was done on the pavement.

EVALUATION

In addition to standard inspection, testing and documentation, nine 6"x6"x20" beams and nine 4 1/2"x9" cylinders were made for each of the PCC mixes. The flexural and compressive strengths were determined at 7, 14, and 28 days with an exception of a set of 3 beams and 3 cylinders taken from the monofilament sections which were tested at a 9 day strength. The flexural and compressive strengths along with field testing and general information about the project can be found in Appendix D.

Jim Cable of Iowa State University and his assistants placed sensors in various test sections to measure and document the temperature and strain during and after construction of the overlay. A copy of the proposal can be found in Appendix F.

The Federal Highway Administration conducted pullout tests at: STA 2385+50, 2428+25, 2455+00, 2545+50, 2620+00, and 2694+50 (Appendix D).

Three 4"x4"x18" beams were made for each of the PCC mixtures and tested for flexural strengths.

POST CONSTRUCTION EVALUATION

Several problems occurred during and after completion of the project. A mid-panel crack between two baskets was found at STA 2499+37. Spalling and other random cracking was also found in various sections. Seven mud balls were found at STA 2504+95. Locations can be found in the distress survey in Appendix E.

PERFORMANCE EVALUATION

A visual review of the general conditions and a crack survey will be conducted annually. Delamination testing will also be conducted annually in the outside wheelpath of both lanes of each 50 mm (2 in.) section for selected portions of 35 m (115 ft). At least four annual Road Rater structural tests will be conducted in 41 test sections. Evaluation of the performance will be conducted through December 31, 1999.

A distress survey was completed on August 6, 1994 by Iowa State University personnel. Road Rater structural testing was conducted on October 13, 1994. This information can be found in Appendix E.

REQUIREMENTS

This project was conducted and met the requirements of the 1992 Iowa Department of Transportation Standard Specifications and the applicable special provisions. The special provisions can be found in Appendix B.

PROJECT COSTS

The contract in Appendix B shows a project cost of $1,880,229.

ACKNOWLEDGEMENTS

Research project HR-559 was sponsored by the Iowa Department of Transportation and the Federal Highway Administration. Funding was received from the Federal Highway Administration.

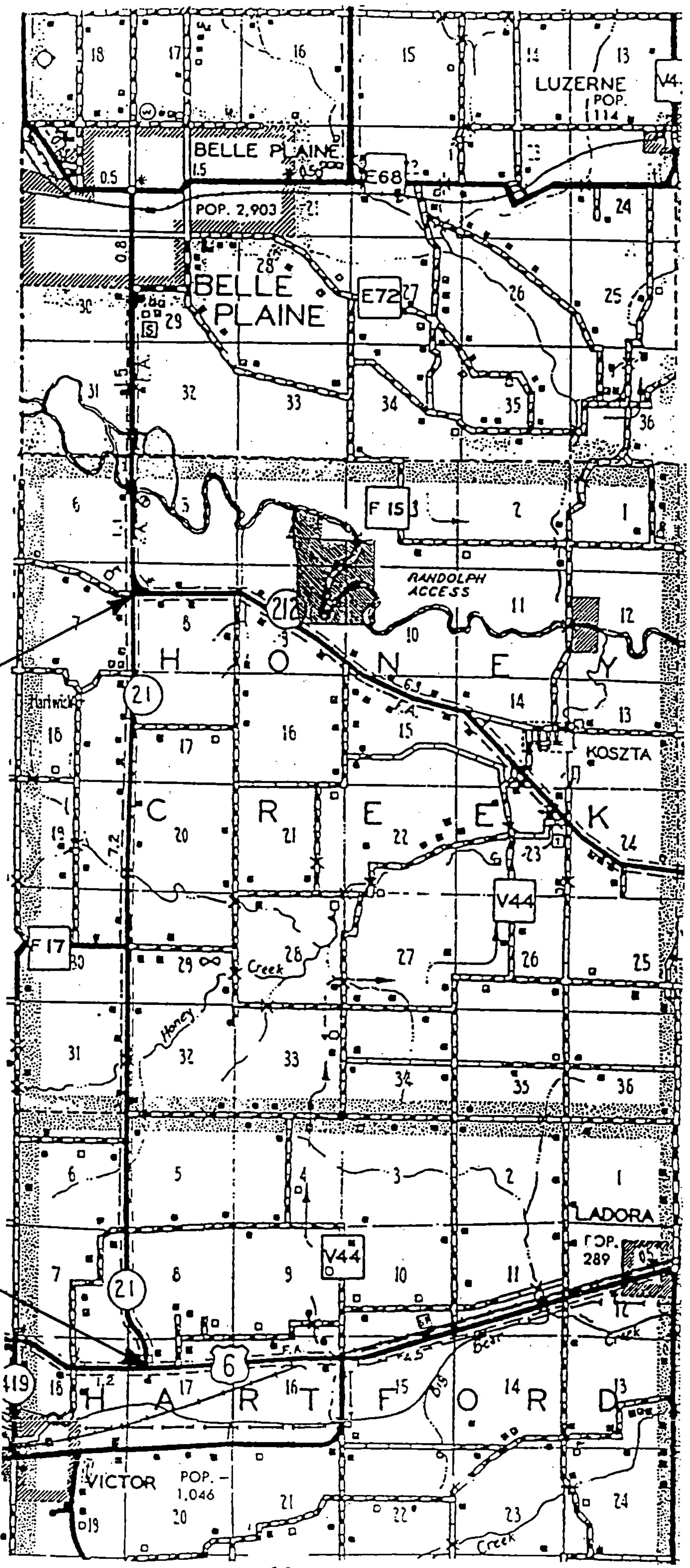
We want to extend our appreciation to Gordon Smith of Iowa Concrete Paving Association, Jim Cable and his assistants of Iowa State University, Brian McWaters of the Iowa DOT, Manatt's Inc. and all employees for their participation in construction and inspection of the project.

Appendix A

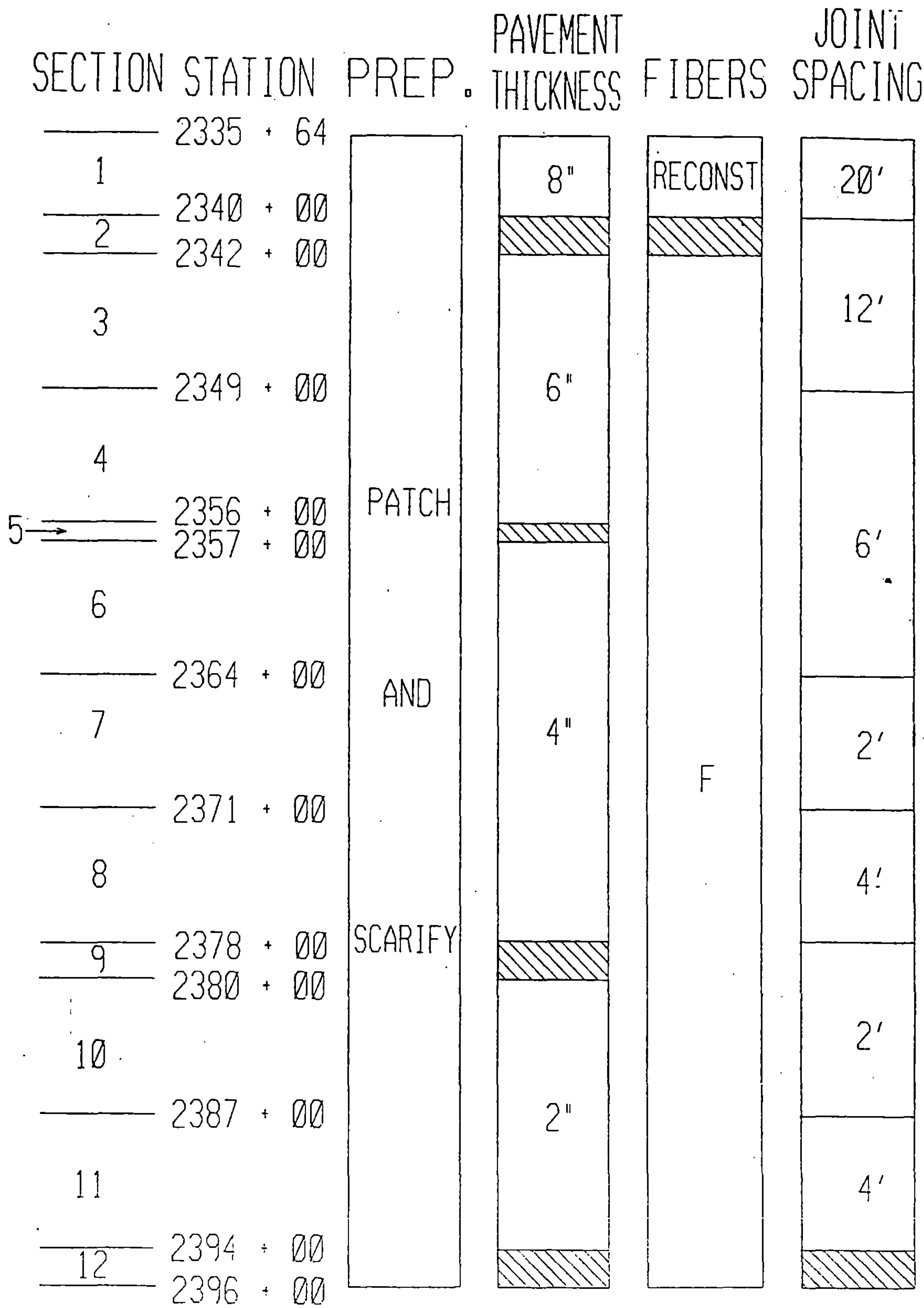
1. Project Location
2. Test Section Layout
3. Summary of Variables

E.O.P, STA 2714+08

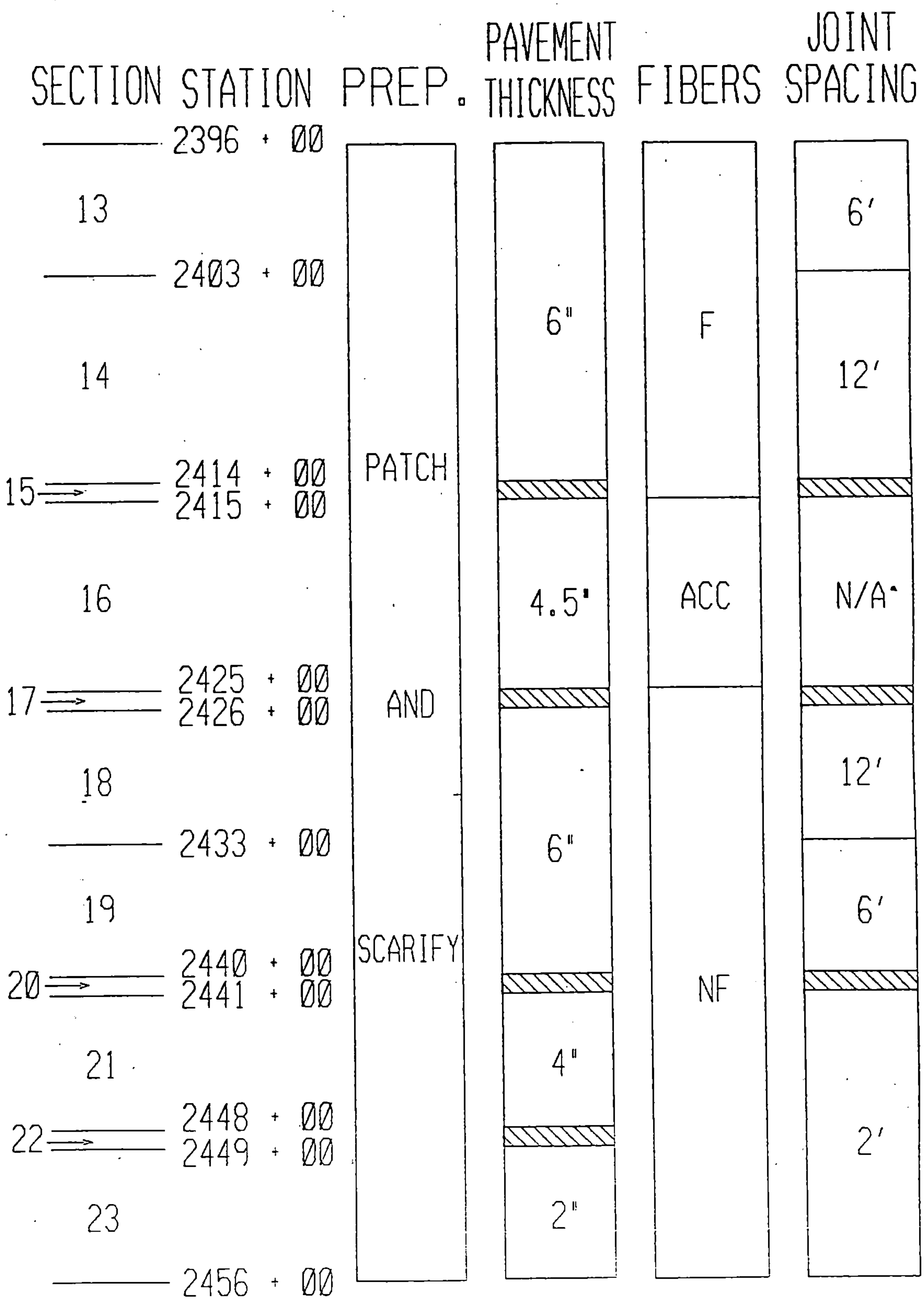
B.O.P, STA 2335+64



WHITETOPPING RESEARCH
STP-21-3(10)--2C-48
IOWA COUNTY
TEST SECTION LAYOUT



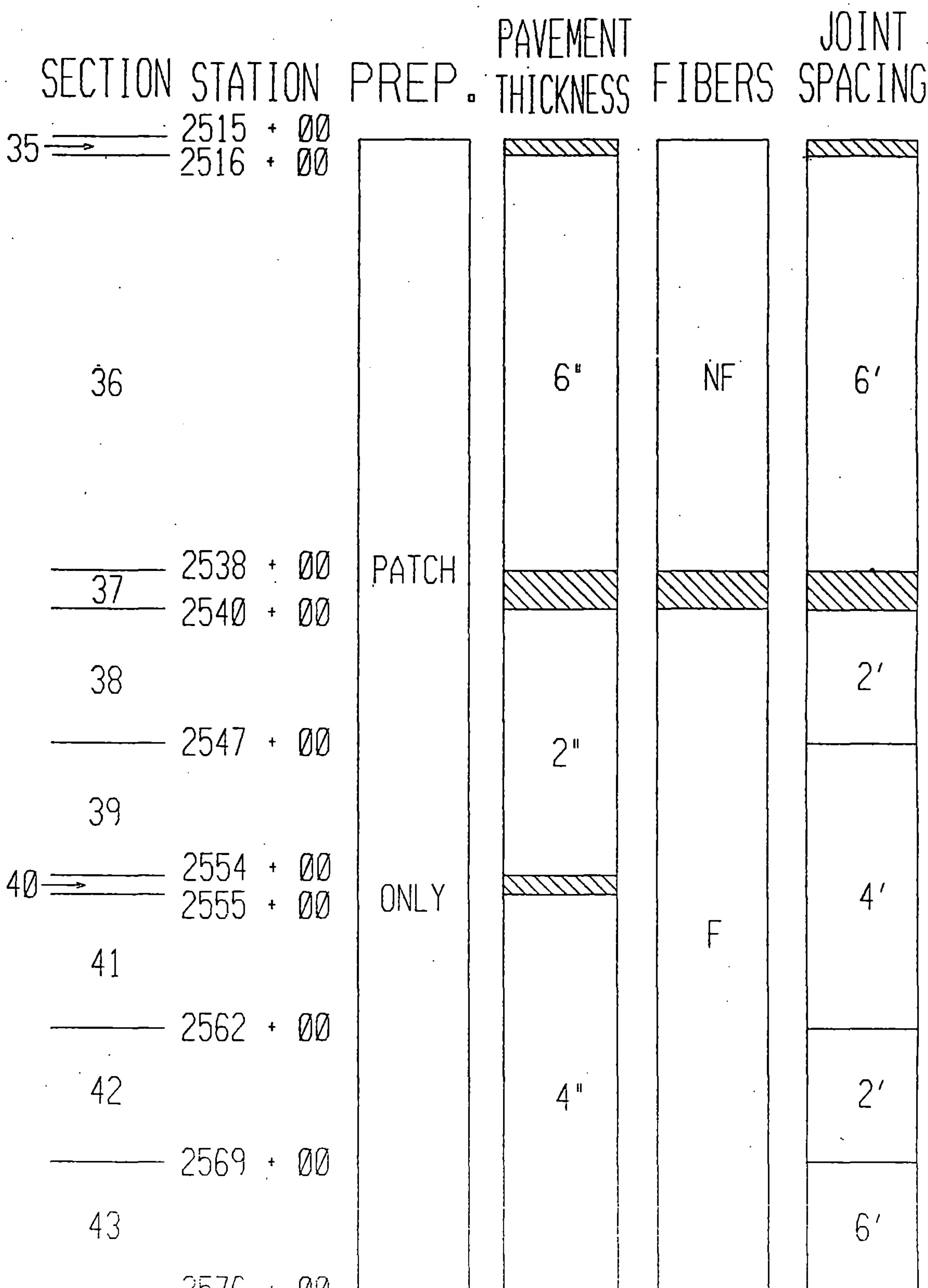
WHITETOPPING RESEARCH
STP-21-3(10)--2C-48
IOWA COUNTY
TEST SECTION LAYOUT



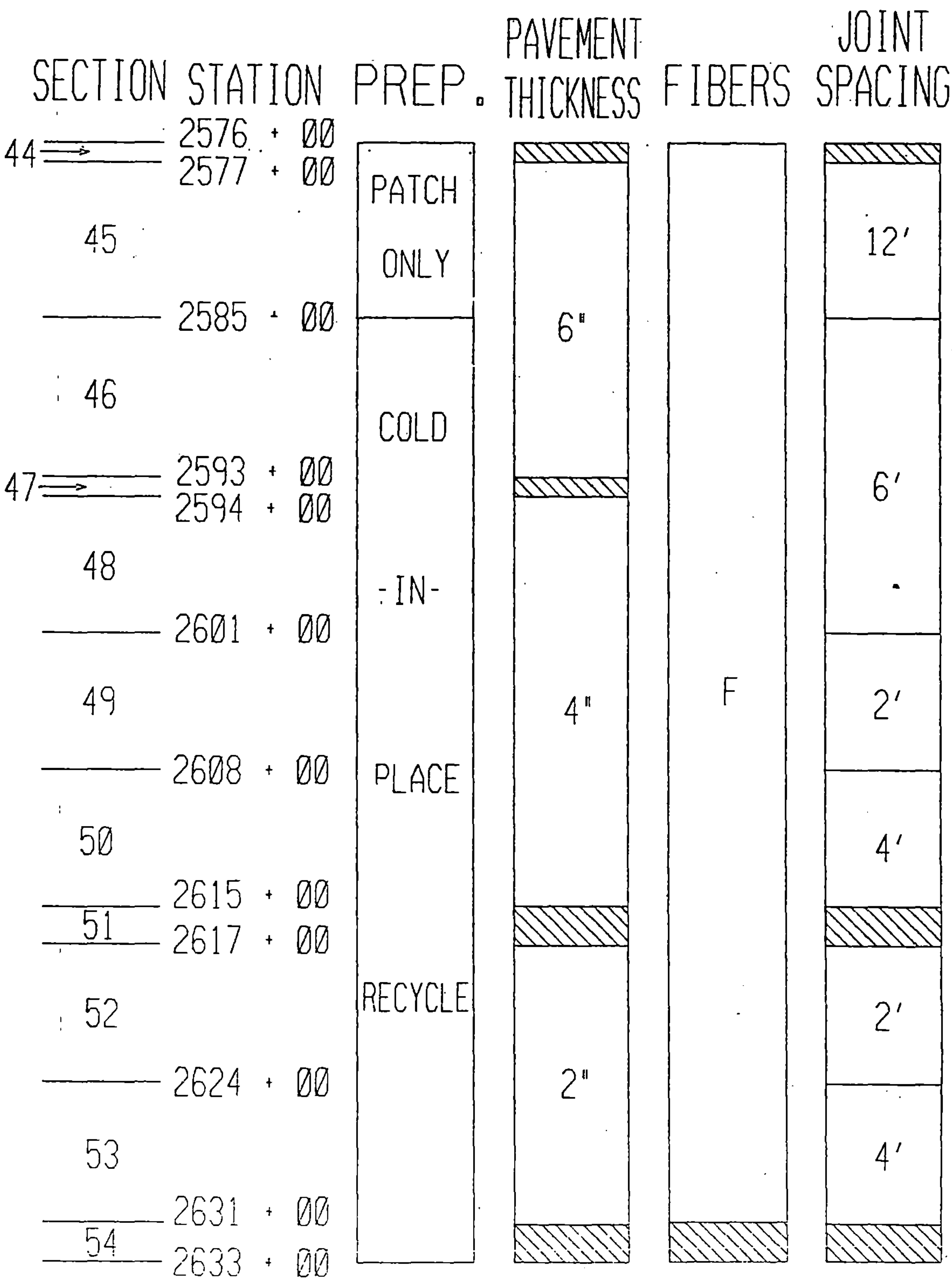
WHITETOPPING RESEARCH
STP-21-3(10)--2C-48
IOWA COUNTY
TEST SECTION LAYOUT

SECTION	STATION	PREP.	PAVEMENT THICKNESS	FIBERS	JOINT SPACING
24	2456 + 00 – 2458 + 00	PATCH AND SCARIFY		NF	
25	2458 + 00 – 2460 + 00	PATCH AND SCARIFY	6"	NF	6'
26	2460 + 00 – 2468 + 00	PATCH ONLY	6"	NF	6'
27	2468 + 00 – 2479 + 00	PATCH ONLY	6"	NF	12'
28	2479 + 00 – 2480 + 00	PATCH ONLY		NF	
29	2480 + 00 – 2487 + 00	PATCH ONLY	4"	NF	4'
30	2487 + 00 – 2489 + 00	PATCH ONLY		NF	
31	2489 + 00 – 2496 + 00	PATCH ONLY	8"	NF	15' ND
32	2496 + 00 – 2503 + 00	PATCH ONLY	8"	NF	15' D
33	2503 + 00 – 2505 + 00	PATCH ONLY		NF	
34	2505 + 00 – 2515 + 00	PATCH ONLY	4.5"	ACC	N/A

WHITETOPPING RESEARCH
STP-21-3(10)--2C-48
IOWA COUNTY
TEST SECTION LAYOUT



WHITETOPPING RESEARCH
STP-21-3(10)--2C-48
IOWA COUNTY
TEST SECTION LAYOUT



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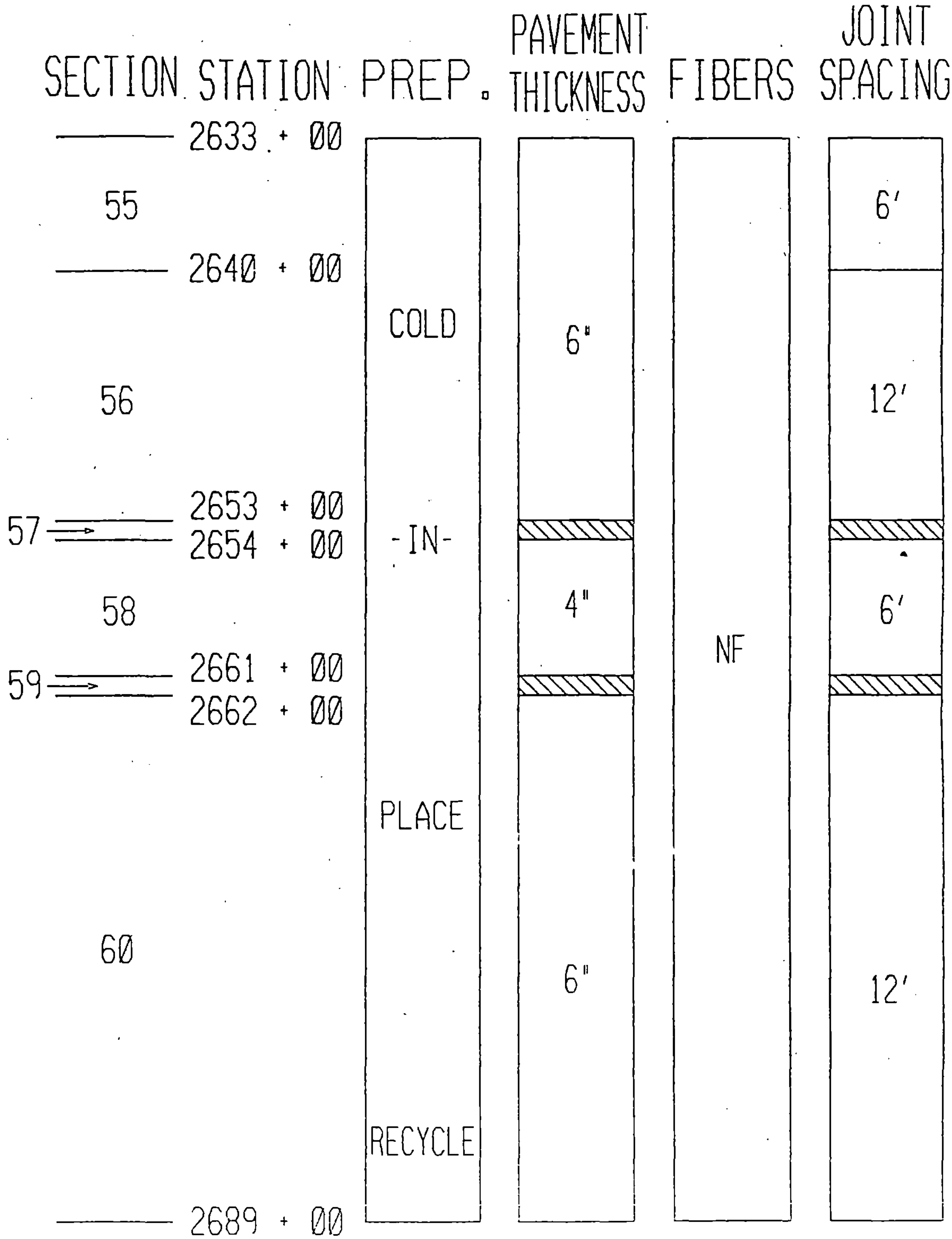
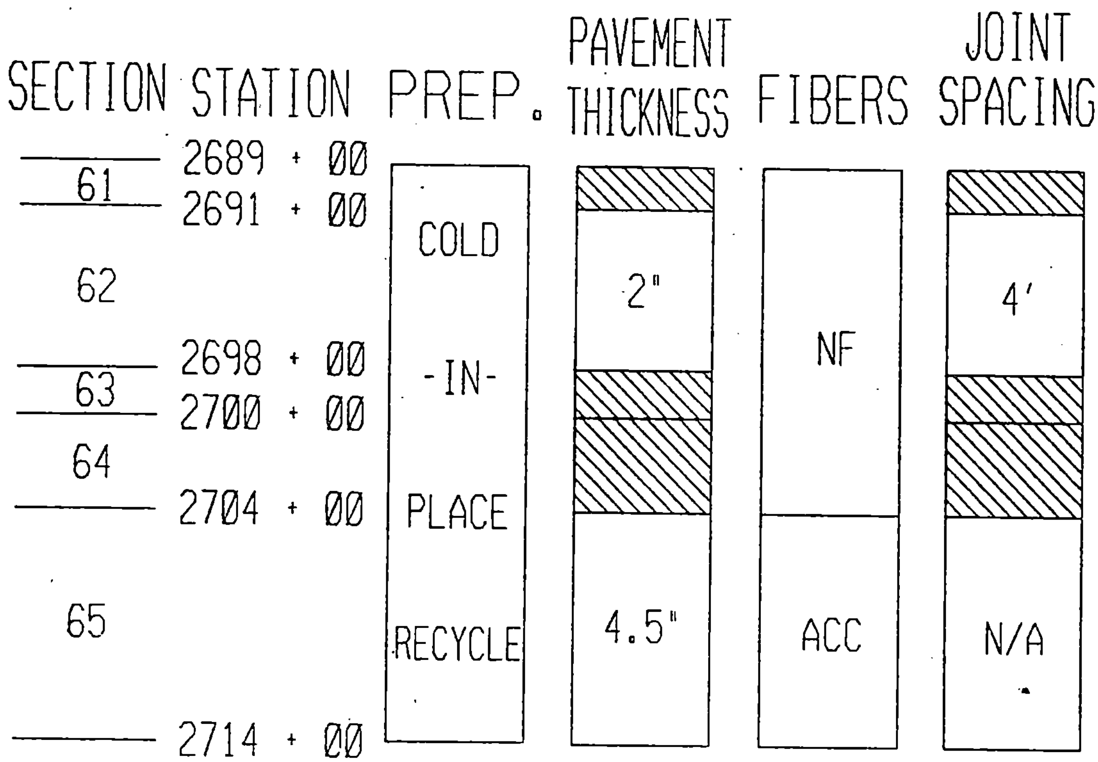
STP-21-3(10)--2C-48
IOWA COUNTY
TEST SECTION LAYOUT



WHITETOPPING RESEARCH
STP-21-3(10)--2C-48
IOWA COUNTY
TEST SECTION LAYOUT



SECTION NUMBER	BEGIN STATION	ENDING STATION	THICK-NESS (mm)	THICK-NESS (in)	FIBER F & NF	JOINT SPACING (m)	JOINT SPACING (ft)	SURFACE PREP
1	2335+64	2340+00	200	8	RECONSTR	6.1	20	***
2	2340+00	2342+00	200-150	8-6	NF-F	3.7	12	P&S
3	2342+00	2349+00	150	6	F	3.7	12	P&S
4	2349+00	2356+00	150	6	F	1.8	6	P&S
5	2356+00	2357+00	150-100	6-4	F	1.8	6	P&S
6	2357+00	2364+00	100	4	F	1.8	6	P&S
7	2364+00	2371+00	100	4	F	0.6	2	P&S
8	2371+00	2378+00	100	4	F	1.2	4	P&S
9	2378+00	2380+00	100-50	4-2	F	0.6	2	P&S
10	2380+00	2387+00	50	2	F	0.6	2	P&S
11	2387+00	2394+00	50	2	F	1.2	4	P&S
12	2394+00	2396+00	50-150	2-6	F	1.2-1.8	4-6	P&S
13	2396+00	2403+00	150	6	F	1.8	6	P&S
14	2403+00	2414+00	150	6	F	3.7	12	P&S
15	2414+00	2415+00	150-110	6-4.5	F	3.7-1.8	12-6	P&S
16	2415+00	2425+00	110	4.5	ACC	ACC	ACC	P&S
17	2425+00	2426+00	110-150	4.5-6	NF	1.8-3.7	6-12	P&S
18	2426+00	2433+00	150	6	NF	3.7	12	P&S
19	2433+00	2440+00	150	6	NF	1.8	6	P&S
20	2440+00	2441+00	150-200	6-4	NF	1.8-0.6	6-2	P&S
21	2441+00	2448+00	100	4	NF	0.6	2	P&S
22	2448+00	2449+00	100-50	4-2	NF	0.6	2	P&S
23	2449+00	2456+00	50	2	NF	0.6	2	P&S
24	2456+00	2458+00	50-150	2-6	NF	0.6-1.8	2-6	P&S
25	2458+00	2460+00	150	6	NF	1.8	6	P&S
26	2460+00	2468+00	150	6	NF	1.8	6	P ONLY
27	2468+00	2479+00	150	6	NF	3.7	12	P ONLY
28	2479+00	2480+00	150-100	6-4	NF	3.7-1.2	12-4	P ONLY
29	2480+00	2487+00	100	4	NF	1.2	4	P ONLY
30	2487+00	2489+00	100-200	4-8	NF	1.2-4.6	4-15	P ONLY
31	2489+00	2496+00	200	8	NF	4.6 ND	15 ND	P ONLY
32	2496+00	2503+00	200	8	NF	4.6 D	15 D	P ONLY
33	2503+00	2505+00	200-110	8-4.5	NF	4.6-1.8	15-6	P ONLY
34	2505+00	2515+00	110	4.5	ACC	ACC	ACC	P ONLY
35	2515+00	2516+00	110-150	4.5-6	NF	1.2-1.8	4-6	P ONLY
36	2516+00	2538+00	150	6	NF	1.8	6	P ONLY
37	2438+00	2540+00	150-50	6-2	NF-F	1.8-0.6	6-2	P ONLY
38	2540+00	2547+00	50	2	F	0.6	2	P ONLY
39	2547+00	2554+00	50	2	F	1.2	4	P ONLY
40	2554+00	2555+00	50-100	2-4	F	1.2	4	P ONLY
41	2555+00	2562+00	100	4	F	1.2	4	P ONLY
42	2562+00	2569+00	100	4	F	0.6	2	P ONLY
43	2569+00	2576+00	100	4	F	1.8	6	P ONLY
44	2576+00	2577+00	100-150	4-6	F	1.8-3.7	6-12	P ONLY
45	2577+00	2585+00	150	6	F	3.7	12	P ONLY
46	2585+00	2593+00	150	6	F	1.8	6	CIP
47	2593+00	2594+00	150-100	6-4	F	1.8	6	CIP
48	2594+00	2601+00	100	4	F	1.8	6	CIP
49	2601+00	2608+00	100	4	F	0.6	2	CIP
50	2608+00	2615+00	100	4	F	1.2	4	CIP
51	2615+00	2616+00	100-50	4-2	F	1.2-0.6	4-2	CIP
52	2616+00	2624+00	50	2	F	0.6	2	CIP
53	2624+00	2631+00	50	2	F	1.2	4	CIP

SECTION NUMBER	BEGIN STATION	ENDING STATION	THICK-NESS (mm)	THICK-NESS (in)	FIBER F & NF	JOINT SPACING (m)	JOINT SPACING (ft)	SURFACE PREP
54	2631+00	2633+00	50-150	2-6	F-NF	1.2-1.8	4-6	CIP
55	2633+00	2640+00	150	6	NF	1.8	6	CIP
56	2640+00	2653+00	150	6	NF	3.7	12	CIP
57	2653+00	2654+00	150-100	6-4	NF	3.7-1.8	12-6	CIP
58	2654+00	2661+0	100	4	NF	1.8	6	CIP
59	2661+00	2662+00	100-150	4-6	NF	1.8-3.7	6-12	CIP
60	2662+00	2689+00	150	6	NF	3.7	12	CIP
61	2689+00	2691+00	150-50	6-2	NF	3.7-1.2	12-4	CIP
62	2691+00	2698+00	50	2	NF	1.2	4	CIP
63	2698+00	2700+00	50-150	2-6	NF	1.2-3.7	4-12	CIP
64	2700+00	2704+00	150-110	6-4.5	NF	3.7-1.2	12-4	CIP
65	2704+00	2714+08	110	4.5	ACC	ACC	ACC	CIP

NOTE: ALL INFORMATION WAS TAKEN FROM PLANS
***: SPECIAL BACKFILL
P&S: PATCH AND SCARIFY
P ONLY: PATCH ONLY
CIP: COLD-IN-PLACE RECYCLE

Appendix B

1. Proposal
2. Special Provision

****

Proposal ID No.: 48-0213-010
Type of Work: PCC OVERLAY - UNBONDED
Primary County: IOWA
Cost Center: 611000
Object Code: 894
Pre-Qual Group: PC (CALL GROUP)

Date of Letting: January 07, 1994
9:00 A.M.
Bid Order No.: 101

Road System: PRIMARY ROAD

Contracting Authority: IOWA DEPT OF TRANSPORTATION, HIGHWAY DIV
Proposal Guaranty: $ 60,000.00
Optional Tied Proposal Allowed: NO
Plans: YES
Bidding Proposal Attachments: FEDERAL AID FORMS 650166, 102115

This Proposal Includes The Following Project(s):

- -

Project: STP-21-3(10)--2C-48 County: IOWA
Work Type: PCC OVERLAY - UNBONDED
Route: IOWA 21 Length (miles):
Location: FROM THE EAST JUNCTION OF U.S. 6, NORTH TO THE JUNCTION OF IOWA 212.
Federal Aid - Predetermined Wages Are In Effect
Milepost: 45.55 To 52.72

- -

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Proposal ID No.: 48-0213-010
Type of Work: PCC OVERLAY - UNBONDED

DBE Goal: 12.50 %

Letting Date: January 07, 1994
9:00 A.M.
Bid Order No.: 101

Site Number	Work Start Date	Working Days	Liquidated Damages
PROJECT COMPLETION CONTRACT	LATE START DATE: 05/02/94	75	$ 1,000.00

PROPOSAL NOTES

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*** PRE-BID MEETING ***

A PRE-BID MEETING WILL BE HELD TO DISCUSS THE CONSTRUCTION OF THIS PROJECT AND TO ANSWER CONSTRUCTION QUESTIONS. THE MEETING WILL BE HELD DECEMBER 20, 1993 AT 1:00 P.M. IN THE COMMISSION ROOM OF THE IOWA DEPARTMENT OF TRANSPORTATION COMPLEX IN AMES, IOWA.

*** WORK RESTRICTION ***

THE CONTRACTOR SHALL NOT CLOSE THE ROAD TO THROUGH TRAFFIC PRIOR TO JUNE 13, 1994 UNLESS WRITTEN PERMISSION IS GIVEN BY THE ENGINEER.

Proposal ID No.: 48-0213-010 Letting Date: January 07, 1994
Primary Work Type: PCC OVERLAY - UNBONDED 9:00 A.M.
Primary County: IOWA Bid Order No.: 101

UNIT BIDS MUST BE TYPED OR SHOWN IN INK OR THE BID WILL BE REJECTED.

Line No	Item Number / Item Description	Item Quantity and Unit	Unit Price Dollars	Unit Price Cts	Bid Amount Dollars	Bid Amount Cts
Section 0001 ROADWAY ITEMS						
0010	2102-0425072 BACKFILL, SPECIAL	1,950.000 SY				
0020	2102-2625000 EMBANKMENT-IN-PLACE	662.000 CY				
0030	2102-2713070 EXCAVATION, CLASS 13, ROADWAY & BORROW	325.000 CY				
0040	2121-7425010 SHOULDERS, GRANULAR, TYPE A	439.000 TON				
0050	2121-7425020 SHOULDERS, GRANULAR, TYPE B	13,447.000 TON				
0060	2121-8450810 TRENCHING & RESHAPING	239.570 STA				
0070	2123-7450020 SHOULDER FINISHING, EARTH	11.220 STA				
0080	2212-0475095 BASE, CLEANING & PREPARATION OF	7.085 MILE				
0090	2212-5070310 PATCHES, FULL-DEPTH REPAIR	5,508.000 SY				
0100	2212-5070330 PATCHES BY COUNT (REPAIR)	49.000 EACH				
0110	2212-5075000 PATCHES, SURFACE	10.000 TON				
0120	2301-4875006 MEDIAN, 6 IN. P.C. CONCRETE	21.000 SY				

Proposal ID No.: 48-0213-010
Primary Work Type: PCC OVERLAY - UNBONDED
Primary County: IOWA

Letting Date: January 07, 1994
9:00 A.M.
Bid Order No.: 101

UNIT BIDS MUST BE TYPED OR SHOWN IN INK OR THE BID WILL BE REJECTED.

Line No	Item Number Item Description	Item Quantity and Unit	Unit Price Dollars	Unit Price Cts	Bid Amount Dollars	Bid Amount Cts
0130	2301-5162307 PAVEMENT, STANDARD OR SLIP-FORM P.C. CONCRETE, CLASS C, 7 IN.	690.000 SY	.		.	
0140	2301-5162308 PAVEMENT, STANDARD OR SLIP-FORM P.C. CONCRETE, CLASS C, 8 IN.	1,707.000 SY	.		.	
0150	2301-6911000 SAMPLES	LUMP	LUMP		.	
0160	2303-0375010 ASPHALT CEMENT	167.000 TON	.		.	
0170	2303-0400450 ASPHALT CEMENT CONCRETE, TYPE A SURFACE COURSE, MIXT. SIZE 1/2 IN.	882.000 TON	.		.	
0180	2303-0400675 ASPHALT CEMENT CONCRETE, TYPE B BINDER COURSE, MIXT. SIZE 3/4 IN.	1,985.000 TON	.		.	
0190	2303-6375000 PRIMER OR TACK-COAT BITUMEN	1,528.000 GAL	.		.	
0200	2310-5151050 PAVEMENT, P.C.C. SLIP-FORM, FURNISH ONLY	12,201.000 CY	.		.	
0210	2310-5151051 PAVEMENT, P.C.C. SLIP-FORM, PLACE ONLY	91,734.000 SY	.		.	
0220	2310-6960000 SCARIFICATION FOR P.C.C. OVERLAY	29,333.000 SY	.		.	
0230	2312-8260051 SURFACING, GRANULAR, CLASS A CRUSHED STONE - ON ROAD	1,000.000 TON	.		.	

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Proposal ID No.: 48-0213-010
Primary Work Type: PCC OVERLAY - UNBONDED
Primary County: IOWA

Letting Date: January 07, 1994
9:00 A.M.
Bid Order No.: 101

UNIT BIDS MUST BE TYPED OR SHOWN IN INK OR THE BID WILL BE REJECTED.

Line No	Item Number Item Description	Item Quantity and Unit	Unit Price Dollars	Unit Price Cts	Bid Amount Dollars	Bid Amount Cts
0240	2399-0400020 ASPHALT REJUVENATING AGENT	38,724.000 GAL	.		.	
0250	2399-0408000 ASPHALT PAVEMENT, IN-PLACE COLD RECYCLED	34,422.000 SY	.		.	
0260	2416-0100024 APRONS, CONCRETE, 24 IN. DIA.	2.000 EACH	.		.	
0270	2417-0225018 APRONS, METAL, 18 IN. DIA.	1.000 EACH	.		.	
0280	2417-1040018 CULVERT, CORRUGATED METAL ENTRANCE PIPE, 18 IN. DIA.	30.000 LF	.		.	
0290	2502-8212034 SUBDRAIN, LONGITUDINAL, (SHOULDER) 4 IN. DIA.	42,159.000 LF	.		.	
0300	2502-8220206 SUBDRAIN OUTLET, CORRUGATED METAL PIPE, 6 IN. DIA.	172.000 EACH	.		.	
0310	2510-6745850 REMOVAL OF PAVEMENT	2,384.000 SY	.		.	
0320	2520-3350010 FIELD LABORATORY	1.000 EACH	.		.	
0330	2525-2638030 SILT FENCE	100.000 LF	.		.	
0340	2526-8285000 SURVEY, CONSTRUCTION	LUMP	LUMP		.	
0350	2527-9263110 PAINTED PAVEMENT MARKING	1,346.310 STA	.		.	

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Proposal ID No.: 48-0213-010 Letting Date: January 07, 1994
Primary Work Type: PCC OVERLAY - UNBONDED 9:00 A.M.
Primary County: IOWA Bid Order No.: 101

UNIT BIDS MUST BE TYPED OR SHOWN IN INK OR THE BID WILL BE REJECTED.

Line No	Item Number Item Description	Item Quantity and Unit	Unit Price Dollars | Cts	Bid Amount Dollars | Cts
0360	2528-8445110 TRAFFIC CONTROL	LUMP	LUMP	.
0370	2528-8445112 FLAGGERS	120.00 DAY	135.00000	16,200.00
0380	2528-8445114 PILOT CARS	20.00 DAY	200.00000	4,000.00
0390	2533-4980005 MOBILIZATION	LUMP	LUMP	.
0400	2599-6895805 RUMBLE STRIP PANEL	3.000 EACH	.	.
0410	2599-8447010 TRAINEE REIMBURSEMENT	520.00 HOUR	0.80000	416.00
0420	2601-2634100 MULCHING	1.000 ACRE	.	.
0430	2601-2636041 SEEDING & FERTILIZING	1.000 ACRE	.	.
0440	2601-2642100 STABILIZING CROP - SEEDING AND FERTILIZING	1.000 ACRE	.	.
	SECTION 0001 TOTAL			.
	TOTAL BID			.

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Run Date: 12/01/93
Proposal ID No.: 48-0213-010 Letting Date: January 07, 1994
Primary Work Type: PCC OVERLAY - UNBONDED 9:00 A.M.
Primary County: IOWA Bid Order No.: 101

Note Description

DBE-940107
DIRECTORY OF CERTIFIED DBE'S

FHWA-1273
REQUIRED CONTRACT PROVISIONS - FEDERAL-AID CONSTRUCTION CONTRACTS (EXCLUSIVE OF APPALACHIAN CONTRACTS)

NOTE: APPENDIX 'A' (ATTACHED TO THE FHWA-1273) SHALL NOT APPLY WHEN A 'PREDETERMINED WAGE RATES' SPECIFICATION HAS NOT BEEN DESIGNATED IN THE CONTRACT DOCUEMENTS.

IA93-1.0
PREDETERMINED WAGE RATES - GENERAL DECISION NUMBER IA930001 FOR HEAVY AND HIGHWAY CONSTRUCTION - STATEWIDE (EXCEPT SCOTT COUNTY)

*** ADDITIONAL REQUIREMENT ***

THE PRIME CONTRACTOR SHALL SUBMIT CERTIFIED PAYROLLS FOR ITSELF AND EACH APPROVED SUBCONTRACTOR WEEKLY TO THE PROJECT ENGINEER. THE CONTRACTOR MAY USE THE IOWA D.O.T. CERTIFIED PAYROLL FORM OR OTHER APPROVED FORM. THE CONTRACTOR SHALL LIST THE CRAFT FOR EACH EMPLOYEE COVERED BY THE PREDETERMINED WAGE RATES. THE PRIME CONTRACTOR SHALL SIGN EACH OF THE SUBCONTRACTOR'S PAYROLLS TO ACKNOWLEDGE THE SUBMITTAL OF THE CERTIFIED PAYROLL.

SP-1125
SPECIAL PROVISIONS FOR RESURFACING WITH PCC OVER ACC AND COLD IN-PLACE RECYCLED ASPHALT PAVEMENTS

*** INTENDED FOR IOWA COUNTY PCC OVERLAY - UNBONDED PROJECT STP-21-3(10)--2C-48 ***

SS-5042
SUPPLEMENTAL SPECIFICATIONS FOR SPECIFIC AFFIRMATIVE ACTION RESPONSIBILITIES (DISADVANTAGED BUISINESS ENTERPRISE) FEDERAL AID PROJECTS

SS-5050
SUPPLEMENTAL SPECIFICATIONS FOR PORTLAND CEMENT CONCRETE PROPORTIONS

SS-5055
SUPPLEMENTAL SPECIFICATIONS FOR TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION, MAINTENANCE, UTILITY AND EMERGENCY OPERATIONS

SS-5056
SUPPLEMENTAL SPECIFICATIONS FOR SPECIFIC EQUAL EMPLOYMENT OPPORTUNITIES - FEDERAL AID PROJECTS

SS-5057
SUPPLEMENTAL SPECIFICATIONS FOR ON-THE-JOB TRAINING

****

Run Date: 12/01/93
Proposal ID No.: 48-0213-010
Primary Work Type: PCC OVERLAY - UNBONDED
Primary County: IOWA

Letting Date: January 07, 1994
9:00 A.M.
Bid Order No.: 101

Note Description

SS-5057 (continued)
(EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBLITIES)

SS-5075
SUPPLEMENTAL SPECIFICATIONS FOR RESURFACING WITH PORTLAND CEMENT CONCRETE OVER ASPHALT CEMENT CONCRETE PAVEMENT

SS-5105
GENERAL SUPPLEMENTAL SPECIFICATION FOR CONSTRUCTION PROJECTS

SS-5107
SUPPLEMENTAL SPECIFICATIONS FOR COLD IN-PLACE ACC RECYCLING

SS-5115
SUPPLEMENTAL SPECIFICATIONS FOR PAVEMENT SMOOTHNESS

005.02
*** BIDDING PROPOSAL PREPARATION INFORMATION ***

A PROPOSAL MAY CONTAIN MORE THAN ONE PROJECT. SEVERAL FORMS TO BE SUBMITTED WITH THE BIDDING PROPOSAL REQUEST THE BIDDER TO ENTER A "PROJECT NUMBER". THE BIDDER SHOULD ENTER THE "PROPOSAL ID" WHEREVER THE PROJECT NUMBER IS REQUESTED IN THE BIDDING DOCUMENTS.

005.03
*** REVISION TO FHWA-1273 ***

DELETE PARAGRAPH IV.4.C.(1) FROM FORM FHWA-1273.

005.07
*** REVISIONS TO SS-5042 ***

MAKE THE FOLLOWING REVISION TO SS-5042, 'SUPPLEMENTAL SPECIFICATIONS FOR SPECIFIC AFFIRMATIVE ACTION RESPONSIBILITIES (DISADVANTAGED BUISINESS ENTERPRISE) FEDERAL AID PROJECTS';

DELETE THE LAST PARAGRAPH UNDER SUBSECTION B.3.E) OF SECTION 5042.06 'COUNTING DBE PARTICIPATION TOWARD MEETING GOALS', WHICH READS;
'FOR THE DBE COMMITMENTS WHERE DAVIS/BACON WAGE REQUIREMENTS APPLY, ALL DRIVERS SHALL BE EMPLOYEES OF THE DBE TRUCKING COMPANY SHOWN ON THE 102115 FORM OR AN OWNER/OPERATOR OF THE DBE TRUCK.'

005.19
*** REVISIONS TO THE STANDARD SPECIFICATIONS CONCERNING THE 'ALKALI LEVEL' OF P.C.C. PAVEMENT ***

THE FOLLOWING REVISIONS TO THE 'STANDARD SPECIFICATIONS - SERIES OF 1992' WILL APPLY TO P.C.C. PAVING ITEMS ONLY. (I.E.: MAINLINE PAVING, RAMPS, SIDEROADS, INTERSECTIONS ETC. IT IS NOT INTENDED TO APPLY TO DRIVEWAYS, SIDEWALKS, INTAKES, PIPES AND CULVERTS, PATCHING OR BRIDGE

Run Date: 12/01/93
Proposal ID No.: 48-0213-010
Primary Work Type: PCC OVERLAY - UNBONDED
Primary County: IOWA

Letting Date: January 07, 1994
9:00 A.M.
Bid Order No.: 101

Note Description

005.19 (continued)
RETROFITS.)

1. ADD THE FOLLOWING NEW PARAGRAPH TO ARTICLE 2301.04, PARAGRAPH E, 'USE OF FLY ASH':
   THE LIMITATION OF THE TOTAL ALKALI LEVEL FOR CEMENT AND FLY ASH COMBINATION IN ARTICLE 4108.01 SHALL APPLY.

2. ADD THE FOLLOWING NEW PARAGRAPH TO ARTICLE 4101.01, 'GENERAL REQUIREMENTS':
   WHEN FLY ASH IS USED IN PORTLAND CEMENT CONCRETE MIXES, THE LIMITATION OF THE TOTAL ALKALI LEVEL FOR CEMENT AND FLY ASH COMBINATION IN ARTICLE 4108.01 SHALL APPLY.

3. REPLACE THE FIRST PARAGRAPH OF ARTICLE 4101.01, 'GENERAL REQUIREMENTS' WITH THE FOLLOWING NEW PARAGRAPH:
   PORTLAND CEMENT SHALL MEET REQUIREMENTS OF THE ASTM SPECIFICATIONS FOR THE TYPE OF CEMENT REQUIRED FOR THE WORK. UNLESS OTHERWISE SPECIFIED, CEMENT SHALL MEET REQUIREMENTS OF ASTM C 150, TYPE II. WHEN HIGH EARLY STRENGTH CONCRETE IS SPECIFIED OR PERMITTED AND CEMENT IS USED IN NORMAL PROPORTIONS, THE CEMENT SHALL MEET REQUIREMENTS OF ASTM C 150, TYPE III. THE PERCENT EQUIVALENT ALKALI FOR THE CEMENT SHALL NOT BE MORE THAN 0.90. IF THE PERCENT ALKALI EQUIVALENT OF THE CEMENT IS BETWEEN 0.75 AND 0.90, THE CEMENT MAY BE TESTED, USING PROJECT MATERIALS IN ACCORDANCE WITH ASTM P 214 WITH EXPANSION NOT TO EXCEED 0.15 PERCENT. THE P 214 TEST WILL BE WAIVED IF CLASS F FLY ASH IS USED IN THE MIX.

4. ADD THE FOLLOWING NEW PARAGRAPHS TO ARTICLE 4108.01, 'DESCRIPTION':
   THE TOTAL CEMENTITIOUS MATERIALS FOR THE VARIOUS MIXES WITH FLY ASH SHALL BE IN ACCORDANCE WITH THE SUPPLEMENTAL SPECIFICATIONS FOR PORTLAND CEMENT CONCRETE PROPORTIONS, WITH THE ADDITIONAL PROVISION THAT THE TOTAL ALKALI LEVEL BASED ON THE COMBINED PERCENT ALKALI EQUIVALENT FOR CEMENT AND PERCENT AVAILABLE ALKALI FOR FLY ASH SHALL NOT EXCEED 0.75. ANY ADJUSTMENTS IN MIX PROPORTIONS IN THE SUPPLEMENTAL SPECIFICATIONS FOR PORTLAND CEMENT CONCRETE PROPORTIONS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR, AND SHALL BE APPROVED BY THE ENGINEER. THE MAXIMUM FLY ASH SUBSTITUTION RATE SHALL BE 15 PERCENT BY WEIGHT. THE PERCENT ALKALI LEVELS FOR APPROVED SOURCES FOR CEMENT AND FLY ASH ARE LISTED IN MATERIALS IM 401 AND IM 491.17 RESPECTIVELY, AND SHALL BE USED IN DETERMINING THE PERCENTAGES OF CEMENT AND FLY ASH OF THE TOTAL CEMENTITIOUS MATERIALS USED IN MIXES.

****

Run Date: 12/01/93
Proposal ID No.: 48-0213-010 Letting Date: January 07, 1994
Primary Work Type: PCC OVERLAY - UNBONDED 9:00 A.M.
Primary County: IOWA Bid Order No.: 101

Note Description

005.19 (continued)

IF THE TOTAL ALKALI LEVEL OF THE CEMENTITIOUS MATERIALS EXCEEDS 0.75 PERCENT, THE PROJECT MATERIALS (CEMENT, FLY ASH, AND SAND) SHALL BE TESTED IN ACCORDANCE WITH ASTM P 214. IF THE EXPANSION IN THIS TEST DOES NOT EXCEED 0.15 PERCENT, THE MATERIALS MAY BE USED FOR THE PROJECT. THE IOWA DEPARTMENT OF TRANSPORTATION WILL PERFORM THE ASTM P 214 TESTING FOR THE FIRST COMBINATION OF MATERIALS PROPOSED BY THE CONTRACTOR. ANY SUBSEQUENT TESTS FOR OTHER COMBINATION OF MATERIALS SHALL BE CONDUCTED BY THE CONTRACTOR IN A LABORATORY APPROVED BY THE ENGINEER.

IF CLASS F FLY ASH IS USED IN THE MIX, THE TOTAL ALKALI LEVEL LIMITATION OF 0.75 PERCENT IN THE CEMENTITIOUS MATERIALS SHALL NOT APPLY, AND THE P 214 TEST WILL BE WAIVED. CLASS F FLY ASH MAY BE SUBSTITUTED AT A 1:1 CEMENT REPLACEMENT RATE BY WEIGHT. THE PROPORTIONS SHALL BE ADJUSTED BY THE CONTRACTOR TO REFLECT CLASS F FLY ASH USAGE, AND SHALL BE APPROVED BY THE ENGINEER.

080.00

*** DBE GOAL INFORMATION ***

THE ESTABLISHED DBE GOAL FOR THIS CONTRACT CONCERNING PARTICIPATION BY DISADVANTAGED BUSINESS ENTERPRISES (E.G., SUPPLIERS, AND SUBCONTACTORS) IS SHOWN ON PAGE 1 OF THE PROPOSAL DETAILS (SECOND SHEET OF THE PROPOSAL) AND APPLIES TO ALL FEDERAL AID PROJECTS INCLUDED IN THIS PROPOSAL.

REFER TO THE CURRENT "DIRECTORY OF CERTIFIED DBE'S" AND TO THE CURRENT "SUPPLEMENTAL SPECIFICATION FOR SPECIFIC AFFIRMATIVE ACTION RESPONSIBILITES (DISADVANTAGED BUSINESS ENTERPRISES) FEDERAL AID PROJECTS" FOR ADDITIONAL INFORMATION AND INSTRUCTIONS.

IN ADDITION, IF THE WINNING BIDDER ELECTS TO USE DBE SUBCONTRACTORS AND/OR SUPPLIERS, FORM 830231 (SUBCONTRACT REQUEST AND APPROVAL) SHALL BE SUBMITTED TO THE PROJECT ENGINEER PRIOR TO THE PRECONSTRUCTION CONFERENCE TO DOCUMENT DBE SUBCONTRACTORS AND/OR SUPPLIERS TO BE USED. THE CONTRACTOR SHALL ATTACH A COMPLETED FORM 102117 FOR EACH DBE SUBCONTRACTOR AND/OR SUPPLIER LISTED ON THE CONTACTOR'S FORM 102115 THAT WAS SUBMITTED AT THE LETTING.

120.01

THE FIELD LABORATORY OR LABORATORIES IF APPLICABLE SHALL BE ON THE PROJECT AT ALL TIMES TESTING IS REQUIRED.

181.14

THE SURFACE COURSE SHALL BE 1/2 IN. MIX WITH NO SPECIAL AGGREGATE FRICTIONAL REQUIREMENTS.

Run Date: 12/01/93
Proposal ID No.: 48-0213-010 Letting Date: January 07, 1994
Primary Work Type: PCC OVERLAY - UNBONDED 9:00 A.M.
Primary County: IOWA Bid Order No.: 101

Note	Description

181.14 (continued)

182.604500
THE PERCENTAGE OF CRUSHED PARTICLES IN THE A.C.C. SHALL BE:

SURFACE	60%
BINDER	45%

500.05
THE FREE TIME ALLOWED BETWEEN NOVEMBER 15 AND APRIL 1 WILL NOT BE PERMITTED ON THIS PROJECT DURING THE WINTER OF 1994-1995. THE CONTRACTOR SHALL WORK DURING THE WINTER OF 1994-1995 ON ALL WORKING DAYS AS DEFINED IN 1101.03 'WORKING DAYS'.

700.00
ALL SECTIONS ON THIS PROPOSAL FORM ARE TIED, AND ALL ITEMS MUST BE BID (WITH THE EXCEPTION OF ALTERNATE ITEMS OR ALTERNATE SETS OF ITEMS). NO OTHER TIES BETWEEN GROUPS OR PROJECTS WILL BE ALLOWED.

720.00
SEE ADDTIIONAL ATTACHED REQUIREMENTS.

STATISTICAL MEASUREMENT AND PAYMENT FOR PCC PAVEMENT

THE PROVISIONS IN THIS ATTACHMENT SHALL REPLACE THE REQUIREMENTS OF ARTICLE 2301.34, PARAGRAPH A, AND ARTICLE 2301.35, PARAGRAPH A, OF THE STANDARD SPECIFICATIONS, SERIES OF 1992.

REPLACE Paragraph A of Article 2301.34, Method of Measurement, with the following new Paragraph A.

A. Portland Cement Concrete Pavement.

The method of measurement described herein for Standard or Slip-Form Portland Cement Concrete Pavement applies to pavement, concrete base, concrete base widening, concrete pavement widening and concrete paved shoulders. The area of pavement constructed of the class specified will be computed in square yards from surface measure longitudinally and nominal plan width. Areas of street connections on urban projects will be determined from plan dimensions. Areas of ramps, including acceleration and deceleration lanes, will be determined in square yards from plan dimensions, using the edges of the main line pavement as terminals of the ramp pavement. The thickness of pavement constructed will be determined from core depths as follows:

For pavement or base with a design width of 20 feet or more, the area will be divided into lots of not more than 14,000 square yards. For pavement or base with a design width less than 20 feet and for pavement widening and paved shoulders, the area will be divided into lots of not more than 7000 square yards. The number of lots, lot size, and core location shall be in accordance with Materials IM 346.

At locations determined by the Engineer, the Contractor shall cut samples from the finished pavement, base, widening, or shoulders by drilling with a core drill of a size that will provide samples with a 4-inch outside diameter. The Contractor shall restore the surface by tamping low-slump concrete into the hole, finishing and texturing. The Contractor shall identify and deliver the cores to the field laboratory or plant inspector. The Engineer will measure the cores and report the results and quality index information.

Pavement and other work described above shall not be cored for thickness determination in the following situations:

1. Lots less than 5000 square yards 20 feet wide or wider.

2. Lots less than 2500 square yards and less than 20 feet wide.

3. Irregular areas which total less than 2500 square yards.

4. Detour pavements, median crossovers, paved drives, runarounds, paved medians and other temporary pavements.

REPLACE Paragraph A of Article 2301.35, Basis of Payment, with the following new Paragraph A.

A. Portland Cement Concrete Pavement.

The basis of payment described herein for Standard or Slip-Form Portland Cement Concrete Pavement applies to pavement, concrete base, concrete base widening, concrete pavement widening and concrete paved shoulders. Payment for the quantities of pavement in square yards in each lot will be at a percentage of the contract unit price in accordance with the following schedule:

Payment Schedule

Percent Payment	Quality Index Range		
103	1.25	or	MORE
101	0.86	to	1.24
100	0.41	to	0.85
98	0.20	to	0.40
95	0.00	to	0.19
90	-0.25	to	-0.01
80	-0.40	to	-0.26
70*	-0.41	or	LESS

* If a QI of -0.41 or less is obtained, additional cores shall be taken to determine the extent and severity of the deficiencies. Depending on the results of this study the Engineer will require one of the following procedures:

(a) The deficient lot shall be removed and replaced with pavement at the Contractor's expense, meeting the contract requirements. Payment for the replaced pavement will be as provided above.

(b) The pavement represented by cores deficient from design thickness by more than one inch shall be replaced. These areas will be defined b limits one-half the distance to the next core which is not deficient from design thickness by more than one inch. The remainder of the deficient lot may be left in place and paid for at 70 percent of the contract price.

If all lots on a project have a quality index of 1.25 or more, the percent of payment will be 105 percent for the project.

If all cores measured in a lot are at or above design thickness, the payment for that lot will not be less than 100 percent of the contract unit price.

Payment for areas of Class A subbase, or PCC paved shoulders will not be more than 100 percent of the contract unit price.

Unless otherwise provided in the contract documents, or mutually agreed upon by the Contractor and the Engineer, areas which are paved with M, F, or FF mixes at the request of the Engineer, will be paid for as provided above except that the unit price will be doubled.

SPECIAL PROVISIONS
for

RESURFACING WITH PORTLAND CEMENT CONCRETE OVER ASPHALT CEMENT CONCRETE AND COLD IN-PLACE RECYCLED ASPHALT PAVEMENTS

STP-21-3(10)--2C-48, Iowa County

January 7, 1994

THE STANDARD SPECIFICATIONS, SERIES OF 1992, ARE AMENDED BY THE FOLLOWING MODIFICATIONS. THESE ARE SUPPLEMENTAL SPECIFICATIONS, AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

This work involves resurfacing portland cement concrete (PCC) pavement over asphalt-cement concrete (ACC) and cold in-place recycled pavements.

The contract documents will specify locations of different PCC pavement thicknesses, the areas of polypropylene fiber reinforced PCC, and the locations of different transverse and longitudinal joint patterns.

Testing and monitoring instruments will be installed in the area of PCC resurfacing for research purposes. These instruments will be installed and operated by others. The contractor's schedule shall accommodate the installation and operation of the testing and monitoring instruments.

A one day open house is planned for this work. Detailed information concerning the open house will be submitted to the Contractor after the award of the contract. The Contractor's schedule shall accommodate this open house.

Section 2301 of the Standard Specifications shall apply for resurfacing PCC pavement over ACC and Cold In-place Recycling pavements with the following modifications.

REPLACE the first paragraph of Article 2301.02, Type of Pavement, with the following new paragraph:

> The Contractor shall construct the PCC pavement resurfacing with slip-form paving equipment.

REPLACE the second sentence of Article 2301.03, Materials, with the following two new sentences:

> Coarse aggregate used in the PCC mix shall meet requirements of gradation number 5 and be of the durability class required by Article 4115.04. Collated or Graded fibrillated polypropylene fibers shall be used where

the contract documents specify PCC with fibers. The minimum length of individual fiber strands shall be 3/4 inch.

REPLACE the first paragraph of Article 2301.04, Portland Cement concrete pavement, with the following new paragraph:

The Contractor shall use a Class C concrete for PCC resurfacing. The Contractor shall use the same concrete mix design for all PCC resurfacing on this project.

ADD Paragraph F, Polypropylene Fibers, to Article 2301.04, Portland Cement Concrete Pavement.

F. Polypropylene Fibers.
Where specified in the contract documents, the Contractor shall incorporate Polypropylene Fibers into the PCC mix in accordance with the fiber supplier's instructions with the Engineer's approval. The Contractor shall add 3 pounds of fibers per cubic yard of concrete. The Contractor shall mix the fibers into fresh concrete so they are uniformly distributed throughout each batch of concrete and there is no clumping of the fibers.

REPLACE all of Article 2301.10, Subgrade Construction with the following:

2301.10 Preparation of Existing ACC and New Cold In-Place Recycled Asphalt Base Pavements.

The contract documents will specify the locations of the existing ACC pavement and the locations of the new cold in-place asphalt pavement.

The contract documents specify the locations of pavement scarification and ACC full depth repair patches on the existing ACC pavement prior to PCC resurfacing. The Contractor shall perform the pavement scarification and ACC full depth repair patch work in accordance with the contract documents and the Iowa DOT Standard Specifications. The Contractor shall perform the pavement scarification work so the surface is left with a smooth profile. It is intended that the depth of pavement scarification will average a nominal 1/4 inch.

The Contractor shall construct the areas of cold in-place recycled asphalt pavement in accordance with the current Supplemental Specifications for Cold In-Place ACC Recycling.

The Contractor shall prepare a pad line for the equipment used for PCC resurfacing. The cost of preparation of the pad area shall be included in the price of placing the PCC pavement resurfacing.

The Contractor shall clean the existing surfaces of all loose or adhering foreign material prior to placement of the PCC over the existing ACC and new cold in-place recycled asphalt pavements.

At the time of PCC placement, the existing ACC and new cold in-place asphalt recycled pavements shall conform to the specified typical cross section. The pavements shall be checked, and any high spots shall be trimmed at the direction of the Engineer.

At the time of PCC placement, adequate provisions shall have been made for drainage away from the area to be paved.

ADD the following paragraph prior to the first paragraph of **Article 2301.14**, Placing Concrete.

The contract documents specify the PCC resurfacing to be placed at depths of 2, 4, 6, and 8 inches. The contract documents identify the locations of each depth of pavement. The contract documents also identify transition areas between each depth of pavement.

REPLACE the fourth from the last Paragraph of Article 2301.14, Placing Concrete, with the following new paragraph:

The Contractor shall install deformed tie bars for all longitudinal joints in accordance with Road Standard RH-51 in areas of PCC resurfacing without fibers and thickness greater than 4 inches. Areas of PCC resurfacing with fibers or 4 inches in thickness or less will not require tie bars in the longitudinal joints.

REPLACE Paragraph D of Article 2301.16, Finishing, with the following new Paragraph D:

D. The current Supplemental Specifications for Pavement Smoothness shall apply for this work. All bumps exceeding 0.5 inch within a 25 foot span, as indicated on the profilogram, shall be corrected, except when otherwise directed by the Engineer. Grinding of pavement less than 4 inches thick for smoothness correction shall be only when approved by the Engineer.

REPLACE the third sentence of the first paragraph of Article 2301.19, Paragraph A, Curing with White Pigmented Liquid Curing Compound.

The rate of application of curing compound on the PCC resurfacing shall be a minimum of 0.10 gallons per square yard of pavement. (Covering 10 square yards per gallon.)

REPLACE all of Articles 2301.22, Transverse Contraction Joints; and 2301.24, Longitudinal Joints, with the following new Article 2301.22.

2301.22 Transverse Contraction and Longitudinal Joints.
The Contractor shall saw transverse contraction and longitudinal joints in the PCC resurfacing in accordance with the joint patterns specified in the contract documents. Each joint shall be constructed substantially true to line with no offsets along the joint. The Contractor has the option of using a "Soff Cut" type of sawing system or approved equivalent to saw the joints in the PCC resurfacing.

Sawing the joints shall commence as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling, and to support the weight of the sawing equipment and operator. All joints shall be sawed before uncontrolled shrinkage cracking takes place. If necessary, the sawing operations shall be carried on both during the day and night, regardless of weather conditions. Sawing shall be discontinued when a crack develops ahead of the saw. In general, all joints should be sawed in sequence. The Contractor shall not use a span saw which is supported on the new pavement, for sawing the PCC resurfacing.

The Contractor shall saw the joints in accordance with the following width and depth requirements for the specified PCC resurfacing thicknesses.

PCC Resurfacing Thickness	Joint Width	Joint Depth
2"	1/8"	1/2"
Greater than 2" to 4"	1/8"	1"
* Greater than 4"	* 1/4"	* 1 1/8"

* The Contractor has the option to construct joints in pavements greater than 4" thick in accordance with Road Standards RH-50 for transverse joints and Road Standard RH-51 for longitudinal joints.

Should uncontrolled cracking occur, a joint shall be formed with a crack saw along the line of the crack, and the joint shall be cleaned and sealed, as provided in Article 2301.25.

If the length of box out exceeds 15 feet, a contraction joint shall be constructed at both ends.

When random transverse cracks occur from a CD joint, the Engineer may require the pavement to be patched and an additional CD joint installed.

ADD the following new paragraph prior to the first paragraph of Article 2301.25, Sealing Joints.

The Contractor shall not seal transverse and longitudinal joints in PCC resurfacing 4 inches or less in thickness unless otherwise specified in the contract documents. The Contractor shall seal all joints in PCC resurfacing greater than 4 inches in thickness. The Contractor is not required to install backer rope in the joints, unless the joints are constructed in accordance with Road Standards RH-50 or RH-51.

REPLACE all of Paragraph A of Article 2301.34, Method of Measurement, with the following new Paragraph A:

A. Portland Cement Concrete Pavement.
The quantity of the various items of work involved in the resurfacing with portland cement concrete over ACC and cold in-place recycled asphalt pavements will be measured for payment by the Engineer in accordance with the following provisions:

1. Slip-Form PCC Pavement, Furnish Only.
   The Engineer will compute the cubic yards of PCC concrete furnished and incorporated in the work by count of batches and the nominal batch volume.

2. Slip-Form PCC Pavement, Place Only.
   The Engineer will compute the total square yards of PCC resurfacing placed from plan dimensions.

3. Scarification for PCC Overlay.
   When Scarification for PCC Overlay is an item in the contract, the Engineer will compute the area scarified in square yards from measurement. When the work is done according to plan dimensions, the area may not be specifically measured and payment will be based on plan quantities.

REPLACE all of Paragraph A of Article 2301.35, Basis of Payment, with the following new Paragraph A:

A. Portland Cement Concrete Pavement.
Resurfacing with portland cement concrete over asphalt cement concrete pavement will be paid the contract price in accordance with the following provisions:

1. Slip-Form PCC Pavement, Furnish Only.
   For the number of cubic yards of PCC concrete incorporated in the work, the Contractor will be paid the contract price per cubic yard. This payment shall be full compensation for mixing the concrete and all materials, including polypropylene fibers, delivered to the grade.

2. Slip-Form PCC Pavement, Place Only.
   For the number of square yards of PCC resurfacing placed, the Contractor will be paid the contract price per square yard. This payment shall be full compensation for placing, finishing, protecting and curing the pavement, sawing and sealing joints, for furnishing and installing reinforcement, for preparation of the pad line and pavements, and for meeting all other requirements of Section 2301.

3. Scarification for PCC Overlay.
   When Scarification for PCC Overlay is an item in the contract, the Contractor will be paid the contract price per square yard for scarification completed. This payment shall be full compensation for furnishing all material, equipment, and labor for the scarification and disposal of scarified material, as designated in the contract documents.

The current Supplemental Specifications for Pavement Smoothness apply for this work. Payment may be modified as provided therein. The modifications shall be made to payments described in both Paragraphs 1 and 2 above.

Appendix C

1. Daily Inspection Reports of PCC
2. Daily Plant Reports for AC

Form 830224
9-89

COMBINED DAILY INSPECTION REPORT OF PORTLAND CEMENT CONCRETE PAVEMENT

Contract No. 40321 Contr. MANATTS INC. Res/Co. Engr. KEN YANNA Project STP-21-3(10)--2C-48 County IOWA

Report No. 13 Date 7/14/94 Date of Last Report 7/13/94 Plant Owner and Location MANATTS PORTABLE, HWY 21 Sq. Yards (Cont. Qty.) 91,734

Weather OVERCAST SKIES Days Temp. Max. 74 Min. 69 Min. Temp. Foll. Night 66 Plant Insp. JOAN LINDER Cert. No. 1602

Item/Lane	Station From	Station To	Length Feet	Sq. Yards	Cu. Yds. Est.	Cu. Yds. Batched	Cu. Yds. Used	% of Est. Used	Time Start / End	Mix No.	Dry Batch Weights F.A.	Dry Batch Weights C.A.	Moisture Content F.A.	Moisture Content C.A.	Cement	Fly Ash	Fine Aggr.	Coarse Aggr.	Water in Mat'ls.	Water Added at Plant	Water Added at Grade	Total Water	Slump	Air	Hand Fin.
Both 0200 0210	2612 -07	—			283	392	391.5	138.3	6:39 / 9:06	C-3 WR-C	1365	1662	2.9	1.5	497	87	1406	1689	66	181	0	247	2 1/4	7.0	B. 6
	—	—			485	672	671.0	138.4	9:48 / 1:18	C-3 WR	1369	1670	2.9	1.5	571	—	1410	1695	66	164	0	230	2 1/4	9.5	5
	2641 +60	2641 +97			12	16	16.0	133.3	1:22 / 1:28	M-3	1272	1555	2.9	1.5	788	—	1310	1579	62	237	0	299			
	—	2641 +97	2990	7973.33																					

	Length Feet	Sq. Yards	Est.	Batched	Used	% of Est. Used
TOTAL	2990	7973.33	780	1080	1078.5	138.3
PREVIOUS TOTAL	25213.30	67182.13	9081.88	11048.0	11003.25	121.2
TOTAL TO DATE	28203.30	75155.46	9861.88	12128.0	12081.75	122.5

Total Cement Batched 383712 C3WR Total Fly Ash Batched — Total Water ~~[illegible]~~ 154560 C3

Maximum Allowable Water 280 Brand of Air Admixture AES Lot# 14072T406 Ave. Water/Cement ~~[illegible]~~ .403 C3

Calcium Chloride ☐ Yes ☒ No Max. Water/Cement .489

Water Reducer ☒ Yes ☐ No Brand PDA 25 DP Lot# 140514 T403 Normal Batch Size 1 CY

Source:

Fly Ash AMERICAN, LOUISA Sp. Gr. 2.72

Fine Aggr. MARANGO REDI-MIX T-203 No. A48508 Sp. Gr. 2.63 Plant Test 2.62

Coarse Aggr. VOLCAN, MONTOUR T-203 No. A86002 Sp. Gr. 2.63 Plant Test 2.63

Certified Aggregate Verification Coarse Aggr. Durability 3i

Fine aggregate 65828-65882/768.95 tons Coarse Aggregate 303889-303955/908.61 tons

Time Lost And Cause

Type of Subgrade ASPHALT

CEMENT Brand	Type	Ticket No.	Amount Tons
LAFARGE	I/II	244055-	283.27
	L.A.	244100	
FLY ASH			
AMERICAN	C	14532	25.08

Method of Curing: WHITE CURE COMPOUND

Texture Method: TINE

BEAMS MADE

Time	Beam No.	Slump	Air
6:50	*15	1 1/4	4.6
11:45	15A	1 1/4	7.7
1:00	15B	1 1/2	7.8
1:30	15M	1 3/4	7.8

Method of Covering Subgrade: ☐ Plastic ☐ Moistened ☒ Slip Form ☐ Fixed Form

Method of Mixing: ☒ Central Mix ☐ Transit Mix

Cold Weather Protection ☐ Yes ☒ No

BEAMS TESTED

Beam No.	Mix No.	Age Days	Depth Inches	Width Inches	Slump	Air	Lb. Water & Pail or Ind. Load	Act. Load	End Reaction (Pounds)	Computation Factor	Mod. of Rupture	Location of Break
11	C-3WR-C	7	6.00	6.04	3/4	7.5	5600	5560	—	124172	690	1/8
7A	3WR-C	14	6.02	6.02	1 1/2	7.2	6600	6560	—	.123758	812	E

AGGR SIEVE ANALYSIS — PERCENT PASSING

Sample I.D.	Grad. No.	1½ IN	1 IN	¾ IN	½ IN	⅜ IN	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200	COMP.
CA-7-14	5		100	100	74	46	4.6	1.2					0.9	YES
FA-7-14	1					100	97	90	75	42	8.1	0.5	0.2	YES

Additional Slump, Air Tests, Remarks

CONC. temps 72 AIR TEMPS 65
75 62
76

MIX #	cement	Flyash	H2O
C3WRC	190904	34104	96884
~~[illegible]~~R			
M3	12608	—	4784

ROAD WASTE 1 1/2 CY

*552 CY OF POLY FIBER

45

Form 830224
9-89

COMBINED DAILY INSPECTION REPORT OF PORTLAND CEMENT CONCRETE PAVEMENT

Contract No. 40321 Contr. MANATTS INC. Res/Co. Engr. KEN YANNA Project STP-21-3(10)--2C-48 County IOWA

Report No. 7 Date 7/5/94 Date of Last Report 7/1/94 Plant Owner and Location MANATTS PORTABLE, HWY 21 Sq. Yards (Cont. Qty.) 91,734

Weather PARTLY CLOUDY Days Temp. Max. 90 Min. 75 Min. Temp. Foll. Night 70 Plant Insp. JOAN LINDER Cert. No. 1602

Item/ Lane	STATION From	STATION To	Length Feet	Sq. Yards	CU. YDS. Est.	CU. YDS. Batched	CU. YDS. Used	% of Est. Used	Time Start / End	Mix No.	DRY BATCH WEIGHTS F.A.	DRY BATCH WEIGHTS C.A.	MOISTURE CONTENT F.A.	MOISTURE CONTENT C.A.	Cement	Fly Ash	Fine Aggr.	Coarse Aggr.	Water in Mat'ls.	Water Added at Plant	Water Added at Grade	Total Water	Slump	Air	Hand Fin.
C200 L2210	5459 +88					488	488.0		6:58 / 9:27	C-3 WR-C	1365	1662	3.5	1.4	487	90	1415	1686	74	156	0	230	1/2	5.5	
						24	24.0		9:32 / 9:37	M-3 C	1267	1551	3.5	1.4	709	80	1313	1573	68	219	0	287	1"	8.0	
						416	416.0		9:39 / 1:16	C-3 WR-C	1365	1662	3.5	1.4	487	90	1415	1686	74	156	0	230	1	7.8	
		2488 +82	2894.0	7717.33	1122.05	488	487.5		1:18 / 3:56	C-3 WR-C	1365	1662	3.2	1.4	487	90	1410	1686	69	166	0	235	3/4	7.8	
										AIR TEMPS			86°	CONC. TEMPS			84°								
													87° 91°				84° 84°								
TOTAL			2894.0	7717.33	1122.05	1416	1415.5	120.8																	
PREVIOUS TOTAL			10972.0	20738.04	3772.99	4585.0	4556.0	120.8																	
TOTAL TO DATE			13866.0	~~28822.70~~ 215105.37	4895.04	6001.0	5971.5	120.8																	

M-3C - 17016 M-3C 1920 M-3 6888

Total Cement Batched 677904 C-3WR-C Total Fly Ash Batched 125280 C-3WR-C Total Water [redacted] C-3WR-C - 322

Maximum Allowable Water 282 Brand of Air Admixture AES Lot # 1403975405 Ave. Water/Cement C-3WR-C .402 .364

Calcium Chloride ☐ Yes ☒ No Max. Water/Cement .487

Water Reducer ☒ Yes ☐ No Brand PDA-25-DP Lot # 140514T403 Normal Batch Size 1 CY

Source:

Fly Ash AMERICAN, MUSCATINE Sp. Gr. 2.80

Fine Aggr. MARENGO REDI-MIX T-203 No. AH8508 Sp. Gr. 2.63 Plant Test 2.63

Coarse Aggr. VOLCAN, MONTOUR. T-203 No. A86002 Sp. Gr. 2.63 Plant Test 2.62

Certified Aggregate Verification Coarse Aggr. Durability 3

Fine aggregate 65457-65529 / 1002.20 tons Coarse Aggregate 303382-303524/1198.21 tons

Time Lost And Cause

Type of Subgrade ASPHALT

CEMENT			
Brand	Type	Ticket No.*	Amount Tons
LAFARGE	I/II	242873 -	368.94
	L.A	243111	
FLY ASH			
AMERICAN	C	0267-	75.18
(MUSCATINE)		0275	

Method of Curing: WHITE P.G. CURE COMP.

Texture Method: TINE

BEAMS MADE			
Time	Beam No.	Slump	Air
8:30	9	1 3/4	9.0
3:35	9A	1 5/8	8.0
9:45	9M	2 1/2	7.6

Method of Covering Subgrade: ☐ Plastic ☒ Moistened ☒ Slip Form ☐ Fixed Form

Method of Mixing: ☒ Central Mix ☐ Transit Mix

Cold Weather Protection ☐ Yes ☒ No

BEAMS TESTED												
Beam No.	Mix No.	Age Days	Depth Inches	Width Inches	Slump	Air	Lb. Water & Pail or Ind. Load	Act. Load	End Reaction (Pounds)	Computation Factor	Mod. of Rupture	Location of Break
3	C3WR-C	10	6.02	6.00	2 3/8	8.6	6200	6170	—	.124170	766	℄
4	C3WR-C	8	6.02	6.02	3/4	8.0	5000	4950	—	.123758	613	1/4"
5	C3WR-C	7	6.00	6.00	2 1/2	8.0	5200	5150	—	.125000	644	1/2"

Sample I.D.	Grad. No.	1½ IN	1 IN	¾ IN	½ IN	⅜ IN	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200	COMP.
CA-7-5	5		100	100	77	53	6.4	1.2					1.2	YES
FA-7-5	1					100	98	90	74	46	9.1	0.6	0.3	YES

(AGGR SIEVE ANALYSIS — PERCENT PASSING)

Additional Slump, Air Tests, Remarks ADDITIONAL slump + air tests; 3/4 + 7.6
5.3 behind paver, 1 1/2 + 8.0, 7/8 + 7.1
[redacted] REPORT #6 7.1
.5 cyd wasted. cement total 87.66
should be 74.91 MT
* Split ticket with Rpt. 1-2

LS 102

Distribution: White Copy - Office of Construction, Yellow Copy - ...

46

Form 830224
9-89

COMBINED DAILY INSPECTION REPORT OF PORTLAND CEMENT CONCRETE PAVEMENT

Contract No. 4032 Contr. MANATTS INC. Res/Co. Engr. KEN YANNA Project STP-21-3(10)--2C-48 County IOWA

Report No. 4 Date 6/28/94 Date of Last Report 6/27/94 Plant Owner and Location MANATTS, PORTABLE - HWY 21 Sq. Yards (Cont. Qty.) 91,734

Weather [illegible] Days Temp. Max. [illegible] Min. [illegible] Min. Temp. Foll. Night 64 Plant Insp. JOAN LINDER Cert. No. 1602

Item/Lane	STATION From	STATION To	Length Feet	Sq. Yards	CU. YDS. Est.	CU. YDS. Batched	CU. YDS. Used	% of Est. Used	Time Start / End	Mix No.	DRY BATCH WEIGHTS F.A.	DRY BATCH WEIGHTS C.A.	MOISTURE CONTENT F.A.	MOISTURE CONTENT C.A.	Cement	Fly Ash	Fine Aggr.	Coarse Aggr.	Water in Mat'ls.	Water Added at Plant	Water Added at Grade	Total Water	Slump	Air
BOTH	2396 +75	—				608	608	~~100~~	6:47 / 12:08	C-3 WR-C	1362	1662	3.2	1.6	487	87	1410	1689	72	116	1	249	1¼	9.6* RETEST
	—	2415 +75	[illegible]	6153.33	915.16	520	520	123.3 ~~100~~	12:12 / 3:21	C-3 WR-C	[illegible]	[illegible]	3.3	1.6	487	90	1412	1689	74	178	0	252	2½	8.0*
BOTH	2412 +75	2415 +04	221.0	610.67	93.0	120	93	100	3:25 / 4:05	C-3 WR-C	[illegible]	1662	3.3	1.6	487	90	1412	1689	74	183	0	257	-	-
										CONC. TEMP.			75°		AIR TEMP		70°							
													77° 78°				76° 79°							
													79°				80°							
TOTAL			2829.0	7594.0	1008.16	1248.0	1221.0	121.1																
PREVIOUS TOTAL			4675.0	12466.01	1580.54	1937.0	1936.0	122.5																
TOTAL TO DATE			7504.0	20010.04	2588.~~64~~ 120	3185.0	3157.0	122.0																

Total Cement Batched MONO-549336 POLY-58440 Total Fly Ash Batched MONO-99696 Poly-10800 Total Water MONO-~~284364~~ 282437 Poly-3084

Maximum Allowable Water 282 Brand of Air Admixture AES Lot# 1403975405 Ave. Water/Cement 0.435 - 0.44

Calcium Chloride ☐ Yes ☒ No Max. Water/Cement .489

Water Reducer ☒ Yes ☐ No Brand PDA-25-DP Lot# 1404385403 Normal Batch Size 1 CY

Source:

Fly Ash AMERICAN-LOUISA, AMERICAN-MUSCATINE Sp. Gr. 2.72 - 2.80

Fine Aggr. MARANGO REDI-MIX, MARANGO T-203 No. A48508 Sp. Gr. 2.63 Plant Test 2.64

Coarse Aggr. VULCAN, MONTOUR T-203 No. A86002 Sp. Gr. 2.63 Plant Test 2.62

Certified Aggregate Verification Coarse Aggr. Durability 3i

Fine aggregate 65315-65378 / 913.25 tons Coarse Aggregate 303197-303293 / 1054.62 tons

Time Lost And Cause

Type of Subgrade ASPHALT

CEMENT			
Brand	Type	Ticket No.	Amount Tons
LAFARGE	II L.A.	242484- 242704	305.41
FLY ASH			
AMERICAN	C	0256- 0258	51.74

Method of Curing: WHITE SOLVENT CURE

Texture Method: TINE

BEAMS MADE			
Time	Beam No.	Slump	Air
7:52	5	2½"	8.0
1:35	5A	1"	7.1

Method of Covering Subgrade: ☐ Plastic ☒ Moistened

☒ Slip Form ☐ Fixed Form

Method of Mixing: ☒ Central Mix ☐ Transit Mix

Cold Weather Protection ☐ Yes ☒ No

BEAMS TESTED												
Beam No.	Mix No.	Age Days	Depth Inches	Width Inches	Slump	Air	Lb. Water & Pail or Ind. Load	Act. Load	End Reaction (Pounds)	Computation Factor	Mod. of Rupture	Location of Break

Sample I.D.	Grad. No.	1½ IN	1 IN	¾ IN	½ IN	⅜ IN	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200	COMP.
CA-6-28	5		100	100	70	45	6.9	1.4					1.2	YES
FA-6-28	1					100	97	89	73	41	8.1	0.7	0.3	YES

(AGGR SIEVE ANALYSIS — PERCENT PASSING)

Additional Slump, Air Tests, Remarks

* ADDITIONAL AIR + SLUMP

8.5 BEHIND 5.6

1128 CY - MONO FIBERS 9.5 " 7.5

120 CY - POLY " 8.2 " 6.3

~~3~~6 CY GRADE WASTE 7.6 - 1⅛"

21 CY - PLANT WASTE 6.8 - 1¼"

7.9 - 2"

Form 820007 10/91 H-1392

Iowa Department of Transportation

DAILY PLANT REPORT

BITUMINOUS TREATED BASE, ASPHALT CONCRETE

County IOWA
Project STP-21-3(10)--2C-48
Contract No. 40321
Date 7-25-94
Report No. 1

Contractor MANATTS INC Plant Location MALCOM
Plant Type BATCH Make STANDARD STEEL Pollution Equipment BAGHOUSE Resident Engineer KENNETH YANNA
Mix Type B Class BINDER Size 3/4" Crushed Aggr. Sources MALCOM STONE A79002 Recycle Source —
Asphalt Source & Grade BITUMINOUS SUPPLY AC-10 Sand Sources MANATTS A86502 Plant Operated 6:50 A.M. to 6:45 P.M. Mix No. ABD4-6002

SIEVE ANALYSIS OF COMBINED AGGREGATES

SAMPLE			SIEVE NO. - % PASSING										
JOB MIX FORMULA - LIMITS			100	100	98/100	81/95	70/84	54/70	46/56		23/33			2.4/8.0
Spl. ID	Time	Compl.	1½	1	¾	½	⅜	4	8	16	30	50	100	200
CF7-25	AM	YES			100	89	82	67	54	42	27	10	5.5	4.4

SAMPLES SUBMITTED

Materials	Senders No.	Materials	Senders No.
HOT MIX	BN7-25A	AC-10	AC7-25A
↓	BN7-25B	↓	AC7-25B
	BN7-25C	COLD FEED	CF7-25A
↓	~~BN7-25D~~		

Intended Added ______ % A.C. Tank Meas. 6.50 ✓ % A.C.
Intended Total 6.25 % A.C. Total 6.50 % A.C.

LAB. DEN. 2.355 **DENSITY RECORD** SOLID DEN. 2.428

Course Laid	Station	¢ Refer	Date Laid	* (1)	Density	% Density	% Voids
BINDER	2416+96	8' RT	7/25/94	2½	2.285	97.028	5.9
"	2418+61	10' RT	"	3¼	2.279	96.773	6.1
"	2423+85	10' RT	"	3	2.281	96.858	6.1
"	2424+41	5' LT	"	2¼	2.250	95.541	7.3
"	2506+22	7' RT	"	2¾	2.290	97.240	5.7
"	2509+41	1' LT	"	3¼	2.286	97.070	5.8
BINDER	2513+15	1' RT	7/25/94	3⅜	2.296	97.495	5.4
				Avg →	2.281	96.858	6.0

TEMPERATURE RECORD

Time	7	9	11	1	3	5
Air	62	75	79	82	85	86
A.C.	320	310	310	310	300	290
Aggr.	305	310	310	315	310	315
Mix	295	300	300	305	305	310
Mat		280	265	260	250	

RECYCLED MIX ONLY

Total RAP Used Tons *(Totalizer)*
Total Aggr. Used Tons
RAP Used % *(Target)* ______ *(Actual)*
Aggr. Used % *(Target)* ______ *(Actual)*

ALL MATERIALS DELIVERIES

Type	Car or Ticket No.	Total Quantity
AC-10	185710	24.67
	185717	~~49.01~~ 24.34
¾" ASP	265290-	
STONE	265331	426.25
M. SAND	264567-	
	264569	56.44
ASP. SAND	61102-	
	61150	378.67

Avg. Field Density Lot #1 96.858% 2.281
Avg. Field Density Lot #2

Advisory - Fines/Bitumen Ratio = 0.68 ✓
Ave. % Field Voids = 6.0
Lab % Voids = $\boxed{3.0}$
Q.I. (Density) =
(Show Calculation)

96.858 - 95.000 = $\frac{1.858}{0.628}$ = 2.96 GWH

PRODUCTION AND PLACEMENT RECORD

* (2)	Side	Course Laid	From Station to Station	Tons Today	Tons To Date
3"	BOTH	BINDER	2415+04 TO 2425+00	863.98	863.98 ✓
"	"	"	2505+00 TO 2515+00		

Acceptance Cold Feed (Certified Projects Only)	1	¾	½	⅜	4	8	16	30	50	100	200
LAB RESULTS		100	91	82	66	53	42	27	10	5.8	4.8

COMMENTS

1:30± : DENNIS LOHRER, MATL. TECH. STOPPED BY; TOOK SAMPLES OF MIX, STONE, SAND.

G.WH.

Acceptance Fines/Bitumen Ratio = 0.74 ✓

COMMENTS: Delays, Breakdowns, Corrective Action, etc.
*Thickness: (1) Actual, (2) Intended
Bituminous Treated Base: Enter % Moisture in % Voids Column

Signed SALLY BALVIN #0500
Inspector Cert. No.

48

Form 820007 10/91 H-1392

Iowa Department of Transportation

DAILY PLANT REPORT

BITUMINOUS TREATED BASE, ASPHALT CONCRETE

County IOWA
Project STP-21-3(10)--2C-48
Contract No. 40321
Date 7-26-94
Report No. 3

Contractor MANATTS INC. Plant Location MALCOM
Plant Type BATCH Make STANDARD STEEL Pollution Equipment BAGHOUSE Resident Engineer KENNETH YANNA
Mix Type B Class BINDER Size 3/4" Crushed Aggr. Sources A79002 MALCOM MINE Recycle Source —
Asphalt Source & Grade BITUMINOUS SUPPLY AC-10 Sand Sources AB6502 MANATTS FLINT PIT Plant Operated 6:45 A.M. to 8:00 P.M. Mix No. ABD4-6002

SIEVE ANALYSIS OF COMBINED AGGREGATES

SAMPLE			SIEVE NO. - % PASSING											
JOB MIX FORMULA - LIMITS				100	98/100	81/95	70/84	56/70	46/56		23/33			2.0/8.0
Spl. ID	Time	Compl.	1½	1	¾	½	⅜	4	8	16	30	50	100	200
CF7-26	3/4 PM	Y			100	91	83	67	54	43	27	10	5.0	4.1

SAMPLES SUBMITTED

Materials	Senders No.	Materials	Senders No.
COLD FEED	CF7-26 3/4		
HOTMIX	BN7-26A		
	BN7-26B		
	BN7-26C		

Intended Added ______ % A.C. Tank Meas. 6.34 % A.C. ✓
Intended Total 6.25 % A.C. Total 6.34 % A.C. ✓

LAB. DEN. 2.346 **DENSITY RECORD** SOLID DEN. 2.421

Course Laid	Station	¢ Refer	Date Laid	*(1)	Density	% Density	% Voids
BINDER	2703+95	6 RT	7/26/94	2"	2.295	97.826	5.2
"	2705+75	1 RT	"	2 3/8"	2.244	95.652	7.3
"	2706+56	11 LT	"	2 1/2"	2.293	97.741	5.3
"	2709+07	11 RT	"	3"	2.253	96.036	6.9
"	2710+31	10 RT	"	3"	2.273	96.888	6.1
"	2711+06	10 LT	"	2 1/2"	2.295	97.826	5.2
BINDER	2712+12	2 RT	7/26/94	2 1/8"	2.275	96.974	6.0

TEMPERATURE RECORD

Time	7	9	11	1	3	5
Air	58°	64°	78°	80°	82°	79°
A.C.	315°	320°	315°	315°	310°	315°
Aggr.	320°	320°	315°	315°	310°	315°
Mix	300°	305°	300°	305°	305°	305°
Mat						285

RECYCLED MIX ONLY

Total RAP Used Tons (*Totalizer*)
Total Aggr. Used Tons
RAP Used % (*Target*) (*Actual*)
Aggr. Used % (*Target*) (*Actual*)

ALL MATERIALS DELIVERIES

Type	Car or Ticket No.	Total Quantity
AC	—	—
3/4" CR	265332/	
	265366	169.70 ✓
M.SAND	264575	18.34 ✓
N.SAND	61168	
	61178	171.87 ✓

Avg. Field Density Lot #1 2.275
Avg. Field Density Lot #2

PRODUCTION AND PLACEMENT RECORD

*(2)	Side	Course Laid	From Station to Station	Tons Today	Tons To Date
3.0"	LT. & RT.	~~2703~~ BINDER	2703+95 TO 2713+03	359.72 ✓	1223.70 ✓

Advisory - Fines/Bitumen Ratio = 0.65 ✓
Ave. % Field Voids = 6.0
Lab % Voids = $\boxed{3.1}$ ✓
Q.I. (Density) =
(Show Calculation)

$$96.992 - 95.000 = \frac{1.992}{0.882} = 2.26$$

G.WH

49

COMMENTS

Acceptance Cold Feed	1	¾	½	⅜	4	8	16	30	50	100	200
(Certified Projects Only)		100	92	80	64	51	41	26	9.1	5.0	4.2

✓ SAT ✓ G.WH

Acceptance Fines/Bitumen Ratio = 0.66 ✓

COMMENTS: Delays, Breakdowns, Corrective Action, etc.
*Thickness: (1) Actual, (2) Intended
Bituminous Treated Base: Enter Moisture in % Voids Column

Signed SALLY BALVIN #0500

Form 820007 10/91 H-1392

Iowa Department of Transportation

DAILY PLANT REPORT

BITUMINOUS TREATED BASE, ASPHALT CONCRETE

County IOWA
Project STP-21-3(10)--2C-48
Contract No. 40321
Date 7-26-94
Report No. 2

Contractor MANATT'S INC Plant Location MALCOM
Plant Type BATCH Make STANDARD STEEL Pollution Equipment BAG HOUSE Resident Engineer KENNETH YANNA
Mix Type B A Class SURFACE Size 1/2" Crushed Aggr. Sources A79002 MALCOM MINE Recycle Source —
Asphalt Source & Grade BITUMINOUS SUPPLY AC-10 Sand Sources A88502 MANATTS FLINT PIT Plant Operated 6:45 A.M. to 8:00 P.M. Mix No. ABD4-1015

SIEVE ANALYSIS OF COMBINED AGGREGATES

SAMPLE			SIEVE NO. - % PASSING											
JOB MIX FORMULA - LIMITS					100	92/100	84/94	61/75	46/58		24/32			3.3/7.3
Spl. ID	Time	Compl.	1½	1	¾	½	⅜	4	8	16	30	50	100	200
CF7-26A	AM	Y				100	94	71	53	41	27	12	7.3	5.8
CF7-26B	PM	Y				100	93	70	52	40	26	12	7.8	6.2
AVERAGE		Y				100	94	70	52	40	26	12	7.6	6.0

SAMPLES SUBMITTED

Materials	Senders No.	Materials	Senders No.
COLD FEED	CF7-26A	HOT MIX	SU7-26A
↓	CF7-26B	↓	SU7-26B
AC-10	AC7-26A-B	↓	SU7-26C

Intended Added ______ % A.C. Tank Meas. 6.29 ✓ % A.C.
Intended Total 6.30 % A.C. Total 6.29 ✓ % A.C.

LAB. DEN. 2.359 ✓ **DENSITY RECORD** SOLID DEN. 2.435 ✓

Course Laid	Station	℄ Refer	Date Laid	*(1)	Density	% Density	% Voids
SURFACE	2417+58	11 RT	7/26/94	1 1/8	2.274	96.397	6.6
"	2419+80	5 RT	"	1 1/2	2.206	93.514	9.4
"	2422+48	℄	"	1 3/8	2.238	94.871	8.1
"	2507+85	9 RT	"	1 1/4	2.285	96.863	6.2
"	2508+00	10 RT	"	1 3/8	2.261	95.847	7.1
"	2513+01	7 LT	"	1 3/8	2.247	95.252	7.7
SURFACE	2514+50	7 RT	"	1 1/2	2.243	95.083	7.9

TEMPERATURE RECORD

Time	7	9	11	1	3	5
Air	58°	64°	78°	80°	82°	79°
A.C.	315°	320°	315°	315°	310°	315°
Aggr.	320°	320°	315°	315°	310°	315°
Mix	300°	305°	300°	305°	305°	305
Mat		290	255	280		

RECYCLED MIX ONLY

Total RAP Used Tons (*Totalizer*)
Total Aggr. Used Tons
RAP Used % (*Target*) (*Actual*)
Aggr. Used % (*Target*) (*Actual*)

ALL MATERIALS DELIVERIES

Type	Car or Ticket No.	Total Quantity
AC-10	185751	24.61 ✓
	185762	24.22 ✓
1/2"	262430/	193.65 ✓
	262470	
M. SAND	264573/	37.45 ✓
	264574	
N. SAND	61153/	186.26 ✓
	61166	
CR. GRAVEL	61187/	
	61195	47.71 ✓

Avg. Field Density Lot #1 2.251
Avg. Field Density Lot #2
Advisory - Fines/Bitumen Ratio = 0.95 ✓
Ave. % Field Voids = 7.6
Lab % Voids = 3.1
Q.I. (Density) =
(Show Calculation)

FAILED

$$\frac{95.404-95.000=0.404}{1.103}=0.37$$

GWH

LOW OUTLIER WILL NOT WORK.

$$\frac{95.404-93.514=1.89}{} \quad \frac{1.89}{1.103}=1.71$$

(HAS TO BE 1.80 OR LARGER TO BE AN OUTLIER) GWH

Acceptance Fines/Bitumen Ratio = 1.00 ✓

PRODUCTION AND PLACEMENT RECORD

* (2)	Side	Course Laid	From Station to Station	Tons Today	Tons To Date
1 1/2	BOTH	SURFACE	2415+04 TO 2425+00	439.66 ✓	439.66 ✓
		↓	2505+00 TO 2515+00		

COMMENTS

Acceptance Cold Feed (Certified Projects Only)	1	¾	½	⅜	4	8	16	30	50	100	200
			100	96	73	52	40	27	12	7.7	6.2
BACKUP →			100	94	72	52	39	26	12	7.9	6.4
AVERAGE →			100	95	72	52	40	26	12	7.8	6.3

ONLY 2 SAMPLES COLLECTED TODAY FOR GRADATION, PLANT SWITCHED OVER TO 3/4" BINDER MIX

MST ✓GWH

COMMENTS: Delays, Breakdowns, Corrective Action, etc.
*Thickness: (1) Actual, (2) Intended
Bituminous Treated Base: Enter % Moisture in % Voids Column

Signed SALLY BALVIN Inspector

#0500 Cert. No.

AIGG 3 100A

Form 820007 10/91 H-1392

Iowa Department of Transportation

DAILY PLANT REPORT

BITUMINOUS TREATED BASE, ASPHALT CONCRETE

County IOWA
Project STP-21-3(10)--2C-48
Contract No. 40321
Date 7-27-94
Report No. 4

Contractor MANATT'S INC. Plant Location MALCOM
Plant Type BATCH Make STANDARD STEEL Pollution Equipment BAGHOUSE Resident Engineer KENNETH VANNA
Mix Type A Class SURFACE Size 1/2" Crushed Aggr. Sources A79002 MALCOM MINE Recycle Source —
Asphalt Source & Grade BITUMINOUS SUPPLY AC-10 Sand Sources A86502 MANATT'S FLINT PIT Plant Operated 8:00 A.M. to 5:30 P.M. Mix No. ABD4-1015

SIEVE ANALYSIS OF COMBINED AGGREGATES

SAMPLE			SIEVE NO. - % PASSING											
JOB MIX FORMULA - LIMITS					100	92/100	89/94	67/75	48/58		24/32			3.3/7.3
Spl. ID	Time	Compl.	1½	1	¾	½	⅜	4	8	16	30	50	100	200
CF7-27	AM	Y				100	94	71	55	43	28	12	6.7	5.4

SAMPLES SUBMITTED

Materials	Senders No.	Materials	Senders No.
COLD FEED	CF7-27	AC-10	AC7-26A-B
HOT MIX	SU7-27A		
	SU7-27B		
	SU7-27C		

Intended Added ______ % A.C. Tank Meas. 6.41 ✓ % A.C.
Intended Total 6.3 % A.C. Total 6.41 ✓ % A.C.

LAB. DEN. 2.338 **DENSITY RECORD** SOLID DEN. 2.426

Course Laid	Station	¢ Refer	Date Laid	*(1)	Density	% Density	% Voids
SURFACE	2705+11	9 LT	7/27/94	1 1/2	2.321	99.273	4.3
"	2705+38	7 LT	"	1 5/8	2.295	98.161	5.4
"	2707+63	4 RT	"	2 1/4	2.286	97.776	5.8
51 "	2708+36	¢	"	2	2.224	95.124	8.3
"	2710+35	2 LT	"	1 3/4	2.228	95.295	8.2
"	2710+61	9 LT	"	1 7/8	2.297	98.246	5.3
SURFACE	2712+81	9 RT	7/27/94	1 1/2	2.265	96.878	6.6

TEMPERATURE RECORD

Time	7	9	11	1	3	5
Air	60°	65°	78	84°	82	80°
A.C.	330°	330°	330°	325°	325°	325°
Aggr.	315°	320°	320°	315°	315°	315°
Mix	305°	310°	310°	305°	310°	305°
Mat		280°	280°	305°		300°

RECYCLED MIX ONLY

Total RAP Used Tons *(Totalizer)* ______
Total Aggr. Used Tons ______
RAP Used % *(Target)* ______ *(Actual)* ______
Aggr. Used % *(Target)* ______ *(Actual)* ______

ALL MATERIALS DELIVERIES

Type	Car or Ticket No.	Total Quantity
AC-10	185800	24.27 ✓
1/2" CR	262471/	~~200.82~~
	262516	163.77 ✓
M. SAND	264577	20.60 ✓
N. SAND	61181/	
	61205	126.22 ✓
M. SAND ~~GRAVEL~~	61203	22.33 ✓

Avg. Field Density Lot #1 2.274
Avg. Field Density Lot #2

PRODUCTION AND PLACEMENT RECORD

*(2)	Side	Course Laid	From Station to Station	Tons Today	Tons To Date
1 1/2	BOTH	SURFACE	2703+95 TO 2713+03	~~306.10~~ ✓	
				333.22	772.88 ✓

Advisory - Fines/Bitumen Ratio = ~~0.86~~ 0.84
Ave. % Field Voids = 6.3
Lab % Voids = $\boxed{3.6}$
Q.I. (Density) =
(Show Calculation)

$97.250 - 95.000 = \frac{2.250}{1.564} = 1.44$

GWH

Acceptance Cold Feed (Certified Projects Only)	1	¾	½	⅜	4	8	16	30	50	100	200
			100	94	72	54	42	28	12	7.1	5.8

COMMENTS

AGGREGATE INTERCHANGE: 1/2" CR. STONE FROM 45% TO 48% - UP 3%
M. SAND FROM 7.5% TO 4.5% - DOWN 3%

Acceptance Fines/Bitumen Ratio = 0.91

MPT

COMMENTS: Delays, Breakdowns, Corrective Action, etc.
*Thickness: (1) Actual, (2) Intended
Bituminous Treated Base: Enter % Moisture in % Voids Column

Signed SALLY BALVIN #0500

Appendix D

1. Summary of Mixes
2. Summary of Joint Spacings
3. Summary of Joint Sawing
4. Summary of Test Beams
5. Summary of Slump and Air Content
6. Summary of Beam and Cylinder Strengths
7. Profilograph Summary
8. Slab Thickness Summary
9. Vibrator Frequency Summary
10. Air and Concrete Temperature Summary

HR559 MIXTURES

2335+64-2341+02	CONVENTIONAL	SECTION 1-2
2341+02-2386+75	FIBRILLATED	SECTION 2-10
2386+75-2412+75	MONOFILAMENT	SECTION 10-14
2412+75-2415+00	FIBRILLATED	SECTION 14-15
2415+00-2425+00	ACC	SECTION 16
2425+00-2505+00	CONVENTIONAL	SECTION 17-33
2505+00-2515+00	ACC	SECTION 34
2515+00-2539+09	CONVENTIONAL	SECTION 35-37
2539+09-2632+25	FIBRILLATED	SECTION 37-54
2632+25-2703+95	CONVENTIONAL	SECTION 54-64
2703+95-2714+00	ACC	SECTION 65

JOINT SPACING
HR559

2335+64-2340+00	20 FT
2340+00-2340+90	15 FT
2340+90-2349+00	12 FT
2349+00-2364+00	6 FT
2364+00-2371+00	2 FT
2371+00-2379+00	4 FT
2379+00-2387+00	2 FT
2387+00-2395+00	4 FT
2395+00-2403+00	6 FT
2403+00-2414+00	12 FT
2414+00-2415+00	6 FT
2415+00-2425+00	N/A ACC
2425+00-2426+00	6 FT
2426+00-2433+00	12 FT
2433+00-2440+50	6 FT
2440+50-2457+00	2 FT
2457+00-2468+00	6 FT
2468+00-2479+50	12 FT
2479+50-2488+00	4 FT
2488+00-2496+00	15 FT ND
2496+00-2504+00	15 FT D
2504+00-2505+00	6 FT
2505+00-2515+00	N/A ACC
2515+00-2539+00	6 FT
2539+00-2547+00	2 FT
2547+00-2562+00	4 FT
2562+00-2569+00	2 FT
2569+00-2576+50	6 FT
2576+50-2585+00	12 FT
2585+00-2601+00	6 FT
2601+00-2608+00	2 FT
2608+00-2616+00	4 FT
2616+00-2624+00	2 FT
2624+00-2632+00	4 FT
2632+00-2640+00	6 FT
2640+00-2653+50	12 FT
2653+50-2661+50	6 FT
2661+50-2690+00	12 FT
2690+00-2699+00	4 FT
2699+00-2702+00	12 FT
2702+00-2703+95	4 FT
2703+95-2714+00	N/A ACC

Note: These are the actual joint spacings on the project
1 FT = 0.3048 m

HR-559
SAW CUTS

2335+64-2345+27	6/24/94 Start: 6:00 PM Section 1
2345+27-2369+34	6/25/94 Start: 12:45 PM 2324+00, Section 3 Time: 3:20 PM 2349+00, Section 4 Time: 2:00 PM 2364+00, Section 7
2369+34-2386+75	6/27/94 Start: 1:45 PM, Section 7 Time: 3:20 PM 2371+00, Section 8 Time: 9:00 PM 2380+00, Section 10
2386+75-2415+00	6/28/94 Start: 12:30 PM Time: 1:20 PM, 2389+00
2425+00-2448+34	6/30/94 No Data
2448+34-2459+88	7/01/94 Start: 1:30 PM Stop: 8:00 PM
2459+88-2488+82	7/05/94 Start: 1:15 PM Stop: 12:30 AM Time: 4:40 PM All transverse to 2469+50 Time: 4:50 PM All cuts up to 2466+00
2488+82-2505+00	7/06/94 Start: 2:00 PM Stop: 9:30 PM Time: 3:30 PM cut to 2492+00
2515+00-2531+10	7/07/94 Start: 1:20 PM Stop: 8:00 PM
2531+10-2561+18	7/11/94 Start: 1:15 PM Stop: 3:30 AM Time: 3:45 PM 2538+50 All transverse Time: 3:48 PM 2535+25 All transverse Time: 3:55 PM 2534+25 All cuts (Gap left for intersection 2536+10-2536+28)
2561+18-2597+65	7/12/94 Start: 1:15 PM Stop: 12:00 AM Time: 3:45 PM every fourth transverse to 2565+50, Random up to 2566+50
2597+65-2612+07	7/13/94 Start: 3:00 PM Stop: 9:30 PM Started at header
2612+07-2641+97	7/14/94 Start: 2:00 PM Stop: 1:30 AM
(Gap for intersection)	
2642+21-2672+30	7/15/94 Start: 2:00 PM Stop: 8:30 PM Time: 3:20 PM All cuts to 2649+00, few random after
2672+30-2703+95	7/18/94 Start: 1:30 PM Stop: 10:30 PM Time: 3:40 PM All transverse to 2679+25, all cuts to 2675+75

BEAM STRENGTHS

BEAM NUMBER	SECTION NUMBER	DATE MADE	AGE DAYS	MIX NUMBER	FIBER	ACT LOAD (kg)	MODULUS OF RUPTURE (kPa)
1	1	6/24/94	7	C–3WR–C	NONE	2060	3910
2	2	6/24/94	7	C–3WR–C	FIB	2590	4920
3	3	6/25/94	10	C–3WR–C	FIB	2800	5280
3A	4	6/25/94	16	C–3WR–C	FIB	2520	4780
4	7	6/27/94	8	C–3WR–C	FIB	2250	4230
4A	9	6/27/94	14	C–3WR–C	FIB	2750	5180
5	11	6/28/94	7	C–3WR–C	MONO	2340	4440
5A	14	6/28/94	14	C–3WR–C	MONO	3060	5820
6	–	6/29/94	7	C–3WR–C	NONE	2250	4270
6A	–	6/29/94	14	C–3WR–C	NONE	2620	4970
7	18	6/30/94	7	C–3WR–C	NONE	2290	4340
7A	21	6/30/94	14	C–3WR–C	NONE	2980	5600
8	23	7/01/94	7	C–3WR–C	NONE	2480	4690
8A	23	7/01/94	14	C–3WR–C	NONE	2880	5520
9	26	7/05/94	7	C–3WR–C	NONE	2570	4860
9M	27	7/05/94	2	M–3–C	NONE	2710	5100
9A	30	7/05/94	14	C–3WR–C	NONE	2480	4690
10	31	7/06/94	7	C–3WR–C	NONE	2980	5610
10A	33	7/06/94	14	C–3WR–C	NONE	2430	4650
11	36	7/07/94	7	C–3WR–C	NONE	2520	4760
11A	36	7/07/94	14	C–3WR–C	NONE	3150	5970
12	36	7/11/94	7	C–3WR–C	NONE	2430	4570
12A	36	7/11/94	14	C–3WR–C	NONE	2620	4920
12B	38	7/11/94	7	C–3WR–C	FIB	2660	5040
12M	39	7/11/94	2	M–3–C	FIB	1930	3660
13	42	7/12/94	7	C–3WR–C	FIB	2750	5210
13A	48	7/12/94	22	C–3WR	NONE	2880	5410
14	48	7/13/94	7	C–3WR	FIB	2520	4740
14M	N/A	N/A	2	M–3	NONE	2340	4430
15	50	7/14/94	7	C–3WR–C	FIB	2660	5040
15A	55	7/14/94	14	C–3WR	NONE	2620	4920
15B	56	7/14/94	7	C–3WR	NONE	2340	4450
15M	56	7/14/94	4	M–3	NONE	2390	4490
16	56	7/15/94	7	C–3WR–C	NONE	2800	5280
16A	60	7/15/94	17	C–3WR–C	NONE	3420	6410
16M	60	7/15/94	3	M–3–C	NONE	3200	6010
17	60	7/18/94	7	C–3WR–C	NONE	2800	5530
17A	62	7/18/94	16	C–3WR–C	NONE	2800	5210
18	–	7/19/94	2	M–3–C	NONE	2390	4490
19	–	7/20/94	7	C–3WR–C	NONE	2885	5370
19A	–	7/20/94	13	C–3WR–C	NONE	2980	5600
20	–	7/21/94	7	C–3WR–C	NONE	2780	5190
20M	–	7/21/94	4	M–3–C	NONE	2710	5070

*ALL DATA TAKEN FROM DAILY PLANT REPORTS

SLUMP AND AIR

DATE	SLUMP	AIR BEFORE	AIR AFTER
6/24/94	3/4"	6.2%	
6/24/94	3 1/2"	9.5%	6.4%
6/24/94	1 3/4"	8.8%	5.8%
6/24/94	1 3/8"	8.0%	5.9%
6/24/94	2 1/4"	6.4%	
6/24/94	3/4"	6.7%	
6/24/94	0	8.0%	
6/24/94	1"	8.0%	
6/24/94	1"	8.0%	
6/24/94	1 1/4"	8.0%	
6/25/94	1"	8.0%	
6/25/94	1 3/8"	8.8%	7.1%
6/25/94	3/4"	7.8%	
6/25/94	1 1/2"	8.2%	6.0%
6/25/94	2"	9.0%	6.8%
6/25/94	1 3/8"	7.1%	
6/25/94	2 1/8"	8.6%	6.5%
6/25/94	7/8"	8.4%	6.0%
6/25/94	1 1/2"	7.6%	
6/25/94	2 3/8"	8.6%	
6/25/94	2 3/8"	8.6%	
6/27/94	1 1/8"	8.6%	6.6%
6/27/94	3/4"	8.0%	
6/27/94	1 1/2"	8.1%	
6/27/94	1 1/4"	8.6%	6.6%
6/27/94	1 1/4"	7.4%	
6/27/94	2 3/8"	8.6%	6.6%
6/27/94	3/4"	8.0%	
6/27/94	2 3/8"	6.6%	
6/28/94	1 1/4"	9.6%	
6/28/94	2 1/2"	8.0%	
6/28/94		8.5%	5.6%
6/28/94		9.5%	7.5%
6/28/94		8.2%	6.3%
6/28/94	1 1/8"	7.6%	
6/28/94	1 1/4"	6.8%	
6/28/94	2"	7.9%	
6/28/94	1"	8.0%	
6/28/94	1"	7.8%	
6/28/94	1"	7.1%	
6/28/94	2 1/2"	8.0%	
6/30/94	1"	6.5%	
6/30/94	1 1/2"	7.0%	
6/30/94	1 1/2"	6.7%	4.4%
6/30/94	1 1/2"	7.5%	

DATE	SLUMP	AIR BEFORE	AIR AFTER
6/30/94	1 1/4"	7.8%	
6/30/94	1 1/2"	7.6%	
6/30/94	1 1/4"	7.5%	
6/30/94	1 1/2"	7.5%	
6/30/94	1 1/2"	7.2%	
6/30/94	1 1/4"	7.5%	
6/30/94	1 1/2"	7.6%	
7/01/94	1 1/2"	7.4%	
7/01/94	2"	7.9%	
7/01/94	1 3/8"	7.5%	
7/01/94	1 3/8"	7.6%	
7/05/94	1/2"	5.5%	
7/05/94	1"	8.0%	
7/05/94	1"	7.8%	
7/05/94	3/4"	7.8%	
7/05/94	1 3/4"	9.0%	
7/05/94	1 5/8"	8.0%	
7/05/94	2 1/2"	7.6%	
7/05/94	3/4"	7.6%	5.3%
7/05/94	1 1/2"	8.0%	
7/05/94	7/8"	7.1%	
7/06/94	1"	7.0%	
7/06/94	1 3/4"	7.4%	
7/06/94	1 1/2"	8.5%	
7/06/94	1 1/4"	8.0%	
7/06/94	1 1/4"	8.0%	
7/06/94	1 1/4"	8.0%	
7/06/94	1 1/4"	7.9%	
7/06/94	1 1/4"	7.6%	
7/06/94	7/8"	7.8%	
7/06/94	3/4"	7.8%	
7/07/94	1"	8.3%	
7/07/94	3/4"	7.5%	
7/07/94	1"	7.2%	
7/07/94	1 1/2"	7.2%	
7/07/94	1 1/2"	8.0%	
7/07/94	1 3/4"	8.0%	
7/07/94	5/8"		
7/07/94	3/4"	8.0%	
7/07/94	3/4"	7.9%	
7/07/94	1 1/4"	7.1%	
7/07/94	1"	6.6%	
7/11/94	1 1/4"	7.8%	
7/11/94	1 3/4"	10.0%	7.1%
7/11/94	1 1/2"	9.5%	6.0%

DATE	SLUMP	AIR BEFORE	AIR AFTER
7/11/94	1 1/4"	8.5%	6.5%
7/11/94	2 1/4"	10.5%	
7/11/94	2 1/4"	7.9%	
7/11/94	1"	7.6%	
7/11/94	2 1/4"	8.0%	
7/11/94	1 1/4"	7.7%	
7/11/94	2 1/4"	9.5%	5.5%
7/12/94	3 3/4"	6.3%	
7/12/94	1 3/4"	9.0%	7.0%
7/12/94	1 3/4"	8.0%	
7/12/94	1 1/4"	8.0%	
7/12/94	1 1/4"	8.0%	
7/12/94	1 1/4"	7.9%	
7/12/94	1 1/4"	7.9%	
7/12/94	1 1/8"	8.0%	
7/12/94	1 3/4"	8.0%	
7/12/94	2 1/4"	8.0%	
7/12/94	1"	7.3%	
7/12/94	1 1/2"	7.7%	
7/12/94	1"	8.0%	
7/12/94	1 1/4"	8.0%	
7/13/94	1 1/2"	7.3%	
7/13/94	1 1/2"	8.0%	
7/13/94	1"	7.6%	
7/13/94	2 1/2"	8.5%	
7/13/94	1 3/4"	8.0%	
7/13/94	1 1/2"	9.5%	6.4%
7/13/94	1 5/8"	7.9%	
7/14/94	2 1/4"	7.0%	6.0%
7/14/94	2 1/4"	9.5%	5.0%
7/14/94	1 1/4"	7.0%	
7/14/94	1 1/4"	7.7%	
7/14/94	1 1/2"	7.8%	
7/14/94	1 3/4"	7.8%	
7/15/94	1 3/4"	7.5%	
7/15/94	2 1/4"	6.8%	
7/15/94	2 1/2"	7.5%	
7/15/94	2 1/4"	6.6%	
7/15/94	1 3/4"	7.6%	
7/15/94	2"	8.2%	5.7%
7/18/94	2 1/4"	8.0%	
7/18/94	1 3/4"	8.0%	
7/18/94	2 1/2"	8.5%	5.1%
7/18/94	2"	8.0%	
7/18/94	1 1/4"	7.5%	

NOTE: ALL DATA TAKEN FROM DALY PLANT REPORTS

1 inch = 25.4 mm

BEAM AND CYLINDER STRENGTHS

CONVENTIONAL

BEAM NUMBER	AGE (DAYS)	LOAD (kg)	STRENGTH (kPa)	CYLINDER NUMBER	AGE (DAYS)	LOAD (kg)	STRENGTH (MPa)
18-C-1	7	2630	4900	L18	7	30400	29.0
18-C-2	7	2590	4800	L20	7	29000	27.7
18-C-3	7	2430	4600	L7	7	28200	27.0
19-C-4	14	2540	4900	L35	14	28500	27.2
21-C-5	14	2590	4900	L10	14	31600	30.2
21-C-6	14	2540	4800	L8	14	36200	35.3
27-C-7	28	2400	4400	L20	28	36100	34.5
27-C-8	28	2740	5000	L18	28	33600	32.1
28-C-9	28	2680	5000	L35	28	36700	35.1

FIBRILLATED

BEAM NUMBER	AGE (DAYS)	LOAD (kg)	STRENGTH (kPa)	CYLINDER NUMBER	AGE (DAYS)	LOAD (kg)	STRENGTH (MPa)
3-F-1	7	2340	4300	L8	7	25400	24.1
4-F-2	7	2020	3900	L10	7	22600	21.7
4-F-3	7	2270	4200	L33	7	21100	20.2
40-F-9	14	2270	4100	L33	14	29800	28.5
39-F-7	14	2470	4600	L10	14	31800	30.4
38-F-6	14	2680	4800	L40	14	34900	33.4
39-F-4	28	2450	4600	L7	28	35700	34.1
39-F-8	28	2540	4600	L8	28	34800	33.3
39-F-5	28	2520	4700	L3	28	41900	40.1

MONOFILAMENT

BEAM NUMBER	AGE (DAYS)	LOAD (kg)	STRENGTH (kPa)	CYLINDER NUMBER	AGE (DAYS)	LOAD (kg)	STRENGTH (MPa)
11-M-1	9	1880	3500	L35	9	29400	28.1
11-M-2	9	2200	4100	L33	9	27200	26.0
11-M-3	9	2060	3900	L40	9	24100	23.0
11-M-4	14	2150	4100	L18	14	31000	29.6
11-M-5	14	2630	4800	L20	14	26500	25.3
11-M-6	14	2590	4800	L10	14	26600	25.4
13-M-7	28	2810	5200	L8	28	37500	35.8
14-M-8	28	2540	4800	L7	28	32800	37.5
14-M-9	28	2590	4800	L3	28	36000	34.3

HR–559 IA 21
PROFILOGRAPH

SOUTHBOUND LANE

BEGIN. STATION	ENDING STATION	MEASURED ROUGH. (mm)	PROFILE INDEX (mm/km)
2344+97	2369+16	112	152
2369+16	2386+54	64.8	122
2386+54	2414+81	82.6	95.8
2414+81	2425+16	31.8	102

NORTHBOUND LANE

BEGIN. STATION	ENDING STATION	MEASURED ROUGH. (mm)	PROFILE INDEX (mm/km)
2344+97	2369+16	177	239
2369+16	2386+54	66.0	125
2386+54	2414+81	122	142
2414+81	2425+16	40.6	131
2425+16	2448+13	97.8	140
2448+18	2460+05	54.6	155
2460+05	2488+67	64.8	73.2
2488+67	2504+84	61.0	123

NOTE: CONDUCTED ON 7/20/94–7/21/94,
7/28/94, 8/19/94, 8/22/94

DEPTH OF SLAB

SECTION NUMBER	MINIMUM			MAXIMUM			AVERAGE			SAMPLE SIZE
	LT	CL	RT	LT	CL	RT	LT	CL	RT	
1	NA	NA	NA	NA	NA	NA	NA	NA	NA	–
2	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
3	200	200	200	200	200	200	200	200	200	1
4	150	160	130	220	220	180	180	190	150	5
5	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
6	100	100	100	130	160	160	120	130	130	3
7	110	110	80	110	120	130	110	110	100	2
8	110	100	150	170	140	180	140	120	170	5
9	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
10	100	80	40	100	90	60	100	80	50	2
11	NA	NA	NA	NA	NA	NA	NA	NA	NA	–
12	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
13	NA	NA	NA	NA	NA	NA	NA	NA	NA	–
14	130	140	150	190	190	190	160	170	170	6
15	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
16	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC
17	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
18	140	150	160	170	180	160	150	170	190	4
19	NA	NA	NA	NA	NA	NA	NA	NA	NA	–
20	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
21	50	80	80	100	140	140	80	110	110	3
22	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
23	60	80	60	130	140	130	100	100	100	3
24	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
25	180	180	200	180	180	200	180	180	200	2
26	150	170	170	200	200	200	170	190	190	4
27	150	170	170	190	200	190	170	190	180	4
28	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
29	150	150	140	150	150	140	150	150	140	1
30	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
31	200	210	180	270	270	280	220	240	240	4
32	200	240	210	230	280	270	210	260	230	4
33	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
34	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC
35	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
36	100	150	170	190	220	180	150	190	170	8
37	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
38	40	80	80	80	100	100	60	90	90	3
39	50	80	70	100	90	110	70	80	80	3
40	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
41	90	110	110	130	130	130	110	120	110	4
42	110	130	110	140	140	130	120	140	120	3
43	70	100	100	120	150	110	100	120	100	3
44	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
45	150	150	150	170	200	170	160	170	160	3
46	160	150	130	170	160	160	160	150	140	3
47	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–

SECTION NUMBER	MINIMUM			MAXIMUM			AVERAGE			SAMPLE SIZE
	LT	CL	RT	LT	CL	RT	LT	CL	RT	
48	110	100	100	140	220	130	130	160	110	3
49	130	150	140	150	220	150	140	180	140	4
50	80	120	120	180	200	120	130	160	120	2
51	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
52	50	80	50	50	80	50	50	80	50	1
53	60	60	40	60	60	40	60	60	40	1
54	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
55	130	150	110	210	220	170	160	180	140	4
56	150	130	130	210	220	200	190	190	170	5
57	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
58	110	110	110	150	150	130	130	130	120	2
59	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
60	120	140	140	200	180	170	150	160	150	9
61	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
62	40	80	80	60	110	120	50	90	100	2
63	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
64	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	TRANS	–
65	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC

NOTE: TRANS: TRANSITION SECTION
NA: NO INFORAMITON AVAILABLE FOR SECTION
ALL MEASUREMENTS IN mm

PAVER VIBRATOR RPM'S

VIBRATOR NUMBER

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RPM'S	7.0	6.5	6.0	5.5	6.5	6.5	5.9	5.9	6.0	9.0	6.8	7.0	7.2	8.5	8.4	7.4
X	7.0	7.0	6.0	5.5	6.5	6.5	6.0	6.0	6.0	9.0	7.0	7.0	7.5	8.1	8.5	7.6
1000	7.0	6.7	8.6	5.5												
				7.5						7.5						

NOTE: CONDUCTED BY ROBERT STEFFES, 6/30/94, APPROXIMATELY STATION 2443+25 ->,
SECTION 21, 12:00 PM
HIGH AND LOW CHANGED AT STATION 2445+75

VIBRATOR NUMBER

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RPM'S	7.7	9.0	8.5	7.7	9.5	8.0	7.7	7.5	8.0	8.8	7.0	6.5	7.3	6.6	8.3	7.0
X	7.4	9.0	8.1	7.5	8.4	7.7	7.7	7.3	7.4	9.0	7.0	6.4	6.8	7.3	9.0	7.6
1000					8.0										8.8	

NOTE: CONDUCTED BY ROBERT STEFFES, 7/11/94, APPROXIMATELY STATION 2555+25, 2558+25 ->,
SECTION 41, 2:00 PM

CONCRETE AND AIR TEMPERATURES

DATE	SECTION	CONCRETE TEMP	AIR TEMP	HIGH TEMP*	LOW TEMP*
6/24/94	1	24	–	27	16
	2	29	25		
6/25/94	3	24	24	28	15
	6	26	29		
	7	27	29		
6/27/94	7	24	18	27	15
	8	25	20		
6/28/94	10	24	27	27	17
	11	24	20		
	12	24	25		
	13	26	28		
	14	26	28		
6/30/94	17	23	18	29	14
	19	24	24		
	21	27	29		
7/01/94	22	24	20	30	17
	23	26	22		
	25	26	26		
7/05/94	26	26	24	32	23
	27	28	28		
	29	29	32		
7/06/94	31	27	29	31	19
	32	29	29		
7/07/94	35	26	21	30	18
	36	26	26		
7/11/94	36	24	19	30	17
	38	26	27		
	39	27	29		
	41	27	31		
7/12/94	41	25	23	30	19
	42	26	24		
	43	27	26		
	45	28	28		
	48	29	31		
7/13/94	48	26	23	27	19
	49	24	25		
	50	24	26		
7/14/94	50	24	17	22	15
	52	24	18		
	53	22	18		
	54	24	–		
	55	24	18		
7/15/94	56	22	18	28	13
	58	22	23		
	59	–	27		
	60	24	25		
7/18/94	60	22	18	29	15
	61	24	27		
	62	25	29		
	64	24	28		

NOTE: ALL TEMPERATURES ARE IN DEGREES CELSIUS

* HIGH AND LOW TEMPERATURES FROM CEDAR RAPIDS AIRPORT

HR−559 IA−21 10/23/94
CONCRETE AND AIR TEMPERATURES

DATE	CONCRETE TEMP	AIR TEMP
6/25/94	24	27
	24	28
	27	28
6/27/94	25	27
	23	27
6/28/94	24	21
	25	24
	26	26
	26	27
6/30/94	23	19
7/07/94	26	24
	26	26
	28	30
7/12/94	25	23
	26	24
	27	26
7/15/94	23	22
	23	23
	24	24
7/18/94	22	19
	24	26
	24	27
	23	28
	24	28

NOTE: ALL TEMPERATURE IN DEGREES CELSIUS
ALL DATA TAKEN FROM DAILY PLANT REPORTS

Appendix E

1. Distress Survey
2. Pullout Testing
3. Road Rater Structural Ratings

DISTRESS SURVEY, IOWA 21
8/6/94

Section	Station	Distress(type, severity, extent)
1	2338+50	Corner cracks at two adjacent joints on right edge (sides 2 inches in length)
	2338+88	Corner cracks at left and right edge (1 inch in longitudinally and 2 inches transversely)
	2339+06	Hairline cracks in longitudinal direction near centerline joint, 2-4 inches in length and extending 2 foot left and right of the longitudinal joint
7	2364+	Exposed aggregate along the joints resulting from the shoe on the saws.
	2369+36	Double joint cut and one one sealed
9	2379+20	Surface loss of individual aggregates for 20+ feet longitudinally and in the transversely at each of the joints
10	2380+24	Surface loss of individual aggregates for along the centerline in areas rectangular in shape and 6 inches in length/width.
19	2433+50 to 2435+42	Surface spall, 3 inches in width and 1/2 inch deep, at the right edge of pavement at joint
21	2443+24	Spall at the joint on the left edge of pavement, 3 in. by 3 in. by 1/2 in.
24	2457+48	Surface aggregate loss due to mud ball, 18 inches left of centerline (3 in. by 5 in. by 2 inches deep)
29	2481+76	Corner crack at left edge of joint, 1 inch longitudinally by 4 inche transverse (tight at this time)
	2481+80	Spall at the joint, left edge, 2 in. by 9 in. by 3/4 in.
31	2492+10	Spall in the NW corner of centerline joint, 1 inch longitudinally be 3 inches transversely, by 1/2 inch in depth
32	2499+37	Midpanel crack (has been sawed, but not sealed)
33	2504+95	Seven poputs due to mudballs (2 inches in diameter and 1 inch in depth) accross the slab

36	2526+95	Size 8 foot prints across the slab, 1/4 inch in depth Transverse crack 4 in. north of joint at right edge extending to joint 1 foot from edge of pavement Transverse crack 1 in south of joint at left edge and extending to joint 3 foot from edge
39	2547+86	Transverse crack 1 inch north of joint at right edge and extending to joint 10 foot from right edge
	2548+02	Transverse crack 7 inches north of joint at right edge and extending to the joint 14 foot from the right edge
	2548+34	Transverse crack 1.5 inches north of joint at right edge and extending to the joint 11 feet from right edge
	2548+50	Transverse crack 1 inch north of joint at the right edge and extending to the joint 0.5 feet from right edge
	2548+66	Transverse crack 1.5 inches north of joint at the right edge and extending to joint 1.0 feet from edge
	2548+72	Transverse crack 1.5 inches north of joint at the right edge and extending to joint 7.0 inches from edge
	2549+00	Transverse crack 1.5 inches north of joint at the right edge and extending to the joint 7.0 inches from edge
	2550+28	Transverse crack 7.5 inches north of joint at right edge and extending to joint at 9 foot from edge Transverse crack 1.5 inches south of joint at left edge and extending to joint at 2.0 feet form edge
	2550+92	Transverse crack 7.5 inches north of joint at right edge and extending to joint 14 feet from edge.
	2551+04	Transverse crack 3.5 inches north of joint at right edge and extending to joint 11.5 feet from edge Transverse crack 4 inches south of joint at left edge and extending to joint 4.0 feet from edge
	2551+20	Transverse crack 7 inches north of joint at right edge and extending to joint 13.0 feet from edge Transverse crack 2.0 inches south of joint at left edge and extending to joint 2 feet from edge
	2551+36	Transverse crack 1 inch north of joint at right edge and extending to joint at 13.0 feet from edge

2.

	2551+52	Transverse crack 1.5 inches north of joint at right edge and extending to joint 18 inches from edge
	2551+68	Transverse crack 7.5 inches north of joint at right edge and extending to joint 13 feet from edge
	2551+84	Transverse crack 7.5 inches north of joint at right edge and extending to joint 8 feet from edge
	2552+00	Transverse crack 2.0 inches north of joint at right edge and extending to joint 2.0 feet from edge
	2552+46	Midpanel transverse crack across slab
	2552+60	Transverse crack 7.5 inches north of joint at right edge and extending to joint 12 feet from edge
		Corner break at left joint edge (30 inches north, 13 inches south and 12 inches transversely) (ck constr. records for shoulder stone roller operation)
	2552+76	Transverse crack 6.0 inches north of joint at right edge and extending to joint 15.0 feet from edge
	2552+92	Corner break at left joint edge (29 inches north, 20 inches south and 14 inches transversely) (ck shoulder roller operation)
	2553+12	Transverse crack 1.5 inches north of joint at right edge and extending to joint 13 feet from edge
		Transverse crack 1.0 inches south of joint at left edge and extending to joint 5 feet from edge
	2553+24	Transverse crack 3.0 inches north of joint at right edge and extending to joint 12 feet from edge
	2553+46	Transverse crack 4.0 inches south of joint at right edge and extending to joint 14 feet from edge
40	2554+08	Transverse crack 1.0 inches north of joint at right edge and extending to joint at 2.0 feet from edge
	2554+42	Transverse crack 4.0 inches north of joint at right edge and extending to joint 6.0 feet from edge
	2554+62	Transverse crack 3.0 inches north of joint at right edge and extending to joint 13.0 feet from edge
	2554+72	Transverse crack 7.0 inches north of joint at right edge and extending to joint 9.5 feet from edge

41	2555+08	Transverse crack 3.5 inches north of joint at right edge and extending to joint 14.0 feet from edge
	2555+42	Transverse crack 3.5 inches north of joint at right edge and extending to joint 14.0 feet from edge
	2555+72	Transverse crack 8.0 inches north of joint at right edge and extending to joint 14.0 feet from edge
	2556+36	Transverse crack 4.5 inches north of joint at right edge and extending to joint 3.0 feet from edge
	2561+20	Transverse crack 3.0 inches south of joint at right edge and extending to joint 2.0 feet from edge
43	2574+03	Transverse crack 1.0 inches south of joint at left edge and extending to joint 1.0 feet from edge
	2574+40	Transverse crack 1.0 inches south of joint at right edge and extending to joint 15.0 feet from edge
45	2578+70	Transverse crack 2.0 inches north of joint at right edge and extending to joint 2.0 feet from edge
46-65		No defects noted in concrete or asphalt sections.

Note: mismatched saw joints or extra saw joints were not recorded

Survey conducted by Jim Cable and Tom Powers
Weather - hot (70 degrees) and sunny
Direction of survey south to north
Direct access to surface of the pavement for examination
Time of survey - 8:30 am to 1:00 pm

HR-559 IA-21
PULLOUT TESTING
10/26/94

STATION	SURFACE PREPARATION	THICK-NESS (mm)	JOINT SPACING (m)	FIBERS	LANE	3' FROM SHOULDER (kPa)	5' FROM SHOULDER (kPa)	9' FROM SHOULDER (kPa)
2385+50	PATCH & SCARIFY	50	0.6	FIB	NORTHBOUND	BROKEN	**265	*284
2428+25	PATCH & SCARIFY	150	3.7	NONE	NORTHBOUND	BROKEN	BROKEN	BROKEN
2455+00	PATCH & SCARIFY	50	0.6	NONE	NORTHBOUND	BROKEN	BROKEN	*148
2545+50	PATCH ONLY	50	0.6	FIB	SOUTHBOUND	**469	**247	**92.4
2620+00	COLD-IN-PLACE	50	0.6	FIB	NORTHBOUND	**111	BROKEN	BROKEN
2695+00	COLD-IN-PLACE	50	1.2	NONE	NORTHBOUND	**136	BROKEN	BROKEN

NOTE: ALL BOND TESTS WERE CONDUCTED AFTER CONCRETE HAD A MINIMUM OF 7 DAY CURE
* CORES BROKE AT CONCRETE-SUBBASE INTERFACE
** CORES BROKE AT DEPTH OF THE CORING INTO THE SUBBASE

AVERAGE STRUCTUAL RATINGS

SECTION NUMBER	NORTH BOUND (4/28/94)	NORTH BOUND (10/13/94)	SOUTH BOUND (4/28/94)	SOUTH BOUND (10/13/94)	COMBINED (4/28/94)	COMBINED (10/13/94)
1	2.76	4.82	2.73	5.53	2.75	5.18
2	2.14	5.14	2.24	4.99	2.19	5.07
3	1.78	5.04	1.99	5.31	1.89	5.18
4	1.93	3.98	1.97	5.60	1.95	4.79
5	2.20	4.73	1.76	3.89	1.98	4.31
6	1.82	3.95	1.75	3.17	1.78	3.56
7	1.83	2.50	1.81	3.00	1.82	2.75
8	2.07	4.83	2.23	3.60	2.15	4.22
9	1.89	3.35	2.61	3.04	2.25	3.20
10	2.15	2.23	2.18	2.86	2.17	2.55
11	–	2.30	2.14	2.23	–	2.27
12	2.20	3.61	1.89	4.37	2.05	3.99
13	1.50	7.02	2.35	5.12	1.93	6.07
14	2.14	4.66	2.02	4.65	2.08	4.66
15	2.33	4.51	2.07	3.74	2.20	4.13
16	1.60	2.59	2.13	2.45	1.87	2.52
17	1.43	4.56	2.19	4.56	1.81	4.56
18	1.83	5.63	3.61	4.79	2.72	5.21
19	2.59	5.86	2.94	5.02	2.77	5.44
20	2.85	4.70	2.04	3.81	2.45	4.26
21	1.62	4.43	2.08	4.16	1.85	4.30
22	2.60	3.16	2.23	2.62	2.42	2.89
23	2.64	3.02	2.23	2.40	2.44	2.71
24	2.83	4.42	2.47	4.47	2.65	4.45
25	2.47	5.98	1.91	5.69	2.19	5.84
26	1.47	6.21	2.12	4.80	1.79	5.51
27	1.89	5.51	2.38	5.24	2.14	5.38
28	2.08	4.45	2.35	4.26	2.21	4.36
29	2.77	6.17	2.29	4.53	2.53	5.35
30	2.07	6.64	2.18	5.07	2.13	5.86
31	1.78	7.74	2.34	6.74	2.06	7.24
32	2.27	7.31	2.28	7.58	2.28	7.45
33	2.37	6.13	2.91	6.35	2.64	6.24
34	2.37	3.93	2.30	2.44	2.34	3.18
35	2.44	5.79	2.57	5.02	2.51	5.41
36	2.18	6.47	2.87	6.40	2.53	6.44
37	2.21	5.25	2.47	4.61	2.34	4.93
38	3.23	4.45	3.35	3.79	3.29	4.12
39	1.97	2.41	2.39	2.63	2.18	2.52
40	2.52	3.99	2.42	3.45	2.47	3.72
41	2.63	4.26	2.21	4.71	2.42	4.49
42	1.98	3.42	1.75	3.57	1.86	3.50
43	1.65	3.52	2.86	4.10	2.26	3.81
44	2.16	3.72	2.26	3.96	2.21	3.84
45	2.42	4.35	2.51	5.28	2.47	4.82
46	2.87	4.33	2.49	4.56	2.68	4.45

SECTION NUMBER	NORTH BOUND (4/28/94)	NORTH BOUND (10/13/94)	SOUTH BOUND (4/28/94)	SOUTH BOUND (10/13/94)	COMBINED (4/28/94)	COMBINED (10/13/94)
47	2.61	4.33	2.09	4.36	2.35	4.35
48	2.42	4.38	2.52	4.56	2.47	4.47
49	2.63	4.94	2.38	4.35	2.51	4.65
50	2.57	3.83	2.66	4.47	2.62	4.15
51	1.84	2.58	1.98	2.77	1.91	2.68
52	2.63	3.16	2.07	2.76	2.35	2.96
53	1.95	3.60	2.50	2.50	2.22	3.05
54	2.35	3.54	2.69	3.45	2.52	3.50
55	1.77	4.45	1.81	5.37	1.79	4.91
56	2.72	4.94	2.35	5.71	2.53	5.33
57	2.58	3.44	1.98	4.36	2.28	3.90
58	2.11	4.94	2.15	4.63	2.13	4.79
59	1.62	3.11	1.73	3.68	1.68	3.40
60	2.18	5.25	1.76	4.79	1.97	5.02
61	1.71	3.26	1.82	2.44	1.77	2.85
62	2.01	2.94	2.35	2.19	2.18	2.57
63	2.80	4.65	1.84	4.44	2.32	4.55
64	1.83	4.67	2.51	4.21	2.17	4.44
65	3.78	3.44	3.16	3.21	3.47	3.33

Appendix F
1. ISU Evaluation Project Proposal

PROPOSAL

submitted to the

IOWA DEPARTMENT OF TRANSPORTATION

HIGHWAY DIVISION

Institution:	Iowa State University Ames, Iowa 50011 Engineering Research Institute Dept. of Civil & Construction Engr. Telephone: 515-294-2336
Principal Investigator:	James K. Cable Associate Professor, Civil Engr. Civil Engineering: Transportation
Title of Proposed Research:	Thin Bonded Overlay Evaluation
Proposed Starting Date:	September 1, 1993
Proposed Time schedule:	Pilot Study - September 1 to December 31, 1993 Field Verification - January 1, 1994 through December 31, 1999.
Proposed Amount:	Laboratory Study $46,960 Field Verification $198,730 Project Total $245,690

Endorsements:

James K. Cable P.E.

James K. Cable P.E.
Principal Investigator
515-294-2862

Richard E. Hasbrook 7-14-93

Richard E. Hasbrook
Contracts and Grants Officer
515-294-5225

Table of Contents

INTRODUCTION: In this day of the mature highway systems, a new set of problems is facing the highway engineer. The existing system has aged to or past the design life of the original pavement design. In many cases, the increased commercial traffic is creating the need for additional load carrying capacity at this time. This situation has caused the State Highway Engineers to consider new alternatives for rehabilitation of the existing surfaces. Alternative surface materials, thicknesses, and methods of installation must be identified to meet the needs of individual pavements and budgets. With overlays being one of the most frequently used rehabilitation alternatives, it is important to learn more about the limitations and potential performance of thin bonded portland cement concrete overlays. In addition it is important to learn more about matching the overlay thickness to the proper jointing patterns to achieve maximum performance in the finished product.

PROBLEM STATEMENT: Currently sufficient information regarding thin bonded portland cement concrete pavement overlay bonding characteristics, minimum thicknesses and jointing patterns does not exist in Iowa or the nation. This information serve to join the several variables, required in the development of a thin portland cement concrete overlay design procedure.

The Iowa 21 project, located near Belle Plaine, Iowa will provide an opportunity to measure the bonding characteristics associated with overlay of an existing asphalt pavement.

Different surface preparations will be used to identify the best combination of surface preparation, overlay thickness and jointing pattern to achieve adequate bond and long term performance.

OBJECTIVES: Most of the current overlays of asphalt roads are constructed of asphaltic concrete. Are concrete overlays (whitetopping) an acceptable alternative to this process and what can be learned about the amount of original bonding between material layers and the bond retention between the overlay and original surface over time?

The objective of this project is the study of the retention of bond between various overlay thicknesses and jointing patterns of portland cement concrete, to asphaltic concrete pavement with different surface preparations. It will be accomplished through the completion of the following series of tasks:

Task 1: Laboratory instrumentation verification.

Task 2: Field installation of instrumentation.

Task 3: Data collection and analysis.

Task 4: Report development.

PROPOSED RESEARCH: The research effort expended to accomplish each task is described as:

Task 1: Laboratory pilot study of research instrument installation methods and bond development in simulated field conditions. Some 64 composite test specimens will be constructed in the laboratory to represent the use or absence of the fibers in the portland cement concrete and the response to static and dynamic loading. Dynamic test specimens will be subjected to repeated loadings while instrumented to determine the best ways of attaching the instruments, the expected magnitude the specimen behavior as it is subjected to loading. Repeated loading will be of a short term nature and would be carried out until the asphalt or concrete cracks and/or allows debonding to occur at the layer interface or a maximum number of cycles is reached. This portion of the study will concentrate on three areas of interest.

First, static testing, will provide information on the which sensors can provide the best measurements of relative movement between the asphaltic concrete and the portland cement concrete overlay depths.

Secondly it will provide information on the best way to connect sensors to the two material surfaces through static testing.

Thirdly it will provide information on the expected levels of strain associated with bond in the static condition and under repeated dynamic load. Static testing will also provide a measure of the global stiffness of the composite section layers.

Laboratory work will simulate the action of the materials during construction and under repeated loading conditions. Where possible information from the Minnesota Test Road project will be employed in experimental design in terms of sensor selection and attachment methods.

Task 2: Field installation of pavement instrumentation during and after construction of the overlay. Some 32 sites will be selected for instrumentation in the field. This allows for two replicates of each of 16 test cases. The plan calls for the purchase of approximately 130 longitudinal strain devices, 32 temperature/humidity devices and 15 LVDTs. The exact brand and type of gage for each of these applications will be known after the laboratory study.

This work will involve the installation of the longitudinal strain and temperature gages at specified locations along the route to measure the change in temperature of the various pavement layers during and after placement of the overlay. Where possible, the gages will be moved from site to site to reduce the number of gages required and retain security. Gages will be installed near the edge of the pavement to provide the least problems for the paving operation and gage maintenance.

Task 3: Data collection of strain measurements and condition surveys at the field construction site and over a five year period after the installation. Measurements will begin when the concrete has reached a strength that allows installation of the strain gage reference points. Initial strain and temperature/humidity measurements, and deflections will be made on an hourly, daily and weekly basis during and after construction until the pavement is opened to traffic and one measurement to represent the 28 day curing time. Measurements will then be conducted at quarterly intervals for the remainder of the five year period or until the instruments fail to provide measurable data.

Visual condition surveys of the pavement surface will also be conducted weekly for the first month after construction and at each of the time periods where strain information is gathered thereafter. Distress data will be identified in number of slabs per test section that exhibit individual types of cracking or loss of bond and recorded.

Falling Weight Deflectometer (FWD) information will be collected prior to the overlay, immediately after the overlay and at one year periods after the overlay placement. Test sites will coincide with the strain measurements to measure pavement reaction to changes in bond, pavement structure (layer moduli), and load transfer capability at joints. Additional points will be surveyed near the centerline and in the interior of selected slabs. This information will be coordinated with pavement sensors to identify bond conditions at interior points in the pavement section.

Task 4: Report Development. Three reports will be prepared to document the research results. The first report will document the results of the laboratory pilot testing. The second will be completed after the installation to document the construction and installation process. The third, at the end of the five year study period, will document the performance of the overlay in terms of distress development and bond retention.

EVALUATION: This report is designed to give guidance to the

Iowa DOT staff on bond retention between thin portland cement concrete overlays and asphaltic concrete pavements. It will assist engineers in understanding the potential bond, and retention under repeated load for various pavement thicknesses and joint configurations.

ESTIMATED COST:

A detailed budget for the project is shown on page 7.

PROJECT BUDGET

Task 1 Laboratory Pilot Tests

SALARIES AND WAGES	Proposed
PRINCIPAL INVESTIGATOR	
James K. Cable (0.25 months)	$ 1,560
Assistant Scientist (2 month)	5,680
OTHER PERSONNEL	
Technician (2 months)	7,000
Research Assistant	
Partial M.S.(2 months)	2,000
Secretary (0.5 month)	850
Hourly (Total Hours = 600)	3,600
FRINGE BENEFITS	
24.55% of faculty salaries	383
30.80% of professional and scientific salaries	3,905
24.92% of research assistant salaries	498
39.45% of clerical salaries	335
MISCELLANEOUS: MATERIALS, SUPPLIES, TRAVEL	6,000
REPORT/PUBLICATION COSTS	
Project report (50 copies of final)	800
TOTAL DIRECT COSTS	$32,611
INDIRECT COSTS	
44% of modified total direct costs	14,349
TOTAL DIRECT AND INDIRECT COSTS	$46,960

PROJECT BUDGET

Tasks 2-4, Field Verification-Final Report

	Proposed
SALARIES AND WAGES	
PRINCIPAL INVESTIGATOR	
James K. Cable (2.0 months)	$12,470
Assistant Scientist (4 months)	11,370
OTHER PERSONNEL	
Technician (5 months)	17,500
Research Assistant	
Partial M.S. (9 months)	9,000
Secretary (1 month)	1,700
Hourly (Total Hours = 900)	5,400
FRINGE BENEFITS	
24.55% of faculty salaries	3,061
24.92% of research assistant salaries	2,243
39.45% of clerical salaries	671
30.80% of professional and scientific salaries	8,892
EQUIPMENT RENTAL SERVICES	15,000
MISCELLANEOUS: MATERIALS, SUPPLIES, TRAVEL	45,700
REPORT/PUBLICATION COSTS	
Interim and final project report (100 copies)	5,000
TOTAL DIRECT COSTS	$138,007
INDIRECT COSTS	
44% of modified total direct costs	$ 60,723
TOTAL DIRECT AND INDIRECT COSTS	$198,730
TOTAL TASKS ONE THROUGH FOUR	$245,690

PROJECT SCHEDULE AND REPORTS: The laboratory pilot project would begin on or before September 1, 1993 and would be completed on or before December 31, 1993. Draft reports will be developed and reviewed in January, 1994 and the final report on this phase of the work would be completed in February, 1994.

The field verification portion of the work will begin in January, 1994 with purchase and preparation of the instrumentation. It will begin on the site when the construction project begins. The second report will be developed for review two months after the completion of field installation and completed the following month. The final report will be scheduled for draft review in November, 1999 and completion in December 1999.

SCHEDULE:

TASK I: September 1, 1993 - December 31, 1993

TASK II: January 1, 1994 - August 31, 1994

TASK III: June 1, 1994 - October 31, 1999

TASK IV: December, 1993 - December 31, 1999

REPORTS:

Each of the three reports specified will be provided with 50 copies to the Iowa Department of Transportation for distribution.

PERSONNEL:

James K. Cable P.E., Associate Professor, CCE will be in charge of the overall organization and management of the project including advisory committee meetings. He will be assisted by a research assistants from the ISU Civil and Construction Engineering Department. FWD work site investigation and data analysis will be provided by outside consultants hired by the University. The research staff will be responsible for the field data collection, analysis and assist in the report development. A copy of the resume for the Principal Investigator is attached.