Longitudinal Joint Forming
In PCC Pavements

Construction Report
for
MLR-00-05

June 2003

Highway Division

Iowa Department
Of Transportation

Longitudinal Joint Forming In PCC Pavements

Construction Report
for
MLR-00-05

By
Robert Steffes
Assistant to the Research Engineer
515-239-1392
Fax: 515-817-6594

and

Ananto Prasetyo
Materials Research
515-233-7915
Fax: 515-239-1092

Office of Materials
Highway Division
Iowa Department of Transportation
Ames, Iowa 50010

June 2003

TECHNICAL REPORT TITLE PAGE

1. REPORT NO.

MLR-00-05

2. REPORT DATE

June 2003

3. TITLE AND SUBTITLE

Longitudinal Joint Forming in PCC Pavements

4. TYPE OF REPORT & PERIOD COVERED

Construction Report, 1-00 to 1-03

5. AUTHOR(S

Robert Steffes
Assistant to the Research Engineer

Ananto Prasetyo
Materials - Research

6. PERFORMING ORGANIZATION ADDRESS

Iowa Department of Transportation
Office of Materials
800 Lincoln Way
Ames, Iowa 50010

7. ACKNOWLEDGMENT OF COOPERATING ORGANIZATIONS/INDIVIDUALS

8. ABSTRACT

In conventional construction practices, a longitudinal joint is sawed in a PCC (Portland Cement Concrete) pavement to control concrete shrinkage cracking between two lanes of traffic. Sawing a joint in hardened concrete is an expensive and time consuming operation. The longitudinal joint is not a working joint (in comparison to a transverse joint) as it is typically tied with a tie bar at 30 inch spacing. The open joint reservoir, left by the saw blade, typically is filled or sealed with a durable crack sealant to keep incompressibles and water from getting into the joint reservoir. An experimental joint forming knife has been developed. It is installed under the paving machine to form the longitudinal joint in the wet concrete as a part of the paving process. Through this research method, forming a very narrow longitudinal joint during the paving process, two conventional paving operations can be eliminated. Joint forming eliminates the need of the joint sawing operation in the hard concrete, and as the joint that is formed does not leave a wide-open reservoir, but only a hairline crack, it does not need the joint filling or sealing operation. Therefore, the two conventional longitudinal joint sawing and sealing operations are both being eliminated by this innovation.

A laboratory scale prototype joint forming knife was built and tested, initially forming joints in small concrete beams. The results were positive so the method was proposed for field testing. Initial field tests were done in the construction season of 2001, limited to one paving contractor. A number of modifications were made to the knife throughout the field tests. About 3000 feet of longitudinal joint was formed in 2001. Additional testing was done in the 2002 construction season, working with the same contractor. About 150,000 feet of longitudinal joint was formed in 2002.

Evaluations of the formed joints were done to determine longitudinal joint hairline crack development rate and appearance. Additional tests will be done in the next construction season to improve or perfect the longitudinal joint forming technique.

9. KEY WORDS

Portland Cement Concrete (PCC)
Longitudinal joint
Formed joint

10. NO. OF PAGES

50

TABLE OF CONTENTS

DISCLAIMER

INTRODUCTION

A longitudinal joint is sawed in a PCC highway to control concrete shrinkage cracking between lanes of traffic. Sawing a joint in hardened concrete is an expensive and time consuming operation. The longitudinal joint is not a working joint (in comparison to a transverse joint) as it is typically tied with tie bars at 30 inch spacing. The open joint reservoir, left by the saw blade, generally is filled or sealed with a durable crack sealant to keep incompressibles and water from getting into the reservoir. Development of a method to obtain a longitudinal joint without sawing it in the hard concrete along with reducing the need to seal the joint would be a significant benefit in the paving industry.

DISCUSSION

Portland cement concrete is primarily hard and strong as a result of the aggregates, mainly the large aggregate (rocks) in a concrete mixture. The mixture is held together by cement and water (paste). Rocks, in PCC, are generally much harder or stronger than the paste. As a result of the random positioning of the rocks in the concrete mix, a shrinkage crack will take a very irregular path, generally going around rocks and passing through the paste. Cracks, in PCC, will follow a path of least resistance.

An alternate method to create a longitudinal joint in PCC would be to form it, in the process of paving, with a steel knife positioned under the paver. The knife, as it passes through the wet concrete, will force to the right or to the left, each rock it hits as it moves forward. As the concrete closes in again, behind the knife, the two vertical faces of the joint will come together. The two faces, joined together will form a vertical plane of weakness (paste) with no large, hard rock in that plane. Thereafter, that plane is the weakest plane in the concrete and it becomes the longitudinal joint. After pavement surface finishing operations are completed, the joint would be invisible until a hairline crack (the joint) develops which follows the path of the knife. As the concrete cures and hardens, it shrinks. The weakened plane, with no large, hard rocks in its path, will develop into a controlled, stress-relieving, straight line, longitudinal hairline crack following the path left by the joint forming knife. The formed joint is created without any sawing of hard concrete. The joint is held closed by center-line tie bars. As no saw blade reservoir is created, no joint sealing is required to fill and seal the reservoir. Thus, this method can eliminate the two conventional paving operations of concrete sawing and sealing and should also not require the maintenance resealing operations some years later.

OBJECTIVES

The primary objective of this research is to develop and field test a device and a method to create the longitudinal joint in a PCC paving project by forming it in the plastic concrete during the paving process. Following the success of longitudinal joint forming would be a secondary objective, to eliminate the longitudinal joint sealing.

PROCEDURE

A laboratory model of a vibrator powered joint forming knife was built and tested in concrete samples in the DOT laboratory (see Figure 1). Information obtained from laboratory tests were passed on to the Iowa Concrete Paving Association (ICPA) and individual PCC paving contractors for their evaluation and potential field trials.

Figure 1. Laboratory vibrator and beam mold with concrete for initial joint forming test.

FIELD TRIALS

After the concept of longitudinal joint forming was presented to the PCC paving industry in January of 2001 the paving contractor, Fred Carlson Co. Inc, proposed to construct a joint forming device on the rear of their paver and to do field trials in a DOT PCC paving project. Field tests starting in May 2001, on highway US 218 in Henry County. Seven independent test sections were constructed in the 2001 paving season covering a total of about 3000 feet of longitudinal joint. Several modifications to the knife design (see Figure 2) were made throughout the 2001 testing period. Results of the joint forming trials are given, (see Appendix A), field trials 1 through 7).

Figure 2. Rear mounted joint forming knife under the floating pan.

Longitudinal joint forming field trials were continued in the 2002 paving season again with the paving contractor Fred Carlson Co. Inc, Based upon experience gained in the 2001 paving season only minor modifications were made in the 2002 season. The most significant of those changes were 1) the addition of a front knife in line with the existing rear knife (starting with project 8, see Figure 3), 2) installing twin/parallel knives, set at 5 ft from each shoulder, for a special project with multiple longitudinal joints (project 8, see Figure 4) and 3) the addition of rubber bushings to the mounting points of the rear knife/vibrator

Figure 3. Front mounted joint forming knife, near paver vibrators.

assembly (project 11-2, see Figure 5). Results of 2002 longitudinal joint forming trials are given, (see Appendix B, field trials 8 through 11.3). The detailed field survey done in January 2003 (see Appendices A and B) showed that some formed joint sites were not yet cracked. A later survey in May 2003 showed that nearly all sites were fully cracked. Timing of formed joint cracking was found to vary from a few days to several months, depending on weather, traffic and other conditions. The majority of joints cracked between one week and one month. It is expected that some sections of longitudinal joint may not crack, even after a long period of time. No uncontrolled random cracks developed except for several very short insignificant sections at the ends of projects.

Figure 4. One of the twin parallel rear mounted joint forming knives.

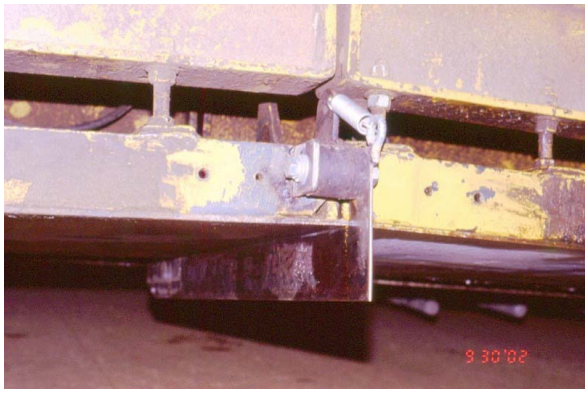


Figure 5. Rear mounted joint forming knife with vibrator and rubber isolator mounts.

Results from cores taken over the formed joint show that a very distinct joint can be constructed by joint forming in the plastic concrete. The joint develops into a longitudinal hairline crack as the concrete cures over time. Improvements were made by reducing the width of the knife throughout the testing period. Shifting of the joint forming knife from the rear of the paver to a more forward location is proposed for future tests. That location shift may also eliminate the need for any direct vibration applied to the knife. The depth of the knife ranged from 2” to 3” throughout the tests for pavements depths going up to around 11”. With more joint forming experience, the knife depth could likely be reduced.

For field tests in 2003, with different contractors and different paver designs, the location of the joint forming knife, need for one or more knives and the need for some vibration may be changed depending mainly on the paver’s method or location of centerline tie bar insertion.

Continuation of longitudinal joint forming field trials are scheduled for the 2003 paving season to determine if the joint forming technique is ready to be an option to be put into future project plan specifications.

IMPLEMENTATION

Experience gained from field trials will be used to introduce the joint forming technique into the paving industry as a means to gain a substantial cost and time savings in longitudinal joint

construction through the elimination of longitudinal joint sawing and joint sealing.

RESPONSIBILITIES

The office of Materials and the office of Construction will be responsible for the research. Authorization to use the longitudinal joint forming procedure in a DOT paving project will be given through the office of Construction. Report writing will be done by the Office of Materials.

COST

No specific funding will be allocated for this project. The DOT will perform the laboratory testing and the paving contractors will cooperate by performing the field tests. Cost savings should range from $ 0.50 to $ 1.00 per linear ft of joint depending on hardness of aggregate and cost of sealant.

REPORTING

A construction report will be written after two seasons of field tests. Intermediate reports will be written each following year until the final report at 5 years age.

ACKNOWLEDGEMENTS

Thanks and appreciation is expressed to the Materials personnel in the Machine Shop for their help in equipment fabrication, to the personnel in the Cement and Concrete laboratory for their help in preparing concrete mixes and doing core strength tests and to the personnel in the General Test laboratory for their help in core testing. A special thanks and appreciation goes out to the Fred Carlson Co. Inc., to the Engineering personnel and to the field paving crew for their significant support in equipment fabrication and efforts towards joint forming improvements in each of the many field trials done.

APPENDICIES

FIELD TRAILS 2001
Projects 01 thru 07

FIELD TRAILS 2002
Projects 08 thru 11.3

Projects

		Length (ft)	
01	Hwy 218, NBL, Mt. Pleasant, Henry Co.	98.4	
02	Hwy 218, SBL, Mt. Pleasant, Henry Co.	164	
03	Hwy 34, EBL, Mt. Pleasant, Henry Co.	183.7	
04	Hwy 218, NBL, Mt. Pleasant, Henry Co.	98.4	
05	Hwy 218, SBL, Mt. Pleasant, Henry Co.	900	
06	Hwy 218, NBL, Mt. Pleasant, Henry Co.	750	
07	Hwy 92, CL, Washington, Washington Co.	400	2,594.5 ft (2001)
08	Hwy 13, CL, Manchester, Delaware Co.	92528	
09.1	Hwy 63, NBL, New Hampton, Chickasaw Co.	10699	
09.2	Hwy 63, SBL, New Hampton, Chickasaw Co.	9203	
09.3	Hwy 63, NBL, New Hampton, Chickasaw Co.	1696	
10.1	Hwy 218, Nashua, Bremer/Chickasaw Co.	16322	
10.2	Hwy 218, Nashua, Bremer/Chickasaw Co.	4593	
11.1	Hwy 151, SBL, Monticello, Jones Co.	4980	
11.2	Hwy 151, SBL, Cascade, Jones Co.	9797	
11.3	Hwy 151, SBL, Cascade, Jones Co.	1217	151,035.0 ft (2002)
		Total :	**153,629.5** ft
			29.1 miles

Notes
NBL = Northbound lane
SBL = Southbound lane
EBL = Eastbound lane
D = Depth
W = Width
L = Length

APPENDIX A

FIELD TRAILS 2001
Projects 01 thru 07

Iowa Department of Transportation

Project Development Division

PLANS OF PROPOSED IMPROVEMENT ON THE

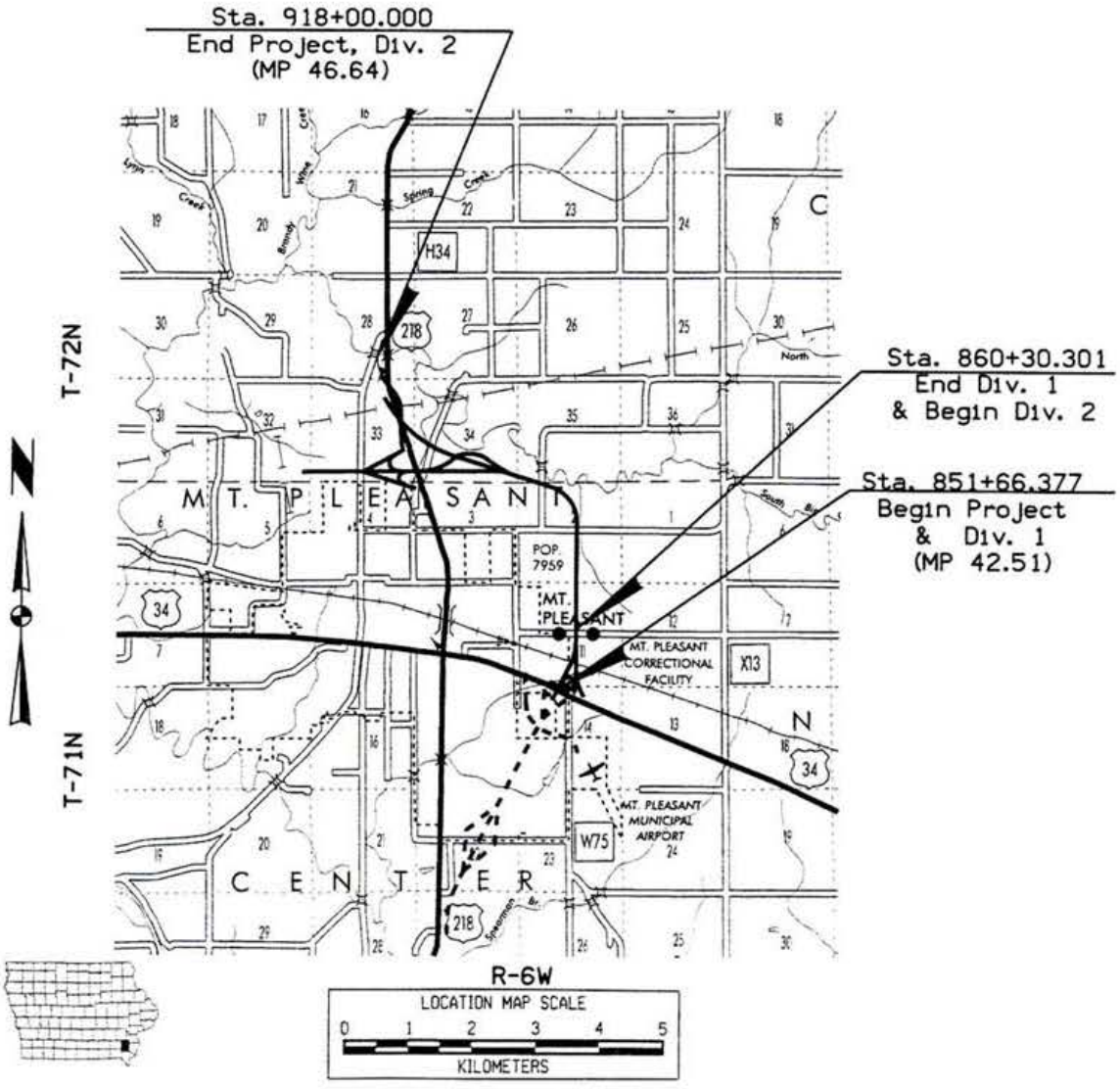
PRIMARY ROAD SYSTEM

HENRY COUNTY

P.C.C. PAVEMENT - GRADE AND NEW

U.S. 218 MT. PLEASANT BY-PASS FROM U.S. 34 NORTH TO 1.5 KM SOUTH OF COUNTY ROAD H-34

NHSX-218-2(57)--3H-44



01) Hwy 218, NBL, Mt. Pleasant, Henry Co.

Project No : NHSX-218-2(51)--3H-44
Knife Type : Paver knife, 2.5"D x 0.25"W x 42"L with 2.5"D x 0.25"W x 40'L tail with rear end supported by a 6"W x 20"L ski.
Note : Metric units.

Date Paved	Sta	Cracking		Note
		(3/20/02)	(1/8/03)	
5/29/2001	M838+25	Crack	Crack	Cores @ M838+41, M838+45, M838+47
	M838+55	Crack	Crack	

Total Length : 30 meters or 98.4 ft

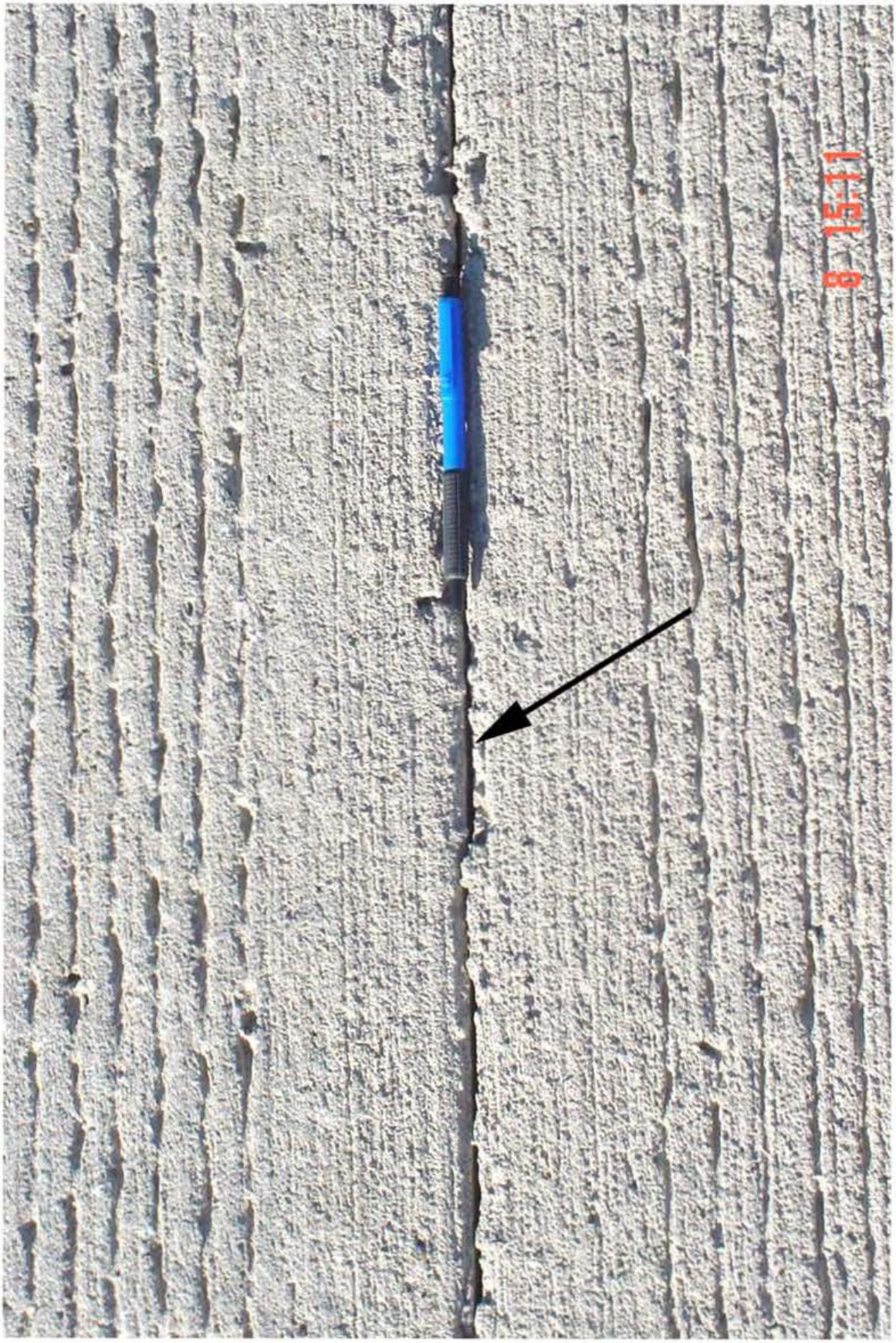
01) Hwy 218, NBL, Sta 838+50, Mt. Pleasant, Henry Co. 1/8/03
Open formed joint left by wide knife.

02) Hwy 218, SBL, Mt. Pleasant, Henry Co.

Project No : NHSX-218-2(57)--3H-44
Knife Type : Paver knife, 2.5"D x 0.25"W x 42"L with 2.5"D x 0.25"W x 40'L tail with 3”D x 3/8”W x 42”L enlarged end section and all supported by a 8"W x 42"L rear end ski.
Note : Metric units.

Date Paved	Sta	Cracking (3/20/02)	Cracking (1/8/03)	Note
6/27/2001	M862+99	Crack	Crack	Cores @ M863+02, M863+20, M862+88*, M862+95*, (*:Control)
	M863+00	Crack	Crack	
	M863+49	Crack	Crack	

Total Length : 50 meters or 164 ft



02) Hwy 218, SBL, Sta 863+37, Mt. Pleasant, Henry Co. 1/8/03
Open formed joint left by wide knife.

Iowa Department of Transportation

Highway Division

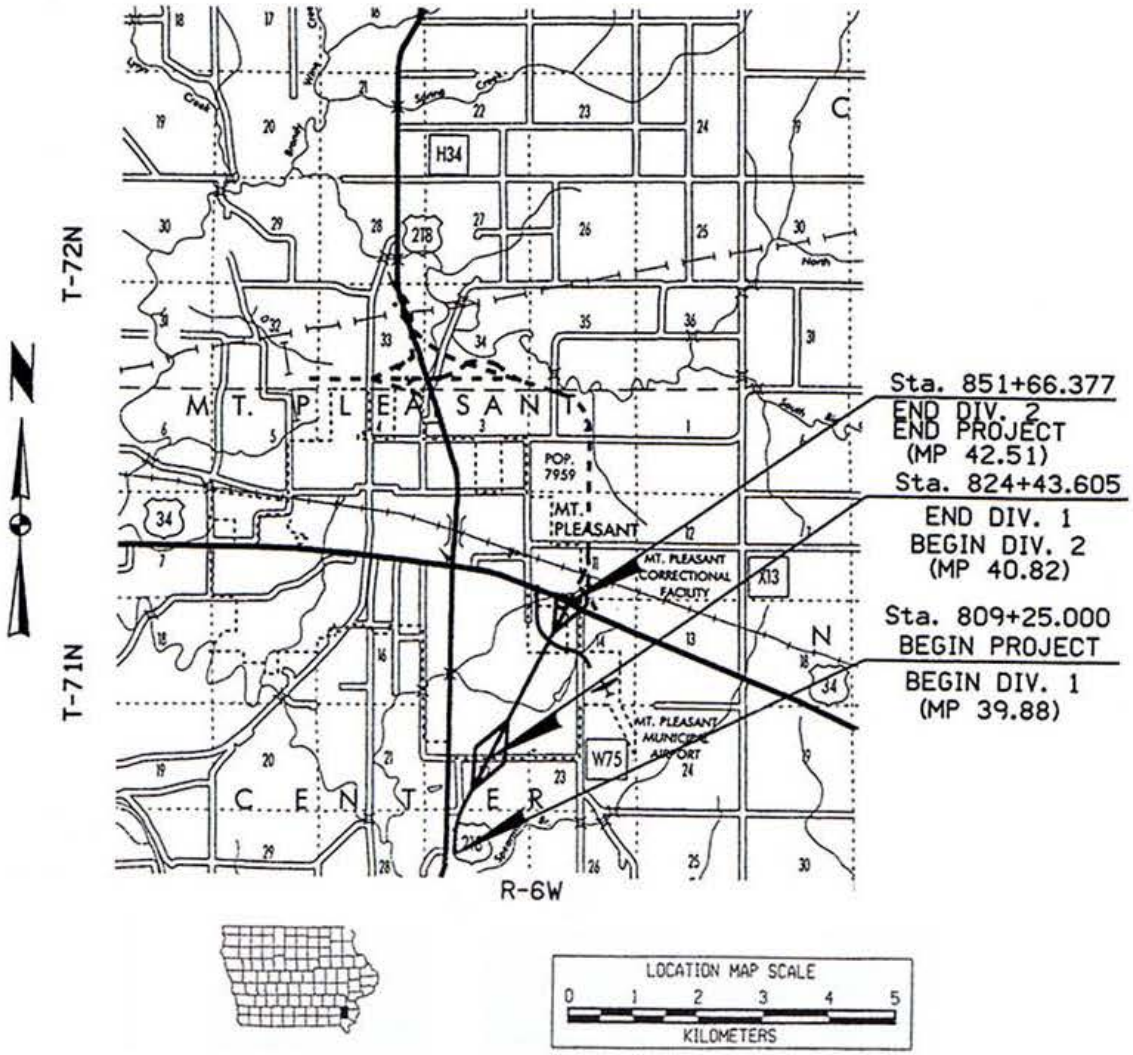
PRIMARY ROAD SYSTEM

HENRY COUNTY

P.C.C. PAVEMENT - GRADE AND NEW

U.S. 218 MOUNT PLEASANT BYPASS FROM NORTH OF BIG CREEK NORTH TO U.S. 34

NHSX-218-2(51)--3H-44

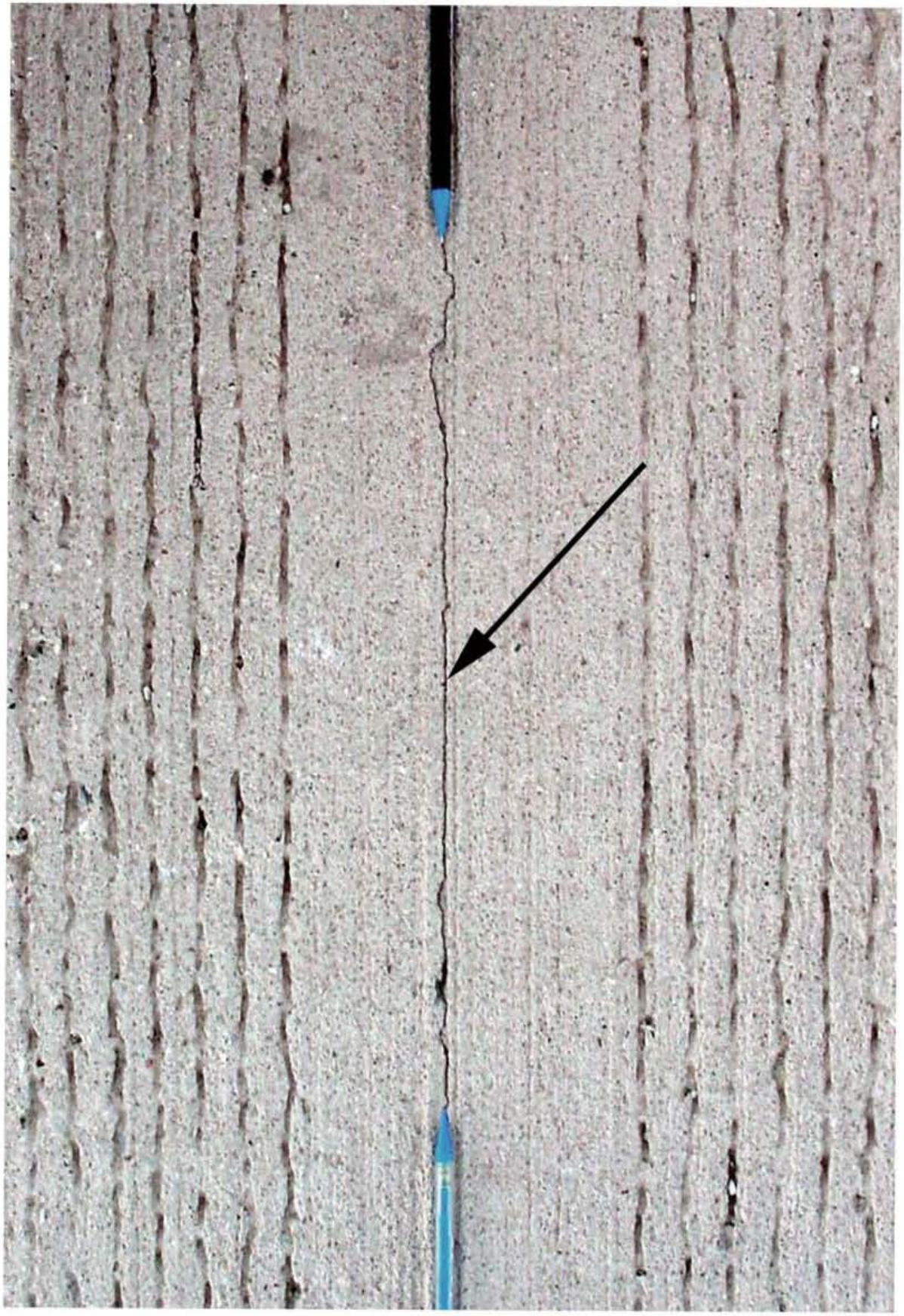


03) Hwy 34, EBL, Mt. Pleasant, Henry Co.

Project No : NHSX-218-2(57)--3H-44
Knife Type : Paver knife, 3”D x 3/16”W x 42”L
Note : Metric units.

Date Paved	Sta	Cracking (3/20/02)	Cracking (1/8/03)	Note
7/13/2001	M225+76	Crack	Crack	Cores @ M226+20
	M226+00	Crack	Crack	
	M226+32	Crack	Crack	

Total Length : 56 meters or 183.7 ft



03) Hwy 34, EBL, Sta 255+85, Mt. Pleasant, Henry Co. 1/8/03

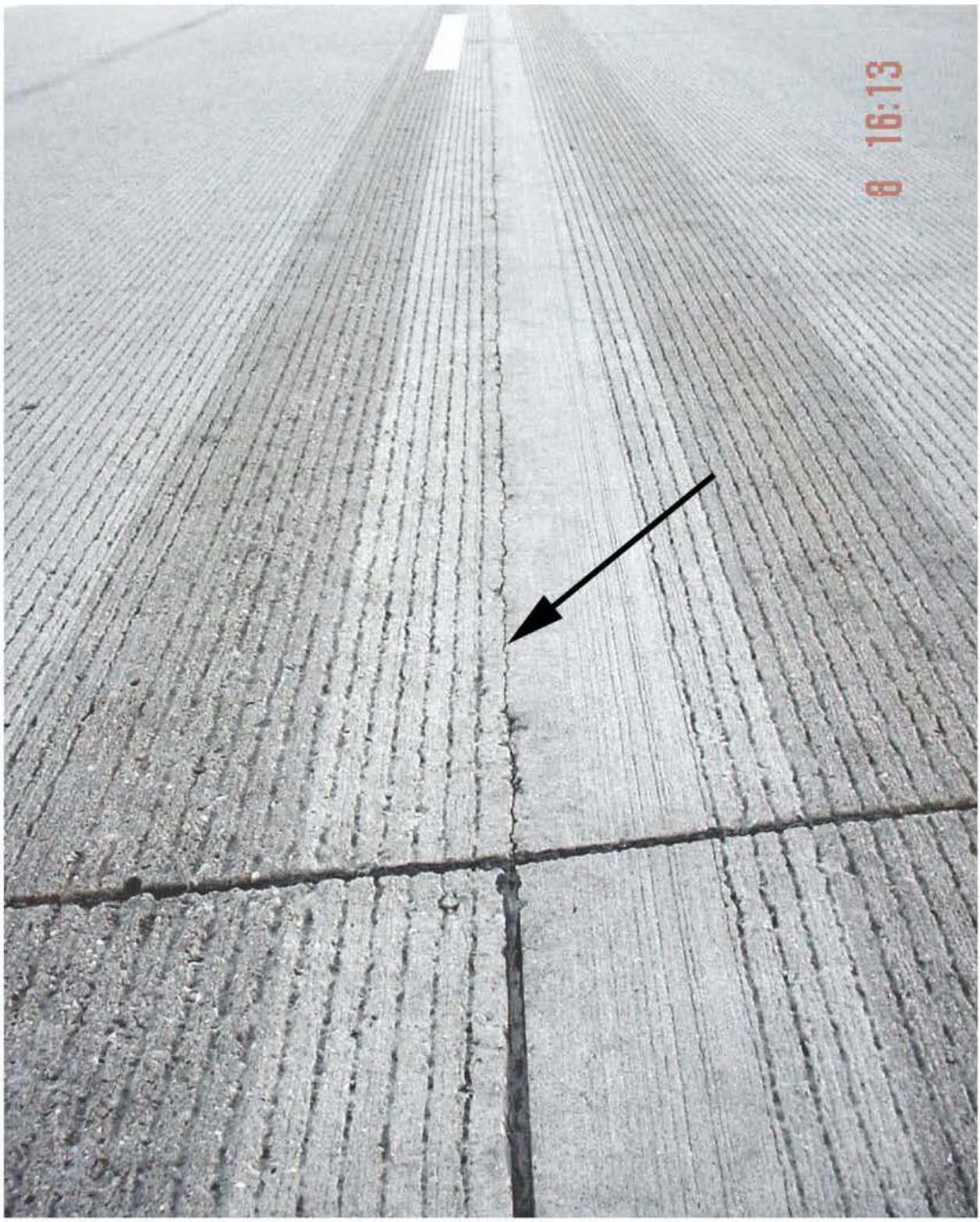
Formed joint hairline crack.

04) Hwy 218, NBL, Mt. Pleasant, Henry Co.

Project No : NHSX-218-2(57)--3H-44
Knife Type : Paver knife, 2.5"D x 0.25"W x 42"L with 2 20'L tails, 2.5"D x 0.25"W, in series, with each rear end supported by a 10"W x 36"L flexible wing ski.
Note : Metric units.

Date Paved	Sta	Cracking		Note
		(3/20/02)	(1/8/03)	
7/26/2001	M904+90	Crack	Crack	Cores @ M905+00
	M905+00	Crack	Crack	
	M905+20	Crack	Crack	

Total Length : 30 meters or 98.4 ft



04) Hwy 218, NBL, Sta 905+20, Mt. Pleasant, Henry Co. 1/8/03
Beginning of formed joint test section.

05) Hwy 218, SBL, Mt. Pleasant, Henry Co.

Project No : NHSX-218-2(57)--3H-44
Knife Type : Paver knife, 3.5"D x 3/16"W x 78"L (total) with a knife mounted vibrator and 16”W x 36”L flexible wing rear ski and also joint debonding fluid (curing compound drip system dispenser working about 30 meters, but not effectively).
Note : Metric units.
: First time using vibrator

Date Paved	Sta	Cracking (3/20/02)	Cracking (1/8/03)	Note
8/13/2001	M852+40	No crack to M852+70	Crack	Cores @M852+70, M852+87, M855+13, M855+80*, (*:control).
	M853+00	Crack	Crack	
	M854+00	Crack	Crack	
	M855+00	Crack	Crack	
	M855+14	Crack	Crack	

Total Length : 274 meters or 900 ft

05) Hwy 218, SLB, Sta 853+00, Mt. Pleasant, Henry Co. 1/8/03

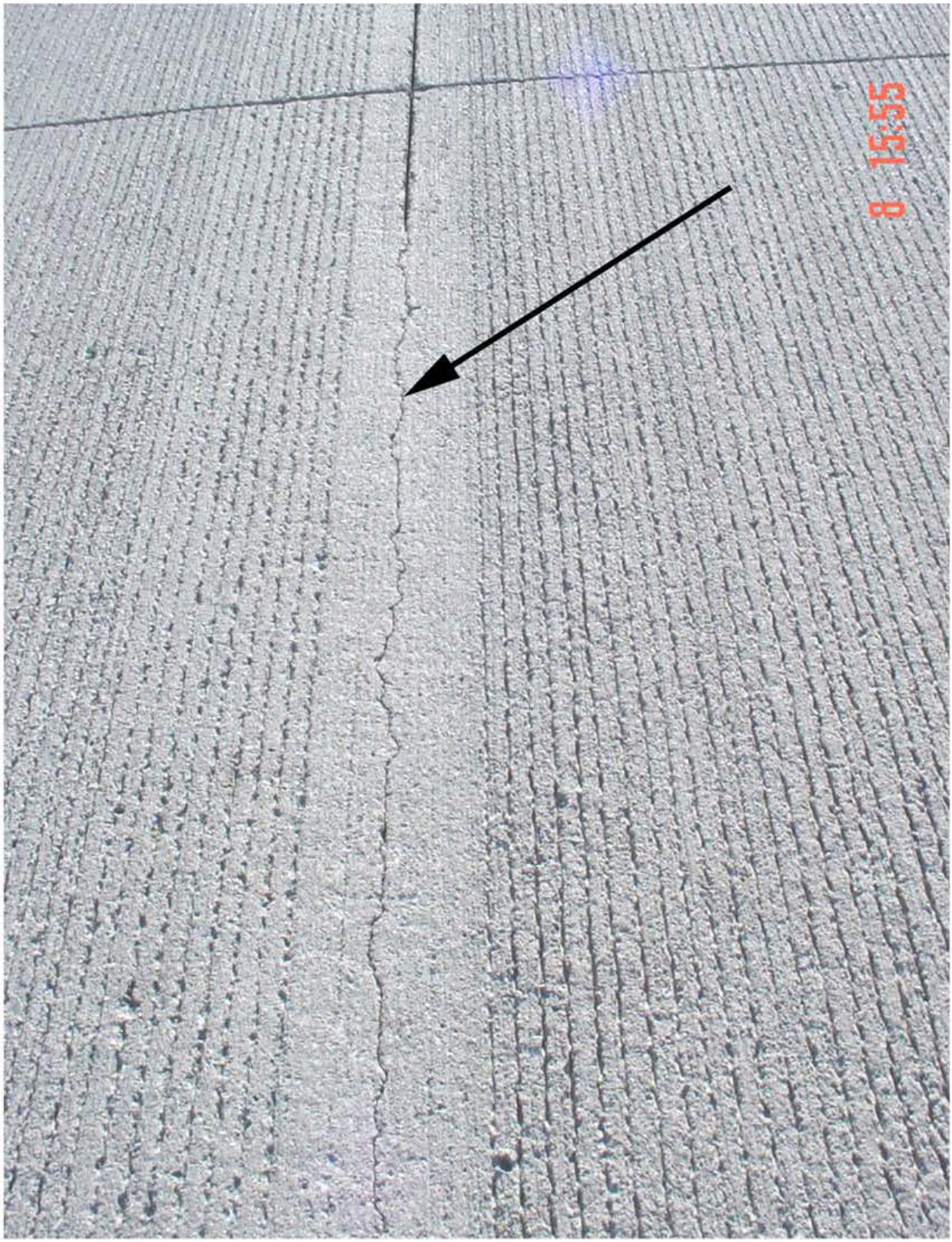
Formed joint hairline crack.

06) Hwy 218, NBL, Mt. Pleasant, Henry Co.

Project No : NHSX-218-2(57)--3H-44
Knife Type : Paver knife, 3.5"D x 3/16"W x 42"L with a knife mounted vibrator.
Note : Metric units.
: Second time using vibrator.

Date Paved	Sta	Cracking (3/20/02)	Cracking (1/8/03)	Note
8/17/2001	M852+40	No crack to M852+66	Crack	Cores @M853+00, M853+51, M853+52
	M852+66		Crack	
	M852+66			Soff-Cut (55 meters or 180ft)
	M853+00			
	M853+21			
	M853+21	Crack	Crack	
	M854+00	Crack	Crack	
	M854+84	No crack to M855+14	Crack	
	M855+00		Crack	
	M855+14		Crack	

Total Length : 274 meters or 900 ft
Total Length of Joint Former : 750 ft



06) Hwy 218, NBL, Sta 853+21, Mt. Pleasant, Henry Co. 1/8/03

End of formed joint test section.

Iowa Department of Transportation

Project Development Division

PLANS OF PROPOSED IMPROVEMENTS ON THE

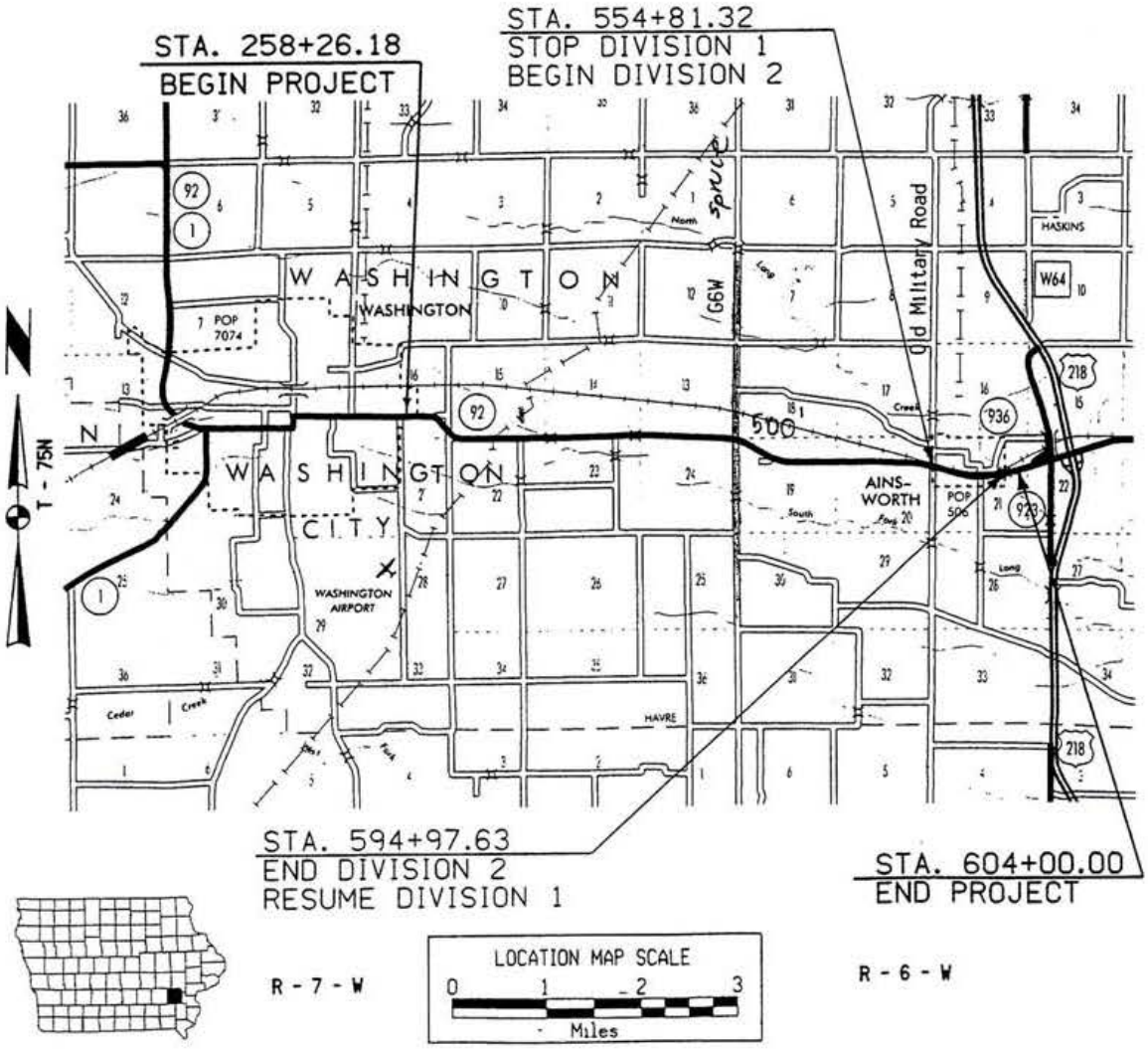
PRIMARY ROAD SYSTEM

WASHINGTON COUNTY

P.C.C. PAVING

FROM EAST CITY LIMITS OF WASHINGTON
TO AINSWORTH

STP-92-9(74)--2C-92



07) Hwy 92, CL, Washington, Washington Co.

Project No : STP-92-9(74)--2C-92
Knife Type : Paver knife, 3.5"D x 3/16"W x 42"L with a knife rigid mounted vibrator.
Note : English units.
: In front of Pork-N-More, 0.5 mi East of Washington

Date Paved	Sta	Cracking (3/20/02)	Cracking (1/8/03)	Note
9/28/2002	276+24	Crack	Crack	
	280+00	Crack	Crack	
	280+04	No crack	Crack	
	280+10		Crack	
	280+10	Crack	Crack	
	280+24		Crack	

Total Length : 400 ft

07) Hwy 92, CL, Sta 280+24, Washington, Washington Co. 1/8/03

Beginning of formed joint test section.

07) Hwy 92, CL Sta 280+06, Washington, Washington Co. 1/8/03

Random crack, 8' long, at beginning of joint test section.

APPENDIX B

FIELD TRAILS 2002
Projects 08 thru 11.3

Iowa Department of Transportation

Highway Division

PLANS OF PROPOSED IMPROVEMENTS ON THE

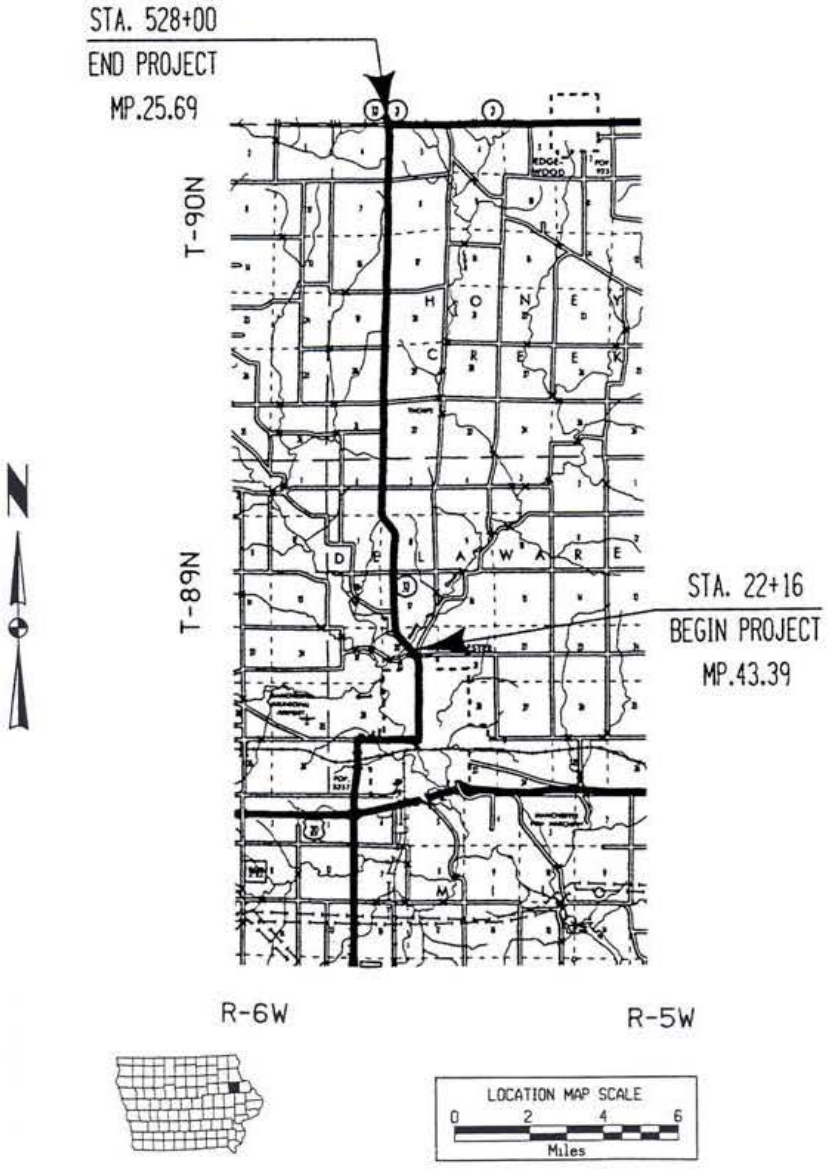
PRIMARY ROAD SYSTEM

DELAWARE COUNTY

PCC OVERLAY

ON IA 13, FROM THE NORTH CITY LIMITS OF MANCHESTER TO IA 3.

STP-13-2(33)--2C-28



08) Hwy 13, CL, Manchester, Delaware Co.

Project No : STP-13-2(33)--2C-28
Knife Type : Twin parallel paver knives, 2”D x 1/8”W x 24" or 48”L (see * and ** in the note).
No vibrator used.
Note : English units.
Paver pan / knife left slight surface depression 5' from shoulder.
All of the day joints do not have a date stamped.
Cores @ 53+03, 71+00, 71+50, 72+50
Concrete is approximately 4" thick.
Formed joint may not always be exactly over transition line.

Date Paved	M.P	Sta	Cracking (1-7-03)		Note
			SBL	NBL	
7/2/2002	0.0 M	51+02	Crack	Crack	
		52+00	Crack	Crack	
		66+00			
7/3/2002		66+00			(14)
	0.5 M	79+35	Crack	Crack	Fiber
		97+35			
7/8/2002		97+35			(27)
	1.0 M	106+00	Crack	Crack	(30)
		127+80			
7/9/2002		127+90			
	1.5 M	133+00	Crack	No crack	
	2.0 M	160+00	No crack	No crack	(50)
		166+85			
7/10/2002		166+85			
	2.5 M	189+00	No crack	Crack	(61)
	3.0 M	217+00	Crack	Crack	
		216+85			
7/15/2002		216+85			
	3.5 M	246+00	Crack	Crack	
		269+95			
7/16/2002		269+95*			*Cut off right side knife protruding beyond the back of the pan
	4.0 M	278+00	Crack	No crack	
	4.5 M	305+00	No crack	No crack	(08)
		326+44			
7/17/2002		326+44**			**Cut off the left side knife protruding beyond the back of the pan.
	5.0 M	333+00	No crack	No crack	

	5.5 M	362+00 374+80	No crack	No crack	
7/18/2002		374+80			Saw but no grinding, (36)
	6.0 M	385+00	No crack	No crack	(40)
	6.5 M	413+00	No crack	No crack	
		419+45			
7/19/2002		419+45			
	7.0 M	441+00	No crack	Crack	
		453+98			
7/22/2002		453+98			54
		457+65			
7/23/2002		457+65			
	7.5 M	468+00	No crack	No crack	
	8.0 M	495+00	No crack	No crack	(85)
	8.5 M	513+00	No crack	Crack	
		513+66	No crack	Crack	End of Project

Total Length : 14.1 km or 8.76 miles

Front knife is 3"D x $^{3}/_{8}$"W x 24"L with the rear 12" extending under the pan and 12" extending in front of the pan (between the vibrators).

08) Hwy 13, Sta 85+00, Manchester, Delaware Co. 1/7/03

Formed joints 5 feet from each shoulder.
Note white tips of fibers in the PCC.

Iowa Department of Transportation

Highway Division

PLANS OF PROPOSED IMPROVEMENT ON THE

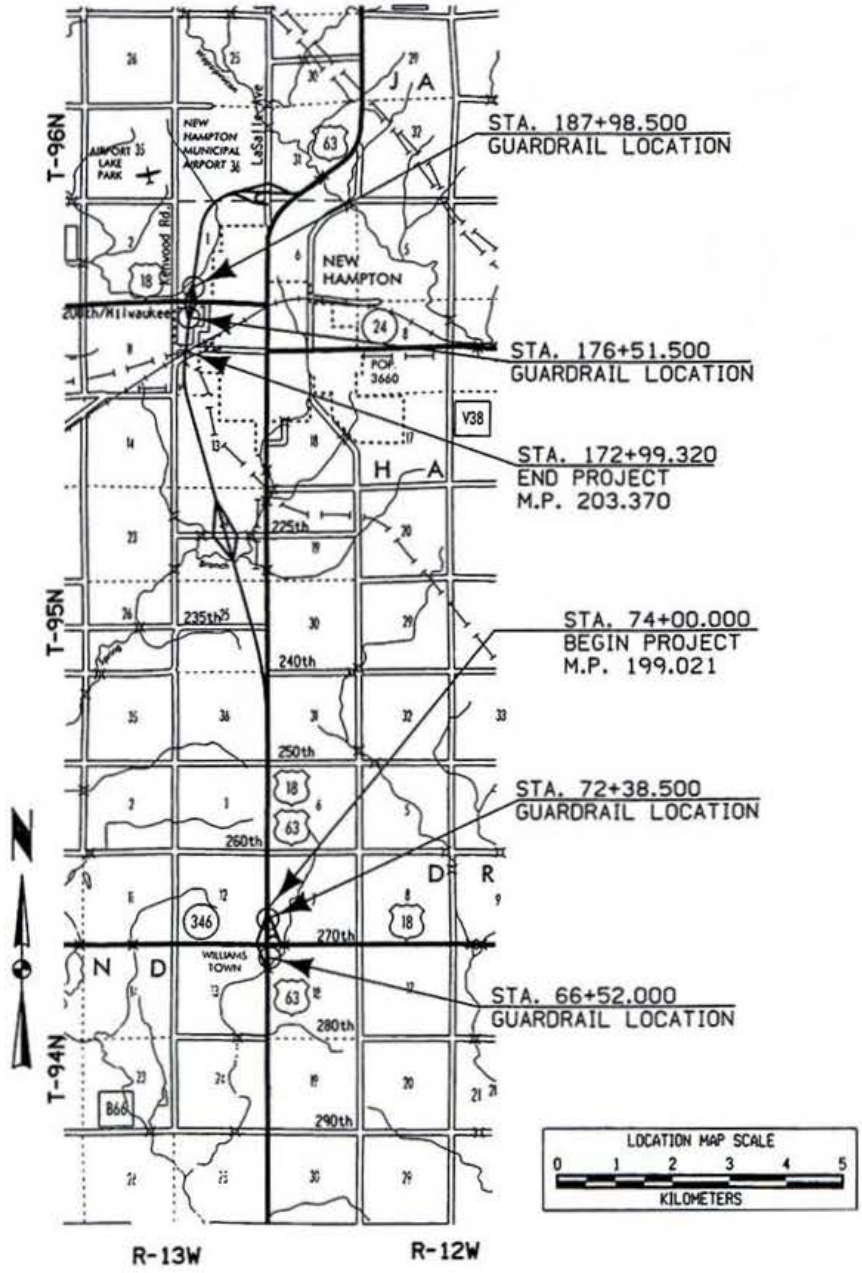
PRIMARY ROAD SYSTEM

CHICKASAW COUNTY

P.C.C. PAVEMENT / GRADE AND NEW

ON U.S. 63 NEW HAMPTON BY-PASS
FROM 0.7 KM NORTH OF
U.S. 18 / IA. 346 NORTH TO I & M R.R.

NHSX-63-8(21)--3H-19



Iowa Department of Transportation

Project Development Division

PLANS OF PROPOSED IMPROVEMENT ON THE

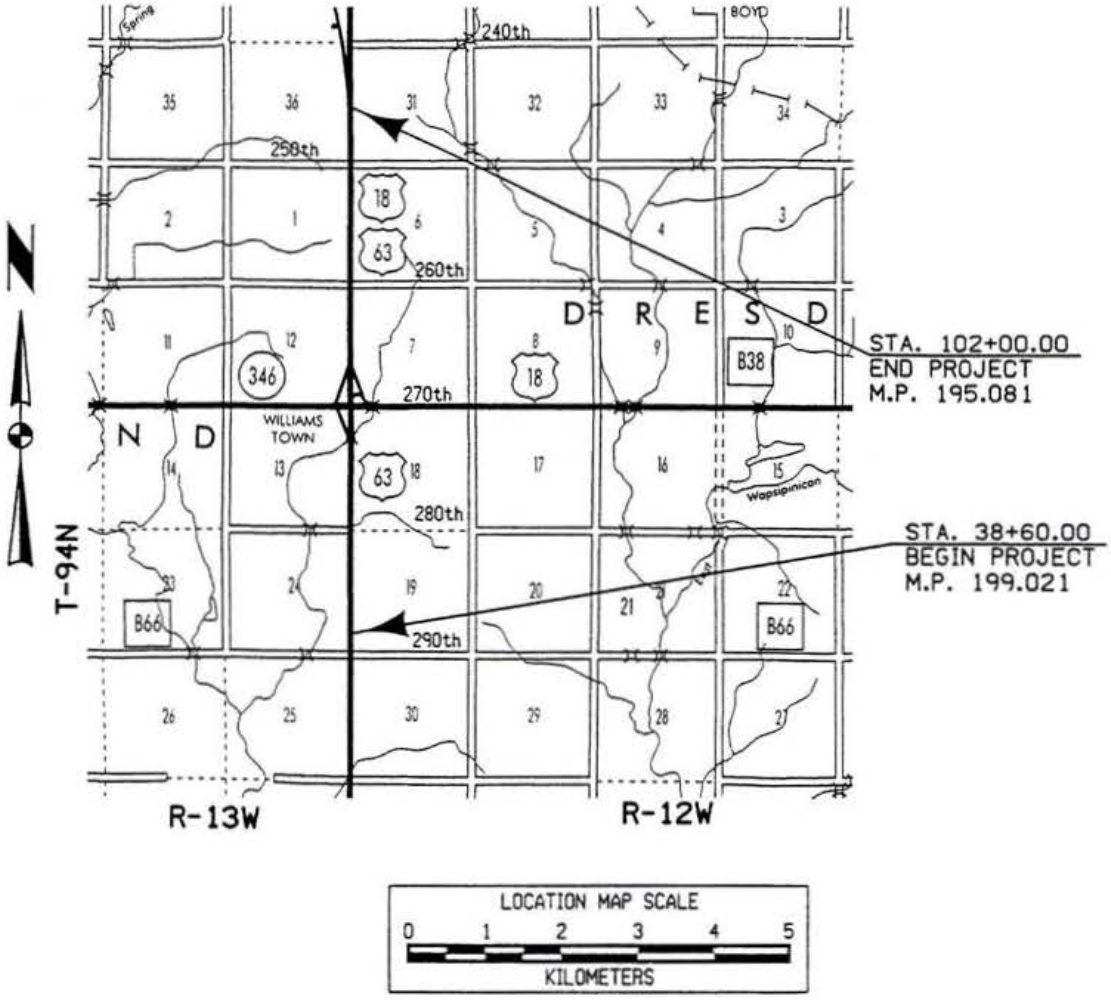
PRIMARY ROAD SYSTEM

CHICKASAW COUNTY

P.C.C. PAVEMENT / GRADE AND NEW

ON U.S. 63 NEW HAMPTON BY-PASS
FROM 2.1 KM SOUTH OF U.S. 18 N. TO SOUTH OF 240TH ST.

NHSX-63-8(17)--3H-19



Iowa Department of Transportation

Highway Division

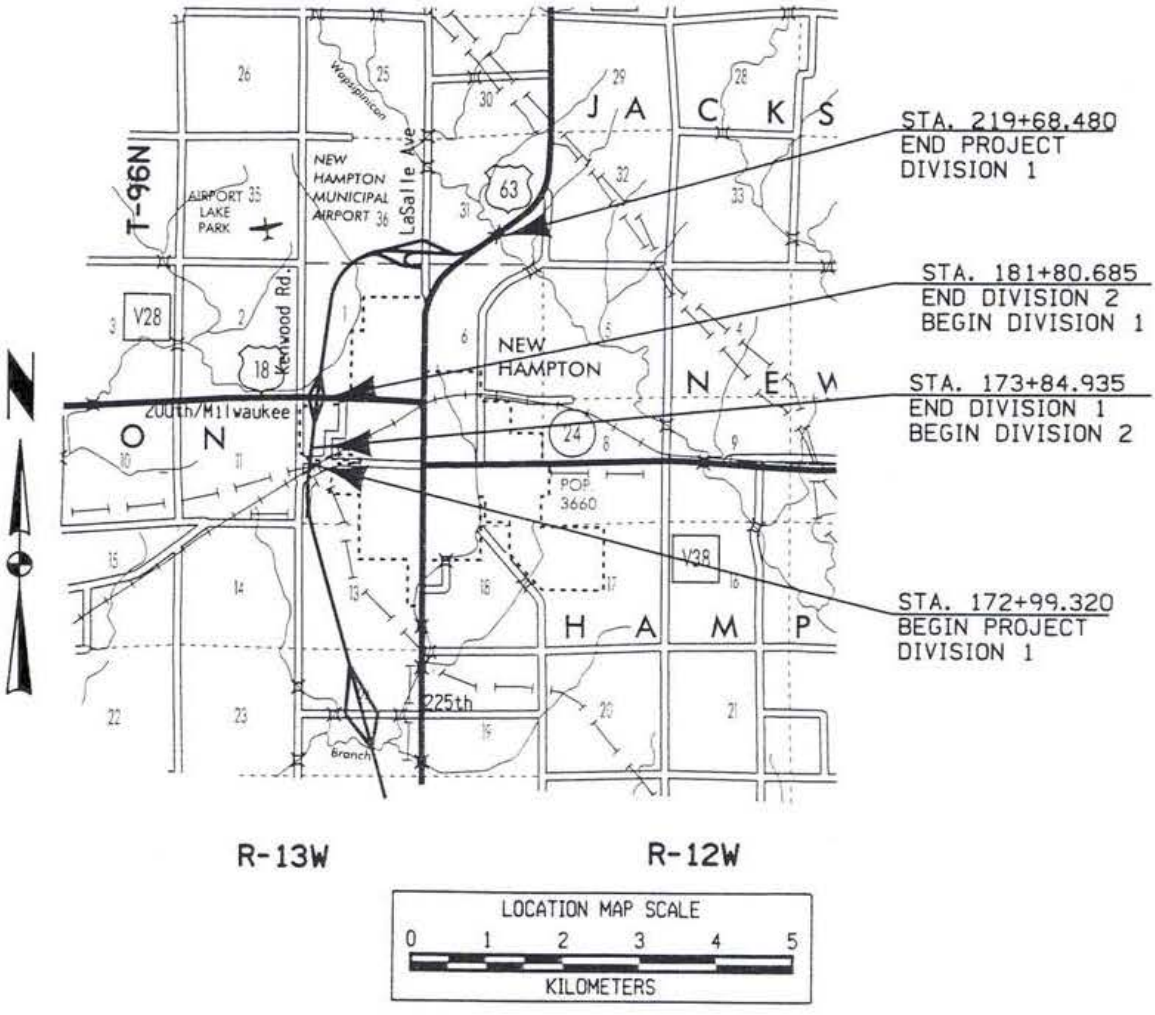
PLANS OF PROPOSED IMPROVEMENT ON THE

CHICKASAW COUNTY

PCC PAVING-NEW

NEW HAMPTON BY-PASS FROM I&M R.R. TO E. FORK OF WAPSI RIVER

NHSX-63-8(44)--3H-19



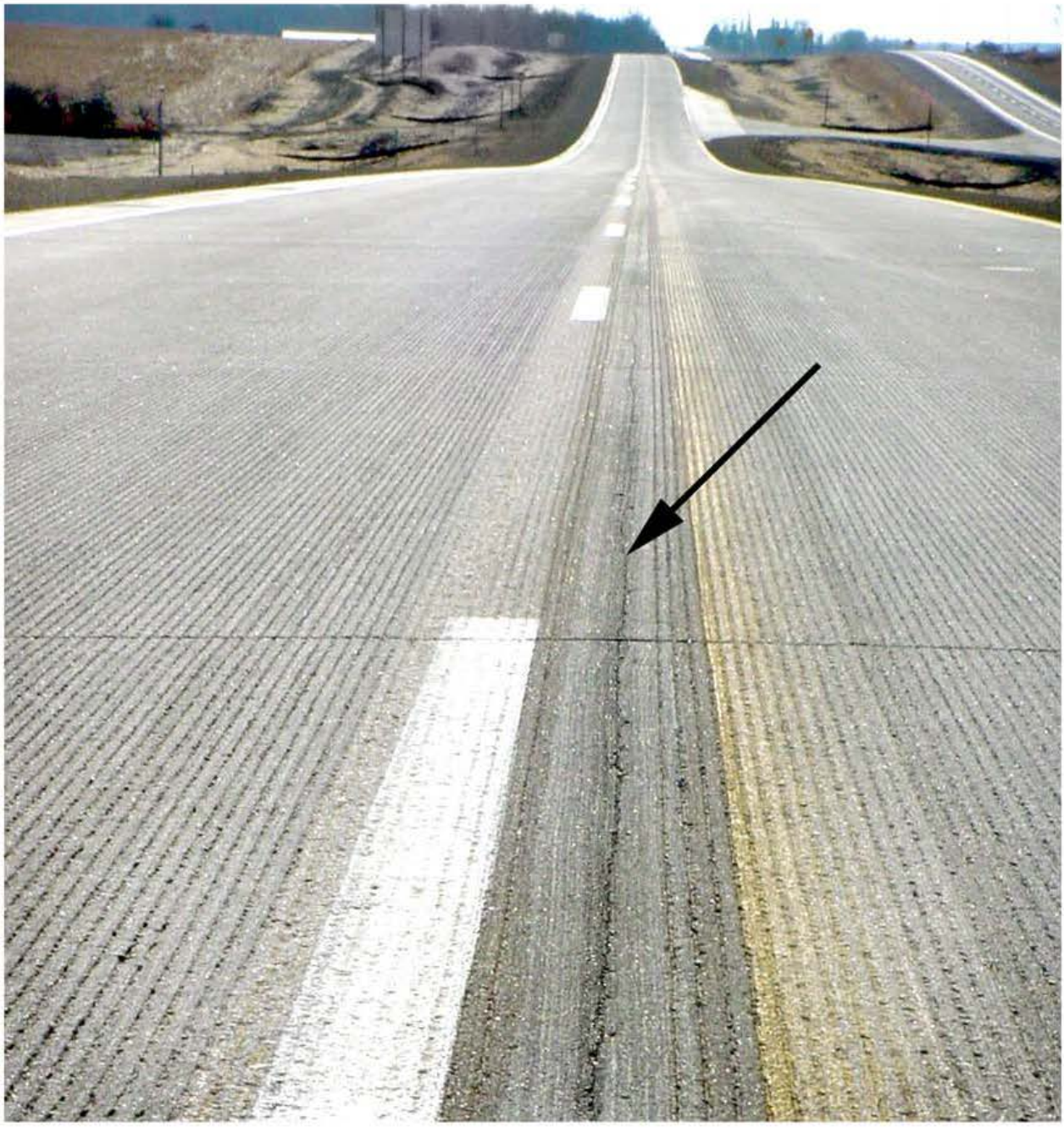
09.1) Hwy 63, NBL, New Hampton, Chickasaw Co.

Project No : NHSX-63-8(17)--3H-19
Front Knife : 3"D x 3/8"W x 24"L with 12" in front of the pan and 12" under the pan.
Positioned between the tamper bar sections.
Tamper bar has a small gap in the center (front knife is in the gap).
Rear Knife: : 3”D x 1/8”W x 42”L, knife mounted rigid vibrator.
Knife should be more forward giving more time for floating pan to smooth out roughness.
Vibrator cracked off at 2nd day, NBL.
Note : Metric units.
: In some sections of this test site the base was very soft or unstable at paving time. (Is this related to wide cracks in some places in the longitudinal joint?) (Is the slab shifting?) (Are tie bars in place?).

Date Paved	Sta	Cracking (1-7-03)	Note
8/14/2002	38+75	Crack	
	39+00	Crack	
	40+00	No visible crack	No Traffic
	41+00	No visible crack	
	42+00	No visible crack	
	43+00	Semi visible	
	44+00	Semi visible	From Sta 43+00 to 47+20 the crack is semi visible
	45+00	Semi visible	and from 47+20 to 53+00 is much more visible.
	46+00	Semi visible	Sta 46+00 = M.P. 195+45
	46+74	Semi visible	
8/15/2002	46+74	Semi visible	
	47+00	Semi visible	
	47+20	Semi visible	
	48+00	Crack	
	49+00	Crack	
	50+00	Crack	The Crack is clearly visible and wide.
	51+00	Crack	(47+20 to 52+00)
	52+00	Crack	
	53+00	Semi visible	
	54+00	Crack	Sta 54+00 = M.P. 195+95
	55+00	No visible crack	
	56+00	Semi visible	
	57+00	Semi visible	
	58+00	Crack	
	59+00	Crack	The Crack is clearly visible and wide.
	59+31	Crack	

Date Paved	Sta	Cracking	Note
8/16/2002	59+31	Crack	
	60+00	Crack	
	61+00	Semi visible	
	62+00	Crack	
	63+00	Semi visible	
	64+00	No visible crack	
	65+00	No visible crack	Core @ sta 65+00 (with vibrator)
	66+00	Crack	
	67+00	Crack	Core @ sta 67+30
	68+00	Crack	
	68+85	Crack	
8/19/2002	68+85	Semi visible	
	69+00	Semi visible	
	70+00	Crack	Just visible, Sta 70+00=M.P 237+25
	71+00	No visible crack	Core @ sta 70+00 (without vibrator)
	71+36	No visible crack	

Station : 38+75 to 71+36
Length : 3.26 km or 2.03 mile



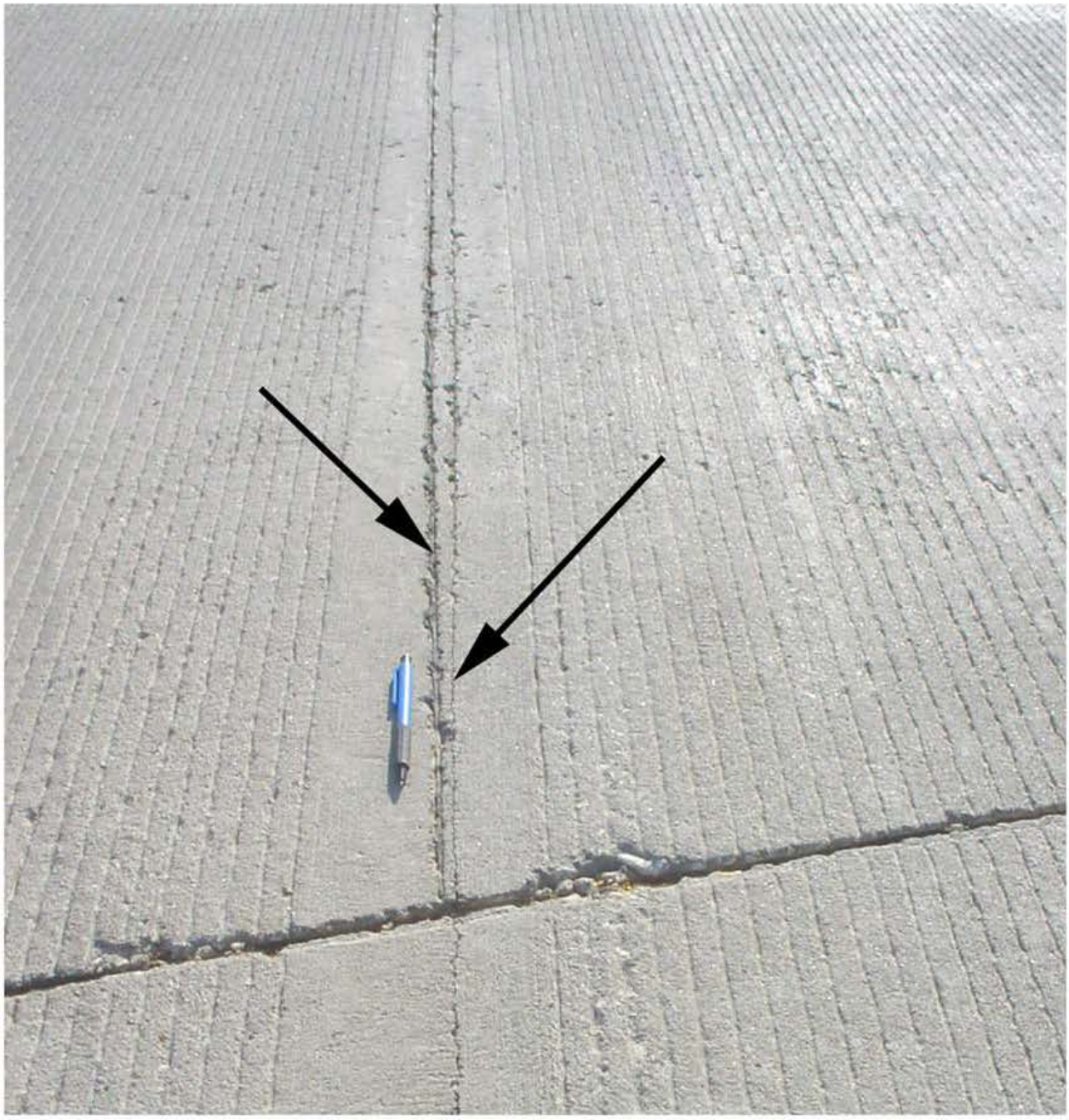
09.1) Hwy 63, NBL, Sta 54+00 (M.P. 195+95), New Hampton, Chickasaw Co. 1/7/03
Formed longitudinal joint.

09.2) Hwy 63, SBL, New Hampton, Chickasaw Co.

Project No : NHSX-63-8(17)--3H-19
Front Knife : 3"D x 3/8"W x 24"L with 12" in front of the pan and 12" under the pan.
Positioned between the tamper bar sections.
Tamper bar has a small gap in the center (front knife is in the gap).
Rear Knife: : 3”D x 1/8”W x 42”L, knife mounted rigid vibrator.
Note : Metric units.

Date Paved	Sta	Cracking (1-7-03)	Note
8/23/2002	102+05	Crack	Double joint.
	102+00	Crack	
	101+00	Semi visible	
	100+00	Semi visible	
	99+00	Crack	
	98+00	Crack	
	97+00	Semi visible	
	96+75	Semi visible	
8/26/2002	96+75	Crack	
	96+00	Crack	
	95+00	Crack	
	94+00	Crack	
	93+00	Crack	
	92+00	Semi visible	
	91+00	Semi visible	
	90+00	Semi visible	
	89+00	Semi visible	
	88+00	Crack	
	87+00	Crack	
	86+00	Crack	
	85+00	Crack	
	84+65	Crack	Sta 84+65 = M.P. 236+35
8/27/2002	84+65	Crack	
	84+00	Crack	
	83+00	Crack	
	82+00	Crack	
	81+00	Crack	
	80+00	Semi visible	
	79+00	Semi visible	
	78+00	Semi visible	
	77+00	Crack	
	76+00	Semi visible	
	75+00	Crack	Sta 75+00 = M.P. 236+95
	74+00	Crack	

Station : 74+00 to 102+05
Length : 2.8 km or 1.74 mile



09.2) Hwy 63, Sta 74+00, New Hampton, Chickasaw Co. 1/7/03
Formed joint plus sawed joint at beginning of test section.

09.3) Hwy 63, NBL, New Hampton, Chickasaw Co.

Project No : NHSX-63-8(17)--3H-19
Front Knife : 3"D x 3/8"W x 24"L with 12" in front of the pan and 12" under the pan.
Positioned between the tamper bar sections.
Tamper bar has a small gap in the center (front knife is in the gap).
Rear Knife: : 3”D x 1/8”W x 42”L, knife mounted rigid vibrator.
Note : Metric units.

Date Paved	Sta	Cracking (1-7-03)	Note
10/21/2002	102+00	Semi visible	
	103+00	No visible crack	
	104+00	No visible crack	
	105+00	No visible crack	
	106+00	No visible crack	
	107+00	No visible crack	
	107+17	No visible crack	

Station : 102+00 to 107+17
Length : 0.517 km or 0.32 mile

Iowa Department of Transportation

Highway Division

PLANS OF PROPOSED IMPROVEMENT ON THE

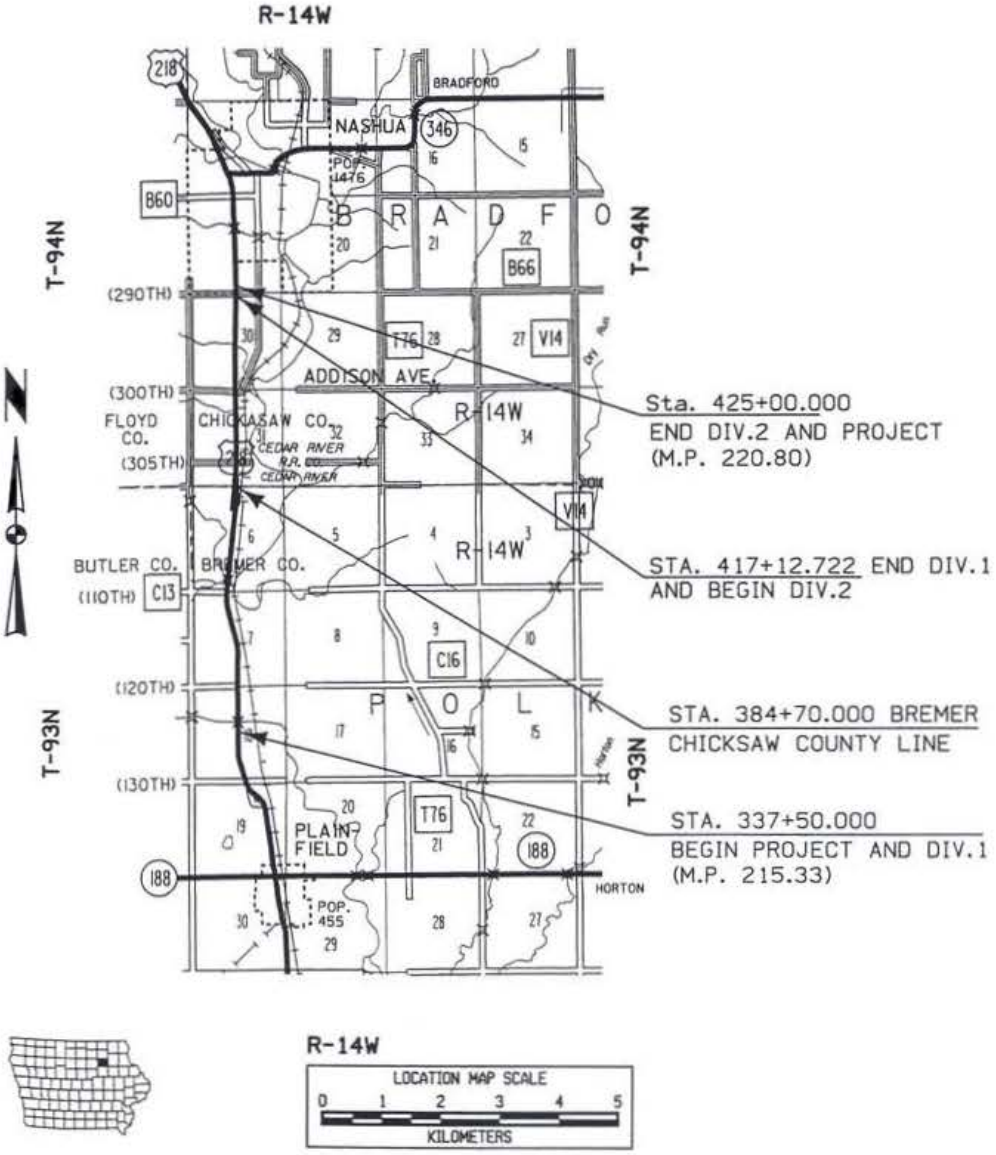
PRIMARY ROAD SYSTEM

BREMER/CHICKASAW COUNTY

P.C.C. PAVEMENT - GRADE AND NEW

FROM NORTH OF 130TH STREET NORTH TO
NORTH OF 290TH STREET IN CHICKASAW COUNTY

NHSN-218-8(67)--2R-09



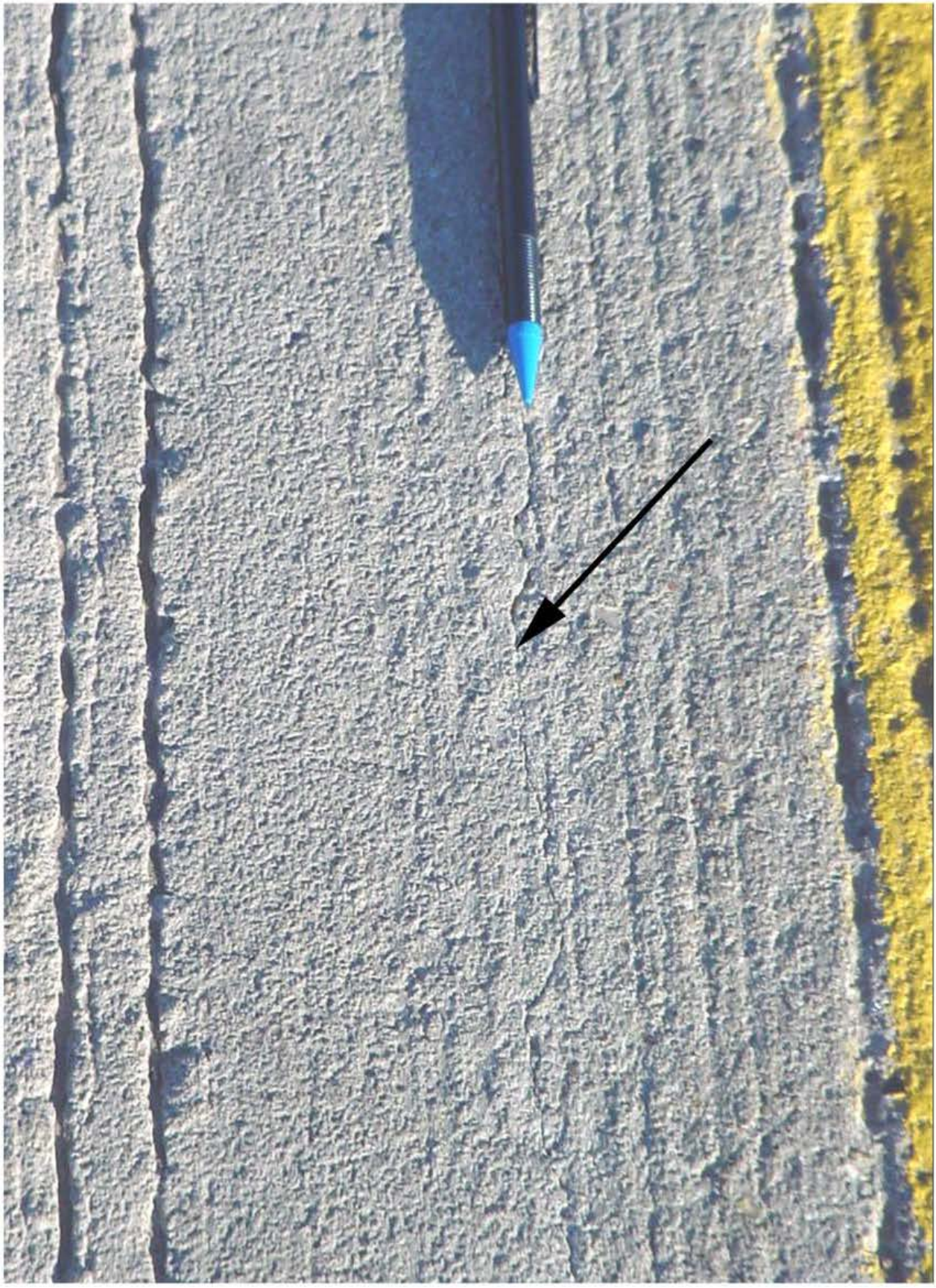
10.1) Hwy 218, SBL, Nashua, Bremer/Chickasaw Co.

Project No : NHSX-218-8(43)--3H-09
Front Knife : 3"D x 3/8"W x 24"L with 12" in front of the pan and 12" under the pan.
Positioned between the tamper bar sections.
Tamper bar has a small gap in the center (front knife is in the gap).
Rear Knife: : 3”D x 1/8”W x 42”L, knife mounted rigid vibrator.
Note : Metric units.

Date Paved	Sta	Cracking (1-7-03)	Note
9/9/2002	387+25	Crack	
	387+00	Crack	
	386+00	Crack	
	385+00	Crack	
	384+00	Crack	
	383+00	Crack	
	382+00	Crack	
	381+00	Crack	
	380+00	Crack	
	379+94	Crack	
9/10/2002	379+94	Crack	
	379+00	Crack	
	378+00	Crack	377+85 = 20 ft PCC patch
	377+00	Crack	
	376+00	Crack	
	375+00	Crack	
	374+00	Crack	
	373+00	Crack	
	372+00	Crack	
	371+00	Crack	
	370+75	Crack	
9/11/2002	370+75	Crack	
	370+00	Crack	
	369+00	Crack	
	368+00	Crack	
	367+00	Crack	
	366+00	Crack	
	365+00	Crack	
	364+00	Crack	
	363+00	Crack	
	362+00	Crack	
	361+00	Crack	
	360+00	Crack	
	359+00	Crack	
	358+45	Crack	

Date Paved	Sta	Cracking	Note
9/12/2002	358+45	Crack	
	358+00	Crack	
	357+00	Crack	
	356+00	Crack	
	355+00	Crack	
	354+00	Crack	
	353+00	Crack	
	352+00	No visible crack	
	351+00	Crack	
	350+00	No visible crack	
	349+00	Crack	
	348+00	Crack	
	347+00	Crack	
	346+82	Crack	
9/13/2002	346+82	Crack	
	346+00	Crack	
	345+00	Crack	
	344+00	Crack	
	343+94	Crack	
9/16/2002	343+94	Crack	
	343+00	Crack	
	342+00	Crack	
	341+00	Crack	
	340+00	Crack	
	339+00	Crack	
	338+00	Crack	
	337+50	Crack	

Station : 337+50 to 387+25
Total Length : 4.975 km or 3.09 mile
% of crack (1-7-03) : 96%



10.1) Hwy 218, SBL, Sta 386+00, Nashua, Bremer/Chickasaw Co. 1/7/03

Formed joint hairline crack.

10.2) Hwy 218, SBL, Nashua, Bremer/Chickasaw Co.

North test section (0.87 Mile)

Project No : NHSX-218-8(43)--3H-09
Front Knife : 3"D x 3/8"W x 24"L with 12" in front of the pan and 12" under the pan.
Positioned between the tamper bar sections.
Tamper bar has a small gap in the center (front knife is in the gap).
Rear Knife: : 3”D x 1/8”W x 42”L, knife mounted rigid vibrator.
Note : Metric units.
: Very smooth centerline band (all)
: Concrete mix was different.
: No saw cuts at day joints.

Date Paved	Sta	Cracking (1-12-03)	Note
9/17/2002	425+00	Crack	Rough end
	424+90	Crack	Several transverse random cracks
	424+00	Crack	No Traffic
	423+00	Crack	Very smooth centerline band
	422+00	Crack	
	421+00	Crack	
	420+00	Crack	
	419+00	Crack	
	418+42	Crack	
9/18/2002	418+42	Crack	
	418+00	No crack	
	417+00	Crack	No sawing-cut thru day joint and do visible crack.
	416+70	Crack	Crack is *visible* on each end of day joint, after 10'.
9/19/2002	416+70	Crack	
	416+00	Crack	
	415+00	Crack	
	414+00	No crack	
	413+00	No crack	
	412+00	Crack	Last 10' not cracked otherwise, cracked till there.
	411+00	Crack	No saw cut.

Station : 411+00 to 425+00
Length : 1.4 km or 0.87 mile

Iowa Department of Transportation

Project Development Division

PLANS OF PROPOSED IMPROVEMENT ON THE

PRIMARY ROAD SYSTEM

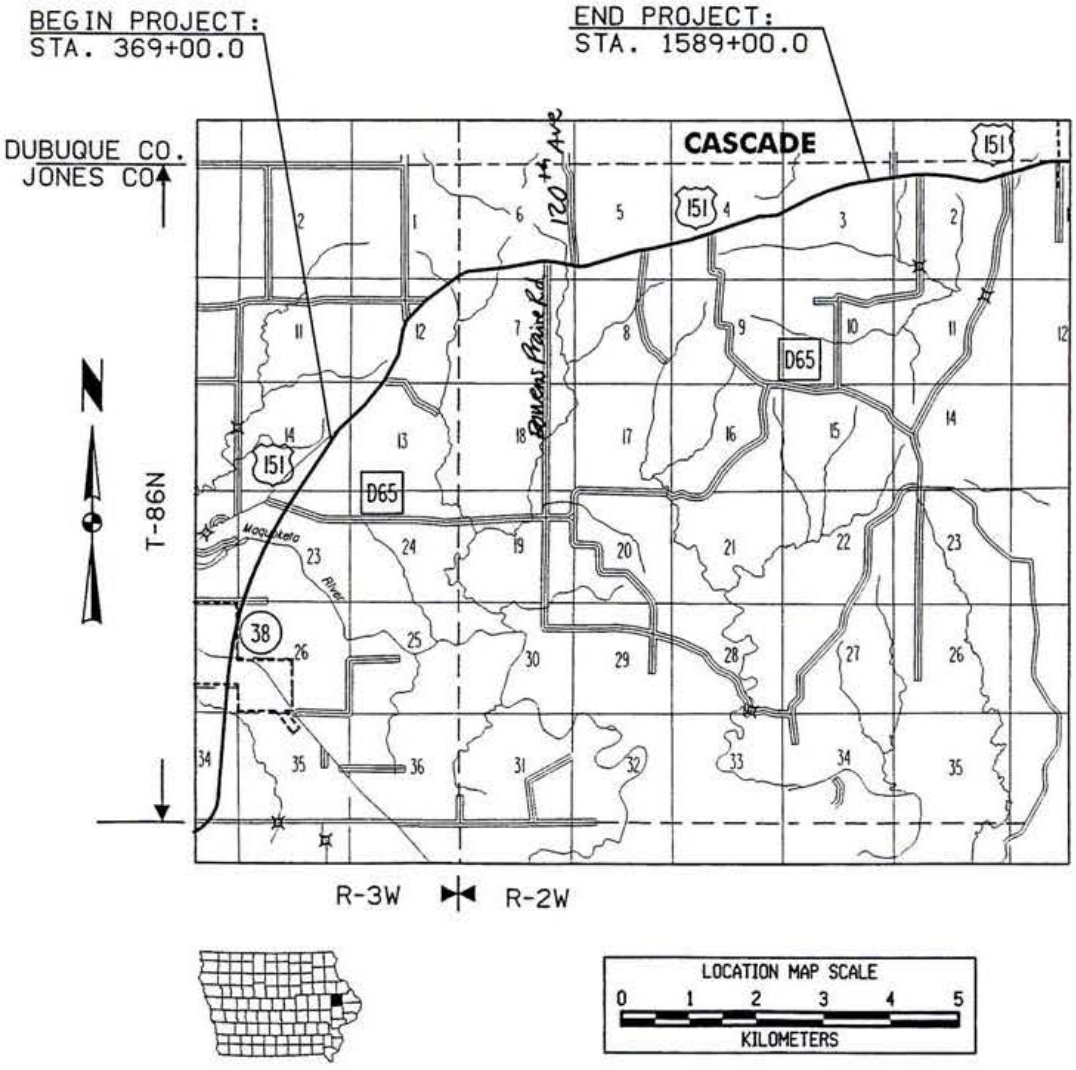
JONES COUNTY

PCC PAVEMENT - GRADE/NEW

SEGMENT 5

ON U.S. HIGHWAY 151 FROM NORTH OF COUNTY ROAD D65 TO CASCADE

NHSX-151-4(85)--3H-53

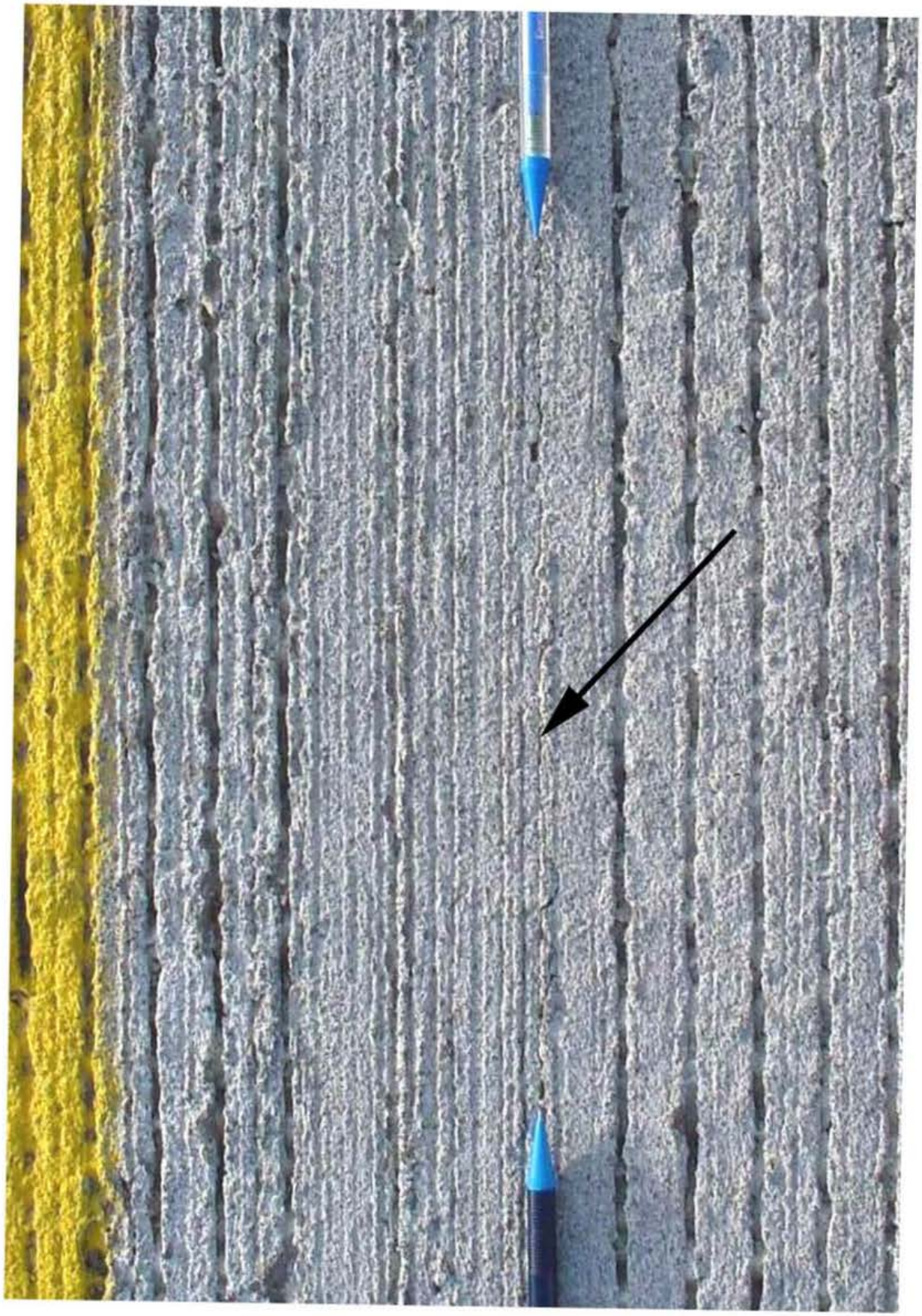


11.1) Hwy 151, SBL, Monticello, Jones Co.

Project No : NHSX-151-4(85)--3H-53
Front Knife : 3"D x 3/8"W x 24"L with 12" in front of the pan and 12" under the pan.
Positioned between the tamper bar sections.
Tamper bar has a small gap in the center (front knife is in the gap).
Rear Knife: : 3”D x 1/8”W x 42”L, knife mounted rigid vibrator.
Note : Metric units.
: Observed at sta 375+90, 376+10, 376+20 using old knife. No vibrator

Date Paved	Sta	Cracking (1-8-03)	Note
9/26/2002	385+80	No Crack	Day Joint, no date stamped
	385+00	No Crack	
	384+00	No Crack	
	383+00	Crack	
	382+00	Crack	
	381+00	Crack	
	380+00	Crack	
	379+00	No Crack	
	378+52	No Crack	Day Joint, no date stamped
9/27/2002	378+52	No Crack	Bob went to site
	378+00	No Crack	
	377+00	Semi crack	
	376+00	No Crack	
	375+00	Crack	
	374+00	Crack	
	373+00	Crack	
	372+00	Crack	
	371+00	Crack	
	370+62	Crack	Day Joint, no date stamped

Station : 385+80 to 370+62
Length : 1.518 km or 0.94 mile



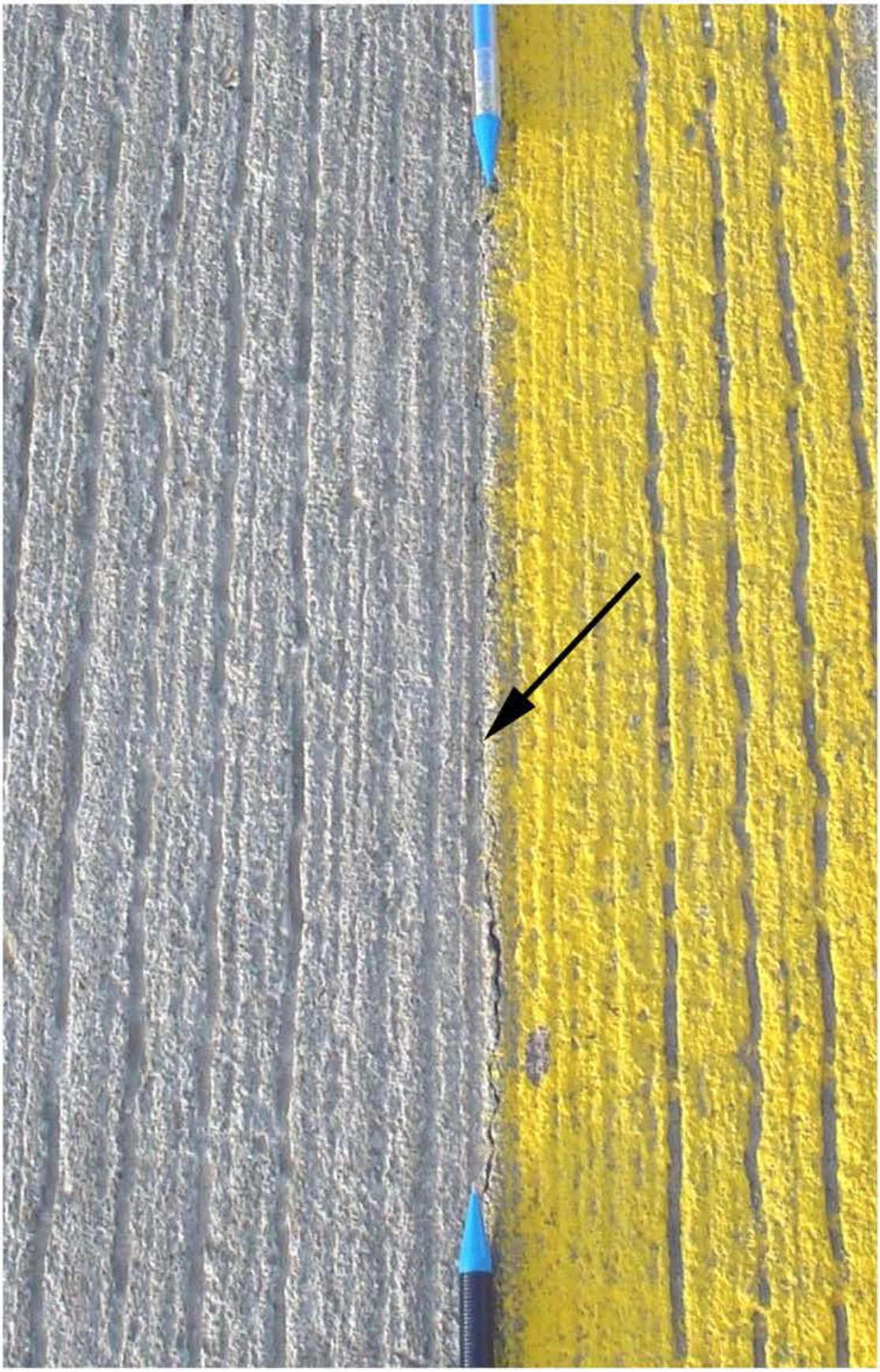
11.1) Hwy 151, SBL, Sta 383+00, Monticello, Jones Co. 1/8/03
Formed joint hairline crack.

11.2) Hwy 151, SBL, Cascade, Jones Co.

Project No : NHSX-151-4(85)--3H-53
Front Knife : 3"D x 3/8"W x 24"L with 12" in front of the pan and 12" under the pan.
Positioned between the tamper bar sections.
Tamper bar has a small gap in the center (front knife is in the gap).
Rear Knife : 3”D x 1/8”W x 48”--52"L, knife mounted isolator mounted vibrator.
Note : Metric units.
: CL rougher, turf drag, no pits.
: New knife design with vibrator, rear knife is below pan. Also had front Knife. Concrete was stiff sometimes. Vibrator was turned off for short times. Observed thru sta 431+20 and vib was running (for sure) at sta 429+50. Paving at 8’/min. Added small ski to front edge of knife to stop rocks from kicking up. Dennis K. called (10/1/02) and said that adding small ski was some improvement to a “cleaner” joint. See photos dated (9/30/02).

Date Paved	Sta	Cracking (1-8-03)	Note
~~9/27/02~~ 9/30/02	435+10	Crack	Rear knife: *3”D x 1/8”W x 48”L* , Knife mounted
	435+00	Crack	isolator mounted vibrator.(Use this first time on
	434+00	No crack	9/30/02)
	433+00	No crack	
	432+00	No crack	
	431+00	No crack	
	430+00	No crack	
	429+00	No crack	Core @ 429+50
	428+00	Crack	
	427+00	No crack	
	426+00	No crack	
	425+00	No crack	
	424+00	No crack	
	423+11		Day Joint, no rear date stamped. Heavy grinding
10/1/2002	423+11		Rear knife: *3”D x 1/8”W x 52”L* , Knife mounted
	423+00	No crack	isolator mounted vibrator. (Use this knife from
	422+00	No crack	10/1/02 and forward for 2002)
	421+00	No crack	Core @ 422+00
	420+00	No crack	
	419+00	No crack	
	418+00	No crack	
	417+00	Crack	
	416+60		Day Joint, no date stamped
10/7/2002	416+60		
	416+00	No crack	
	415+00	No crack	
	414+00	No crack	
	413+00	No crack	
	412+00	No crack	
	411+00	No crack	
	410+00	No crack	
	409+00	No crack	
	408+00	No crack	
	407+00	No crack	
	406+00	No crack	
	405+24	No crack	Day Joint, no date stamped

Station : 405+24 to 435+10
Length : 2.986 km or 1.86 mile



11.2) Hwy 151, SBL, Sta 428+00, Cascade, Jones Co. 1/8/03

Formed joint hairline crack.

11.3) Hwy 151, SBL, Cascade, Jones Co.

Project No : NHSX-151-4(85)--3H-53
Front Knife : 3"D x 3/8"W x 24"L with 12" in front of the pan and 12" under the pan.
Positioned between the tamper bar sections.
Tamper bar has a small gap in the center (front knife is in the gap).
Rear Knife: : 3”D x 1/8”W x 52"L, knife mounted isolator mounted vibrator.
Note : Metric units.
: Centerline is very smooth, no cavity/hole, no pits/raveling

Date Paved	Sta	Cracking (1-7-03)	Note
10/10/2002	454+68	No crack	Day Joint, no date stamped
	454+00	No crack	
	453+00	No crack	
	452+00	No crack	
	451+00	No crack	
	450+97	Crack	Day Joint, no date stamped

Station : 450+97 to 454+68
Length : 0.371 km or 0.23 mile