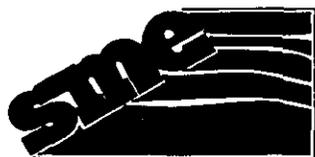


MI SPS-6



soil and materials engineers, inc.

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June 13, 1996

Mr Richard Ingberg, P E , Regional Engineer
FHWA LTPP
c/o Braun Intertec, Inc
6875 Washington Avenue South
P O. Box 39108
Minneapolis, MN 55439

Re Michigan SPS-6 Construction Report
FHWA-LTPP
SME Project No PP18400



Dear Mr Ingberg

Enclosed please find three copies of the construction report for the Michigan SPS-6 project

Should you have any questions concerning this report, please contact our office

Very truly yours,

SOIL AND MATERIALS ENGINEERS, INC.

Cary T Keller, P E
Senior Engineer

Enclosure Construction Report Michigan SPS-6 (3 copies)

pc Erland Lukanen, Braun Intertec
Monte Symons, FHWA-LTPP
Henry Quiroga, MDOT M & T

Detroit
Bay City
Kalamazoo
Lansing
Toledo

Consultants in the geosciences, materials, and the environment

FEDERAL HIGHWAY ADMINISTRATION
Long Term Pavement Performance
Specific Pavement Studies

CONSTRUCTION REPORT FOR SPS-6
260600

Michigan Department of Transportation
Michigan Control Section FR09101
Michigan Job Number 28164A

US-10 Eastbound, Bay County
Michigan

Report Prepared by
Soil and Materials Engineers, Inc
FHWA-LTPP North Central Region
December 1995



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- TABLE 2 -** Rehabilitation activities for each test section of the Michigan SPS-6 experiment
- TABLE 3 -** PCC thickness from pre-construction verification coring
- TABLE 4 -** Post construction samples obtained showing measured average AC thickness and deviation from plan thickness

LIST OF FIGURES

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1.0 INTRODUCTION

The SHRP experimental project SPS-6 "Rehabilitation of Jointed Portland Cement Concrete (PCC) Pavements" investigates the effects of different rehabilitation strategies and overlay thickness on long term pavement performance. Construction guidelines for this SPS-6 experiment can be found in SHRP-LTPP-OM-013 dated July of 1990. The existing PCC pavement is subjected to four different levels of rehabilitation including

- 1) **A routine maintenance** section with no overlay
- 2) **Minimal surface preparation** sections with and without overlay
- 3) **Intensive surface preparation** sections with and without overlay
- 4) **Crack and seat** sections with overlay
- 5) **MDOT Supplemental Section:** Rubbelizing of existing PCC & overlay

The Michigan SPS-6 experiment was constructed in 1990 on US-10 in Bay County (Figure 1). The test sections are located on the eastbound driving lane of the four lane divided highway about 7 miles west of Bay City (Figure 2). This project falls into the category of rehabilitated rigid pavements built on fine grained soils in the wet-freeze environment.

The road is a rural principal arterial. Traffic volumes reported in the project nomination for the year 1986 were as follows

AADT (two direction)	9600
% Commercial	9%
18 KESAL Rate	300,000 ESAL/year

A piezoelectric type PAT bending plate WIM system has been installed at the site to document the actual traffic patterns.

The existing pavement section was constructed in 1958 and consisted of two 12' lanes of 9 inch PCC with a 99 ft contraction joint spacing. This was placed on 4 inches of sand and gravel base, and 9 inches of sand subbase. All sections are located on shallow fills. In 1980 approximately 80% of the joints were replaced with full depth concrete. The primary distress that initiated this project was deteriorated joints and interior slab cracking. Minor "D" cracking was also noted.

All test sections rest on a relatively level deposit of glacial lakebed clay. Project soil borings typically describe the surface clays as plastic to firm yellow brown or brown sandy clay. Typical Atterberg values for clay from this region would be, LL= 30 to 40%, PI= 15 to 20% with the particle distribution being about 1/3 sand and gravel, 1/3 silt, and 1/3 clay and colloids.

Since an automatic weather station was not constructed at the site, it will be necessary to rely upon the observations at a nearby weather station. The closest weather station to this project is the Bay City station, about 10 miles away.

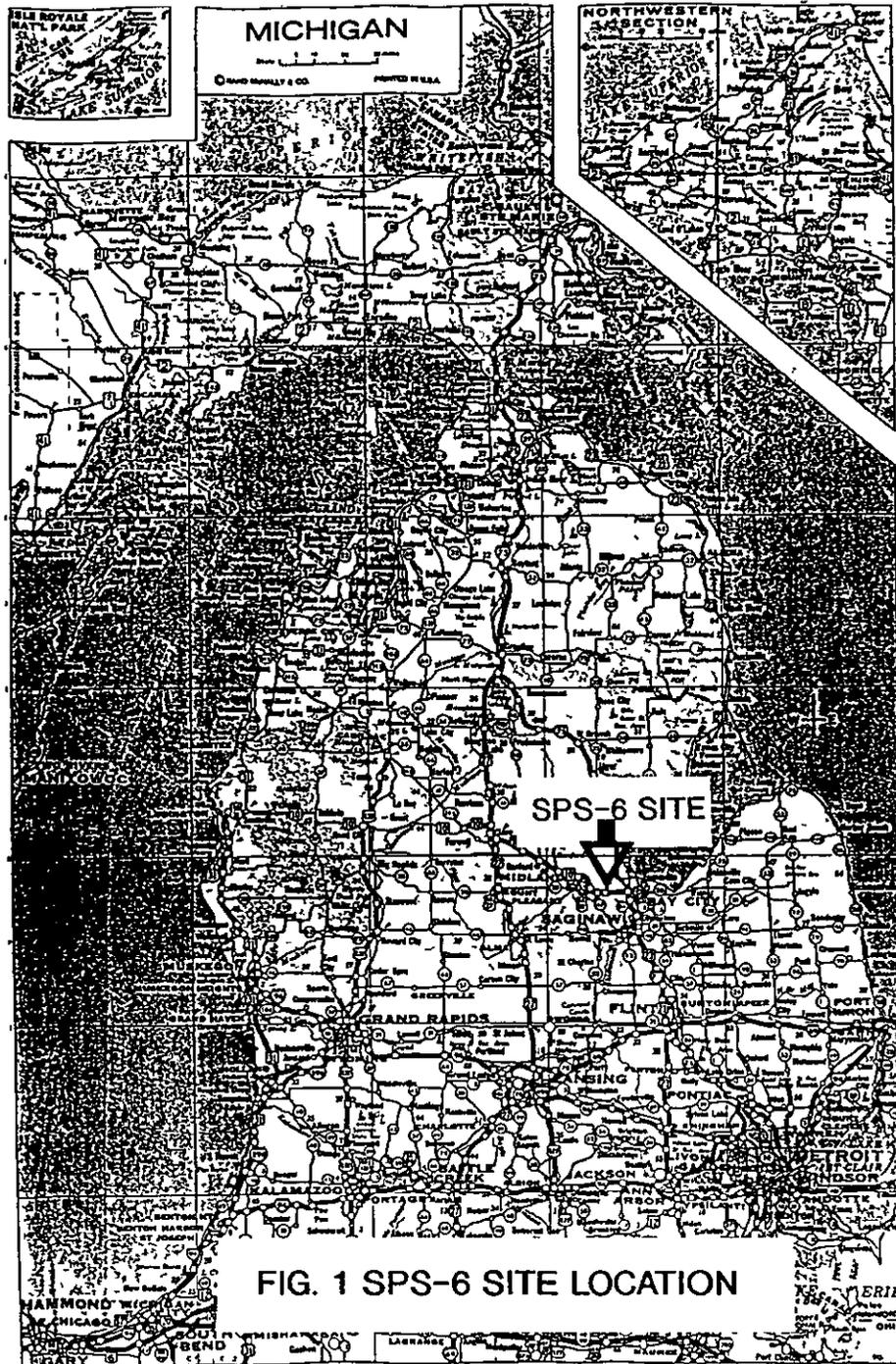


FIG. 1 SPS-6 SITE LOCATION



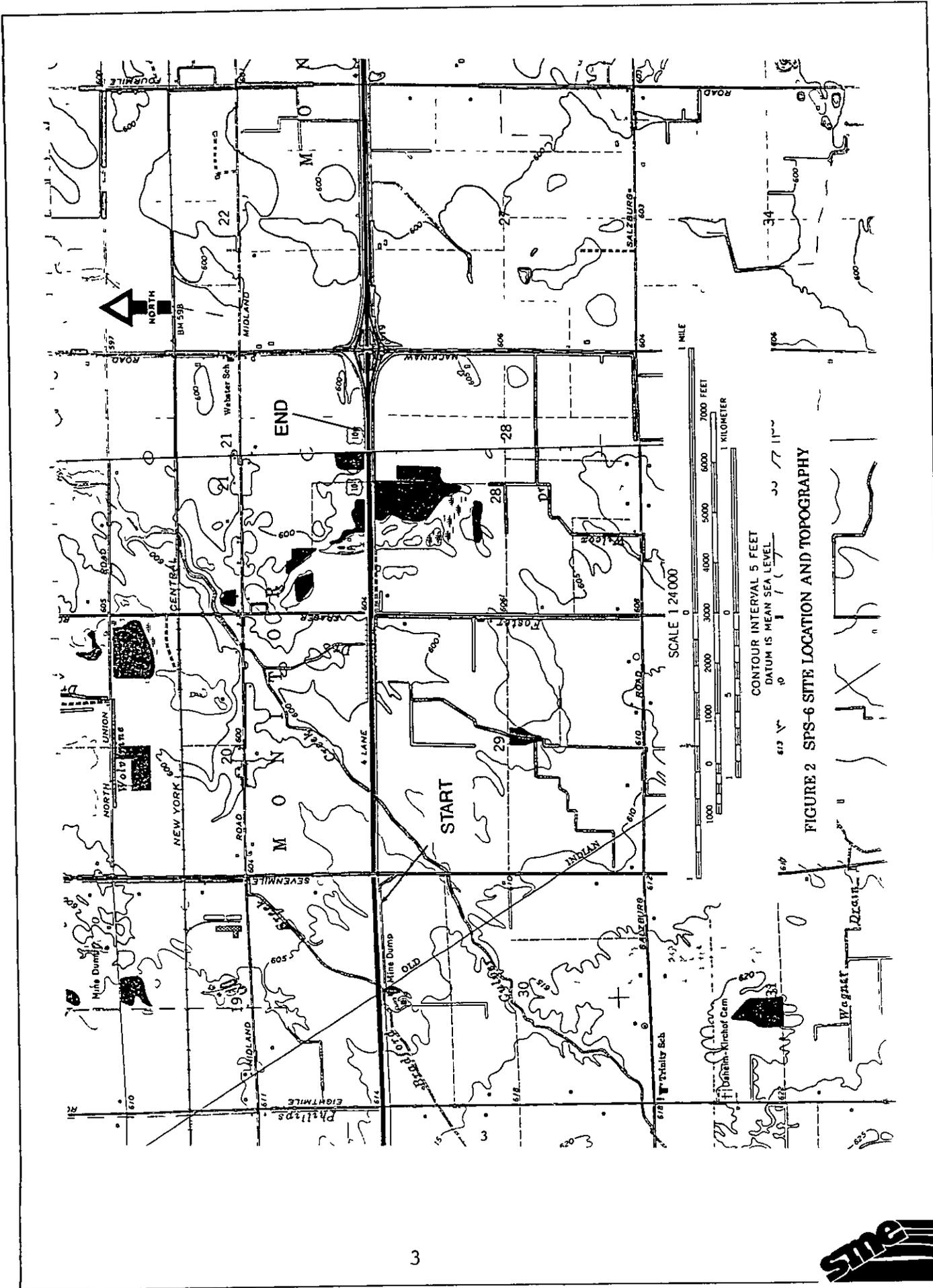


FIGURE 2 SPS-6 SITE LOCATION AND TOPOGRAPHY



This SPS-6 experiment was added as a work order to a construction contract which had already been let. This resulted in some deviations and data omissions. Appendix A contains the SPS Project Deviation Report. Project level deviations are as follows:

- ◆ There were some underground structures located beneath test sections. Since the project was a rehabilitation of an existing roadway, drainage structures could not be moved. Based on the pre-construction surveys during site verification, there were no distresses in the existing pavement caused by the structure.
- ◆ No split spoon or Shelby tube samples of subgrade or embankment were obtained during the pre-construction sampling and testing program. However, hand augers and soil sampling were performed to a depth of approximately 5 feet.
- ◆ Although it was recommended, no load transfer testing was conducted.
- ◆ No diamond grinding was done on the maximum concrete pavement restoration section which did not receive an overlay. The project rehabilitation was an overlay and mobilizing a contractor to perform the diamond grinding was cost prohibitive.
- ◆ All patches for minimal restoration sections were done in accordance with MDOT detail 7 specifications (Appendix A). These details utilize asphalt concrete as the patching material and do not require full depth removal. Approval was received from SHRP for this deviation.
- ◆ Elevation surveys are in error because benchmarks were lost between pre-overlay measurements and post-overlay measurements.
- ◆ The post construction sampling of the asphalt concrete layers is incomplete. The state has been requested to do additional testing to adequately characterize the in-place material (Appendix D).
- ◆ Some thickness measurements of PCC cores were not recorded during the pre-construction sampling program.

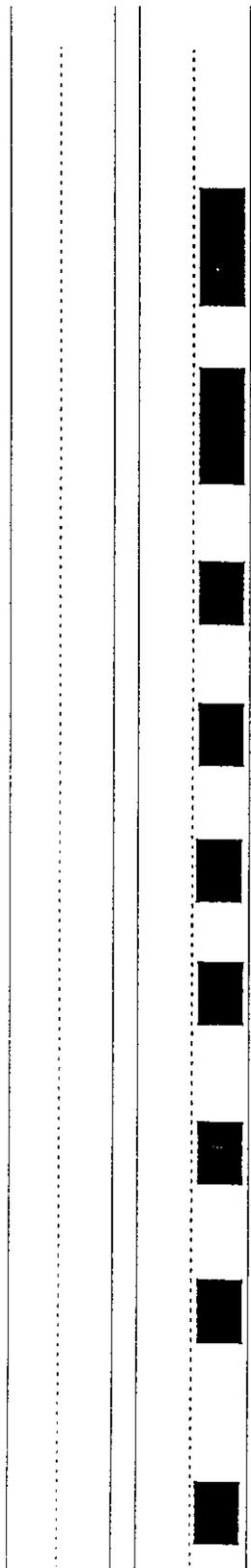
Personnel from the North Central Region involved in the nomination and layout of the site were Chuck Gemayel, Starr Kohn, and Cary Keller. Dave Church, SHRP contact for the



Michigan D O T , represented MDOT in the planning of the project The following is a list of key personnel, contractors, agencies and equipment that were involved in the construction, administration, and sampling & testing for this project

Resident Engineer	Mr Frank Epple Michigan Department of Transportation
Materials Sampling and Testing	Michigan Department of Transportation
Prime Contractor	Saginaw Asphalt Paving Co 3200 Carrolton Rd Carrolton Mi 48724
Underdrains	D A Corbin General Contractors, Inc Utica Mi 48087
Earthwork	Champagne & Mark Excavating 1445 Liberty Rd Saginaw, Mi 48604
Shoulders & Bituminous Approaches	Lois Kay Contracting 306 Stoker Dr Saginaw, Mi 48604
Shoulder Pulverizing and Shaping	Ajax Paving Industries P O Box 317 Madison Heights, Mi 48071
Rubbelizing Pavement	Klochko Equipment Rental 2782 Corbin Ave Melvindale, Mi 48122
Miscellaneous Concrete Pavement, Base, and Joints	A J Rehmus & Sons, Inc 1208 N Berney Bay City, Mi 48706
Equipment	2 Barber-Green Pavers, 3 rollers, 1 Primer truck, Drum Mix Asphalt Plant





SPS-6 LAYOUT
US-10
EASTBOUND LANE
MICHIGAN

260605 706+95 - 716+95

260602 695+66 - 705+66

260601 685+66.5 - 690+66.5

260604 676+62 - 681+62

260603 667+90 - 672+90

260606 660+90 - 665+90

260607 648+00 - 653+00

260608 637+73 - 642+73

260609 617+00 - 622+00

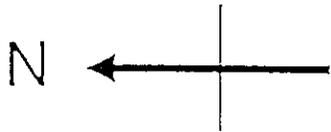


FIGURE 3. SPS-6 SITE LAYOUT



2.0 PROJECT DETAILS

2.1 Section Properties

The site layout for the Michigan SPS-6 experiment is shown in Figure 3. Sections with no overlay were located to the east end of the site. Crack/break and seal and rubberized sections with 8 inch overlay were located at the west. Beginning and ending stations shown indicate the lengths of each test section. Table 1 shows the design cross sections for each test section constructed. Each section was provided different levels of surface preparation/rehabilitation. Table 2 summarizes the work performed for each section. Appendix B contains copies of the MDOT plan sheets used for this project while Appendix C provides joint patching details, crack and seal specifications, and saw and seal specifications.

2.2 Project "As-Sampled" Sampling Plans

Both a pre-construction and a post-construction sampling plan were developed for the Michigan SPS-6 experiment. Figures 4 and 5 show the sampling plans executed. Tables 3 and 4 present the layer thickness observations from pre construction verification cores and post- construction sampling.

3.0 INDIVIDUAL SECTION DETAILS

3.1 Section 260602

This section had minimal surface preparation with no overlay. The only rehabilitation work conducted consisted of partial and full depth repairs with asphalt cement concrete. All repairs for the entire section were conducted in accordance with MDOT specifications for detail 7 repairs. A review of a pavement condition survey conducted in 1992 indicated the following performance trends:

Corner Breaks/D-Cracking: None

Longitudinal Cracking: 6.5 meters

Transverse Cracking: A total of 81 unsealed transverse cracks were noted. 42%, 32%, and 26% were noted as having low, medium, and high severity distress respectively.

Joint Deficiencies: Seven joints were noted as having seal damage, (3-severe). 305 meters of centerline joint seal damage was noted. 4.7 meters of low severity spalling and 1.3 meters of medium severity spalling was noted for longitudinal joints. Six spalled transverse joints were noted having 6.6 meters in the medium severity and 3.7 meters in the high distress categories.

Surface Deformation: The aggregate used in the original PCC pavement was polished.

Miscellaneous Distress: Very little faulting of cracks and joints was noted. The largest being 6 mm with the normal being negligible. Lane shoulder drop-off and separation was noted at most measurement locations. Average



Section I.D.	Design Cross Section	Section Length, ft.
260601	MDOT Standard Practice Control Section	500'
260602	Minimum Restoration of existing 9" PCC with no overlay.	1000'
260603	Minimum Restoration of existing 9" PCC with a 4" overlay.	500'
260604	Minimum Restoration of existing 9" PCC with a 4" overlay. Joints are sawn and sealed.	500'
260605	Intensive Restoration of existing 9" PCC with no overlay.	1000'
260606	Intensive Restoration of existing 9" PCC with a 4" overlay.	500'
260607	Crack/break and seat of existing 9" PCC with a 4" overlay.	500'
260608	Crack/break and seat of existing 9" PCC with a 8" overlay.	500'
260609	Rubbelization of existing 9" PCC with a 7" overlay.	500'

Table 1. Design cross sections for the Michigan SPS-6 experiment.

Restoration Activity	Minimal Restoration			Intensive Restoration		Crack/Break & Seat		Rubbelize
	260602	260603	260604	260605	260606	260607	260608	260609
Overlay Thickness, in.	0	4	4	0	4	4	8	7
Joint Sealing	no	no	no	yes	no	--	--	--
Crack Sealing	yes	no	no	yes	no	--	--	--
Partial Depth Repair	AC only	AC only	AC only	AC only	AC only	--	--	--
Full Depth Repair	AC only	AC only	AC only	PCC	PCC	--	--	--
Diamond Grinding	no	no	no	no	no	no	no	--
Subsealing	no	no	no	no	no	no	no	--
Underdrains	no	no	no	yes	yes	no	no	yes
Crack/break & Seat	--	--	--	--	--	yes	yes	--
Rubbelize	--	--	--	--	--	--	--	yes
Saw & Seal A.C. Joints	--	--	yes	--	--	--	--	--

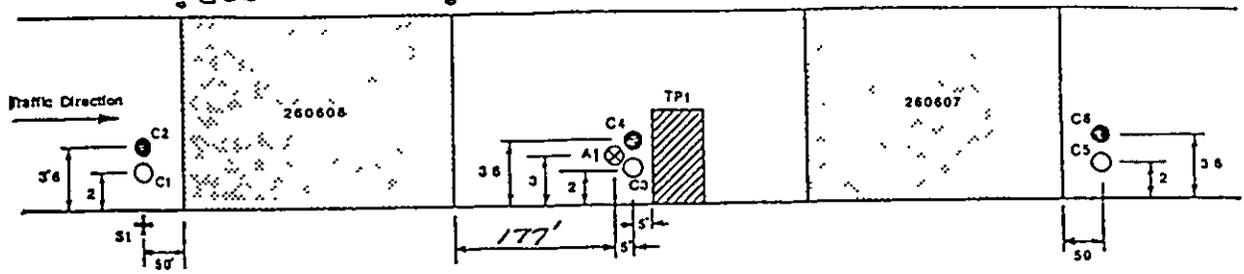
Table 2. Rehabilitation activities for each test section of the Michigan SPS-6 experiment.



Transition
CES 7"-8"

Transition
CES 8"-CES 4"

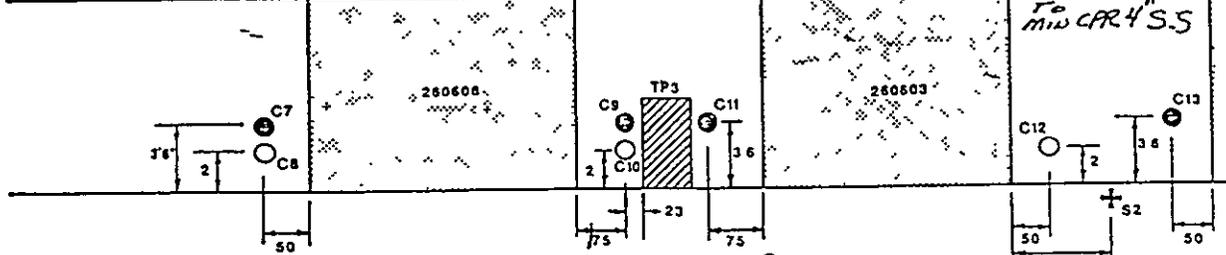
CES 4"



Transition
CES 4" → Max CPR 4"

TRANS
Max CPR 4" → MIN CPR 4"

TRANS
MIN CPR 4"

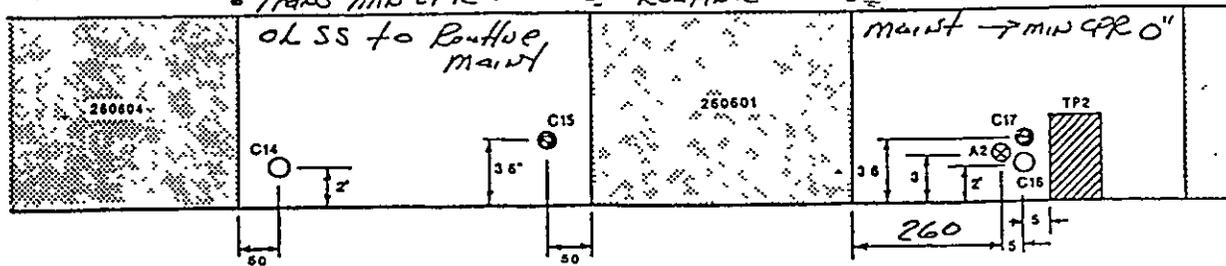


MIN CPR
4" Saw & Seal

TRANS MIN CPR 4"

TRANS
Routine

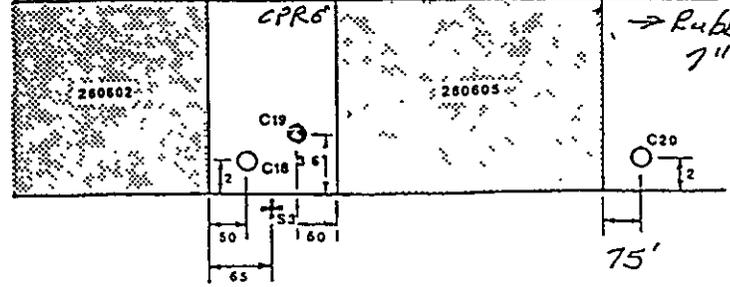
TRANS
maint → MIN CPR 0"



MIN CPR 0"

TRANS
MIN CPR 0" → Max CPR 0"

TRANS Max CPR
→ Rubblized 7"



- LEGEND**
- ⊙ - 6 OD, C TYPE
 - ⊗ - 6' OD, A TYPE
 - - 4 OD CORE OF PAVT C TYPE
 - ⊕ - SHOULDER PROBE TO 20' DEPTH
 - ▨ - TEST PIT (1' x 6' x 12' Below top of subgrade)

CES = Crack & Seal
SES = Saw & Seal
CPR = Core Pavement Repair

FIGURE 4 PRE-CONSTRUCTION SAMPLING AND TESTING



Test Section	Sampling Location	PCC Thickness, in.
260609	0-50	9.0
260609	5+50	9.0
260608	5+50	9.0
260608	0-50	9.2
260607	5+50	9.0, 9.1, 9.2
260606	0-50	9.0, 9.1, 9.0
260606	5+75	9.3, 9.5
260605	0-50	9.3
260604	5+50	9.0
260603	5+50	10.0
260602	0-50	9.3
260602	5+50	9.3
260601	5+50	9.0

Table 3. PCC thickness from pre-construction verification coring.

Core Number	Test Section	Thickness, in.			Total Thickness	Deviation from Plan
		Base	Leveling	Top		
C1	260608	4.6	1.5	1	7.1	-0.9
C2	260608	4.5	1.8	1.1	7.4	-0.6
C3	260608	3.9	1.5	1.2	6.6	-1.4
C4	260608	3.5	1.6	1.2	6.3	-1.7
C5	260607	3.5	--	1.3	4.8	0.8
C6	260607	3.1	--	1.4	4.5	0.5
C7	260607	3.7	--	1.1	4.8	0.8
C8	260607	3.2	--	1.1	4.3	0.3
C9	260606	4.1	--	1.1	5.2	1.2
C10	260606	3.7	--	1.3	5	1
C11	260606	3.9	--	1.2	5.1	1.1
C12	260606	3.4	--	1.3	4.7	0.7
C13	260603	3.9	--	1.1	5	1
C14	260603	3.5	--	1.2	4.7	0.7
C15	260603	4	--	1.4	5.4	1.4
C16	260603	3.7	--	1.5	5.2	1.2
C17	260604	4.1	--	1.5	5.6	1.6
C18	260604	3.7	--	1.6	5.3	1.3
C19	260604	3.9	--	1.3	5.2	1.2
C20	260604	3.6	--	1.4	5	1

Table 4. Post construction samples obtained showing measured average AC thickness and deviation from plan thickness.



values were 4 mm and 6.5 mm respectively. 35% of the partial depth asphalt patches were noted as deteriorated. 10.7 and 7.9 square meters were in the severe and moderate distress categories, respectively. Water bleeding and pumping were noted at one location over a length of 1 meter (370+00+/-). Vegetation was noted as growing in the longitudinal joints.

3.2 Section 260603

This section had minimal surface preparation with a 4 inch overlay. The only rehabilitation work conducted consisted of partial and full depth repairs with asphalt cement concrete. All repairs for the entire section were conducted in accordance with MDOT specifications for detail 7 repairs. There is a 12" culvert at station 3+75. A review of a pavement condition survey conducted in 1992 indicated the following performance trends:

Cracking: Very little cracking was noted. 0.5 meters of unsealed longitudinal cracking was noted. Four transverse or reflective cracks were noted for a total length of 15 meters.

Other Distress: None

3.3 Section 260604

This section had minimal surface preparation with a 4 inch overlay with sawed and sealed joints (see Appendix A for sealed joint detail and special provision). The only rehabilitation work conducted consisted of partial and full depth repairs with asphalt cement concrete. All repairs for the entire section were conducted in accordance with MDOT specifications for detail 7 repairs. A review of a pavement condition survey conducted in 1992 indicated the following performance trends:

Cracking: Very little cracking was noted. 1 meter of unsealed longitudinal cracking was noted. Nine sealed transverse reflective cracks with low severity distress were noted for a total length of 33 meters.

Other Distress: An area of bleeding of 1.5 square meters was noted.

3.4 Section 260605

This section had intensive surface preparation with no overlay. The rehabilitation work conducted consisted of both partial depth repairs with asphalt cement concrete and full depth concrete repairs. All partial depth repairs for the entire section were conducted in accordance with MDOT specifications for a detail 7. A review of a pavement condition survey conducted in 1992 indicated the following performance trends:



Corner Breaks/D-Cracking: None

Longitudinal Cracking: 1.3 meters

Transverse Cracking: A total of 34 sealed transverse cracks were noted. 26%, 65%, and 9% were noted as having low, medium, and high severity distress respectively

Joint Deficiencies: Five joints were noted as having low severity seal damage. No centerline joint seal damage was noted. 6.8 meters of low severity spalling and 1.3 meters of medium severity spalling was noted for longitudinal joints. Five spalled transverse joints were noted having 0.5 meters in the low severity and 4.3 meters in the medium severity distress categories

Surface Deformation: The aggregate used in the original PCC pavement was polished

Miscellaneous Distress: Very little faulting of cracks and joints was noted. The largest being 6 mm with the normal being negligible. Lane shoulder drop-off and separation was noted at most measurement locations. Average values were 8 mm and 4.6 mm respectively. Four of the partial depth asphalt patches were noted as deteriorated, for a total of 1.3 square meters, all being in the moderate distress category. 27 of the full depth concrete patches were noted as deteriorated. 47, 120, and 38 square meters were in the low, moderate, and severe distress categories respectively

3.5 Section 260606

This section had intensive surface preparation with a 4 inch overlay. The rehabilitation work conducted consisted of both partial depth repairs with asphalt cement concrete and full depth concrete repairs. All partial depth repairs for the entire section were conducted in accordance with MDOT specifications for a detail 7. There is a 12" culvert at station 4+40. A review of a pavement condition survey conducted in 1992 indicates the following performance trends

Cracking: Very little cracking was noted. Two unsealed transverse reflective cracks with low severity distress were noted for a total length of 7.4 meters

Other Distress: Three Patched 6" core holes were noted between stations 1+28 and 1+42

3.6 Section 260607

This section was a break/crack and seat with a 4 inch overlay (see Appendix A for the crack and seat contract special provision). A review of a pavement condition survey conducted in 1992 indicated that no distress had developed

3.7 Section 260608

This section was a break/crack and seat with a 8 inch overlay. A review a pavement condition survey conducted in 1992 indicated that the only distress observed consisted of a two square meter area of raveling and weathering. An oil spill was also noted at the center of the lane between stations 1+46 to 1+52 but no binder softening was evident.

3.8 Section 260659

This section was rubbelized with a 7 inch overlay. A review of a pavement condition survey conducted in 1992 indicated that it was in excellent condition.

4.0 SUMMARY

Two years after construction, the crack/break and seat sections showed the least amount of distress.

There is a considerable amount of data missing on the layer thickness and AC properties. Layer thickness data available indicates that the in place AC thickness for the 4" overlay sections is greater than plan and less than plan for the 8" overlay sections. Additional sampling and testing is necessary to better describe the as-built section properties. Appendix D contains a memorandum requesting some additional sampling from the project.

Appendix A

SPS Deviation Report



LTPP SPS Project Deviation Report Project Summary Sheet		State Code <u>26</u>	Project Code <u>0600</u>
Project Classification Information			
SPS Experiment Number: <u>6</u>	State or Province: <u>MICHIGAN</u>		
LTPP Region:	<input type="checkbox"/> North Atlantic <input checked="" type="checkbox"/> North Central <input type="checkbox"/> Southern <input type="checkbox"/> Western		
Climate Zone:	<input type="checkbox"/> Dry-Freeze <input type="checkbox"/> Dry-No Freeze <input checked="" type="checkbox"/> Wet-Freeze <input type="checkbox"/> Wet-No Freeze		
Subgrade Classification:	<input checked="" type="checkbox"/> Fine Grain <input type="checkbox"/> Coarse Grain <input type="checkbox"/> Active (SPS-8 Only)		
Project Experiment Classification Designation (SPS 1, 2 and 8):			
Construction Start Date: <u>MAY, 1990</u>	Construction End Date: <u>SEPTEMBER, 1990</u>		
FHWA Incentive Funds Provided to Agency for this Project:		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Deviation Summary			
Site Location Deviations:	<input checked="" type="checkbox"/> No Deviations <input type="checkbox"/> Minor Deviations <input type="checkbox"/> Significant Deviations		
Construction Deviations:	<input type="checkbox"/> No Deviations <input type="checkbox"/> Minor Deviations <input checked="" type="checkbox"/> Significant Deviations		
Data Collection and Processing Status Summary			
Inventory Data (SPS 5,6,7,9):	<input type="checkbox"/> Complete Submission <input checked="" type="checkbox"/> Incomplete <input type="checkbox"/> Data Not Available		
Materials Data:	<input type="checkbox"/> All Scheduled Samples Obtained and Tested <input checked="" type="checkbox"/> Incomplete/No Test Data		
Construction Data:	<input type="checkbox"/> All Required Data Obtained <input checked="" type="checkbox"/> Incomplete/Missing Data Elements		
Historical Traffic Data:	<input type="checkbox"/> All Required Historical Estimates Submitted (SPS 5,6,7,9) <input checked="" type="checkbox"/> Required Estimates Not Submitted		
Traffic Monitoring Equipment:	<input checked="" type="checkbox"/> WIM Installed On-Site <input checked="" type="checkbox"/> AVC Installed On-Site <input type="checkbox"/> ATR Installed On-Site <input type="checkbox"/> No Equipment Installed		
Traffic Monitoring:	<input checked="" type="checkbox"/> Preferred <input type="checkbox"/> Continuous <input type="checkbox"/> Minimum <input type="checkbox"/> Below Minimum <input type="checkbox"/> Site Related		
Traffic Monitoring Data:	<input checked="" type="checkbox"/> Monitoring Data Submitted <input type="checkbox"/> No Monitoring Data Submitted		
FWD Measurements:	<input type="checkbox"/> Preconstruction Tests Performed <input type="checkbox"/> Construction Tests Performed <input checked="" type="checkbox"/> Post-construction Tests Performed		
Profile Measurements:	<input checked="" type="checkbox"/> Preconstruction Tests Performed <input checked="" type="checkbox"/> Post-construction Tests Performed		
Distress Measurements:	<input checked="" type="checkbox"/> Preconstruction Tests Performed <input checked="" type="checkbox"/> Post-construction Tests Performed		
Maint. & Rehab. Data:	<input type="checkbox"/> Complete Submission <input type="checkbox"/> Incomplete <input checked="" type="checkbox"/> Data Not Available		
Friction Data:	<input checked="" type="checkbox"/> Complete Submission <input type="checkbox"/> Incomplete <input type="checkbox"/> Data Not Available		
Report Status			
Materials Sampling and Test Plan:	<input checked="" type="checkbox"/> Document Prepared <input type="checkbox"/> Final Submitted to FHWA		
Construction Report:	<input checked="" type="checkbox"/> Document Prepared <input type="checkbox"/> Final Submitted to FHWA		
AWS: (SPS 1, 2, & 8)	<input type="checkbox"/> AWS Installed <input type="checkbox"/> AWS Installation Report Submitted to FHWA		

Appendix B

Project Plans



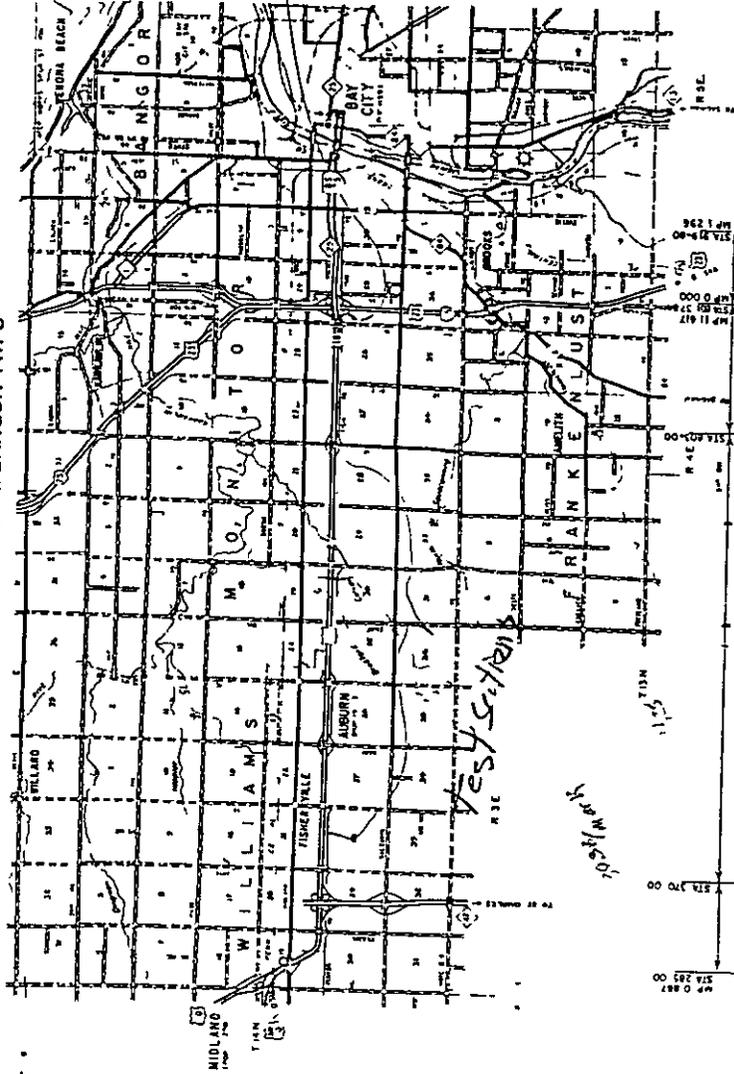
MICHIGAN DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED

MICHIGAN PROJECT ACFR102(317) ACFR255(314), ACIR75-2(365)
 CONTROL SECTION FU09101, FR 09101, FU09042, IR09034
 JOB NUMBER 28163A 28165A, 28164A, 28166A, 28206A
 US-10, M-25 & I-75 BS

BAY CO

WILLIAMS MONITOR & BANGOR TOWNSHIPS



CONTROL SECTION #1 0910
 BEGINNING STA 210+00
 ENDING STA 214+00
 FILE ITEM NO. 781216

CONTROL SECTION #2 0910
 BEGINNING STA 214+00
 ENDING STA 218+00
 FILE ITEM NO. 781216

CONTROL SECTION #3 0910
 BEGINNING STA 218+00
 ENDING STA 222+00
 FILE ITEM NO. 781216

CONTROL SECTION IR09034
 JOB NUMBER 28206A
 CONTROL NO. 28206A
 FILE ITEM NO. 780917

ROAD PLANS	SHEET NOS
TYPICAL CROSS SECTION	1
NOTE SHEET	2, 4
CRUS IN STAGING	3
BRIDGE HANDS WITHNESS SHEET	5
CULVERT BORDERS	6
RAUP & PLUMS PROFILES	8, 9, 10
PERMANENT SIGNING	11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24
QUANTITY SHEETS	25-27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

BRIDGE PLANS
 8 OF 0910

TITLE SHEET LEGEND

PROPOSED PROJECT	---
EXISTING ROAD	---
RAILROAD	---
ATWATER	---
GRAVEL	---
UNPAVED ON CITY STREET	---
SECTION LINE	---
TOWNSHIP LINE	---
COUNTY LINE	---
CITY OR VILLAGE LIMITS	---
RAILROADS	---

DATE	FOR AMOUNT	FEDERAL NUMBER	SHEET NO.	TOTAL SHEETS
NO 10 M-25 & I-75 BS	28163A, 28165A, 28164A, 28166A, 28206A		1	81

THE INFORMATION CONTAINED ON THESE PLANS SHALL BE DONE IN ACCORDANCE WITH THE MICHIGAN DEPARTMENT OF TRANSPORTATION'S STANDARD SPECIFICATIONS AND SUPPLEMENTAL SPECIFICATIONS.

US 10 YEAR 1987
 U.S. 10
 U.S. 10
 U.S. 10
 U.S. 10

09101 & FU 09042 & IR 09034 - 28163A, 28164A, 28165A & 28166A & 28206A

APPROVALS

DESIGNED BY: *[Signature]*
 CHECKED BY: *[Signature]*
 DRAWN BY: *[Signature]*
 IN CHARGE: *[Signature]*

DATE: 7/11/87

SCALE: 1" = 40' 0"

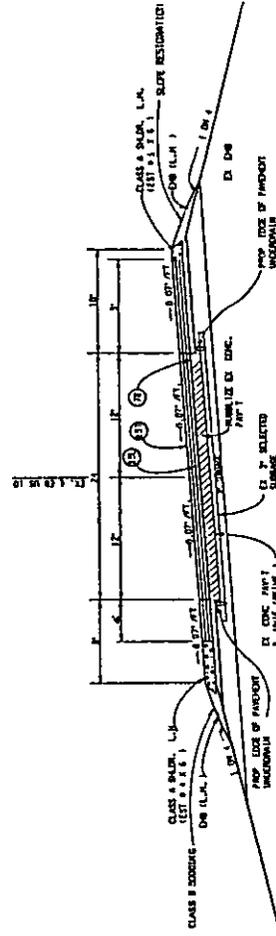
PROJECT: MICHIGAN DEPARTMENT OF TRANSPORTATION

SECTION: 10

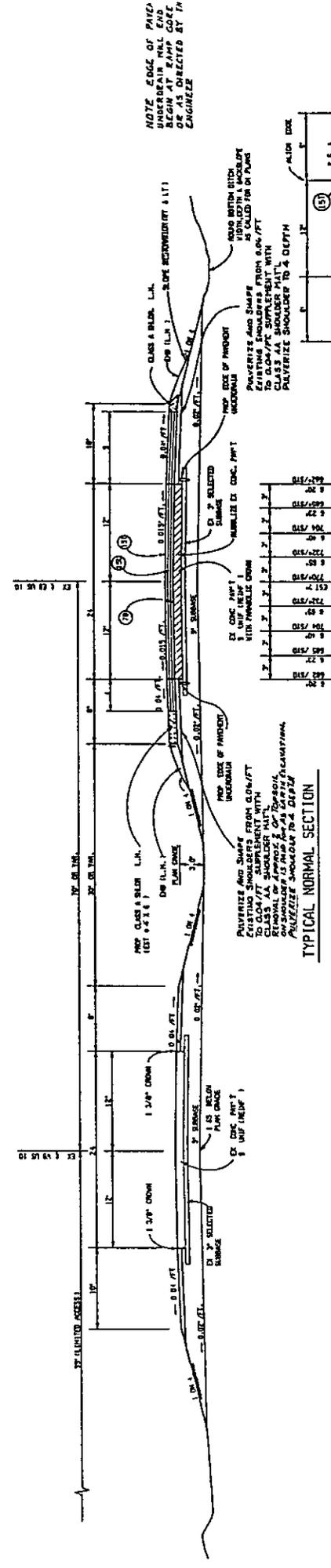
DATE: 7/11/87

FILE ITEM NO. 781216

1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10



TYPICAL SUPERELEVATED SECTION EB US-10



TYPICAL NORMAL SECTION

TO APPLY
 STA 285+00 TO STA 292+48 60 EB
 STA 312+72 77 TO STA 319+80 EB

BITUMINOUS APPLICATION ESTIMATE

ITEM	ITEM	QUANTITY	ESTIMATED THICKNESS	ASPHALT PENETRATION	REMARKS
15	BITUMINOUS MIXTURE 1500T, 300VA	160	1 1/2	85 100	
16	BITUMINOUS MIXTURE 1500L, 300VA	170	1 1/2	85 100	
7	BITUMINOUS BASE MIXTURE 700 200	300	3	85 100	
	BITUMINOUS ROAD COAT	0 0 10 GAL			FOR INFORMATION ONLY

NOTE: EDGE OF PAV'D UNDERDRAIN SHALL END BEGIN AT RAMP CORNER OR AS DIRECTED BY THE ENGINEER

PROVIDE AND SHAPE TO CLASS 4 SLOPE FROM 0.04/FT TO CLASS 3 SLOPE WITH CALIBRATE SHOULDER TO 4 DEPTH

PROVIDE AND SHAPE TO CLASS 4 SLOPE FROM 0.04/FT TO CLASS 3 SLOPE WITH CALIBRATE SHOULDER TO 4 DEPTH

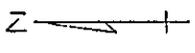
TEMPORARY ROADWAY FOR RAMP A
 US-10, I-75 INTERCHANGE
 STA 100+00 TO STA 107+80

TYPICAL CROSS SECTION

DATE	SCALE	DATE	JOB NO.
05/13/89	1" = 6'	09/10	28163 A
			DESIGN UNIT
			RECORD

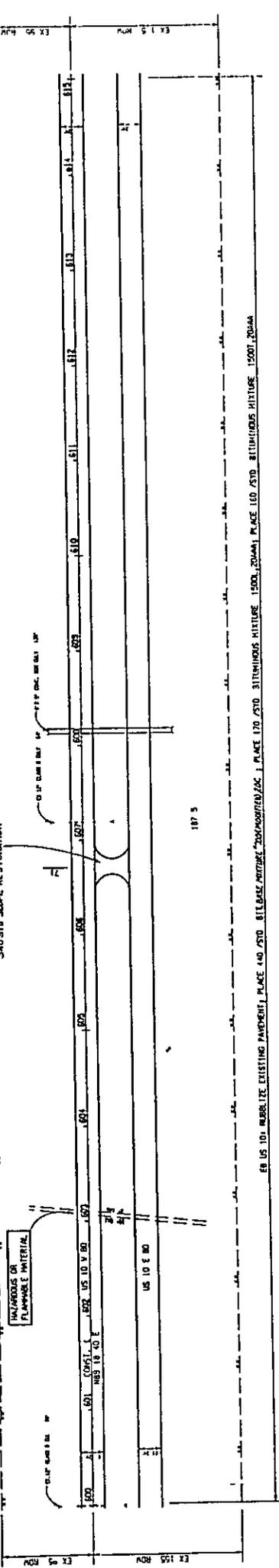


DATE	1957
BY	...
CHECKED	...
APPROVED	...



MONITOR TYP
SCALE
SEC 13

CROSS OVER
SUBGRADE
US 10 BITUMINOUS APPROACHES
124 STD CL A SOLDERS (LM)
III 670 SUBBASE (LM)
340 STD SLURRY RESTORATION

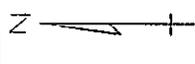


US 101 REBUILD EXISTING PAVEMENT, PLACE 140 STD BITUMINOUS MIXTURE, 1500L, 20MM, PLACE 160 STD BITUMINOUS MIXTURE, 1500L, 20MM

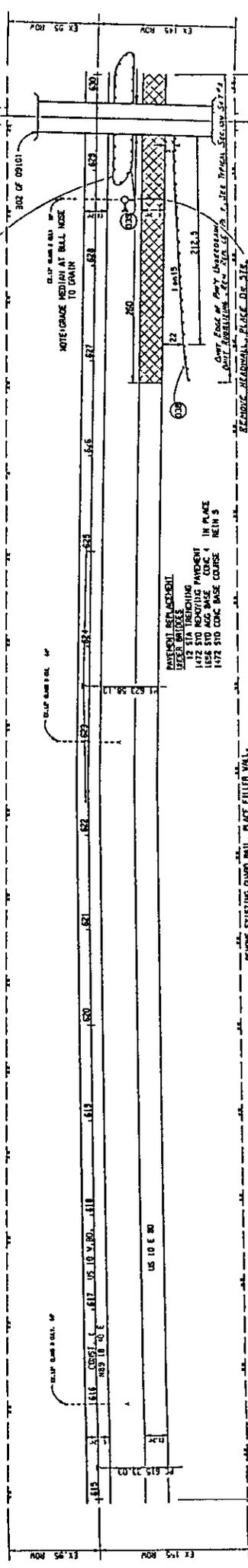
MONITOR TYP
SCALE
SEC 13

CURST /
CURVE DATA
D 2 12 00 RT
P 1 40 10 LA
T 823 10
L 1650 00
E 7 32
C 2 13 13
PI 631 63 03

SEVEN MILE RD



PLACE WALL NOSE OVER MAIL AT MEDIAN PIER
75 LFT ONLY CASTED BEAM GUARD RAIL, TYPE B
230 STD EXPANSION Joints
384 LFT SUEWASE UNDERDRAIN, 6
4 EACH OUTLET ENDING IN
500 EACH REFLECTORIZED WASERS
200 LFT REMOVING BEAM GUARD RAIL



REINFORCE EXISTING GUARD RAIL, PLACE FILLER WALL,
BRIDGE APPROACH GUARD RAIL AND CABLE RETRACTION

100 LFT REMOVING BEAM GUARD RAIL
37 STD FILLER WALL, CONCRETE
202 STD STEEL REINFORCED SOLIS, 2 1/4
12 EACH GUARD RAIL ARCH BRIDGE DET 1 I
187 5 LFT ONLY BEAM GUARD RAIL TYPE T
200 STD EXPANSION Joints
871 STD REFLECTORIZED WASERS
8 EACH REFLECTORIZED WASERS

REINFORCE EXISTING GUARD RAIL, PLACE FILLER WALL,
BRIDGE APPROACH GUARD RAIL AND CABLE RETRACTION

100 LFT REMOVING BEAM GUARD RAIL
37 STD FILLER WALL, CONCRETE
202 STD STEEL REINFORCED SOLIS, 2 1/4
12 EACH GUARD RAIL ARCH BRIDGE DET 1 I
187 5 LFT ONLY BEAM GUARD RAIL TYPE T
200 STD EXPANSION Joints
871 STD REFLECTORIZED WASERS
8 EACH REFLECTORIZED WASERS

REINFORCE EXISTING GUARD RAIL, PLACE FILLER WALL,
BRIDGE APPROACH GUARD RAIL AND CABLE RETRACTION

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37 STD FILLER WALL, CONCRETE
202 STD STEEL REINFORCED SOLIS, 2 1/4
12 EACH GUARD RAIL ARCH BRIDGE DET 1 I
187 5 LFT ONLY BEAM GUARD RAIL TYPE T
200 STD EXPANSION Joints
871 STD REFLECTORIZED WASERS
8 EACH REFLECTORIZED WASERS

REINFORCE EXISTING GUARD RAIL, PLACE FILLER WALL,
BRIDGE APPROACH GUARD RAIL AND CABLE RETRACTION

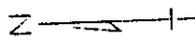
100 LFT REMOVING BEAM GUARD RAIL
37 STD FILLER WALL, CONCRETE
202 STD STEEL REINFORCED SOLIS, 2 1/4
12 EACH GUARD RAIL ARCH BRIDGE DET 1 I
187 5 LFT ONLY BEAM GUARD RAIL TYPE T
200 STD EXPANSION Joints
871 STD REFLECTORIZED WASERS
8 EACH REFLECTORIZED WASERS



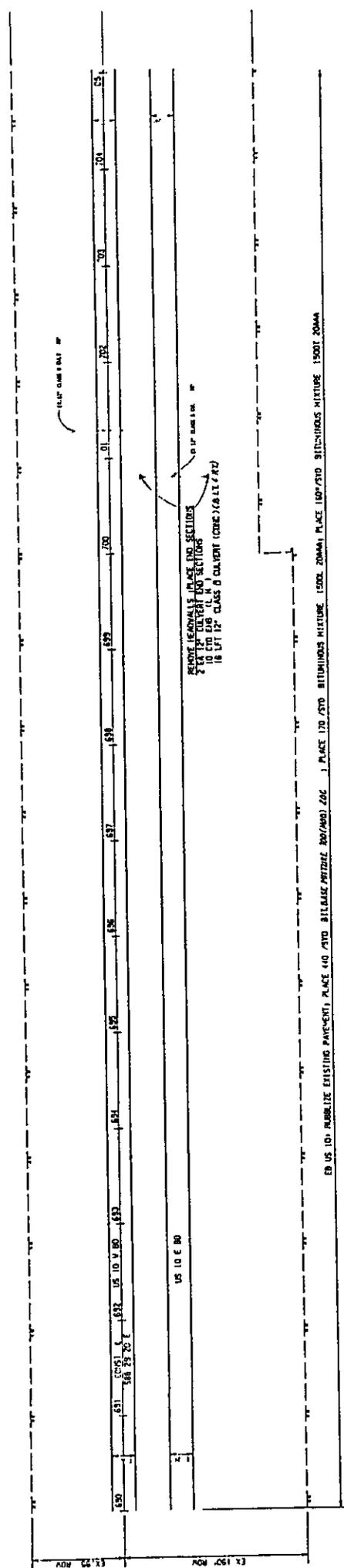
DATE 05/12/89 SCALE 1" = 50' JOB NO. 28164 A RECORD
STA 600+00 TO STA 630+00
DESIGNER

US 101 REBUILD EXISTING PAVEMENT, PLACE 140 STD BITUMINOUS MIXTURE, 1500L, 20MM, PLACE 160 STD BITUMINOUS MIXTURE, 1500L, 20MM

DATE	05/12/89
SCALE	1" = 50'
PROJECT NO.	28164 A
DESIGNER	
CHECKER	
APPROVER	

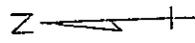


MONITOR TYP
PLAN RAE
SEC 21



EO US 10' RUBBLITE EXISTING PAVEMENT, PLACE 40' STD BITUMINOUS MIXTURE (500L 20MM) 20C | PLACE 170' STD BITUMINOUS MIXTURE (500L 20MM) 1500T 20MM

MONITOR TYP
PLAN RAE
SEC 21

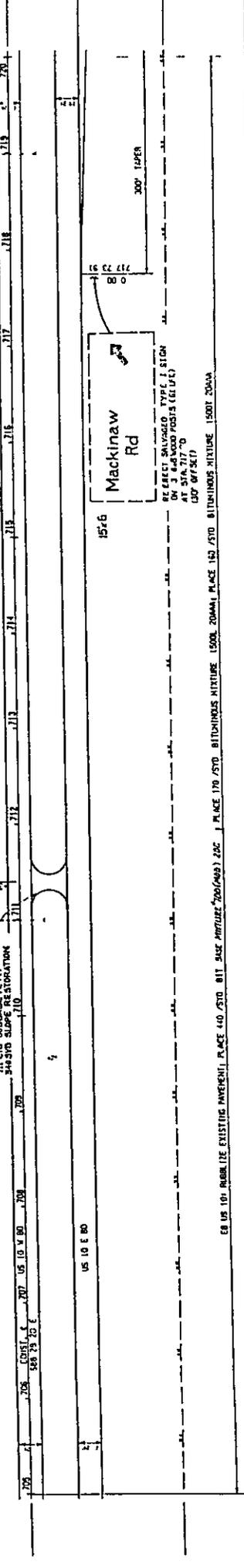


- PLACE SURFACING QUANTITIES THIS SHEET.
- 8113 STD RUBBLIZED PAVEMENT
 - 8000 STD SHOULDER PAVEMENT AND SHOULDER
 - 7725 10N 811 MIXTURE (L+M) 20MM
 - 7725 10N 811 MIXTURE (L+M) 20MM
 - 7725 10N 811 MIXTURE (L+M) 20MM
 - 6000 LFT EDGE OF PAVEMENT UNDERDRAIN
 - 1447 STD CLASS A SHOULDERS (LH)
 - 1447 STD CLASS A SHOULDERS (RH)
 - 23 STD BIRTH EXCAVATION

REMOVE ORIGINALS IN PLACE END SECTIONS
2' x 12" CONCRETE END SECTIONS
10 STD END (L+M) 20MM
18 LFT 12" CLASS B COLLECT (CONCRETE/GRASS)

PROSE OVER
EXISTING QUANTITIES

- 15 10N BITUMINOUS APPROACHES
- 154 STD CLASS A SHOULDERS (LH)
- 111 STD SUBBASE (L+M)
- 344 STD SUPERPAVEMENT



EO US 10' RUBBLITE EXISTING PAVEMENT, PLACE 40' STD BITUMINOUS MIXTURE (500L 20MM) 20C | PLACE 170' STD BITUMINOUS MIXTURE (500L 20MM) 1500T 20MM

DATE 05/12/89 SCALE 1" = 50' SHEET NO. 09101 TOTAL SHEETS 28164 A PROJECT NO. 28164 A DESIGNER APPROVER

STA 690+00 TO 720+00

Appendix C

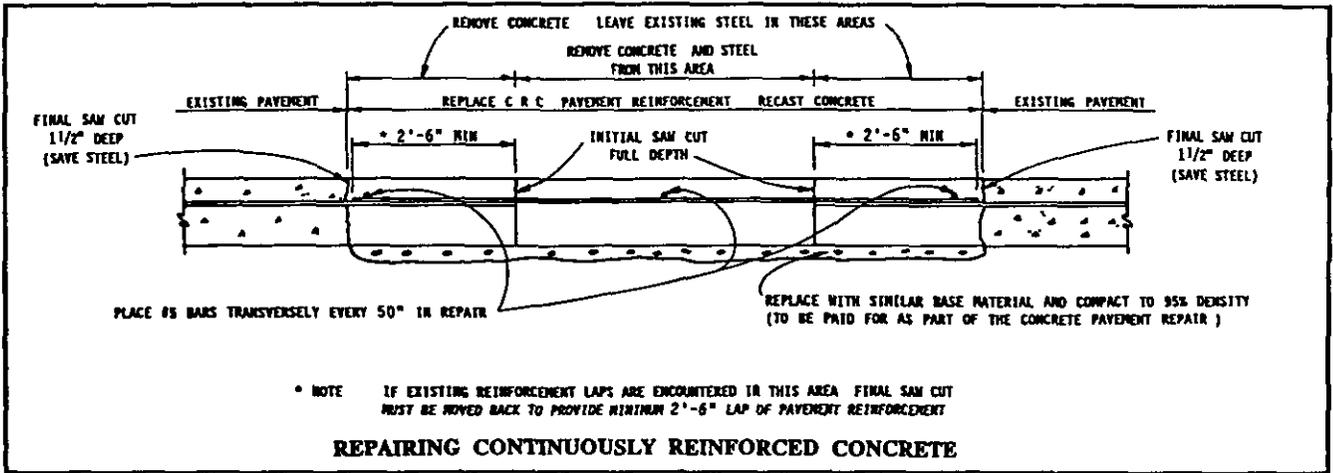
MDOT Standard Repair Details

Contract Special Provisions

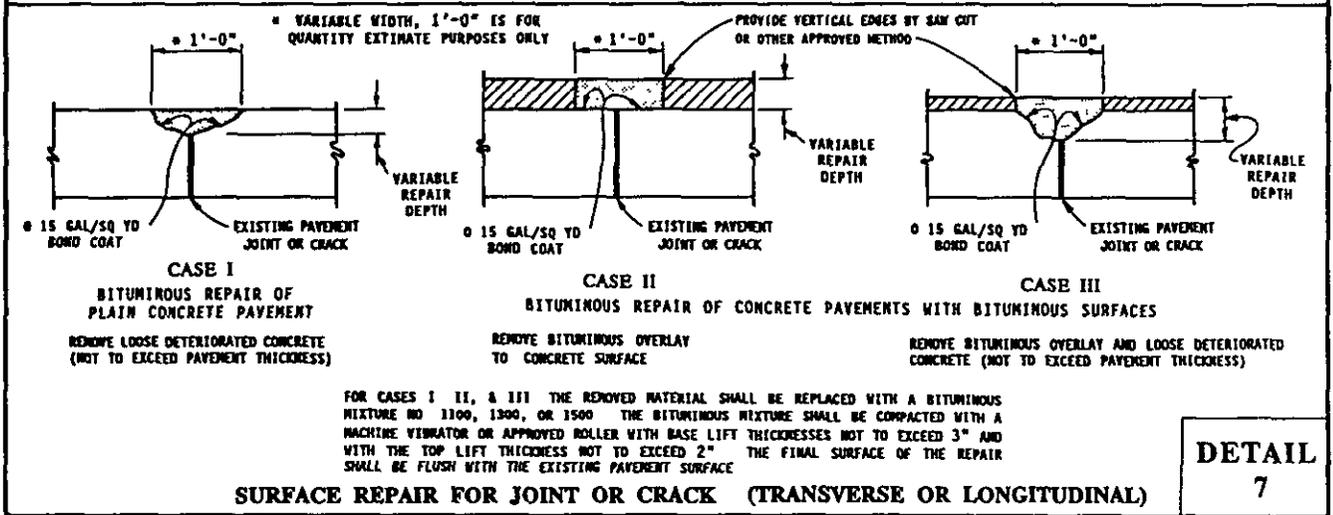
A Cracking and Seating

B Sawed and Sealed AC Joints

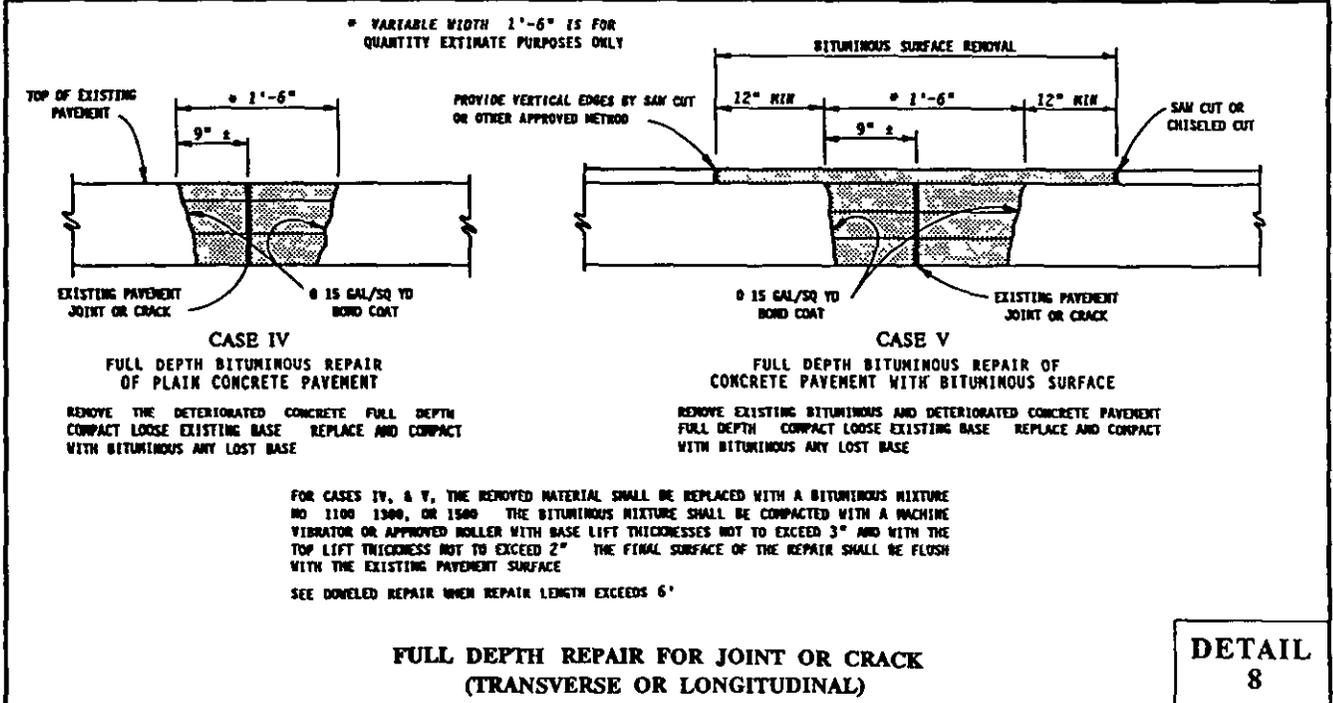




REPAIRING CONTINUOUSLY REINFORCED CONCRETE

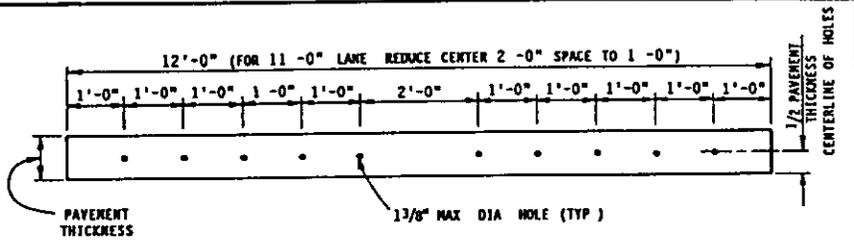


DETAIL 7



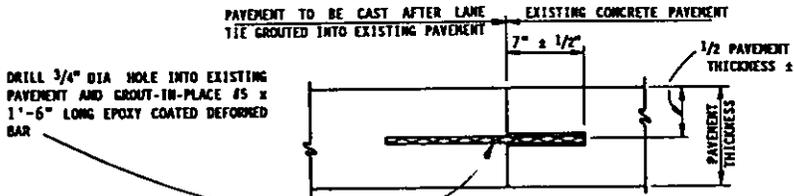
DETAIL 8

<p>PREPARED BY DESIGN DIVISION</p>	<p><i>J.H. Keys</i> ENGINEER OF CONSTRUCTION</p>	<p><i>C.D. Arnold</i> ENGINEER ROAD DESIGN</p>	<p>MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS STANDARD PLAN FOR</p> <p>CONCRETE PAVEMENT REPAIR</p>			
	<p><i>Monte Jendree</i> ENGINEER OF MAINTENANCE</p>	<p><i>J.P. Mc</i> ENGINEER OF DESIGN</p>				
	<p><i>James D. Culp</i> ENGINEER OF MATERIALS TECHNOLOGY</p>	<p>DEPARTMENT DIRECTOR PATRICK NOWAK</p>				
<p>DRAWN BY <i>H.A.W.</i></p>	<p><i>W.B. ...</i> ENGINEER OF TRAFFIC AND SAFETY</p>	<p>BY <i>W. ...</i> DEPUTY DIRECTOR HIGHWAYS</p>	<p>12-3-91 F H W A APPROVAL</p>	<p>11-27 91 PLAN DATE</p>	<p>II-44G</p>	<p>SHEET 4 OF 5</p>

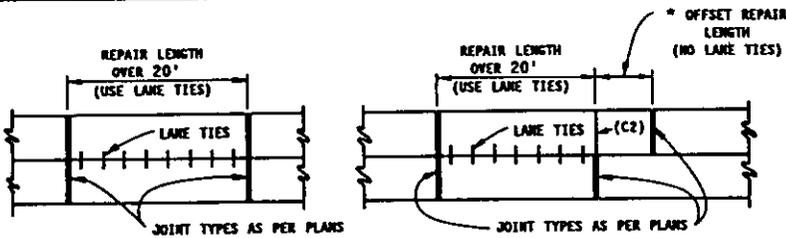


NOTE THE HOLE SPACING MAY BE ADJUSTED 1" HORIZONTALLY, RAISED 1/2", OR LOWERED 1/2" FROM THE ABOVE LOCATIONS TO AVOID DRILLING INTO THE REINFORCEMENT

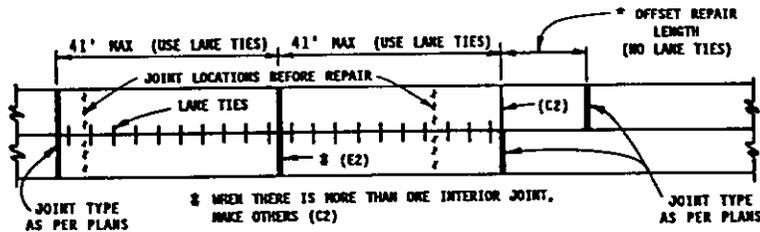
DOWEL OR DEFORMED BAR SPACING FOR CONCRETE REPAIRS



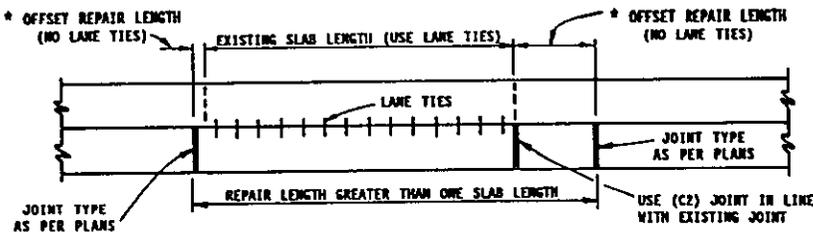
LANE TIE-PAVEMENT REPAIR



REPAIR LENGTHS LESS THAN ONE SLAB LENGTH, BUT MORE THAN 20' (ALL LANE REPAIRS)



REPAIR LENGTHS OVER ONE SLAB LENGTH (ALL LANE REPAIRS)



REPAIR LENGTHS OVER ONE SLAB LENGTH (ONE LANE REPAIRS)

* IF OFFSET IS MORE THAN 6' PLACE (C2) JOINT IN LINE WITH REPAIR JOINT
 IF OFFSET IS 6' OR LESS ELIMINATE TIE IN LINE (C2) JOINT
 IF OFFSET IS LESS THAN 2' ELIMINATE THE OFFSET

LANE TIES FOR DOWELED REPAIRS

<p>PREPARED BY DESIGN DIVISION</p> <p>DRAWN BY H.A.W.</p> <p>CHECKED BY J.D.C.</p>	<p><i>H. J. Hays</i> ENGINEER OF CONSTRUCTION</p>	<p><i>C. J. Arnold</i> ENGINEER ROAD DESIGN</p>
	<p><i>Monte Fendler</i> ENGINEER OF MAINTENANCE</p>	<p><i>Patrick Nowak</i> ENGINEER OF DESIGN</p>
	<p><i>James D. Culp</i> ENGINEER OF MATERIALS & TECHNOLOGY</p>	<p>DEPARTMENT DIRECTOR PATRICK NOWAK</p>
	<p><i>W. D. ...</i> ENGINEER OF TRAFFIC AND SAFETY</p>	<p><i>W. J. MacLean</i> DEPUTY DIRECTOR HIGHWAYS</p>

MICHIGAN DEPARTMENT OF TRANSPORTATION
 BUREAU OF HIGHWAYS STANDARD PLAN FOR

CONCRETE PAVEMENT REPAIR

12-3-91	11 27 91	II-44G	SHEET 3 OF 5
F H W A APPROVAL	PLAN DATE		

MICHIGAN
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS

SPECIAL PROVISION
FOR
CONCRETE PAVEMENT CRACKING AND SEATING

4.00(5a)

1 of 2

05-16-84

Description.-This work shall consist of cracking and seating existing concrete pavement following removal of existing bituminous overlays, if present, and prior to placement of a bituminous overlay.

Equipment.-The device to be used for cracking the concrete pavement shall be approved by the Engineer and shall be capable of producing the desired cracking pattern without displacing the concrete more than 1/2-inch vertically or without excessive spalling of the concrete. The equipment for seating the cracked concrete shall be a pneumatic tired roller meeting the applicable requirements specified in Subsection 2.08.13 of the 1984 Standard Specifications, except it shall have a suitable body for ballast loading with such capacity that the gross load may be varied from 30 to 50 tons.

Construction Methods.-Following removal of any existing bituminous overlays, the existing concrete pavement shall be cracked by such equipment and by such a method so as to produce full depth, generally transverse, hairline cracks at a nominal longitudinal spacing of _____. Care should be taken to prevent the formation of a continuous longitudinal crack.

Before cracking operations begin, the Engineer will designate test sections. The Contractor shall crack the test sections using varying energy and striking patterns until a satisfactory cracking pattern is established. This energy and striking pattern will then be required for the remainder of the project unless the Engineer determines conditions have changed such that a satisfactory cracking pattern is no longer being produced. Adjustments shall then be made to the energy and/or striking pattern as required to re-establish a satisfactory cracking pattern. When cracking the test sections, the Contractor shall furnish and apply water to dampen the pavement following cracking to enhance visual determination of the cracking pattern. The Contractor shall furnish and apply water to a check section once each day to verify that the specified crack pattern is being maintained.

Following cracking, the concrete shall be rolled until the concrete pieces are assured of being seated. The roller gross load shall be as directed by the Engineer.

If the pavement is opened to traffic after the cracking operation but prior to placement of the first bituminous course, the Contractor shall maintain the pavement for traffic by sweeping, patching, etc., as needed.

Measurement and Payment.-The completed work as measured for CONCRETE PAVEMENT CRACKING AND SEATING will be paid for at the contract unit price for the following contract item (pay item).

<u>Pay Item</u>	<u>Pay Unit</u>
Concrete Pavement Cracking.....	Square Yard

4.00(5a)

MICHIGAN
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS

SPECIAL PROVISION
FOR
SAWING AND SEALING TRANSVERSE JOINTS
IN BITUMINOUS OVERLAYS

M&T AWP25

1 of 2

03-05-90

a Description -This work shall consist of sawing, cleaning, and sealing transverse joints in new bituminous overlays placed on existing portland cement concrete pavements

All work, materials, and equipment shall be in accordance with the 1984 Standard Specifications (primarily Subsection 4 50 22-c) with the exceptions and additions specified herein

b Materials

- 1 Joint Sealant -The hot-poured joint sealant shall meet the requirements of the Special Provision for Low-Modulus Hot-Poured Joint Sealant contained in this proposal
- 2 Bond Breaker Tape -The bond breaker tape shall be one of those listed in the Prequalified Materials List for Bond Breaker Tapes

c Equipment

- 1 Saw -The saw for sawing the joint groove shall be equipped with a diamond blade, or diamond blades, so that all the bituminous mixture is removed to the specified width and depth in one pass
- 2 Sealant Heating Kettle -The heating kettle shall be a double-boiler system equipped with a pressure system to pump the sealant directly into the joint groove Direct heating or pouring the sealant from a hand-type pouring pot will not be permitted

d Construction

- 1 Joint Location -Prior to placing the bituminous overlay, the Engineer will reference the location and alignment of the existing transverse joints or limits of full depth concrete repairs by the use of pins and a stringline or by other suitable methods If the existing joint or repair limits are offset by 1 0 inch or more at the longitudinal joint then the joints or repair limits will be referenced individually
- 2 Sawing -The joint groove in the bituminous overlay shall be sawed directly over the existing transverse joint or full depth concrete repair limits in the underlying concrete pavement The joint groove shall be sawed in a straight line across the entire width of the lane or pavement including the shoulders If the transverse joint or repair limits in the underlying concrete are offset by 1 0 inch or more at the longitudinal pavement joint, the joint sawed in the bituminous overlay shall also be offset at the longitudinal joint to coincide with the underlying joint or repair limits The joints shall be sawed to the dimensions shown on the Special Detail for Sawing Transverse Joints in Bituminous Overlays A relief cut equal to or greater than one-third of the depth of the bituminous overlay placed shall be sawed over the underlying joint or repair limits The relief cut shall be made within seven days after the placement of the overlay or prior to the development of reflective cracking If, due to time or weather constraints, the top course of the overlay is not placed until the following construction season, relief cuts shall be sawed in the bituminous course or courses placed Relief cuts will not require sealing and will not be paid for separately The final joint groove shall be sawed to the specified dimensions and shall be centered over the relief cut Traffic shall not be allowed over the final joint groove prior to sealing the joint

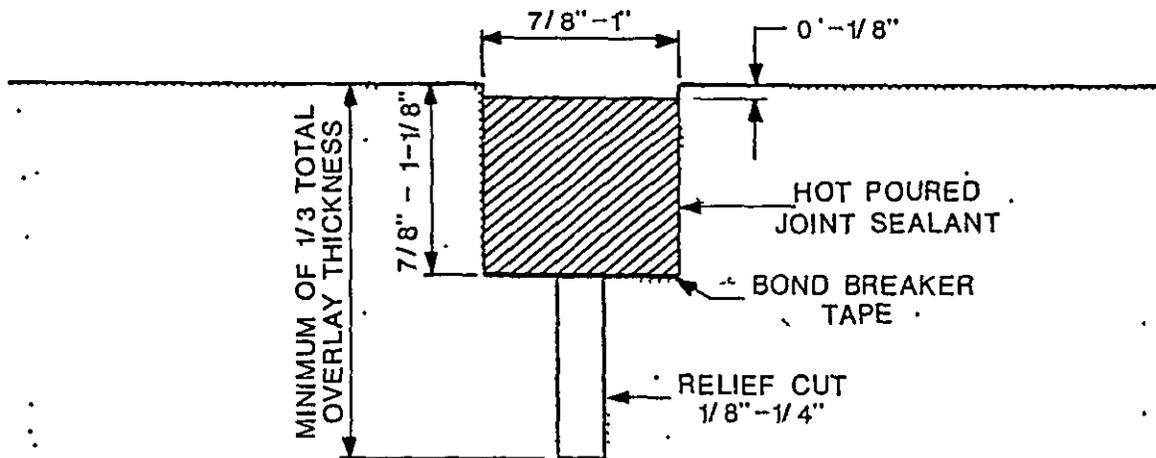
- 3 Joint Cleaning -Immediately after the sawing operation, the joint groove and adjacent pavement area shall be cleaned with high pressure water (minimum pressure of 50 psi) to remove all saw slurry and debris from the joint groove and pavement surface. Immediately prior to sealing the joint, the joint groove shall be cleaned with a jet of compressed air free of oil and water and having a minimum pressure of 90 psi. If, in the judgement of the Engineer, air cleaning is not effective, the joint grooves shall be abrasive blasted followed by the aforementioned air cleaning.
- 4 Joint Sealing -Immediately after the final cleaning, a bond breaker tape shall be placed in the joint groove and secured to the bottom of the joint groove. The joint groove shall then be filled with hot-poured sealant. The sealant (after cooling) shall be flush to 1/8 inch below the surface of the pavement. The joint grooves and the surface of the pavement adjacent to the joint shall be dry at the time of sealing.
 - The joints shall not be sealed when the temperature is less than 50 F except by the approval of the Engineer.
 - Traffic shall not be allowed over the sealed joint until the sealant has cooled sufficiently to resist pick-up.

e Measurement and Payment -The completed work as measured for SAWING AND SEALING TRANSVERSE JOINTS IN BITUMINOUS OVERLAYS will be paid for at the contract unit price for the following contract item (pay item)

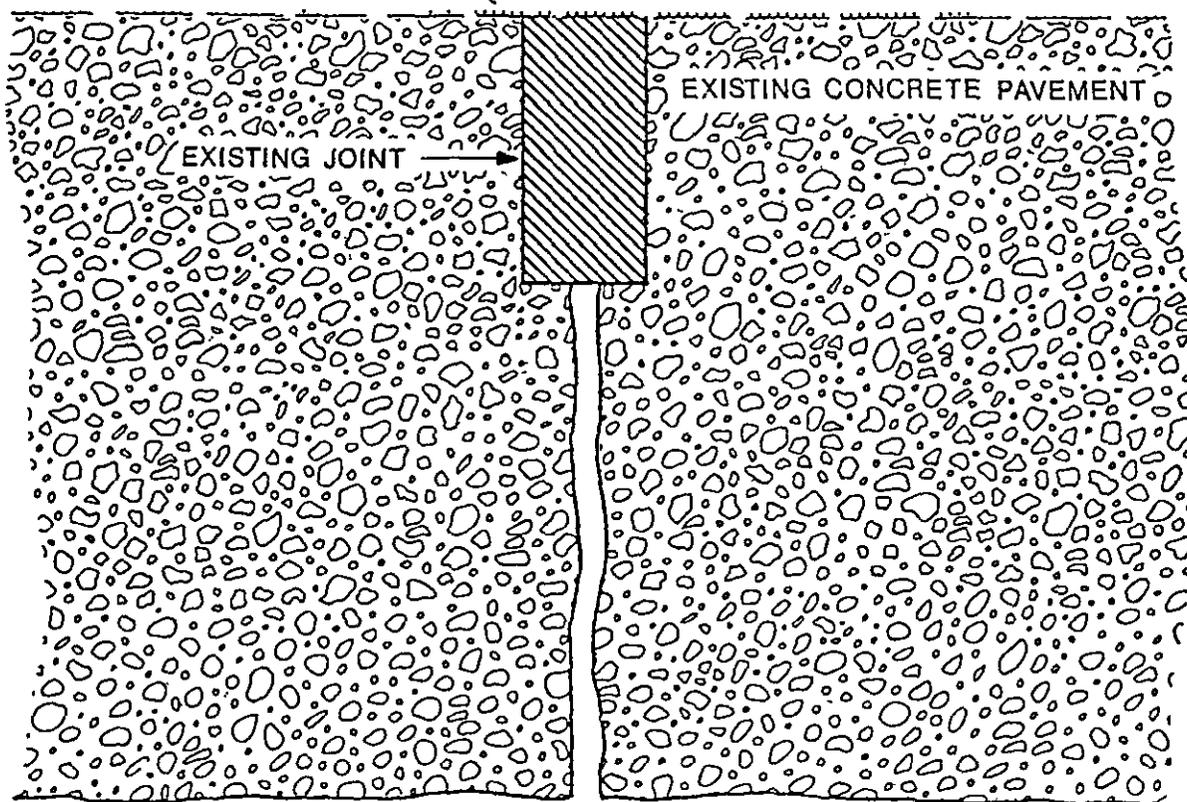
<u>Pay Item</u>	<u>Pay Unit</u> .
Sealing Transverse Joints in Bituminous Overlays	Linear Foot

The payment for Sealing Transverse Joints In Bituminous Overlays includes furnishing all labor, equipment, and materials required to saw the relief cut, saw the final joint groove, clean the joint groove, place the bond breaker tape, and seal the joint with hot-poured joint sealant.

SPECIAL DETAIL
FOR
SAWING TRANSVERSE JOINTS IN BITUMINOUS OVERLAYS



NEW BITUMINOUS OVERLAY



MICHIGAN
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS

SPECIAL PROVISION
FOR
LOW-MODULUS HOT-POURED JOINT SEALANT

M&T AWP6

1 of 1

03-25-87

- a. Description -This special provision covers a low-modulus hot-poured joint sealant used to seal joints and cracks.
- b. Material -The low-modulus hot-poured sealant shall meet the requirements of the 1984 Standard Specifications, Subsection 8 16 04-a with the following exceptions and additions
1. Bond -The sealant shall be tested at -20F for 3 complete cycles at 100 percent extension. The fine aggregate incorporated into the concrete mixture used to make the bond blocks shall be 2NS sand.
 2. Penetration at 77F -The penetration at 77F shall be 130 ± 20
 3. Penetration at 0F -The penetration at 0F shall be not less than 40. Two specimens shall be prepared and tested after being conditioned for 24 hours at 0F. The test shall be completed within 20 seconds after removal from the freezer.
 4. Packaging and Marking -The containers in which the material is packaged shall be legibly marked with a non-fading weather-resistant type of ink or paint. The markings shall include the manufacturer's name, or trade name, batch number, recommended pouring temperature, and the maximum safe heating temperature.
 5. Sampling and Testing -The sealant will be sampled by a representative of the Department. A minimum of two weeks will be required for testing from the time the sample is received.

Appendix D

Recommendations for Additional Testing

MEMORANDUM

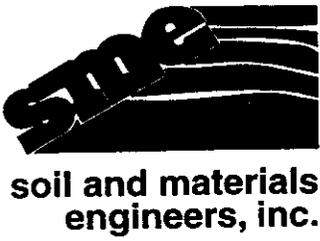
February 7, 1996

TO: Henry Quiroga, MDOT M & T
FROM: Cary T. Keller
RE: Additional Sampling Michigan SPS-6

When this project was constructed in late 1990, the materials sampling plan had not yet been finalized. This led to a few problems during the pre-construction phase and missing information from the during and post-construction phase. To correlate the lab data and field sampling notes and data sheets, we need some additional cores, and a few bulk samples of asphalt concrete, subbase, and subgrade soil. The attached figure shows the locations for the cores and augers. We believe a total of eighteen 4 inch cores are needed to verify the layer types and thicknesses. Three 12 inch cores will be required for bulk sampling of base course asphalt concrete. Finally, three 6 inch cores and auger sampling to a depth of 5 feet are necessary to correlate the results of earlier test pits which had been excavated before construction and to provide samples for laboratory testing if necessary.

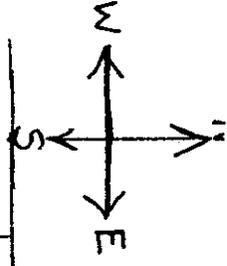
We will be contacting you soon to arrange for your help in conducting this investigation. We believe it should take about 1 day to complete the work.

soil and materials engineers, inc.
43980 Plymouth Oaks Blvd
Plymouth, Michigan 48170
(313) 454-9900
(313) 454-0629 fax

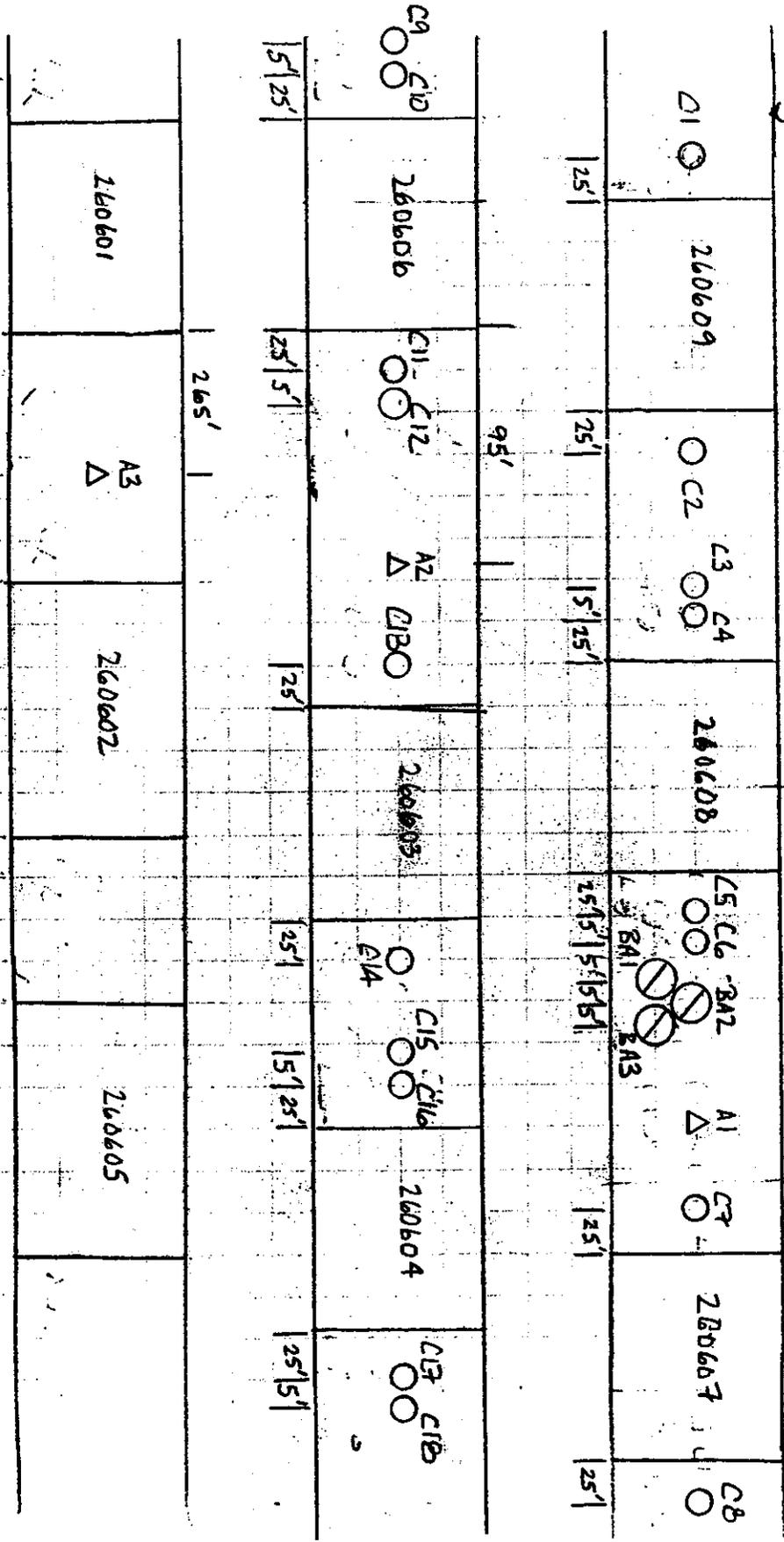


CLIENT ATTN: MARK ARRITI
MDOT M&T
US-10
 PROJECT MICHIGAN SPS-6
POST. CONSTRUCTION MST

FILE NUMBER PP18400
 DATE 2/7/96
 COMPUTED BY CKL
 CHECKED BY _____



DIRECTION OF TRAFFIC →



LEGEND AND NOTES

- 4" CORE OF AC (18 TOTAL)
- 12" CORE OF AC (3 TOTAL)
(OR 4-10" CORES)

- △ 6" CORE OF AC AND PCC, AUGER TO 5' AND SAMPLE (3 TOTAL)
- NOTES: 1) SAMPLING DEPTHS ARE 6' FROM EDGE OF METAL EXCEPT BA CORES WHICH ARE AT 3' AND 6' 2) OUTSIDE LANE ONLY