



LTPP North Central Regional Office

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May 15, 2001

Mr. Jack Springer, HRDI-13
FHWA-LTPP
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101-2296

Re: SPS Construction Report for SPS-A8 south of Hannibal, Missouri

Dear Mr. Springer,

I have enclosed a copy of the SPS construction report for the SPS-A8 near Hannibal, Missouri. Reports for the remaining projects in Missouri will be completed in the near future, and sent to you as they are available. Please let me know if you have any comments or questions concerning this report. You may contact me at 217/356-4500.

Sincerely,

Brenda B. Mehnert
ERES Division of ARA, Inc.

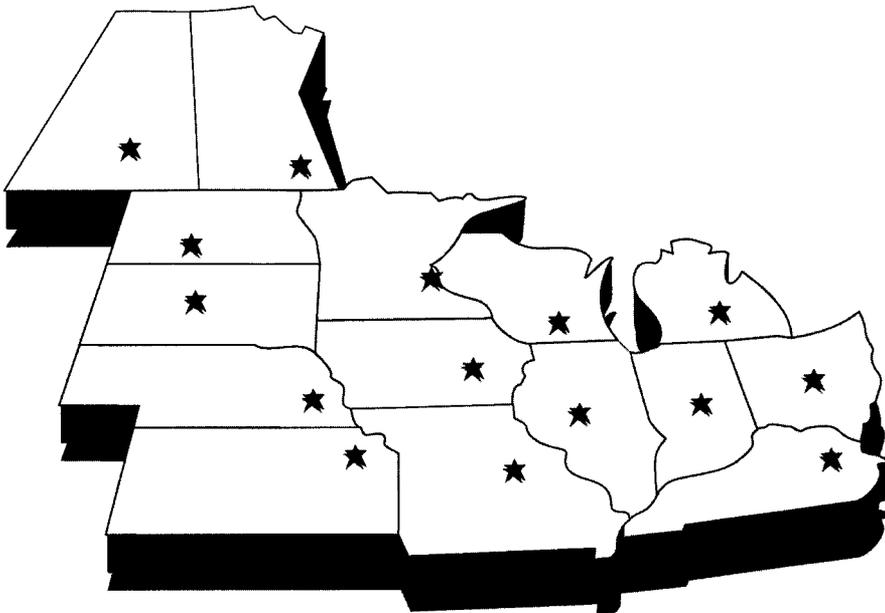
Enclosures:

cc: M. Symons (FHWA-COTR)
J. Jiang (LTPP-DATS)

Construction Report for Missouri SPS-8 29A800

DTFH61-96-C-00013

May 15, 2001



**SPS-A8 Construction Report
Ralls County, Missouri
West Outer Rd (SB), adjacent to Route 61
(24 km south of Hannibal, Missouri)**

Sections 29A801, 29A802, 29A807 and 29A808

Federal Highway Administration
LTPP Division
North Central Region

Report Prepared By:
Brenda B. Mehnert

ERES Consultants
A Division of Applied Research Associates, Inc.
505 West University Ave.
Champaign, Illinois 61820

May 15, 2001

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ATTACHMENTS

ATTACHMENT A: PROJECT LOCATION

ATTACHMENT B: SITE LAYOUT

ATTACHMENT C: MATERIAL SAMPLING AND TESTING PLAN

ATTACHMENT D: LAYER DESCRIPTION AND THICKNESS FOR EACH SECTION

ATTACHMENT E: PROJECT DEVIATION REPORT

1 Project Overview

The Strategic Highway Research Program (SHRP) SPS-8 project investigates environmental effects on both rigid and flexible pavements in the absence of heavy loads. This project encompasses both types of structures built on conventional nondrained base materials over three types of subgrade. The factors addressed on the long-term pavement performance of these two types of pavements are:

- Pavement type
- Layer thickness
- Subgrade soil types
- Climatic conditions

The analysis of information developed from this experiment will provide substantially improved data for validation and improvement of the environmental effects models used in the design of rigid and flexible pavements.

This is the second SPS-8 project in Missouri and therefore is noted as 29A800. Four test sections were constructed for this project, two flexible and two rigid pavements. The flexible pavements consisted of varying base layer thickness and asphalt concrete surface. The rigid pavements had the same base thickness but different PCC surface layer thickness. All the sections were constructed with the same type of base layer and subgrade—crushed stone over a fine-grained subgrade.

This report summarizes the “as-built” pavement layers of the Missouri 29A800 site that includes four SHRP test sections constructed between October and December 1998. Field tests were performed, and laboratory samples obtained and analyzed, at different stages of construction from each test section. All samples were taken from the southbound lane.

1.1 Experiment Cell

This Missouri 29A800 site is located in the wet-freeze environmental zone and was constructed on a fine-grained subgrade. The fine-grained subgrade soils are high swelling type.

1.2 Project Location

The Missouri 29A800 project is located on the frontage road, west of US Highway 61 (US-61) in Ralls County, Missouri. This road is also known as the West Outer Road. Specifically, the four sections are located on the southbound lane of this two-lane frontage road. This site is approximately 24 km south of Hannibal, Missouri. Attachment A is a general project location map.

The test site is located on a .375 percent downgrade. The horizontal curvature for both sections is tangent. The lanes are 3 m wide and have asphalt concrete (AC) shoulders that are 1.2 m wide. The shoulders were constructed with 51 mm of AC on a 152 mm crushed stone base.

1.3 Project Layout

The Ralls County 29A800 site incorporates four SHRP sections. Attachment B contains the test section layout that summarizes surface thickness and layer descriptions.

1.4 Traffic Characteristics

The nomination form submitted by the Missouri Department of Transportation indicated the traffic data at the time of construction shown in Table 1. This two-lane section of frontage road is classified as a local road.

Table 1. Traffic data for Missouri 29A800.

Annual Average Daily Traffic (two directions)	118 vehicles
% Heavy Trucks and Combinations (of AADT)	42
Estimated 18K ESAL Rate in Study Lane (1000 ESAL/YR)	48 Flexible 96.5 Rigid
Total Design 18K ESAL Applications in Design Lane	96,000 Flexible 193,000 Rigid
Design Period (years)	20

ESAL = Equivalent single axle load.

1.5 Limits of Test Sections

Table 2 shows the limits of the test sections at the SPS-A8 site. Each test section includes a monitoring section of 152 m (500 ft) and 7.6-m (25 ft) at each end of the monitoring section to be used as sampling areas.

Table 2. Limits of Missouri 29A800 test sections.

Test Section #	Test Section		500-ft Monitoring Section	
	Beginning Station	End Station	Beginning Section	End Station
29A801	177+75	183+25	178+00	183+00
29A802	185+75	191+25	186+00	191+00
29A807	195+75	201+25	196+00	201+00
29A808	202+75	208+25	203+00	208+00

1.6 Weather Monitoring

An automatic weather station (AWS) unit was installed February 2000 inside the Missouri DOT maintenance yard in Hannibal, Missouri. This unit is approximately 6.8 km south of the 29A800 site.

1.7 Traffic Monitoring

There was no traffic-monitoring device installed near this site.

1.8 Personnel

North Central Regional Coordination Office

ERES Consultants
Tom Wilson
Principal Investigator
505 West University Avenue
Champaign, Illinois 61820 (800) 344-7477

Material Testing

Braun Intertec Corporation
Bruce M. Thorson, PE or David Clauson
LTPP Testing Contractor
P.O. Box 39108
Minneapolis, Minnesota 55439-0108 (612) 941-4151

Jason Blomberg
Research, Development and Technology
Missouri Dept. of Transportation
105 West Capitol Avenue
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LTPP Design Review

John Miller
PCS/LAW
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State Department of Transportation

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Research, Development and Technology
Missouri Dept. of Transportation
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Jefferson City, MO 65102 (573) 751-2551 and Fax (573) 751-6555
www.modot.state.mo.us

Construction Contractor

Ronald Ideker, Pres.
Ideker, Inc.
Box 7140, 4614 South 40th Street
St. Joseph, MO 64507 (816) 364-4783

1.9 Known Deviations from Guidelines

Attachment E contains project deviation reports filled out during and after construction.

1.10 Summary of Key Construction Equipment

Subgrade Preparation

- 11.0 ton Sheepsfoot

Crushed Stone Preparation

- Double drum vibrator roller (11.0-ton)

Asphalt Concrete Pavement Placement

- Barber Greene (model BG260) paver
- 11.0-ton single drum vibrator roller
- 10.0-ton double drum vibrator roller
- Asphalt concrete drum mix plant (GNM)

PCC Placement

- CMI-250 (Slip Form Paver)
- Portland cement concrete mix plant (Ideker's)

2 Project Details

Project meetings were held before construction began. Representatives from the contractor, sub-contractors, LTPP, and Missouri DOT attended these meetings. Preparation of the subgrade did not begin until October 1998. Construction was completed in December 1998.

2.1 Design Features

Table 3 summarizes the asphalt, concrete, and base layer thickness for each section. Edge drains were not installed in any of the sections.

Table 3. Summary of material thickness and edge drains for each section.

Test Section Number	Surface Thickness (mm) (Surface)	Material and Thickness (mm) (Crushed Stone Base)	Edge Drains
29A801	109 AC	211	No
29A802	175 AC	312	No
29A807	218 PCC	152	No
29A808	282 PCC	152	No

2.2 Material Sampling and Testing

Locations of material sampling and field testing for each layer are given in attachment C. LTPP sampling field testing procedures have been developed specifically for the SHRP SPS-8 program, and all activities were performed in accordance with these guidelines unless noted in attachment E. Samples for laboratory testing were sent to Braun Intertec and the Missouri Department of Transportation.

2.3 Construction Activities

Removal of the existing pavement for this project began in early September 1998. Sections 29A801, 29A802, and 29A808 were located in cut areas, whereas section 29A807 was located in a cut and fill area. Subgrade preparation followed shortly thereafter. Paving operations were completed by mid-December 1998.

2.4 Subgrade Preparation

Subgrade preparation began October 14, 1998, and was completed October 20, 1998. An 11.0-ton sheepfoot was used for compacting the subgrade. Sections 29A801 and 29A802 were in a cut section whereas, section 29A807 was in a fill section. Section 29A808 was in a cut and fill section. All the sections were reconstructed with a typical subgrade lift thickness of 203 mm.

The flexible sections, 29A801 and 29A802, were constructed on a 0.5 percent vertical upgrade. A 3.0 percent vertical downgrade was maintained for the rigid sections, 29A807 and 29A808.

2.5 Placement of Base Layer

Preparation of the unbound base layer began on October 27, 1998 and was completed the same day. An 11-ton double drum vibrator roller was used for compaction. For all sections, lift thickness was typically 57 to 76 mm. Section 29A802 with the 279-mm base had three lifts—127, 76, and 102 mm.

2.6 Asphalt Paving

Paving operations began November 16, 1998, and were completed November 18, 1998. Two asphalt concrete mixes are used in these two flexible pavement test sections, the binder course and surface course. The GNM Drum Mix Plant, located 70 minutes from the site, produced the hot mix asphalt concrete (dense graded) for this site. Placement of the asphalt concrete was performed with a Barber Greene, model BG260 paver with a laydown width of 3 m. There was one longitudinal surface joint located between the lanes. The mean laydown temperature of the asphalt was 150°C, and the air temperature was 10°C. The first and the final layer were both allowed to cure for 1 day.

The AC binder course was placed before the final AC surface. A nominal lift thickness of 58 mm was used for the AC binder. For the asphalt concrete surface, a nominal lift thickness of 43 mm was used. The mean laydown temperature of the asphalt was 136°C, and the air temperature was 27°C.

Typically, for the AC surface layers, breakdown compaction was performed with an 11-ton single-drum vibrator roller. A 10-ton pneumatic-tired roller was used for the final compaction.

2.7 PCC Paving

The paving operation began November 24, 1998, and was completed the next day. The concrete mix plant used was Ideker's, located 1.6 km away, for a haul time of 10 minutes. A CMI-250 slip form paver was used at this site. A 6-m width was paved in one pass. Eight vibrators were placed 305 mm apart and 51 mm below the surface.

One mix design was used for this project. Type 1 cement was used with an air-entraining admixture (AASHTO M154). The coarse aggregate was made of 100 percent crushed stone and the fine aggregate was composed of 100 percent natural sand. The consolidation of materials was attained with internal vibrators and finishing was completed by machine-troweling. A membrane-curing compound was used and the surface was textured using a 3-m power comb.

The surface was profiled December 7, 1998, using a California type Profilograph with a 0.0-in blanking band. No diamond surface grinding was necessary because the profile index was 57 in/mile.

The average contraction joint spacing was 9 m. Spaced every 305-mm were dowels coated with epoxy. These dowels were 457 mm long with a 32-mm diameter. These were installed using pre-placed baskets. Transverse joints were sawed to a 51-mm depth and sealed with low-modulus silicone. The longitudinal joint was also sawed along the weakened plane.

Attachment A
Project Location

A-1 General project location.

Missouri (29)

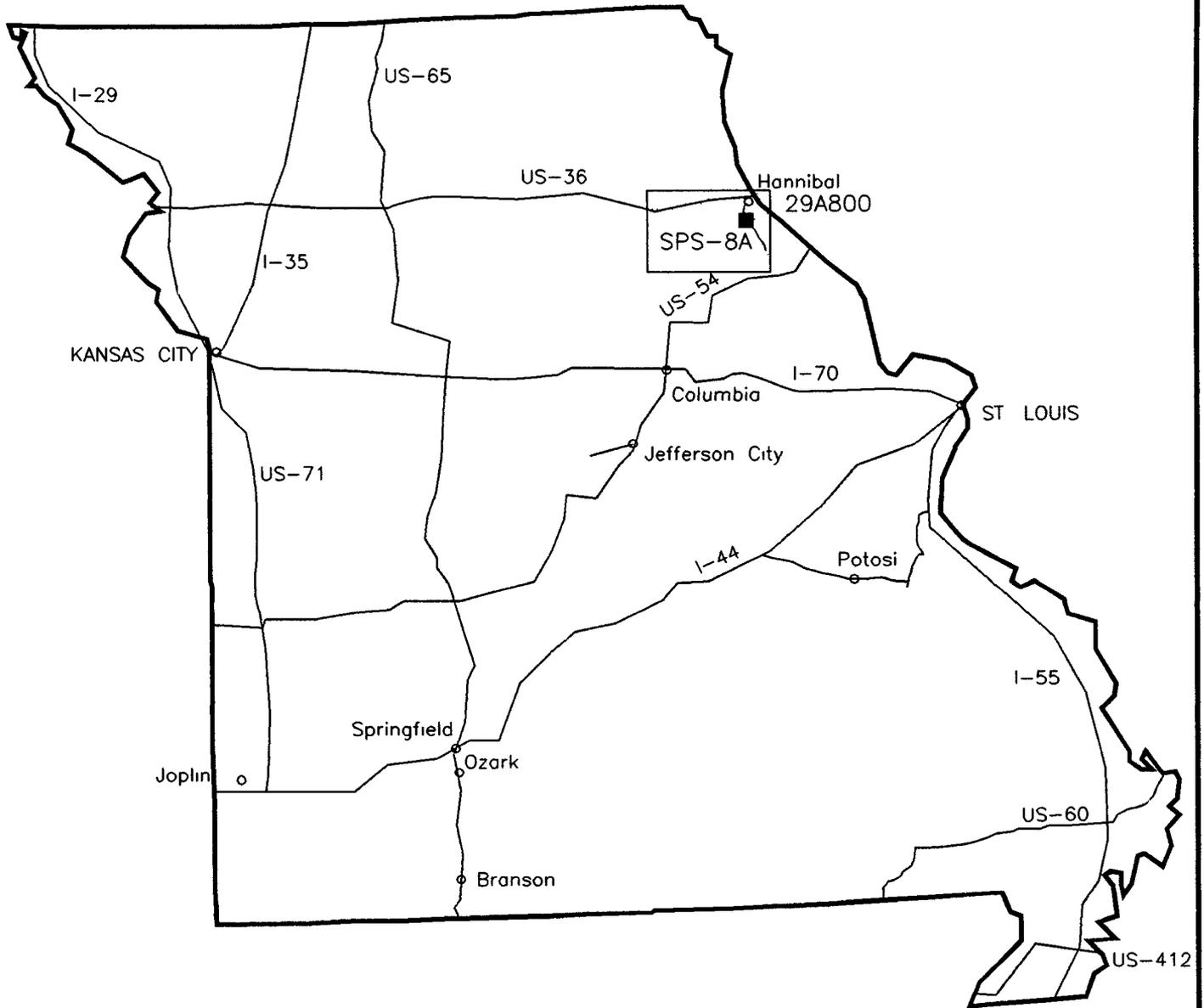


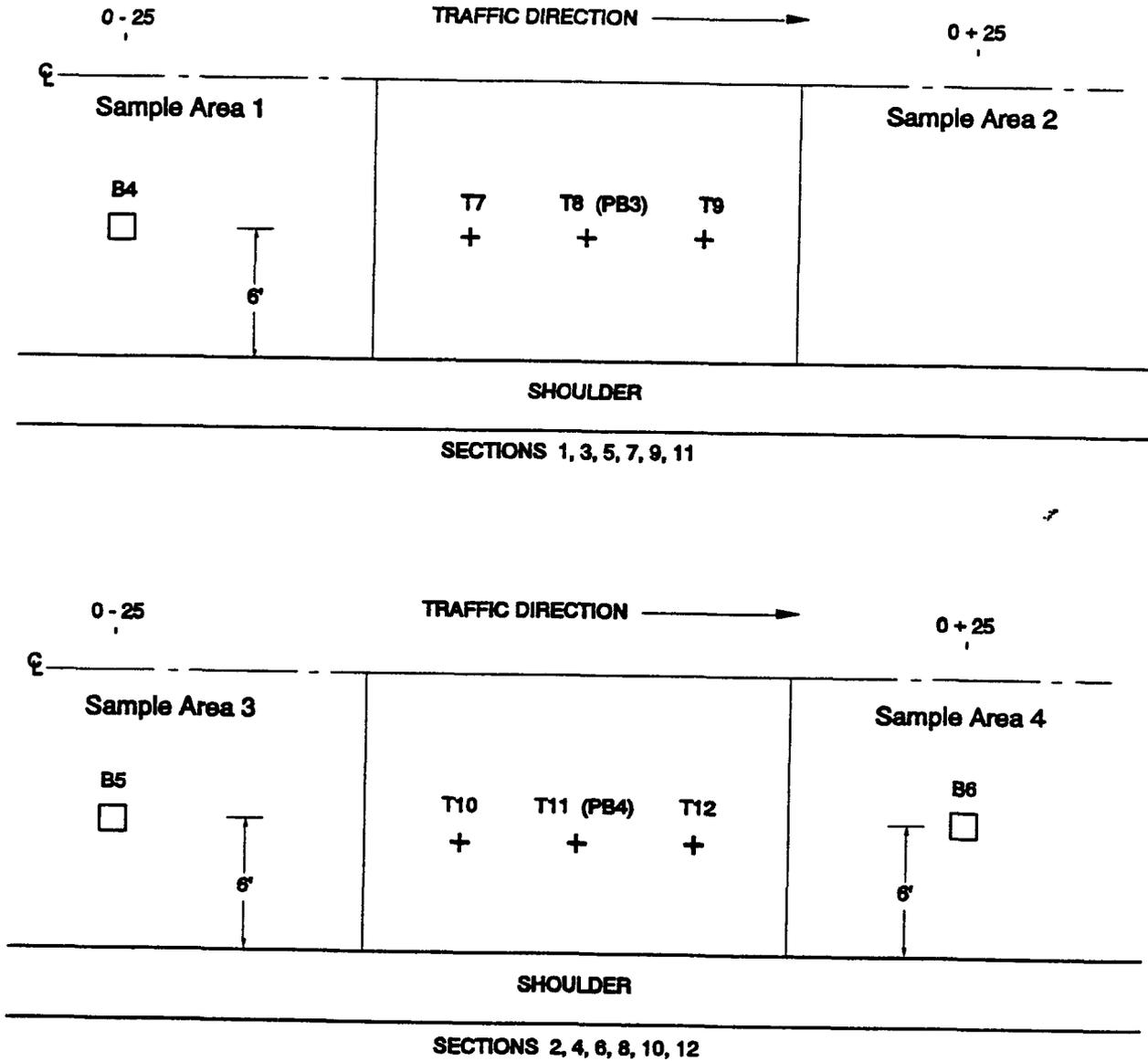
Figure A-1. General Project Location.

Attachment B

Site Layout

Figure B-1. Missouri SPS-A8 site layout.

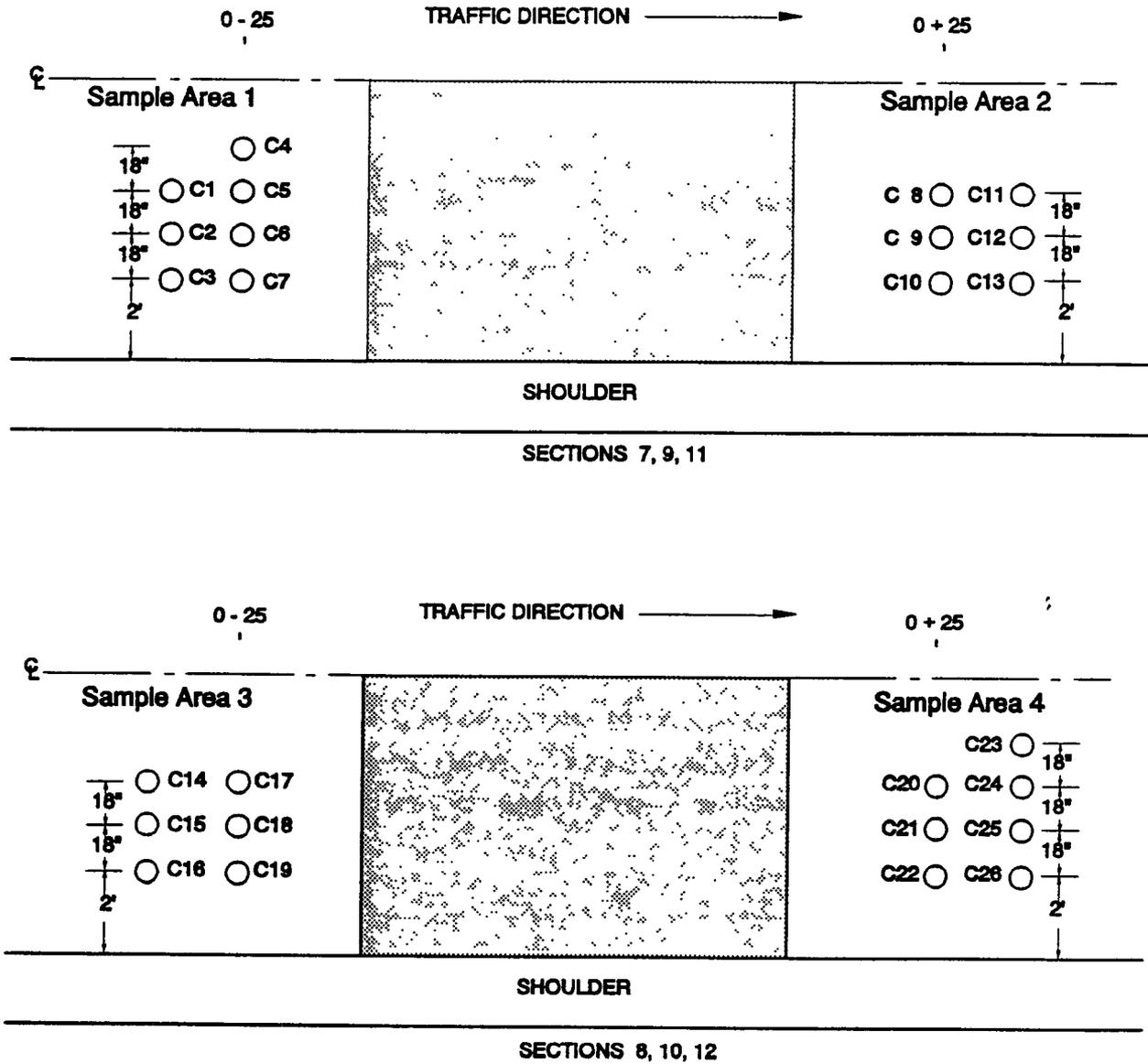
Attachment C
Material Sampling and Testing Plan



LEGEND

- B5 - Bulk sampling location 1ft x 1 ft - full layer thickness
- + T10 - In - place density test location
- PB3 - Location of Plate Bearing Test (Rigid Sections Only)
- 1 in = 25.4 mm
- 1 ft = 0.305 m

Figure C-2. Sampling and testing locations for base course.



LEGEND

○ - 4" Diameter Core of PCC surface

14 day - C1, C10, C20, C5, C14, C23

28 day - C2, C11, C21, C6, C15, C24, C3, C12
C26, C9, C18

1 year - C4, C13, C22, C8, C16, C25, C7, C17, C19

1 in = 25.4 mm

1 ft = 0.305 m

Figure C-4. Sampling and testing locations for PCC surface.

Attachment D

Layer Description and Thickness for Each Section

Table D-1. Material codes.

Material Code	Material Description
103	Subgrade-Fine-Grained Soils: Fat Clay
303	Base-Crushed Stone
700	Asphalt Concrete Binder PG64-22
700	Asphalt Concrete Surface PG64-28
730	Portland Cement Concrete (PCC)

Table D-2. Layer description and thickness for each section.

Test Section	Layer Number	Project Layer	Material Code	Average Layer Thickness (mm)
29A801 SB	1	Subgrade	103	N/A
	2	Base-Crushed Stone	303	211
	3	AC Binder	700	69
	4	AC Surface	700	41
29A802 SB	1	Subgrade	103	N/A
	2	Base-Crushed Stone	303	312
	3	AC Binder	700	135
	4	AC Surface	700	41
29A807 SB	1	Subgrade	103	N/A
	2	Base-Crushed Stone	303	152
	3	PCC	730	218
29A808 SB	1	Subgrade	103	N/A
	2	Base-Crushed Stone	303	152
	3	PCC	730	282

Attachment E
Project Deviation Reports

LTPP SPS Project Deviation Report Project Summary Sheet		State Code		<u>2</u>	<u>9</u>
		Project Code		<u>A</u>	<u>8</u>
Project Classification Information					
SPS Experiment Number: SPS-8		State or Province: Missouri			
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 checked="" type="checkbox"/> Active (SPS-8 Only)	
Project Experiment Classification Designation (SPS 1, 2, & 8): SPS-A8					
Construction Start Date: September 1998		Construction End Date: December 1998			
FHWA Incentive Funds Provided to Agency for this Project:					<input checked="" 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 checked="" type="checkbox"/> No Deviations	<input type="checkbox"/> Minor Deviations	<input type="checkbox"/> Significant Deviations	
Data Collection and Processing Status Summary					
Inventory Data (SPS 5,6,7, & 9):		<input type="checkbox"/> Complete Submission	<input 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		
Construction Data:		<input checked="" type="checkbox"/> All Required Data Obtained	<input type="checkbox"/> Incomplete / Missing Data Elements		
Historical Traffic Data:		<input type="checkbox"/> All Required Historical Estimates Submitted (SPS 5, 6, 7, & 9)			
		<input type="checkbox"/> Required Estimates Not Submitted			
Traffic Monitoring Equipment:		<input type="checkbox"/> WIM Installed On-Site	<input type="checkbox"/> AVC Installed On-Site	<input type="checkbox"/> ATR Installed On-Site	
		<input checked="" type="checkbox"/> No Equipment Installed			
Traffic Monitoring:		<input 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 type="checkbox"/> Monitoring Data Submitted		<input type="checkbox"/> No Monitoring Data Submitted	
FWD Measurements:		<input type="checkbox"/> Pre-construction Tests Performed		<input type="checkbox"/> Construction Tests Performed	
		<input checked="" type="checkbox"/> Post-construction Tests Performed			
Profile Measurements:		<input type="checkbox"/> Pre-construction Tests Performed		<input checked="" type="checkbox"/> Post-construction Tests Performed	
Distress Measurements		<input type="checkbox"/> Pre-construction Tests Performed		<input checked="" type="checkbox"/> Post-construction Tests Performed	
Maintenance and Rehab. Data:		<input type="checkbox"/> Complete Submission	<input type="checkbox"/> Incomplete	<input type="checkbox"/> Data Not Available	
Friction Data:		<input type="checkbox"/> Complete Submission	<input type="checkbox"/> Incomplete	<input checked="" 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 checked="" type="checkbox"/> Final Submitted To FHWA	
AWS: (SPS 1, 2, & 8)		<input checked="" type="checkbox"/> AWS Installed	<input checked="" type="checkbox"/> AWS Installation Report Submitted to FHWA		

**LTPP SPS Project Deviation Report
Construction Guidelines Deviation**

State Code
Project Code

 2 9
 A 8 0 0

Comments Pertain to All Test Sections on Project

Comments Pertain Only to Section(s): (Specify) _____

Construction Guidelines Deviation Comments

No deviations in construction noted.

LTPP SPS Project Deviation Report
Other Deviations

State Code
Project Code

A_ 8 2 9
_ 0 0



Comments Pertain to All Test Sections on Project



Comments Pertain Only to Section(s): (Specify) _____

Other Deviation Comments

None known.

**LTPP SPS Project Deviation Report
Site Location Guidelines Deviations**

State Code
Project Code

A_ 8 0 0 2 9

Comments Pertain to All Test Sections on Project

Comments Pertain Only to Section(s): (Specify) 29A807 and 29A808

Site Location Guideline Deviation Comments

29A807 located in fill section.

29A808 located in cut and fill section.

**LTPP SPS Project Deviation Report
Data Collection and Materials Sampling and
Testing Deviations**

State Code
Project Code

 2 9
 A 8 0 0



Comments Pertain to All Test Sections on Project



Comments Pertain Only to Section(s): (Specify) _____

Data Collection & Material Sampling and Testing Deviation Comments

No plate-bearing tests were performed for any of the concrete section layers.

P-59 FWD testing was not performed before the test section was constructed.

B3 bulk sample located after the section for the subgrade was not taken for section 29A802 & 29A808.

A2 sampling in Section 29A801 and 29A807 was not performed.

EXTRA bulk sampling was performed within the sections at the "A" (shelby tube) locations and are noted as B1A for section 29A801, B2A for section 29A802, B7A for section 29A807, and B8A for section 29A808.

S1 and S2 shoulder probes were not performed.