Long-Term Pavement Performance Warm-Mix Asphalt Study Final Report, Volume VI: SPS-10 Construction Documentation Guide

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U.S. Department of Transportation
Federal Highway Administration

Research, Development, and Technology
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LTPP™

FOREWORD

Warm-mix asphalt (WMA), an innovative material that is part of the Federal Highway Administration Every Day Counts program, has been implemented by State highway agencies throughout the United States. WMA covers a variety of categories, each designed to allow for production and compaction of AC at temperatures lower than conventional hot-mix asphalt (HMA).

Recognizing that a knowledge gap exists in the comparison of WMA and HMA over the performance life of each type of pavement, the Long-Term Pavement Performance (LTPP) program initiated this project to design a national experiment to study the performance of WMA relative to HMA. New test sections will be recruited into the LTPP program under the designation of Specific Pavement Studies-10 (SPS-10), "Warm Mix Asphalt Overlay of Asphalt Pavement Study."

The purpose of this volume of the report series is to document the guidelines and information for detailing construction activities for the SPS-10 experiment for the LTPP program. The SPS-10 experiment is designed to capture information on the short- and long-term performance of WMA relative to HMA. This experiment has been structured to ensure consistency and compatibility with the existing LTPP program objectives and database while addressing information gaps regarding WMA performance. The intent of the SPS-10 experiment is to capture not only field performance, but also laboratory test data that will allow both user-agencies and researchers a better understanding of the potential benefits of WMA. Collectively, this information could be used for performance prediction.

Mark Swanlund
Acting Director, Office of Infrastructure
Research and Development

TECHNICAL REPORT DOCUMENTATION PAGE

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
		NOTE: volumes greater than 1,000 L shall be shown in m^3		
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2,000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	$candela/m^2$	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2,000 lb)	T
		TEMPERATURE (exact degrees)		
°C	Celsius	1.8C+32	Fahrenheit	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m2	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	2.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

*SI is the symbol for International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised March 2003)

LONG-TERM PAVEMENT PERFORMANCE WARM-MIX ASPHALT STUDY PROJECT REPORT SERIES

This volume is the sixth of six volumes in this research report series. Volume I is the final report, and volume II through volume VI contain detailed information about the design and operations of the experiment. The following list contains the volumes of this series:

Volume	Title	Report Number
I	Long-Term Pavement Performance Warm-Mix Asphalt Study, Volume I: Final Report	FHWA-HRT-22-018
II	Long-Term Pavement Performance Warm-Mix Asphalt Study Final Report, Volume II: SPS-10 Experimental Matrix and Research Plan	FHWA-HRT-22-019
III	Long-Term Pavement Performance Warm-Mix Asphalt Study Final Report, Volume III: SPS-10 Nomination Guidelines	FHWA-HRT-22-020
IV	Long-Term Pavement Performance Warm-Mix Asphalt Study Final Report, Volume IV: SPS-10 Materials Sampling and Testing Requirements	FHWA-HRT-22-021
V	Long-Term Pavement Performance Warm-Mix Asphalt Study Final Report, Volume V: SPS-10 Performance Monitoring Guide	FHWA-HRT-22-022
VI	Long-Term Pavement Performance Warm-Mix Asphalt Study Final Report, Volume VI: SPS-10 Construction Documentation Guide	FHWA-HRT-22-023

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LIST OF ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
AC	asphalt concrete
AS	Aquashield™
ASTM	American Society for Testing and Materials
BBR	bending beam rheometer
$CaCl^2$	calcium dichloride
CBR	California Bearing Ratio
CMA	calcium magnesium acetate
CPR	concrete pavement restoration
CRCP	continuously reinforced concrete pavement
DSR	dynamic shear rheometer
ESAL	equivalent single-axle load
FHWA	Federal Highway Administration
FWD	falling weight deflectometer
GPS	General Pavement Studies
HA	highway agency
HOT	high-occupancy toll
HOV	high-occupancy vehicle
HMA	hot-mix asphalt
HMAC	hot-mix asphalt concrete
HPMS	Highway Performance Monitoring System
ID	identification
JPCP	jointed plain concrete pavement
JRCP	jointed reinforced concrete pavement
LL	liquid limit
LTM	long-term monitoring
LTPP	Long-Term Pavement Performance
MC	medium curing
NaCl	sodium chloride
PCC	portland cement concrete
PG	performance grade
PI	plasticity index
PL	plastic limit
PMA	plant-mixed asphalt
RA	recycling agent
RAP	recycled asphalt pavement
RAS	recycled asphalt shingles
QC	quality control
RSC	regional support contractor
RTFO	rolling thin film oven
SAMI	stress-absorbing membrane interlayer
SHRP	Strategic Highway Research Program
SPS	Specific Pavement Studies
VMA	voids in mineral aggregate

WIM	weigh-in-motion
WMA	warm-mix asphalt
WMAC	warm-mix asphalt concrete

INTRODUCTION

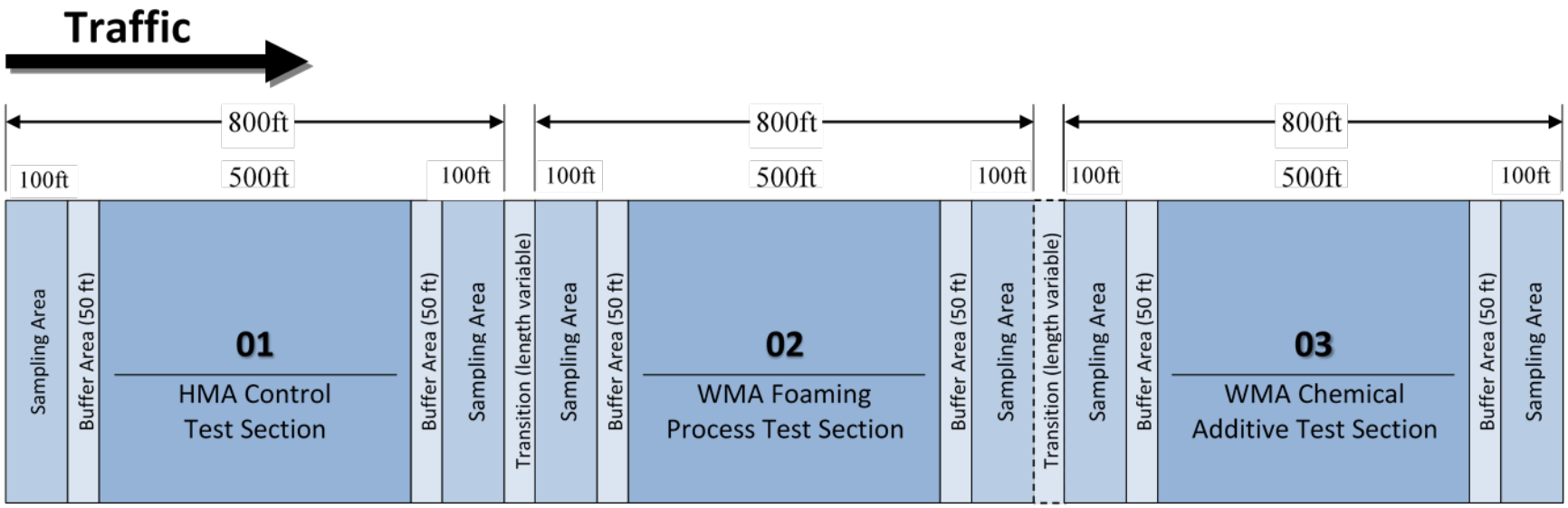
This document provides guidelines and information for documenting construction activities for the Specific Pavement Studies-10 (SPS-10) experiment warm-mix asphalt (WMA) study. These guidelines should be followed by the Federal Highway Administration (FHWA) Long-Term Pavement Performance (LTPP) regional support contractor (RSC) when working with U.S. State and Canadian Provincial highway agencies (HAs) in documenting SPS-10 construction activities. Properly documenting the construction activities for each SPS-10 project into a stand-alone SPS-10 construction report is critical to future analysis efforts.

PROJECT DESCRIPTION

The SPS-10 experiment is intended for test sections not previously in the LTPP program. Projects nominated into the SPS-10 experiment will be constructed specifically to satisfy cells within the experimental matrix. Because these sections will be nominated into the program prior to rehabilitation, all construction activities, material properties, and sampling will be documented to ensure a complete dataset. Each SPS experiment in the LTPP program is designed to have a set of targeted goals, construction guidelines, and experimental approaches aimed at intensive studies of a few significant variables. This section, among other things, defines the goals/objectives of the SPS-10 experiment and the significant variables to be studied.

The SPS-10 experiment requires construction of a minimum of three core test sections at each project site as well as any supplemental sections built by the HA. Figure 1 demonstrates a sample test section layout, including stationing, transition areas, and pavement layers. Construction is limited to overlays of asphalt concrete (AC) pavements only. The minimum three core test sections consist of:

- HAs' standard hot-mix asphalt (HMA) (control section).
- WMA mix with a WMA foaming process category.
- WMA mix with a WMA chemical additive category.



Source: FHWA.
1 ft = 0.3048 m.

Figure 1. Diagram. Example test section layout.

WMA technologies currently available can be grouped into the following four categories (some technologies are a combination of these):

- Foaming additive.
- Chemical additive.
- Organic additive.
- Foaming process.

The LTPP SPS-10 experiment focuses on the chemical additive and foaming process technologies. Since this is a materials comparison study, the pavement structure and thicknesses of the layers containing the experimental mixtures must be the same on all test sections. HAs are encouraged to take the opportunity afforded by the construction of these experimental test sections, whose long-term performance will be uniformly monitored, to construct supplemental sections investigating experimental factors of specific HA interest.

CONSTRUCTION REPORT

A construction report is required for every SPS-10 project. An important piece of the construction report is completing the data sheets associated with building the project. This process enables maximum uniformity across all projects and ensures that a comprehensive set of data is entered into the LTPP database (Elkins et al. 2017). Guidelines for developing the construction report are outlined in the following section.

Table 1 lists the LTPP SPS construction data sheets that were developed for the SPS-10 experiment.

Table 1. List of LTPP data sheets and titles.

LTPP SPS-10 Construction Data Sheet Number	LTPP SPS-10 Construction Data Sheet Title
LTPP SPS-10 data sheet 1	Project ID
LTPP SPS-10 data sheet 2	Project stations
LTPP SPS-10 data sheet 3	General information
LTPP SPS-10 data sheet 4	Layer
LTPP SPS-10 data sheet 5	Age and major improvements
LTPP SPS-10 data sheet 6	Snow removal/deicing
LTPP SPS-10 data sheet 7–8	HPMS data items
LTPP SPS-10 data sheets 9–11	PMA aggregate properties
LTPP SPS-10 data sheet 12	PMA binder
LTPP SPS-10 data sheet 13	PMA binder aged
LTPP SPS-10 data sheet 14	AC, DSR, BBR, and direct tension
LTPP SPS-10 data sheet 15	RAP
LTPP SPS-10 data sheets 16–17	PMA lab mix design
LTPP SPS-10 data sheet 18	PMA lab mix design warm mix

LTPP SPS-10 Construction Data Sheet Number	LTPP SPS-10 Construction Data Sheet Title
LTPP SPS-10 data sheets 19–20	PMA mix prop
LTPP SPS-10 data sheet 21	Superpave™ mixture properties
LTPP SPS-10 data sheets 22–23	PMA construction
LTPP SPS-10 data sheets 24–25	Unbound
LTPP SPS-10 data sheets 26–27	Subgrade
LTPP SPS-10 data sheet 28	QC measurements
LTPP SPS-10 data sheet 29	Field thickness
LTPP SPS-10 data sheet 30	Notes and comments
LTPP SPS-10 data sheet 31	Milled sections
LTPP SPS-10 data sheet 32	Improvement listing
LTPP SPS-10 data sheet 33	Pre-overlay surface preparation sketch
LTPP SPS-10 data sheet 34	PMA pre-overlay (patch)
LTPP SPS-10 data sheet 35	PMA pre-overlay (sealing)
LTPP SPS-10 data sheets 36–37	PMA pre-overlay seal coat

BBR = bending beam rheometer; DSR = dynamic shear rheometer; HPMS = Highway Performance Monitoring System; ID = identification; PMA = plant-mixed asphalt; RAP = recycle asphalt pavement; QC = quality control.

Use table 2 to complete the SPS-10 data sheets for the SPS-10 project and sections.

Table 2. List of LTPP data sheets to be completed for each section.

Construction Data Sheets	WMA Test Sections	HMA Test Sections	Project Level
1	—	—	✓
2	—	—	✓
3	—	—	✓
4	✓	✓	—
5	—	—	✓
6	—	—	✓
7	✓	✓	—
8	✓	✓	—
9–11	a*	a*	—
12	a*	a*	—
13	a	a	—
14	a	a	—
15	a	a	—
16–17	a*	a*	—
18	a*	a*	—
19–20	a*	a*	—
21	a*	a*	—
22–23	a*	a*	—
24–25	b	b	—
26–27	c	c	—
28	✓	✓	—

Construction Data Sheets	WMA Test Sections	HMA Test Sections	Project Level
29	✓	✓	—
30	✓	✓	—
31	✓	✓	—
32	✓	✓	—
33	✓	✓	—
34	✓	✓	—
35	✓	✓	—
36–37	✓	✓	—

—No data available.
✓ = always complete this data sheet.
a = complete data sheet for each plant-mixed asphalt layer (including existing layers and new overlay layers constructed for the SPS-10 experiment).
b = complete data sheet for each existing unbound layer.
c = complete data sheet for each existing subgrade layer.
*also complete data sheet for each asphalt-treated base.

CHAPTER 1: CONSTRUCTION REPORT REQUIREMENTS

This chapter outlines participation requirements and provides guidelines and information for documenting construction activities for an SPS-10 study. Documenting the construction activities during each project in a stand-alone SPS-10 construction report is vital to future analysis efforts.

The following list provides the recommended elements for each SPS-10 construction report:

- Cover page.
- Table of contents (including a list of tables and list of figures).
- Chapter 1: Introduction.
- Chapter 2: Project description.
- Chapter 3: Construction.
- Chapter 4: Summary.
- Chapter 5: Key observations.
- Appendix A: Construction photographs.
- Appendix B: Mix designs.
- Appendix C: Materials sampling and testing layouts.
- Appendix D: Other construction documents.
- Appendix E: Complete set of SPS-10 data sheets.
- Appendix F: SPS-10 deviation report.

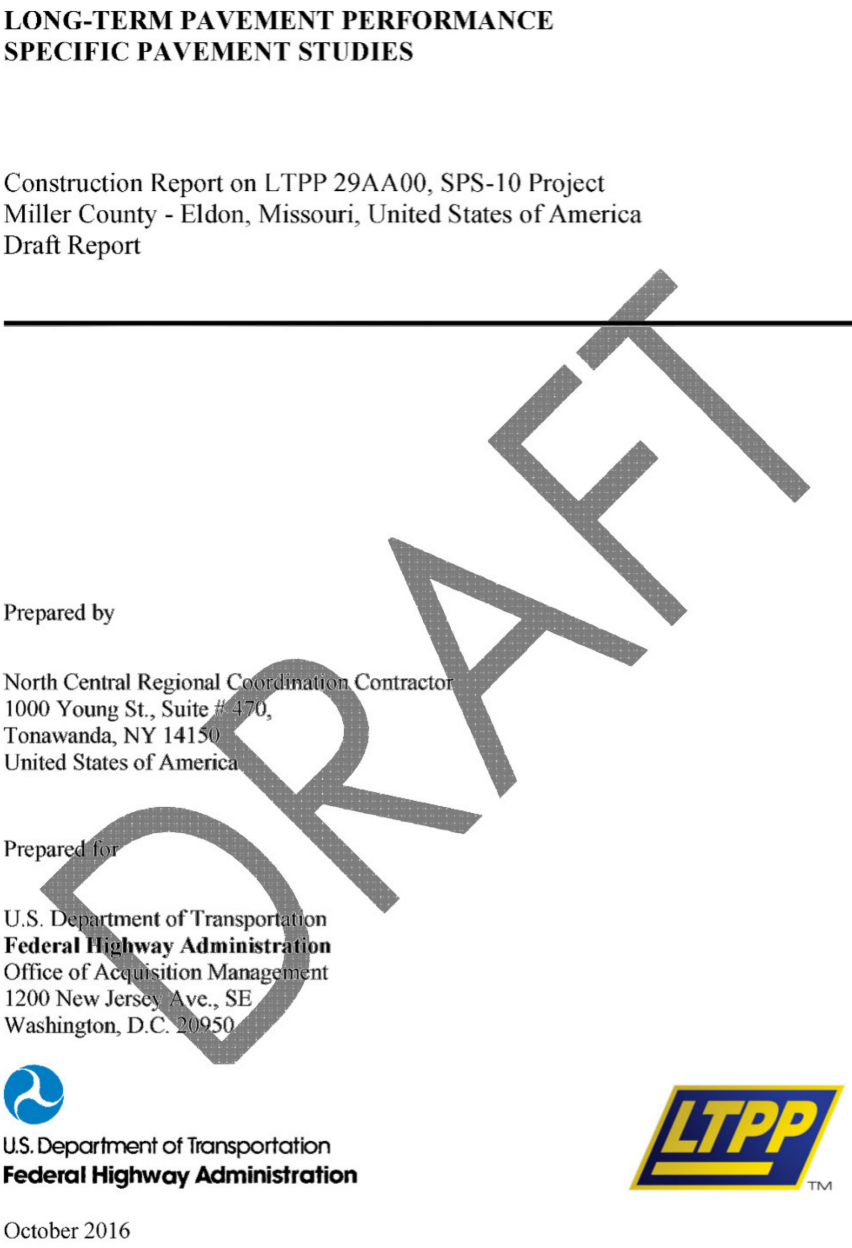
The minimum contents for each element are described in the following section.

SPS-10 CONSTRUCTION REPORT COVER PAGE

The cover page should contain the following information:

1. LTPP and FHWA logos.
2. "SPS-10 project" label.
3. Project location.
4. "Draft report" or "final report" note (depending on the version of the report).
5. Report author (the RSC that developed the report and their contact information).
6. Date report completed.

A mockup of a completed construction report cover page is shown in figure 2.



Source: FHWA.

Figure 2. Illustration. Mockup of report cover page.

SPS-10 CONSTRUCTION REPORT CHAPTER 1: OVERVIEW

The following sections should be included in the introduction for each SPS-10 construction report.

General Overview of SPS-10

The general overview of the SPS-10 project should include the following information at a minimum:

The SPS-10 experiment is designed to capture information on the short- and long-term performance of WMA compared to HMA. For the purposes of the experiment, LTPP defines WMA as asphalt mixtures produced at least 30 °F below normal HMA production temperatures or asphalt produced at below 275 °F. The experiment provides the ability to directly compare the performance of WMA to HMA. Field performance will be monitored over the long term, and data from laboratory testing of WMA materials will be provided to researchers looking to evaluate various features of WMA. Collectively, this information will be used for a better understanding of the potential benefits of WMA and for better performance predictions.

The objectives of the SPS-10 experiment are to:

- Evaluate and improve the practical aspects of implementing the WMA system through a hands-on field trial by interested HAs.
- Compare the performance of the WMA technologies against mixes designed with current HAs' HMA specifications, asphalt-aggregate specifications, and mix-design procedures.
- Provide long-term performance data to evaluate and refine the WMA technologies, design procedures, and models.
- Test the sensitivity of the WMA technology relative to low-temperature cracking, fatigue, or permanent deformation distress factors.
- Provide HAs with the opportunity to evaluate the performance of other experimental features through the construction of supplemental sections.

The SPS-10 experiment is intended for test sections not previously in the LTPP program. Because these sections will be nominated into the program prior to rehabilitation, all construction activities, materials properties, and sampling are documented in this report.

Broad Overview of the Project

Include a broad overview of the specific project in the introduction of the construction report. The broad overview of the project will note the highway (interstate or State route), travel direction, and location of the SPS-10 project site. Along with the location of the project, other information included must be, at a minimum, the total number of test sections (three core sections and supplemental sections), the WMA technologies and recycled asphalt pavement

(RAP) used, and a brief overview of the project pavement structure and any rehabilitation performed.

Description of Report Organization

A brief description of the report organization must be included to provide a summary of the remaining report sections/chapters and their respective contents. For a typical construction report, the following outline should be followed:

- Chapter 2 provides the project location, description, and other attributes of the project.
- Chapter 3 describes the materials and construction procedures for each layer and then continues to detail construction sequence and operations.
- Chapter 4 summarizes the test section construction.
- Chapter 5 documents the key observations.
- Appendix A contains a collection of construction photographs from the project.
- Appendix B contains the mix designs for each section.
- Appendix C contains the materials sampling and testing layouts.
- Appendix D contains construction documents, including the project plans, specifications, special provisions, and production strip charts as well as daily logs and field notes of activities, equipment, and weather conditions.
- Appendix E contains the SPS-10 data sheets.
- Appendix F includes the deviation report.

SPS-10 CONSTRUCTION REPORT CHAPTER 2: PROJECT DESCRIPTION

The project description will include basic information on the project with the use of text as well as tables and figures. The description will serve as an introduction to the specific SPS-10 experiment. Project information will contain, at a minimum, the following sections.

Test Section Layout

Include a figure of the test section layout that describes the stationing, transition areas, and pavement layers.

Physical Attributes

The report should include the physical attributes of the project (i.e., project location, surrounding terrain, and the existing pavement condition). The highway (interstate or State route), the nearest township/city, and the Global Positioning System coordinates must be described. A figure of the

location of the project on a map must be included. Also, the immediate terrain (e.g., rolling hills, flat, etc.) and the existing pavement condition should be included. A description of existing pavement should include the structure, layers, maintenance and rehabilitation history, and condition. The description of the condition of the pavement must be presented in terms of manual distress survey, deflection testing, transverse profile, longitudinal profile, and texture measurements.

Climate

The project climate data must describe the climatic zone of the project using one of the four LTPP-defined climatic zones: wet freeze, dry freeze, wet no-freeze, and dry no-freeze. The criteria established to distinguish wet and dry climates is based on annual precipitation. The LTPP program defines climates with an annual precipitation of less than 20 inches (508 mm)/yr as "dry." Conversely, wet climates are those receiving more than 20 inches (508 mm) of precipitation per year. Freezing index is used by the LTPP program to define the freeze and no-freeze climates. A site located where the annual freezing index is greater than 150 °F meets the LTPP criteria for the freeze climatic zone (Elkins 2021). The annual freezing index and annual precipitation must also be stated explicitly, separate from the climatic zone, along with the seasonal (winter and summer) average for minimum and maximum temperature. The location of nearest operational National Oceanic and Atmospheric Administration or National Weather Service weather station and the distance from the site must be noted.

Traffic

To provide a brief overview of the traffic conditions of the project, a table should be included that describes the annual average daily traffic of the project in each direction. The percent of heavy trucks and combinations of vehicles in the LTPP test lane should also be included in the table. Finally, the table should include the estimated 18,000 lb equivalent single-axle load (ESAL) for the study lane and the design length period with the total design 18,000 ESAL applications in the design lane for the project. If load spectra traffic data are available, the data must be described in this section of the construction report. Traffic monitoring with a weigh-in-motion (WIM) must describe the location, model, manufacturer, and last calibration of the WIM.

Project Geometry

The project geometry must describe the grade of the project among other items. The horizontal and/or vertical curvature also must be included if any exists as well as the embankment and cut/fill properties of the project. Finally, any special features relating to the project geometry must be described; for example, indicate whether any onramps, offramps, or culverts exist inside the project limits.

Supplemental Test Sections (If Included)

Sponsoring HAs have the opportunity to expand the SPS-10 experiment to address their own interests and concerns as well as to incorporate innovative technologies through the construction of supplemental sections. If supplemental sections are included in the project, also include a brief overview. The current, recommended, potential supplemental sections are as follows:

- Using organic WMA additives.
- Using foaming additives (instead of foaming process used in core sections).
- Using varying levels of RAP or including RAP percentages outside the acceptable range for core test sections.
- Including recycled asphalt shingles (RAS).
- Changing the thickness of the overlay layer.
- Changing the binder grade.
- Changing production temperatures or constructing sections with WMA technology produced at temperatures above the acceptable range for core test sections.
- Using multiple WMA technologies in one mixture.
- Using stone-matrix asphalt, or gap- or open-graded mixtures.
- Changing aggregate sources.

If such supplemental sections are used, the overview must note the properties of the supplemental sections, including mix design, pavement design thickness, structure, and WMA technologies as used.

Project Personnel (HA, Contractor, RSC)

The personnel involved in the project should be noted, including personnel from the governing HA, the contractor(s), and the RSC. The HA should be noted along with the personnel from the project, including the resident engineer for the project, the assistant resident engineer, the inspector(s), the field sampling and testing crew, and any others involved with the coordination and execution of the project. The primary contractor should be noted along with the project manager and construction superintendent. Subcontractors, if used, should be mentioned together with their assigned project responsibilities. In addition, list the RSC personnel onsite during construction as well as the personnel onsite tasked with pre-overlay, construction, and post-overlay LTPP monitoring. Such field notes should include personnel performing falling weight deflectometer (FWD) testing, manual distress survey, texture, and profile testing measurements.

SPS-10 CONSTRUCTION REPORT CHAPTER 3: CONSTRUCTION

Detailed construction information (in text as well as tables and figures) must be provided, including, at a minimum:

- Work activity dates, including patching, crack sealing, mill work, and any overlay work.

- Description of equipment onsite (and at the production plant). Information should be included for the hot-mix production plant and the pavement equipment. Hot-mix production plant information should include the type of plant used, description, and location along with hauling distance and haulers. Information for the paving equipment should include the paver used, the pick-up machine, the rollers, and the number of passes.

- Detailed materials information (full mix designs will be contained in appendix B of the construction report) should include the aggregate source, aggregate properties, and the number of stockpiles used.

- Field quality-control (QC) test results performed by the HA or contractor.

- Section by section details including lift thickness, paving width, density, temperature (i.e., ambient, at the production plant and laydown, and during paving), compactive effort, and any construction issues or problems.

SPS-10 CONSTRUCTION REPORT CHAPTER 4: SUMMARY

The summary must be an overview of key project details and construction activities. The summary will note the number of LTPP test sections within the project, the highway (interstate or State route number) and the city closest to the project site. A brief recap of each section's attributes must also be included (pavement thicknesses, WMA technologies (if used) and pre-overlay preparation practices performed). Also, the project's beginning construction date and ending construction date must be included. Finally, any construction issues encountered must be included, with a more detailed description included in chapter 5 (key observations).

SPS-10 CONSTRUCTION REPORT CHAPTER 5: KEY OBSERVATIONS

The key observations chapter will capture noteworthy observations for each test section. This chapter will also document issues encountered during construction, including, but not limited to, equipment breakdowns, weather conditions, and/or material variability.

SPS-10 CONSTRUCTION REPORT APPENDIX A: CONSTRUCTION PHOTOGRAPHS

Appendix A must contain photos of each section before, during, and after rehabilitation. Photographs of the production plant and paving operation must also be contained in this appendix.

SPS-10 CONSTRUCTION REPORT APPENDIX B: MIX DESIGNS

Appendix B will contain complete mix design information for each section (core and supplemental):

- Appendix B1—HMA.
- Appendix B2—Foaming process.
- Appendix B3—Chemical additive.

Appendices for supplemental sections should start at B4 and continue sequentially based on the number of supplemental sections.

SPS-10 CONSTRUCTION REPORT APPENDIX C: MATERIALS SAMPLING AND TESTING LAYOUTS

Appendix C will contain copies of the layouts from the materials sampling and testing (MS&T) plan, including a copy of the as-sampled, field-used layout from the MS&T plan and the originally designed MS&T plan with any differences noted between the two plans.

SPS-10 CONSTRUCTION REPORT APPENDIX D: OTHER CONSTRUCTION DOCUMENTS

Appendix D will contain other construction documents pertaining to the project, including the following (if available):

- Plans, specifications, and special provisions.
- Strip charts during production.
- Daily log of activities/equipment/weather.
- Other available construction information.
- Daily field notes from personnel onsite.

SPS-10 CONSTRUCTION REPORT APPENDIX E: SPS-10 DATA SHEETS

SPS-10 data sheets for the SPS-10 experiment include primarily items related to the WMA technologies and the placement temperatures and properties of the overlay material. A complete set of SPS-10 data sheets along with descriptions of each data sheet are in chapter 2 of this volume, “Data Collection and Recording.”

SPS-10 CONSTRUCTION REPORT APPENDIX F: SPS-10 DEVIATION REPORT

Any deviations from the SPS-10 guidelines must be noted in a deviation report. Blank copies of the various deviation report elements can be found in appendix B of this volume.

CHAPTER 2: DATA COLLECTION AND RECORDING

RECORD DATA

These guidelines contain the SPS-10 data sheets necessary for recording data activities during test section construction.

Even though space is provided in the data sheets for a broad array of data items, it is recognized that much of the data will not be available. When the data item is not applicable to or represents something that does not exist on the test section, enter an "N" to indicate that the data item is not applicable. If the data item is applicable but the value is unknown (i.e., not available in project records), enter a "U" to indicate that the value is unknown. Many data items will require codes to be entered. Unless otherwise noted in the following instructions, the codes are listed or referenced on the data sheets in this volume.

Some construction data items may apply to more than one test section. However, a large portion of the data items will be specific to each test section. Data items common to all test sections will be referred to as "project-level data," while data items specific to each test section will be referred to as "section-specific data."

DATA COMMON FOR ALL LTPP SPS-10 DATA SHEETS

A common set of project identification (ID) data appears in the upper-right-hand corner of every data sheet. These data items are described as follows:

- State code: The State code is a number used to identify the U.S. State or Canadian Province in which the pavement section is located. (See table 3 for codes.)
- Strategic Highway Research Program (SHRP) section ID: The SHRP section ID is a four-digit ID number assigned by the LTPP. This number is used to facilitate the computer filing of the projects and will identify the section in the field.

SHRP ID

The SHRP section ID is an LTPP-assigned four-digit ID number. This number is used to facilitate the computer filing of the projects and will identify the section in the field.

SPS-10 sections have a six-digit identifier. The first two digits represent the State code, and the next four digits represent the SHRP ID. The first digit of the SHRP ID identifies the section as an SPS-10 experiment. This digit will always be a 0 (zero). The second digit is a designator to differentiate between multiple projects for a specific SPS experiment in the same HA. An A, B, C, and so on are assigned to the first, second, third, and so on project selected for a SPS-10 experiment in the same HA. The remaining two digits identify the individual test section. The test section number is specific to the experiment design. Project-level data are specified using 00 as the test section number. For SPS projects, the inventory data are expected to apply to the entire project length. Therefore, the data should be entered for the project level section ID of 00. See the following breakdown for an example, 040A01:

Where:

04 = the State code for Arizona.
0 = the designation for an SPS-10 experiment.
A = the first SPS-10 experiment assigned in Arizona.
01 = the first section at this site.

DESCRIPTION OF LTPP SPS-10 DATA SHEETS

The following provides a description of each data sheet used in the collection of SPS-10 data.

Project ID (SPS-10 Data Sheet 1)

A project and section ID data sheet need to be completed for each project. These data are to be filled out from project records on SPS-10 data sheet 1.

Individual data items are as follows:

- Date of data collection or update (item 1): The month and year in which the "as-built" construction inventory data was collected. The number to identify the month is in numerical sequence of the months as they occur during the year (i.e., enter 03 for March, etc.). The year is identified using four digits.

- Highway agency district number (item 2): The number identifying the HA district in which the pavement test section is located.

- County or parish (item 3): The code for the county or parish where the pavement section is located. County codes come from Federal Information Processing Standards Publication 6, *Counties of the States of the United States* (NIST 2008).

- Functional class (item 4): The number identifying the functional classification of highway for which the pavement section is a sample (table 4).

- Route number (item 5): The signed route number (leading zeros should not be used). For example, I–81 should be coded as "81," and I–35W should be coded as "35." The signed route number should be the same route number that is identified for the route in data items 4 and 5 (route signing and route qualifier).

- Route signing (item 6): The type of route signing. These codes appear in table 26.

- Route qualifier (item 7): The type of route signing. Codes for route signing are provided on SPS-10 data sheet 8.

- Alternate route name (item 8): A familiar, nonnumerical designation for a route. This data item is optional and can be left null if it is unknown.

- Number of through lanes (item 9): The number indicating the total number of through lanes in the direction of travel.

- Date open to traffic (item 10): The year and month the project was opened to traffic.

- Construction costs per lane mile (in $1,000s) (item 11): The total average construction cost (in $1,000s) per lane mile for the test section.

- Milepoint (item 12): The milepoint at which the project is located.

- Elevation (item 13): The elevation of the project.

- Additional location information (item 14): Text describing any additional location information, such as landmarks. This type of information will help field crews locate the project during monitoring activities.

Project Stations (SPS-10 Data Sheet 2)

A reference project station system must be established for each project. While a majority of the construction data sheets are completed in English units, this data sheet will be completed using metric units. This station referencing system starts with station 0 + 00 assigned to the starting point of the first test section encountered during the project. The station number of the beginning and end of all test sections on the project will be referenced to this point to provide a relative distance measure of the beginning, end, and distance between test sections on the site. This continuous system is used to avoid compounding measurement. This information will be used to process profile data collected from continuous measurements over the test sections and to identify the locations of the materials sampling and testing operations on the test sections for the entire site. Additionally, this information will indicate the ordering and distance between test sections.

Field measurements (made with a steel tape) should be used to locate the start and end point of each test section with an accuracy of ± 0.1 m (0.328 ft). Ideally, these measurements should be made prior to overlay construction, e.g., when the test section locations are initially marked on the pavement. These data can then be used as a check against the repositioning of the start and end of the test sections following overlay construction. Otherwise, these measurements should be performed on the as-marked sections following construction.

These data are to be filled out from project records on SPS-10 data sheet 2.

Individual data items are as follows:

- Test section ID (item 1): The four-digit test section ID number should be entered for each SPS-10 section.

- Start station number (item 2): The station number of the starting point of the test section relative to the starting point of the first test section on the project to the nearest 0.1 m.

- End station number (item 3): The station number of the ending point of the test section relative to the starting point of the first test section on the project to the nearest 0.1 m.

- Subgrade structure type (item 4): Enter the code number shown under note 1 on SPS-10 data sheet 2 to indicate if the test section is located entirely on fill, cut, or at grade or is located on both cut and fill. If the test section is located on both cut and fill, the approximate location of the cut-fill transition within the test section should be entered using a test section relative station number (0 + 00 to 1 + 52.4).

- Direction of travel (item 5): Code for signed direction of traffic flow along the entire route, including the test section.

- Intersections between test sections on the project (item 6): If any intersections occur between any of the test sections on the project, indicate the number or name of the intersection route as well as the reference project station number (referring to the start of the first project test section), and check whether the intersection is an entrance or exit ramp and/or whether it has a stop sign, a traffic signal, or no sign/signal.

General Information (SPS-10 Data Sheet 3)

This data sheet provides geometric, drainage, and general information on the sections throughout the entire project length. These data are to be filled out from project records on SPS-10 data sheet 3.

Individual data items are as follows:

- Lane width (item 1): The width of the lane to be monitored to the nearest foot.

- Monitoring site lane number (item 2): A number that identifies which lane will be monitored. The lane numbering methodology is identified on SPS-10 data sheet 3. Lanes should be numbered, starting with the outside lane as lane one, and increase toward the centerline of the roadway.

- Direction of travel (item 3): Code for signed direction of traffic flow along the entire route including the test section.

- Speed limit (item 4): The posted speed limit for the given section of the road.

- Median type (item 5): The type of median. Codes for the type of median are provided on SPS-10 data sheet 9.

- Median width (item 6): The existing median width.

- Drainage data (items 7–10): Space is provided to enter data describing subsurface drainage features. If there is no drainage, enter “N” for those spaces pertaining to drainage.

- Subsurface drainage location (item 7): A code indicating whether the subsurface drainage is continuous along the section or is provided at intermittent locations. Codes are provided on SPS-10 data sheet 3.

- Subsurface drainage type (item 8): A code indicating the type of system used to provide subsurface drainage ranging from no subsurface drainage provided to a well system or a drainage blanket with longitudinal drains. Codes for each type of subsurface drainage are provided on SPS-10 data sheet 3. A code and space are provided for describing another type of subsurface drainage if different from those provided on SPS-10 data sheet 3.

- Diameter of longitudinal drainpipes (item 9): The inside diameter to the nearest tenth of an inch (0.1 inch) of the longitudinal drainpipes used for subsurface drainage. If there is no longitudinal drainage, enter "N."

- Spacing of laterals (item 10): The average spacing in feet between lateral drains from the pavement subdrainage system. Enter "N" if there are no subdrainage laterals.

- Shoulder data (items 11–16): Space is provided to enter data describing both the outside and inside shoulder. If there are no shoulders, enter "N" for those spaces pertaining to shoulders.

- Shoulder surface type (item 11): A code indicating the type of material used for the surface of the shoulder for the outside and inside shoulders. Codes are provided on SPS-10 data sheet 3. If the full width of the shoulder is only partially paved, enter the code for the material used in the paved portion of the shoulder.

- Total width (item 12): The total paved and unpaved width of the outside shoulder. A separate space is provided for the total paved and unpaved width of the inside shoulder to the nearest foot.

- Paved width (item 13): The paved widths of the outside and inside shoulders to the nearest foot.

- Shoulder base type (item 14): Codes identifying the types of material used as the base of the pavement structure on the shoulders. (See table 9 for codes.)

- Shoulder surface thickness (item 15): The average thicknesses of the inside and outside shoulder surfaces to the nearest tenth of an inch (0.1 inch).

- Shoulder base thickness (item 16): The average base thicknesses along the shoulders to the nearest tenth of an inch (0.1 inch).

Layer (SPS-10 Data Sheet 4)

The data on this data sheet provide key information as to the structure of the pavement when it is open to traffic during the LTPP study. These data are to be filled out from project records on SPS-10 data sheet 4. As all subsequent data sheets refer back to this one, special care should be taken in establishing the layering.

Individual data items are as follows:

- Layer number (item 1): Space is provided for up to nine layers. If more than nine layers are needed, please use an additional SPS-10 data sheet 4. Layer numbering begins at the bottom of the structure and increases moving to the top of the structure. Therefore, the subgrade is always layer number one, and the last (and largest) number identifies the surface layer.

- Layer description (item 2): A layer description code identifying the function of the layer within the pavement structure is to be entered for each of the layers in the system. Codes are provided on SPS-10 data sheet 4. For AC layers, separate lifts of the same mixture are not to be identified as separate layers.

  Many HAs cover poor subgrade soils with 1–3 ft of select material. Such an embankment should be reported as a subbase with a layer description code 06.

- Material type classification (item 31): A code identifying the type of material used in each layer of the pavement structure, including the subgrade, should be entered for material type classification. Codes for surfacing materials, base and subbase materials, subgrade soils, and thin seals and interlayers are identified in table 8, table 9, table 10, and table 11, respectively.

- Layer thickness (item 4): Four numbers can be provided to indicate the mean, minimum, maximum, and standard deviation of thickness for each specific layer in inches (to the nearest tenth of an inch (0.1 inch)). If only a single specified design value for thickness is available from project records, enter it as the "mean value."

Age and Major Improvements (SPS-10 Data Sheet 5)

This data sheet provides information regarding dates of construction for the primary pavement structure and any major improvements or rehabilitation that have occurred since that construction. Data should be provided for any improvement events on the existing pavement structure up to the SPS-10 construction. These data are to be filled out from project records on SPS-10 data sheet 5 for which long-term monitoring (LTM) is planned.

Individual data items are as follows:

- Date of latest construction/reconstruction (item 1): Month and year in which construction or reconstruction (if any, not including overlay or mill and overlay, have been performed) of the pavement to be monitored has been completed. The first two digits represent the numerical sequence of the month as it occurs during the year, and the remaining four digits are the year.

- Date subsequently opened to traffic (item 2): The month and year that the pavement was originally opened to traffic (not the date when the project was accepted). The first two digits represent the numerical sequence of the month as it occurs during the year, and the remaining four digits are the year.

- Latest construction/reconstruction cost per lane mile (item 3): The total average original construction or reconstruction cost in $1,000 per lane mile for the project that includes the test section, aside from nonpavement costs, such as bridges, culverts, lighting, and guard rails. This cost is to be reported as a cost indexed to the year reported in the data entry for "date of latest construction/reconstruction."

- Major improvements since the latest construction/reconstruction (items 4–8): Space is provided for identifying six major improvement activities by year in which they have been accomplished (not including bridges, culverts, lighting, etc.). Major improvements do include overlays and associated pretreatments (patching, milling, joint repair, etc.) and inlays (mill and fill).

- Year (item 4): The year in which the major improvement was constructed.

- Work type code (item 5): A code to identify the type of activity performed. Codes are provided in table 20.

- Work quantity (item 6): The quantity of work applied to the section in appropriate units. (Refer to table 20 for determining appropriate units.)

- Thickness (item 7): For improvements that increase the thickness of the pavement structure (such as "surface treatment, single layer" or "surface treatment, double layer," etc.), enter the thickness of the improvement to the nearest tenth of an inch (0.1 inch).

- Major improvement type other (item 8): Type of improvement performed if other than those specified.

- Additional roadway widening information (items 9–12): The following data items are applicable only if the roadway has been widened.

- Year when roadway widened (item 9): The year when the roadway was widened. If the roadway has not been widened, enter "N."

- Original number of lanes (item 10): The original number of lanes in the survey direction prior to roadway widening. If the roadway has not been widened, enter "N."

- Final number of lanes (item 11): The final number of lanes after the roadway has been widened. If the roadway has not been widened, enter "N."

- Lane number of added lane (item 12): Lane number added when roadway has been widened. The numbering begins with the outside lane as lane 1, the next lane as lane 2, etc. If the roadway has not been widened, enter "N."

Snow Removal/Deicing (SPS-10 Data Sheet 6)

This data sheet provides information on the snow removal and deicing practices used by the HA at the test section location. These data are to be filled out from project records on SPS-10 data sheet 6.

Individual data items are as follows:

- Frequency of snow removal at test site (item 1): Indicate the general number of times in a year that snow removal is required at the section location.

- Frequency of application of deicing chemicals on the test site (item 2): Indicate the general number of times per year that deicing chemicals are applied to the test section.

- Type of deicers used on this test site (item 3): A code indicating the type of chemicals used for deicing on the test section. Codes are provided on SPS-10 data sheet 6.

- Discontinued deicers since the test site was open to traffic (item 4): A code indicating any chemicals that were once used at the location for deicing but are not longer used on a regular basis. Codes are provided on SPS-10 data sheet 6. Additionally, space is provided to indicate the year that the deicing chemicals were discontinued.

Highway Performance Monitoring System (HPMS) Data Items (Project Level) (SPS-10 Data Sheet 7)

This data sheet provides project-level HPMS data item information on the entire project length. These data are to be filled out from project records on SPS-10 data sheet 7.

Individual data items are as follows:

- HPMS sample number (item 1): 12-digit "section/grouped data" assigned to any section of highway in the HPMS.

- HPMS section subdivision (item 2): Code used to identify a further subdivision of an original HPMS section. This code is generally included as a 13th digit of the HPMS sample number.

- Urban code (item 3): The U.S. Census urban area code. Enter up to five digits. Leading zeros are not required. Default codes for urban code are provided on SPS-10 data sheet 7.

- Facility type (item 4): The operational characteristic of the roadway. Codes for each type of facility are provided on SPS-10 data sheet 7.

- Access control (item 5): The degree of access control for the given section of the road. Codes for each type of access control are provided on SPS-10 data sheet 7.

- Ownership (item 6): The entity that has legal ownership of a roadway. If more than one code applies, code the lowest numerical value. These codes appear in table 27.

- High-occupancy vehicle (HOV) type (item 7): The type of HOV operations. Codes for each type of HOV are provided on SPS-10 data sheet 7.

- HOV lanes (item 8): The maximum number of lanes in both directions designated for HOV operations.

- Peak lanes (item 9): The number of lanes in the peak direction of flow during the peak period.

- Counterpeak lanes (item 10): The number of lanes in the counterpeak direction of flow during the peak period.

- Right-turn lanes (item 11): The presence of right-turn lanes at a typical intersection. These codes appear in table 28.

- Left-turn lanes (item 12): The presence of left-turn lanes at a typical intersection. These codes appear in table 28.

HPMS Data Items (Project Level) (Continued) (SPS-10 Data Sheet 8)

The data on this data sheet is a continuation of the information from SPS-10 data sheet 7.

Individual data items are as follows:

- Toll charged (item 1): Identify if the site is a toll facility regardless of whether a toll is charged. Codes for each type of toll charge are provided on SPS-10 data sheet 8.

- Toll type (item 2): Indicate if this site has the presence of special tolls (e.g., high-occupancy toll (HOT) or other managed lanes). Codes for each type of toll charge are provided on SPS-10 data sheet 8.

- Widening obstacles (item 3): Obstacles that prevent widening of the existing roadway for additional through lanes. Code all conditions that apply in either direction on either side of the section and leave blank for unreported data. Enter any combination of the codes (e.g., if there are historic and dense development obstacles, code "EA" or "AE" for this data item). There is no requirement for the ordering of the codes; a code should not be used more than once in a sequence of codes (e.g., "AEA"). Code "X" cannot be used with other codes (e.g., "XE") This item provides for the coding of obstacles that may prevent or limit the ability to widen the roadway surface within approximately 100 ft of the outer edge of the through lanes present in either direction of the section. Codes for widening obstacles are provided in table 29.

- Widening potential (item 4): The number of through lanes that could be potentially added. Code the number of lanes (0–9) for which it is feasible to widen the existing road in both directions. Code a "9" if it is possible to add nine or more lanes. Code this item based on the feasibility of widening the existing road and the presence of obstacles as

identified in data item 13 (widening obstacles) and the proximity of the obstacle to the roadway.

- Terrain type (item 5): The type of terrain. Codes for the type of terrain are provided on SPS-10 data sheet 8.

- Curve classification (item 6): The curve classification data using the degree of curvature ranges provided on SPS-10 data sheet 8.

- Grade classification (item 7): The grade classification using the percent grade ranges provided on SPS-10 data sheet 8.

- Percent passing sight distance (item 8): The percent of the section length that is striped for passing.

Plant-Mixed Asphalt (PMA) Aggregate Properties (SPS-10 Data Sheet 9)

This data sheet provides information regarding asphalt aggregate properties. These data are to be filled out from project records on SPS-10 data sheets 9, 10, and 11. For existing PMA layers, HA records should be used to complete this data sheet. For PMA layers constructed specifically for the SPS-10 project, this data sheet should be filled out during construction activities. Additionally, this data sheet should be completed for all asphalt-treated base layers.

Individual data items are as follows:

- Layer number (item 1): The number of the layer for which the data on this sheet is being provided (to be taken from SPS-10 data sheet 4).

- Type of aggregate (item 2): The type of aggregate used as identified by one of the codes appearing on SPS-10 data sheet 9.

- Composition of coarse aggregate (items 3–5): When more than one coarse aggregate is used, the type code, as provided on SPS-10 data sheet 9, and the percentage by total weight of coarse aggregate should be indicated for each coarse aggregate. Space is provided for up to three different types of coarse aggregate. If only one type of coarse aggregate is used, enter its type and 100 percent in the top set of the data spaces, leaving the others blank. Space is provided for identifying another type of material if one was used other than those for which codes are provided. Coarse aggregate is considered to be that portion retained on the no. 8 (2.36-mm) sieve.

- Geologic classification of coarse aggregate (item 6): The geologic classification of the natural stone used as coarse aggregate in the concrete. These codes appear in table 12 and provide ID as to which of the three major classes of rock the coarse aggregate belongs to and the type of rock within those classes. If a blend was used, enter the code for the geologic classification for the material representing the majority of the coarse aggregate. If a crushed slag, manufactured lightweight, or recycled concrete was used, enter “N.”

- Composition of fine aggregate (items 7–9): When more than one fine aggregate is used, the type code, as provided on SPS-10 data sheet 9, and percentage by total weight of fine aggregate should be indicated for each fine aggregate. Fine aggregate is defined as that passing the no. 8 (2.36-mm) sieve and retained on the no. 200 (75-µm) sieve. Space is provided for up to three different fine aggregate types. If only one type of fine aggregate is used, enter its type code and 100 percent in the top set of the data spaces, leaving the others blank.

- Type of mineral filler (item 10): The type of mineral filler used as identified by one of the codes appearing on SPS-10 data sheet 9.

- Aggregate durability test results (items 11–14): The type of tests used to evaluate the durability of the aggregate used in the mix and the results in thousandths (0.001) recorded in units specified for the test. Three of these sets are for coarse (items 11, 12, and 13) and one (item 14) for the combination of coarse and fine aggregates. The durability test type codes appear in table 16.

PMA Aggregate Properties (Continued) (SPS-10 Data Sheet 10)

This data sheet is a continuation of the data on SPS-10 data sheet 9.

Individual data items are as follows.

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- Type of aggregate (item 2): The type of aggregate used as identified by one of the codes appearing on SPS-10 data sheet 10.

- Polish value of coarse aggregates (item 3): The accelerated polish value of the coarse aggregates used in the surface layer, as determined by American Association of State Highway and Transportation Officials (AASHTO) standard T279 and American Society for Testing and Materials (ASTM) standard D3319 (AASHTO 2018; ASTM 2011b).

- Angularity coarse one face (item 4): The coarse aggregate angularity for aggregates with one or more faces.

- Angularity coarse two faces (item 5): The coarse aggregate angularity for aggregates with two or more faces.

- Angularity fine (item 6): The angularity for fine aggregate.

- Soundness coarse (item 7): The coarse aggregate soundness.

- Soundness fine (item 8): The fine aggregate soundness.

- Coarse aggregate toughness (item 9): The toughness of coarse aggregate.

- Deleterious materials (item 10): The estimate of percentage of deleterious materials.

- Clay content (item 11): The clay content determined by the use of the sand equivalent.

- Thin elongated particles (item 12): The percentage by weight of aggregate that have a maximum to minimum dimension of greater than five.

- Gradation of combined aggregates (item 13): The percent passing of coarse and fine aggregates on various standard sieve sizes to the nearest 1 percent. Values are not expected to be available for all 18 sieve sizes; the objective is to provide a sufficient number of sieve sizes to accommodate testing and specification practice for most HAs.

PMA Aggregate Properties (Continued) (SPS-10 Data Sheet 11)

This data sheet is a continuation of the data on SPS-10 data sheets 9 and 10.

Individual data items are as follows.

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- Type of aggregate (item 2): The type of aggregate used as identified by one of the codes appearing on SPS-10 data sheet 11.

- Absorption of aggregate (items 3 and 4): The absorption of aggregates (to the nearest thousandth (0.001)) for coarse aggregate (item 3) and fine aggregate (item 4). The absorption of aggregates can be determined using AASHTO T85 and ASTM C127 (coarse aggregate) or AASHTO T84 and ASTM C128 (fine aggregate) (AASHTO 2013b; AASHTO 2014a; ASTM 2015a).

- Bulk specific gravities (items 5–8): The bulk specific gravities (to the nearest thousandth (0.001)) for coarse aggregate (item 5), fine aggregate (item 6), mineral filler (item 7), and the aggregate combination (item 8). The bulk specific gravities for the aggregate fractions are measured using the laboratory procedures indicated on the data sheet. The bulk specific gravity for the aggregate combination (usually called bulk specific gravity of aggregate) is shown in figure 3 and calculated as follows:

$$G_{sb} = \frac{P_1 + P_2 + P_3}{\frac{P_1}{G_1} + \frac{P_2}{G_2} + \frac{P_3}{G_3}}$$

Figure 3. Equation. Calculation of bulk specific gravity for the total aggregate.

Where:

G_{sb} = bulk specific gravity for the total aggregate.
P_1, P_2, P_3 = percentages by weight of coarse aggregate, fine aggregate, and mineral filler.
G_1, G_2, G_3 = specific gravities of coarse aggregates, fine aggregates, and mineral filler.

- Effective specific gravity of aggregate combination (item 9): The calculated effective specific gravity to the nearest thousandth (0.001). This calculation requires the maximum specific gravity (no air voids) of the paving mixture, which is obtained by test method AASHTO T209 or ASTM D2041 (AASHTO 2020b; ASTM 2019c). The effective specific gravity of the aggregate is shown in figure 4 and calculated as follows:

$$G_{se} = \frac{100 - P_b}{\frac{100}{G_{mm}} - \frac{P_b}{G_b}}$$

Figure 4. Equation. Calculation of the effective specific gravity of aggregate.

Where:

G_{se} = effective specific gravity of aggregate.
P_b = asphalt cement, percent by total weight of mixture.
G_b = specific gravity of asphalt.
G_{mm} = maximum specific gravity of paving mixtures (no air voids).

- Theoretical maximum specific gravity of the RAS (item 10): The theoretical maximum specific gravity for the aggregate combination of the RAS.

PMA Binder (SPS-10 Data Sheet 12)

A new data sheet should be filled out for each type of binder that is used in the layer (virgin, RAP, RAS, and combined.) Additionally, a new data sheet should be completed for all asphalt-treated base layers.

Individual data items are as follows:

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- Type of binder (item 2): The type of binder used as identified by one of the codes appearing on SPS-10 data sheet 12.

- Asphalt grade (item 3): The performance grade (PG) of performance-graded binders. If a PG binder was not used, enter "N."

- Asphalt grade (item 4): The grade of asphalt cement used (table 19) prior to the addition of WMA technology. Space is provided on the data sheet for identifying another grade of asphalt cement not appearing in table 19.

- Source (item 5): The refinery that produced the asphalt cement used in the warm-mix asphalt concrete (WMAC) layer being described. If PG grading was not used, leave this field null. A list of asphalt refiners and processors is provided in table 17. Space is provided to specify other sources that may not be included in table 17.

- Specific gravity of asphalt cement (item 6): The specific gravity of the asphalt cement (to the nearest thousandth (0.001)) when it is available. If unavailable, a typical specific gravity for asphalt cements produced at the source refinery may be entered. This specific gravity is measured as specified by AASHTO T228 (ASTM D70) (AASHTO 2009b; ASTM 2018b).

- Viscosity of asphalt at 140 °F (item 7): The result in poises from absolute viscosity testing using test method AASHTO T202 (ASTM D2171) on samples of the original asphalt cement prior to its use in construction of the pavement section and prior to the addition of WMA technology (AASHTO 2015e; ASTM 2018c).

- Viscosity of asphalt at 275 °F (item 8): The results in centistokes (to the nearest hundredth (0.01)) from kinematic viscosity testing using test method AASHTO T201 (ASTM D2170) on samples of the original asphalt cement and prior to the addition of WMA technology (AASHTO 2015d; ASTM 2018d).

- Penetration at 77 °F (item 9): The penetration (in tenths of a millimeter (0.1 mm)) at 77 °F (25 °C) with a 100-g load and a 5-s load duration using test method AASHTO T49 (ASTM D5) on the original asphalt cement in the mixture and prior to the addition of WMA technology (AASHTO 2015c; ASTM 2020b).

- Asphalt modifiers (items 10 and 11): Space is provided to list the type and quantity of up to two modifiers added to the asphalt cement for whatever purpose. A list of possible asphalt cement modifiers and codes for data entry are provided in table 18. The quantities of modifier should be provided in percent of asphalt cement weight. Some modifiers (such as lime) may be specified in terms of percent of aggregate weight, but they must be converted to percent of asphalt cement weight for uniformity. WMA technologies are not to be considered modifiers.

- Ductility at 77 °F (item 12): The ductility in centimeters at 77 °F (25 °C) using test method AASHTO T51 (ASTM D113) and prior to the addition of WMA technology (AASHTO 2009a; ASTM 2017b).

- Ductility at 39.2 °F (item 13): The ductility in centimeters at 39.2 °F (4 °C), using the procedures of test method AASHTO T51 (ASTM D113) and prior to the addition of WMA technology (AASHTO 2009a; ASTM 2017b).

- Test rate for ductility measurement at 39.2 °F (item 14): The test speed in centimeters per minute for the ductility measurement taken at 39.2 °F (4 °C) and prior to the addition of WMA technology.

- Penetration at 39.2 °F (item 15): The penetration (in tenths of a millimeter (0.1 mm)) at 39.2 °F (4 °C), with a 200-g load and a 60-s load duration using test method AASHTO T49 (ASTM D5) on samples of the original asphalt cement prior to its use as a construction material and the addition of WMA technology (AASHTO 2015c; ASTM 2020b).

- Ring and ball softening point (item 16): The softening point of the asphalt cement in Fahrenheit as measured with the ring and ball apparatus used in test method AASHTO T53 (ASTM D36) on samples of the original asphalt cement prior to its use as a construction material and prior to the addition of WMA technology (AASHTO 2011; ASTM 2014a).

PMA Binder Aged (SPS-10 Data Sheet 13)

This data sheet provides information regarding PMA binder aged properties for each layer. This data sheet can be filled out multiple times for a single layer when binder properties were captured at more than one aging condition. These data are to be filled out from project records on SPS-10 data sheet 13 for which LTM is planned.

For existing PMA layers, HA records should be used to complete this data sheet. For new SPS-10 construction layers, this data sheet should be filled out during construction activities. Additionally, this data sheet should be completed for all asphalt-treated base layers.

Individual data items are as follows:

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (from SPS-10 data sheet 4).

- Type of binder (item 2): The type of binder used as identified by one of the codes appearing on SPS-10 data sheet 13.

- Test procedure used to measure aging effects (item 3): The test procedure used to "age" the asphalt cement in the laboratory and to measure the effects of the aging. Codes are provided on SPS-10 data sheet 13 along with space to identify a process used other than those for which codes are provided.

- Specific gravity of asphalt cement (item 4): The specific gravity of the asphalt cement (to the nearest thousandth (0.001)) when it is available. If unavailable, a typical specific gravity for asphalt cements produced at the source refinery may be entered. This specific gravity is measured as specified by AASHTO T228 (ASTM D70) (AASHTO 2009b; ASTM 2018b).

- Viscosity of asphalt at 140 °F (item 5): The result in poises from absolute viscosity testing using test method AASHTO T202 (ASTM D2171) on samples of the original asphalt cement prior to its use in construction of the pavement section and prior to the addition of WMA technology (AASHTO 2015e; ASTM 2018c).

- Viscosity of asphalt at 275 °F (item 6): The results in centistokes (to the nearest hundredth (0.01)) from kinematic viscosity testing using test method AASHTO T201 (ASTM D2170) on samples of the original asphalt cement and prior to the addition of WMA technology (AASHTO 2015d; ASTM 2018d).

- Ductility at 77 °F (item 7): The ductility in centimeters at 77 °F (25 °C) using test method AASHTO T51 (ASTM D113) and prior to the addition of WMA technology (AASHTO 2009a; ASTM 2017b).

- Ductility at 39.2 °F (item 8): The ductility in centimeters at 39.2 °F (4 °C) using the procedures of test method AASHTO T51 (ASTM D113) and prior to the addition of WMA technology (AASHTO 2009a; ASTM 2017b).

- Test rate for ductility measurement at 39.2 °F (item 9): The test speed in centimeters per minute for the ductility measurement taken at 39.2 °F (4 °C) and prior to the addition of WMA technology.

- Penetration at 77 °F (item 10): The penetration (in tenths of a millimeter (0.1 mm)) at 77 °F (25 °C) with a 100-g load and a 5-s load duration using test method AASHTO T49 (ASTM D5) on the original asphalt cement in the mixture and prior to the addition of WMA technology (AASHTO 2015c; ASTM 2020b).

- Penetration at 39.2 °F (item 11): The penetrating (in tenths of a millimeter (0.1 mm)) at 39.2 °F (4 °C) with a 200-g load and a 60-s load duration using test method AASHTO T49 (ASTM D5) on samples of the original asphalt cement prior to its use as a construction material and prior to the addition of WMA technology (AASHTO 2015c; ASTM 2020b).

- Ring and ball softening point (item 12): The softening point of the asphalt cement in Fahrenheit, as measured with the ring and ball apparatus used in test method AASHTO T53 (ASTM D36), on samples of the original asphalt cement prior to its use as a construction material and prior to the addition of WMA technology (AASHTO 2011; ASTM 2014a).

- Weight loss (item 13): The weight loss resulting from the laboratory aging process to the nearest one-tenth of a percent (0.1 percent).

AC Dynamic Shear Rheometer (DSR), Bending Beam Rheometer (BBR), Direct Tension (SPS-10 Data Sheet 14)

This data sheet provides information for DSR, BBR, and direct tension properties for each layer. This data sheet can be filled out multiple times for a single layer that has binder from different sources. These data are to be filled out from project records on SPS-10 data sheet 14 for which LTM is planned.

For existing PMA layers, HA records should be used to complete this data sheet. For new SPS-10 construction layers, this data sheet should be filled out during construction activities. Additionally, this data sheet should be completed for all asphalt-treated base layers.

Individual data items are as follows:

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- Type of binder (item 2): The type of binder used as identified by one of the codes appearing on SPS-10 data sheet 14.

- DSR complex modulus and phase angle (item 3): The dynamic shear complex modulus reported to the nearest hundredth kilopascal (0.01 kPa) for the tank processed asphalts and the phase angle reported to the nearest degree.

- DSR complex modulus and phase angle (item 4): The dynamic shear complex modulus reported to the nearest hundredth kilopascal (0.01 kPa) for the rolling thinned film of rolling thin film oven- (RTFO) processed asphalts and the phase angle reported to the nearest degree.

- DSR complex modulus and phase angle (item 5): The dynamic shear complex modulus reported to the nearest hundredth kilopascal (0.01 kPa) for the pressure-aged vessel processed asphalts and the phase angle reported to the nearest degree.

- BBR stiffness modulus and slope (item 6): The stiffness modulus reported to the nearest megapascal and the slope reported to the nearest thousandth (0.001).

- Direct tension tensile strength and tensile strain (item 7): The tensile stress reported to the nearest tenth of kilopascal (0.1 kPa) and the percent strain to the nearest hundredth percent (0.01 percent).

RAP (SPS-10 Data Sheet 15)

This data sheet provides information regarding RAP and RAS. A new sheet should be filled out for each PMA. If RAP (identified with the number "1") is included in the mix, items 3, 4, 6, and 7 should be completed. If the mix includes RAS (identified with the number "2"), items 5, 6, and 7 should be completed. These data are to be filled out from project records on SPS-10 data sheet 15.

Individual data items are as follows:

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- Type of aggregate (item 2): The type of aggregate used as identified by one of the codes appearing on SPS-10 data sheet 15. If RAP or RAS were not used, enter an "N" in this field.

- Procedure used to break up and/or remove the RAP (item 3): A code to indicate the procedure used for removal of the asphalt pavement to be recycled. Codes are provided on SPS-10 data sheet 15. Additionally, space is provided to describe a different type of procedure if none of those for which codes are provided was used.

- RAP processing (item 4): A code, as provided on SPS-10 data sheet 15, to indicate how the pavement material was processed after removal.

- Type of RAS (item 5): Type of RAS used in the mixture.

- Percent of binder in the RAP/RAS by mass (percent) (item 6): The percent of binder in the RAP.

- RAP additive (item 7): A yes ("Y") or no ("N") answer to indicate whether an additive was added to the RAP stockpile to maintain workability. If an additive was added, enter the quantity in percentage by mass. Also, enter the type of additive that was used.

PMA Laboratory Mix Design (SPS-10 Data Sheet 16)

This data sheet provides information regarding laboratory mixture design. These data are to be filled out from project records on SPS-10 data sheets 16, 17, and 18 for which LTM is planned.

For existing PMA layers, HA records should be used to complete this data sheet. For new SPS-10 construction layers, this data sheet should be filled out during construction activities. Additionally, this data sheet should be completed for all asphalt-treated base layers.

Individual data items are as follows:

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- Maximum specific gravity (item 2): The maximum specific gravity (to the nearest thousandth (0.001)), calculated using the equations in figure 4 and figure 5.

$$G_{mm} = \frac{100}{\frac{P_s}{G_{se}} + \frac{P_b}{G_b}}$$

Figure 5. Equation. Calculation of maximum specific gravity of paving mixture.

Where:

G_{mm} = maximum specific gravity of paving mixture (no air voids).
P_s = aggregate, percent by total weight of mixture.
G_{se} = effective specific gravity of aggregate.
P_b = asphalt, percent by total weight of mixture.
G_b = specific gravity of asphalt.

- Bulk specific gravity (item 3): The bulk specific gravity (to the nearest thousandth (0.001)) of the recycled mixture compacted in the laboratory at the optimum asphalt content selected and by appropriate procedures for Marshall or Hveem stability. Test method ASTM D1188 is to be used for establishing the bulk specific gravity (ASTM 2007a).

- Optimum asphalt content (item 4): The optimum amount of asphalt cement as obtained from Marshall or Hveem stability testing that is added to the recycled mixture to the nearest one-tenth of a percent (0.1 percent).

- Percent air voids (item 5): The calculated air voids (to the nearest tenth of a percent (0.1 percent)) in the recycled mixture, compacted in the laboratory to the optimum asphalt content and by appropriate procedures for Marshall or Hveem stability. The equation shown in figure 6 may be used for calculating the percent air voids.

$$P_a = 100\frac{G_{mm} - G_{mb}}{G_{mm}}$$

Figure 6. Equation. Calculation of air voids in compacted mixture.

Where:

P_a = air voids in compacted mixture, percent of total volume.
G_{mm} = maximum specific gravity of paving mixture (zero air voids) as determined by ASTM D2041 (ASTM 2019c).
G_{mb} = bulk specific gravity of compacted mixture.

- Marshall stability (item 6): The Marshall stability (test method AASHTO T245, (ASTM D1559)) of the mixture at optimum asphalt content in pounds (AASHTO 2015f; ASTM 1989).

- Number of blows (item 7): The number of blows of the compaction hammer that were applied to each end of the specimen to compact it for Marshall stability and flow testing.

- Marshall flow (item 8): The Marshall flow (test method AASHTO T245 (ASTM D1559)) of the mixture at optimum asphalt content. This item is to be entered as the whole number of the measured hundredth of an inch (i.e., if 0.15 is measured, enter "15") (AASHTO 2015f; ASTM 1989).

- Hveem stability (item 9): The Hveem stability or "stabilometer value" of the mixture at optimum asphalt content as measured with the Hveem apparatus using test method AASHTO T246 (ASTM D1560) (AASHTO 2010b; ASTM 2015f).

- Hveem cohesiometer value (item 10): The cohesiometer value of the mixture at optimum asphalt content, in grams per 25-mm (1-inch) width (or diameter) of specimen, obtained by test method AASHTO T246 (ASTM D1560) (AASHTO 2010b; ASTM 2015f).

- Voids in mineral aggregate (item 11): Enter the design void space between the aggregate particles of a compacted AC mixture, which includes the air voids and the effective asphalt content, to the nearest tenth of a percent (0.1 percent). Percent of voids in mineral aggregate (VMA) is calculated as shown in figure 7:

$$VMA = 100 - \frac{G_{mb} P_s}{G_{sb}}$$

Figure 7. Equation. Calculation of VMA.

Where:

VMA = voids in mineral aggregate (percent of bulk volume).
G_{sb} = bulk specific gravity of aggregate.
G_{mb} = bulk specific gravity of compacted mixture (ASTM D2726) (ASTM 2021b).
P_s = aggregate, percent by total weight of mixture.

- Effective asphalt content (item 12): The design effective asphalt content (total asphalt content of the paving mixture minus the portion of asphalt that is lost by absorption into the aggregate particles as a percentage of the total mixture to the nearest tenth of a percent (0.1 percent)). The asphalt absorption may be calculated as a percent of total weight of mixture and is calculated as shown in figure 8:

$$P_{ab} = P_{ba} P_s = \frac{G_{se} - G_{sb}}{G_{se} G_{sb}} G_b P_s$$

Figure 8. Equation. Calculation for absorbed asphalt percent by weight of total mixture.

Where:

P_{ab} = absorbed asphalt, percent by weight of total mixture.
P_{ba} = absorbed asphalt, percent by weight of aggregate.
P_s = aggregate, percent by total weight of mixture.
G_{se} = effective specific gravity of aggregate.
G_{sb} = bulk specific gravity of aggregate.
G_b = specific gravity of asphalt.

- Superpave gyratory compaction Ndesign (item 13): Enter the number of revolutions of the Superpave gyratory compactor to achieve 4 percent air voids.

- Gyration ratio (item 14): The gyration ratio measured. The recommended compactability criterion is the gyration ratio should be less than or equal to 1.25. The gyration ratio is calculated as shown in figure 9:

$$Ratio = \frac{(N_{92})_{\tau-30}}{(N_{92})_{\tau}}$$

Figure 9. Equation. Calculation of gyration ratio.

Where:

Ratio = gyration ratio.
$(N_{92})_{T\text{-}30}$ = gyrations to 92 percent relative density at 30 °C below the planned field compaction temperature.
$(N_{92})_T$ = gyrations to 92 percent relative density at the planned field compaction temperature.

- Asphalt grade (item 15): Enter the code for the asphalt grade used in asphalt mixtures, if available. (See the asphalt code sheet in table 19.)

- Hamburg wheel-tracking test conditioning (item 16): The condition of the Hamburg wheel-track testing.

- Deformation at 20,000 passes (item 17): The deformation measurement at 20,000 passes during the Hamburg wheel-tracking test measured in inches.

- Test temperature (item 18): The temperature used during the Hamburg wheel-tracking test in Fahrenheit.

- Tensile strength ratio (AASHTO T283) (item 19): Percentage of tensile strength ratio using AASHTO T283 (AASHTO 2014e).

PMA Laboratory Mix Design (Continued) (SPS-10 Data Sheet 17)

The data on this data sheet are a continuation of the information from SPS-10 data sheet 16.

Individual data items are as follows:

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- Flow number (AASHTO TP-79) (item 2): The number of cycles corresponding to the minimum rate of change.

- Flow number temperature (item 3): The flow number temperature in Fahrenheit.

- Planned production temperature (item 4): The planned production temperature of the asphalt mixture in Fahrenheit.

- Planned field compaction temperature (item 5): The planned field compaction temperature in Fahrenheit.

- Design asphalt binder content of mix without RAS/RAP (item 6): The percentage of asphalt binder content without RAS or RAP.

- Percent RAS in mixture (item 7): The percentage of RAS in the mixture.

- Percent shingle asphalt binder in RAS (item 8): The percentage of shingle asphalt binder in the RAS.

- Percent RAP in mixture (item 9): The percentage of recycled asphalt cement in the mixture.

- Percent asphalt in RAP (item 10): The percentage of asphalt in the recycled asphalt cement mixture.

- Percent of RAP/RAS binder in the mix by mass (binder replacement) (item 11): The amount of binder from RAP/RAS as a percentage of total binder in the mixture (from the mix design.)

- Amount of new untreated aggregate added (item 12): The amount of new untreated aggregate added, to the nearest tenth of a percent (0.1 percent) of the combined weight of the aggregates in the recycled mixture.

- Recycling agent (RA) (item 13): Codes to identify the type and quantity of RA used. The codes for type of RA appear in table 23. The amount of RA should be provided by weight added to the reclaimed (aged) asphalt to the nearest tenth of a percent (0.1 percent) of the reclaimed asphalt cement weight. As an example, if the weight of the RA to be added to the aged asphalt cement was 41.5 percent of the weight of the aged asphalt in the reclaimed mixture, "41.5" would be entered on SPS-10 data sheet 17.

- Amount of new asphalt cement added (item 14): The quantity of new asphalt cement to the nearest tenth of a percent (0.1 percent) of total recycled mixture weight (including reclaimed AC and untreated aggregate and asphalt cement/RA added).

PMA Laboratory Mix Design (Continued) (SPS-10 Data Sheet 18)

The data on this data sheet are a continuation of the information from SPS-10 data sheets 16 and 17. This data sheet only needs to be filled out for sections that use WMA.

Individual data items are as follows:

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- Type of warm-mix technology (item 2): The type of warm-mix technology that was used. If a technology other than those provided is used, space is provided to specify the technology used and a brand name. If the mix is HMA, enter the code for "none."

- Form of WMA additive (item 3): The type of WMA technology, as identified on the SPS-10 data sheet 18, used in the mixture. If the mix is HMA, enter the code for "none."

- Dosage rate (item 4): The percent by total weight of the binder. If the binder is HMA, leave this field null.

- Method of introducing additive to the mix (item 5): The method used to introduce the WMA technology to the mix. If a method other than the options provided is used, space is provided to specify the method used. If the mix is HMA, enter the code for "none."

PMA Mixture Properties (SPS-10 Data Sheet 19)

This data sheet provides information regarding mixture properties as placed. These data are to be filled out from project records on SPS-10 data sheets 19 and 20 for which LTM is planned.

For existing PMA layers, HA records should be used to complete this data sheet. For new SPS-10 construction layers, this data sheet should be filled out during construction activities. Additionally, this data sheet should be completed for all asphalt-treated base layers.

Individual data items are as follows:

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- Type of samples (item 2): Whether the test samples were sampled in the field and compacted in the laboratory or removed from the compacted pavement. The codes appear on SPS-10 data sheet 19.

- Maximum specific gravity (item 3): The maximum specific gravity (no air voids) of a mixture sampled during or soon after construction according to AASHTO T209 or ASTM D2041(AASHTO 2020b; ASTM 2019c). Where possible, several samples should be tested and the average entered in the space given on SPS-10 data sheet 19. Use the resulting maximum specific gravity and the design asphalt content for the mixture to calculate the effective specific gravity of the aggregate using the equation in figure 4. Once the effective specific gravity of the aggregate is established, it may be used to calculate other maximum specific gravities for the mixture at other measured asphalt contents using the equation in figure 5.

- Bulk specific gravity (item 4): The number of tests and the mean, minimum, maximum, and standard deviation of bulk specific gravities (to the nearest thousandth (0.001)) of compacted mixtures measured on cores removed from the pavement during or right after construction. While the test method specified in ASTM D1188 is preferable, the results from nuclear density tests (ASTM D2950), appropriately calibrated to measurements on cores, may also be used (ASTM 2007a; ASTM 2014b).

- Asphalt content (item 5): The number of tests and the mean, minimum, maximum, and standard deviation of percentages by weight of the total asphalt cement (including that absorbed by the aggregate) in the asphalt mixture to the nearest one-tenth of a percent (0.1 percent). Asphalt contents measured by extraction tests (AASHTO T164 (ASTM D2172)) on field samples are preferred, but results from nuclear test methods may also be used (AASHTO 2014b; ASTM 2017d). If no such test results are available, enter the specified asphalt content as the mean and leave the other spaces blank.

- Percent air voids (item 6): The number of tests and the mean, minimum, maximum, and standard deviation of calculated air voids (to the nearest tenth of a percent (0.1 percent)) as a percent of the material volume. These data are frequently not available but can be calculated using other available data from reports on mix design and density measurements on samples from the pavement. Percent air voids is calculated as shown in the equation in figure 6.

- Voids in mineral aggregate (item 7): The number of tests and the mean, minimum, maximum, and standard deviation of mean void space between the aggregate particles of

a compacted mixture, which includes air voids and the effective asphalt content, to the nearest one-tenth of a percent (0.1 percent). Percent of VMA is calculated as shown in the equation in figure 7.

- Effective asphalt content (item 8): The number of tests and the mean, minimum, maximum, and standard deviation of effective asphalt content (total asphalt content of the paving mixture minus the portion of asphalt that is lost by absorption into the aggregate particles), expressed by weight of total mixture to the nearest tenth of a percent (0.1 percent). The asphalt absorption may be calculated as a percent of total weight of mixture as shown in the equation in figure 8.

- Type of asphalt production plant (item 9): The type of production plant that produced the WMAC mixture. Codes for different types of production plants are provided on SPS-10 data sheet 19. Space is also given to identify a type of production plant that the codes provided do not include.

- Type of antistripping agent (item 10): The type of antistripping agent used in the mixture. The codes are provided in table 24.

- Antistripping agent liquid or solid code (item 11): A code to indicate whether the antistripping agent used is a liquid or solid. Codes are provided on SPS-10 data sheet 19.

- Amount of antistripping agent (item 12): The amount of antistripping agent used in the mixture by weight to the nearest tenth of a percent (0.1 percent) of weight of asphalt if the agent is liquid and weight of aggregate if it is solid.

PMA Mixture Properties (Continued) (SPS-10 Data Sheet 20)

The data on this data sheet are a continuation of the data from SPS-10 data sheet 19.

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- Type of samples (item 2): Whether the test samples were sampled in the field and compacted in the laboratory or removed from the compacted pavement. The codes appear on SPS-10 data sheet 20.

- Type of asphalt production plant (item 3): The type of production plant that produced the AC mixture. Codes are provided on SPS-10 data sheet 20.

- Type of antistripping agent (item 4): The type of antistripping agent used in the mixture. The codes are provided in table 24.

- Antistripping agent liquid or solid code (item 5): A code to indicate whether the antistripping agent used is a liquid or solid. Codes are provided on SPS-10 data sheet 20.

- Amount of antistripping agent (item 6): The amount of antistripping agent used in the mixture by weight to the nearest tenth of a percent (0.1 percent) of weight of asphalt if the agent is liquid and weight of aggregate if it is solid.

- Moisture susceptibility test type (item 7): The type of test used to evaluate the moisture susceptibility of the asphalt mixture. Codes are provided on SPS-10 data sheet 20.

- Moisture susceptibility test results (item 8): Space is provided to record the Hveem stability number or percent stripped and the tensile strength ratio or index of retained strength, depending on the test procedure used.

Superpave Mixture Properties (SPS-10 Data Sheet 21)

This data sheet provides information regarding Superpave properties of the mixture as placed. These data are to be filled out from project records on SPS-10 data sheet 21 for which LTM is planned.

For existing PMA layers, HA records should be used to complete this data sheet. For new SPS-10 construction layers, this data sheet should be filled out during construction activities. Additionally, this data sheet should be completed for all asphalt-treated base layers.

Individual data items are as follows:

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- Type of samples (item 2): Indicate whether the test samples were sampled in the field and compacted in the laboratory or removed from the compacted pavement. The codes appear on SPS-10 data sheet 21.

- Frequency sweep (item 3): The mean complex modulus and phase (SHRP Designation M-002) in pounds per square inch and to the nearest tenth of a degree (0.1 degree) for phase angle for each of the three temperatures (39.2 °F, 68 °F, 104 °F (4 °C, 20 °C, and 40 °C, respectively)) (Harrigan, Leahy, and Youtcheff 1994). (Use test method ASTM D7312 (ASTM 2010a).)

- Uniaxial strain (item 4): The axial stress and percent strain (SHRP Designation M-003) for each of the three temperatures (39 °F, 68 °F, and 104 °F (4 °C, 20 °C, and 40 °C, respectively)) in kilopascal and to the nearest hundredth of a percent strain (0.01percent) (Harrigan, Leahy, and Youtcheff 1994).

- Volumetric strain (item 5): The confining pressure and percent strain (SHRP Designation M-003) for each of the three temperatures (39 °F, 68 °F, and 104 °F (4 °C, 20 °C, and 40 °C, respectively)) in kilopascal and to the nearest hundredth of a percent strain (0.01 percent).

- Simple shear (item 6): The axial stress, shear stress, and percent strain (SHRP Designation M-003) for each of three temperatures (preferred 39 °F, 68 °F, and 104 °F (4 °C, 20 °C, and 40 °C, respectively) in pounds per square inch and to the nearest hundredth of a percent strain (0.01percent)) (Harrigan, Leahy, and Youtcheff 1994).

PMA Construction (SPS-10 Data Sheet 22)

This data sheet provides information regarding construction, roller, and compaction data. These data are to be filled out from project records on SPS-10 data sheets 22 and 23.

For existing PMA layers, HA records should be used to complete this data sheet. For new SPS-10 construction layers, this data sheet should be filled out during construction activities. Additionally, this data sheet should be completed for all asphalt-treated base layers.

Individual data items are as follows:

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- Date operations began (item 2): The date paving operations began.

- Date paving completed (item 3): The date paving was completed.

- Mixing production plant type (item 4): The type of mixing production plant used. Codes are provided on SPS-10 data sheet 22.

- Mixing production plant name (item 5): Name of the mixing production plant.

- Type of materials transfer equipment used (item 6): A code to indicate the type of materials transfer equipment used. Codes are provided on SPS-10 data sheet 22. Space is also provided to describe some other type of equipment used if none of those for which codes are provided are used. Additionally, there is a space provided to list the brand name of the equipment used.

- Tack coat (y/n) (item 7): A yes (“Y”) or no (“N”) field indicating whether a tack coat was applied.

- Tack coat type (item 8): The type of tack coat that was applied. The codes appear in table 19. Space is provided on the SPS-10 data sheet 22 for identifying another type of tack coat if the types identified in table 19 are not applicable.

- Tack coat dilution (item 9): The dilution of the tack coat in percent asphalt as part of the total

- Application rate (item 10): The number to record the gallons per square yard of the application rate.

- Haul distance and time (item 11): The distance from the production plant to the site in miles and the time from the production plant to site in minutes.

- Single-pass laydown width (item 12): Width of pavement (in feet) that the paver lays down in a single pass.

- Transverse joint location (item 13): Location in meters from the start of the section to a transverse paving joint.

- Longitudinal surface joint (item 14): Code indicating whether the longitudinal surface joint is between lanes (1) or within the LTPP test lane (2).

- Longitudinal joint offset (item 15): Location (in feet) of the longitudinal joint from the outside shoulder.

- Significant events (item 16): Note any significant events that may have impacted the paving operations, such as disruptions, weather events, equipment issues, etc.

PMA Construction (Continued) (SPS-10 Data Sheet 23)

The data on this data sheet are a continuation of the data from SPS-10 data sheet 22.

Individual data items are as follows.

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- Mixing temperature (item 2): The temperature of the mixture during mixing at the production plant (i.e., the mix as discharged) in Fahrenheit.

- Production plant exhaust temperature (item 3): The production plant exhaust temperature in Fahrenheit.

- Mean delivery temperature (item 4): The average temperature of mixture during delivery to the project site in Fahrenheit.

- Laydown temperatures (item 5): The number of tests taken and the mean, minimum, maximum, and standard deviation of the temperatures measured. The temperature should be measured just behind the screed. Three to five measurements should be made.

- Roller data (items 6–22): Codes appear on SPS-10 data sheet 23 for steel-wheeled tandem, pneumatic tired, single-drum vibratory, and double-drum vibratory rollers. For each type of roller, space is provided to describe significant characteristics for up to four different rollers. Steel-wheeled tandem rollers are described by their gross weights to the nearest tenth of a ton (0.1 ton). Pneumatic tired rollers are described by their gross weight and tire pressure in pounds per square inch. Vibratory rollers are described by their gross weight in tons to the nearest tenth (0.1 ton), frequency in vibrations per minute,

amplitude in inches to the nearest thousandth (0.001 inch), and roller speed in miles per hour to the nearest tenth (0.1 mph).

- Compaction data (items 23–31): Space is provided to enter the compaction data up to four lifts.

- Description of the roller (items 23–28): Descriptive data to identify the type of roller used (code from SPS-10 data sheet 23) and number of coverages for breakdown, intermediate, and final compactions for up to four lifts. A "coverage" in this case is defined as one trip of the roller across the pavement.

- Air temperature (item 29): The ambient temperature measured in Fahrenheit while compaction is accomplished.

- Compacted thickness (item 30): The thickness of the compacted mat measured in inches to the nearest tenth of an inch (0.1 inch). If coring is not performed, the planned thickness should be recorded.

- Curing period (item 31): Enter the number of days before a new lift is placed or the layer is opened to traffic.

Unbound (SPS-10 Data Sheet 24)

This data sheet provides information regarding the unbound or stabilized base or subbase material and should be filled out for each unbound base layer. These data are to be filled out from project records on SPS-10 data sheets 24 and 25 for which LTM is planned.

Individual data items are as follows:

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- AASHTO soil classification (item 2): The AASHTO soil classification for the base or subbase material (prior to any stabilization). The code numbers appear in table 13 for the various AASHTO classifications (AASHTO 1991).

- Atterberg limits (item 3): The plasticity index (PI), liquid limit (LL), and plastic limit (PL) determined by AASHTO T90 and AASHTO T89 or ASTM D4318 (AASHTO 2013c; AASHTO 2020c; ASTM 2017f).

- Maximum lab dry density (item 4): The maximum laboratory dry density in pounds per cubic foot for the base or subbase material in the layer of interest.

- Optimum lab moisture content (item 5): The optimum moisture content obtained in the laboratory to the nearest one-tenth of a percent (0.1 percent) for the base or subbase layer.

- Test used to measure maximum dry density (item 6): The test method used to establish the maximum dry density and optimum moisture content. Codes are provided on SPS-10

data sheet 20 for the most commonly used test methods. Space is also provided for identifying another test method used if different from the test methods listed.

- Compactive energy for "other" method (item 7): The compactive energy in feet-pounds per cubic inch applied if a test method was used that was not included in the list of codes in item 6. If the test method used already was included in the list of codes in item 6, this space is to be left blank.

- In situ dry density (item 8): The number of samples tested as well as the mean, minimum, maximum, and standard deviation of field measurements of the in situ dry density in pounds per cubic foot for the base or subbase layer.

- In situ moisture content (item 9): The number of samples tested and the mean, minimum, maximum, and standard deviation of field measurements of the base or subbase in situ moisture content in percent of dry weight of the material. These moisture content data are to be based on the same tests as the dry density data in item 8.

- Compressive strength (item 10): The number of tests performed as well as the mean, minimum, maximum, and standard deviation of the compressive strength in pounds per square inch of the stabilized or unstabilized material.

- Type of compression test (item 11): The type of test used to evaluate the compressive strength of the material. Codes are provided on SPS-10 data sheet 24 along with space to identify the test type if the appropriate type is not listed.

- Confining pressure (item 12): The confining pressure applied during the compressive strength testing. If the test was unconfined, enter "0.0."

- Calcium carbonate content (item 13): The percent by weight of the base or subbase material that is composed of calcium carbonate, as determined by ASTM D4373 (ASTM 2014c).

Unbound (Continued) (SPS-10 Data Sheet 25)

The data on this data sheet is a continuation of the information from SPS-10 data sheet 24.

Individual data items are as follows:

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- California Bearing Ratio (CBR) (item 2): The mean CBR value of the material as determined by test method AASHTO T193 or ASTM D1883 (AASHTO 2013d; ASTM 2016a).

- Resistance (*R*-value) (item 3): The mean *R*-value as determined by test method AASHTO T190 (ASTM D2844) (AASHTO 2014c; ASTM 2018e).

- Modulus of subgrade reaction (*K*-value) (item 4): The mean *K*-value in pounds per cubic inch of deflection measured at the top of the base or subbase after it is compacted in place.

- Type of test (item 5): The type of test used. Either the repeated load test (AASHTO T221 or ASTM D1195) or the static load test (AASHTO T222 or ASTM D1196) may be used, and these test codes are provided on SPS-10 data sheet 25 (AASHTO 1981a; AASHTO 1990; ASTM 2009; ASTM 2012).

- Type and percent stabilizing agent (for stabilized layers only) (items 6 and 7): The types of stabilizing agents and the average percent of each by dry weight of soil mixed into the base or subbase material in the layer of interest. Codes are provided on SPS-10 data sheet 25 for stabilizing agents commonly in use, and space is provided to identify an agent not listed. An average of measured percentages is used whenever available. If percentages have not been measured, the specified percentage should be entered. If neither measured nor specified data are available but the layer is known to have been stabilized, a percentage should be estimated based on practice at the time the stabilized base or subbase layer was constructed. If only one stabilizing agent is used, leave the spaces for "stabilizing agent 2" blank. If the base or subbase material is not stabilized, enter "N."

- Gradation of base or subbase material (coarse and fine aggregates) (item 8): The percentage of material passing various standard sieve sizes to the nearest percent. The values are not expected to be available for all 17 sieve sizes; the objective is to provide space for a sufficient number of sieve sizes to accommodate testing practices for most HAs.

Subgrade (SPS-10 Data Sheet 26)

The properties of the predominant subgrade type encountered on the project should be entered on this data sheet. In cases where a known variation in the subgrade occurs along the project, SPS-10 data sheets 26 and 27 should be completed for each test section.

Individual data items are as follows:

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- AASHTO soil classification (item 2): The AASHTO soil classification for the subgrade material. These codes are provided in table 13 (AASHTO 1991).

- California Bearing Ratio (CBR) (item 3): The CBR for the subgrade soil (test method AASHTO T193 or ASTM D1883) (AASHTO 2013d; ASTM 2016a).

- Resistance (*R*-value) (item 4): The mean resistance *R*-value as determined by test method AASHTO T190 (ASTM D2844) (AASHTO 2014c; ASTM 2018e).

- Modulus of subgrade reaction (*K*-value) (items 5 and 6): The mean modulus of subgrade reaction in pounds per square inch per inch of deflection for the in situ subgrade, and the type of test used. Either the repeated load test (AASHTO T221 (ASTM D1195)) or the static load test (AASHTO T222 or ASTM D1196) may be used as coded on SPS-10 data sheet 26 (AASHTO 1981a; AASHTO 1990; ASTM 2009; ASTM 2012).

- Plasticity index (item 7): The average of plasticity indices measured for samples from the first 5 ft (1.5 m) of the subgrade (test methods AASHTO T90 or ASTM D4318) (AASHTO 2020c; ASTM 2017f).

- Liquid limit (item 8): The average of the LLs measured for samples from the first 5 ft (1.5 m) of subgrade (test methods AASHTO T89 or ASTM D4318) (AASHTO 2013c; ASTM 2017f).

- Maximum laboratory dry density (item 9): The maximum laboratory dry density in pounds per cubic foot for the subgrade material.

- Optimum laboratory moisture content (item 10): The optimum moisture content obtained in the laboratory to the nearest tenth of a percent for the subgrade (0.1 percent).

- Test used to measure maximum dry density (item 11): A code, provided on SPS-10 data sheet 22, to indicate whether standard AASHTO, modified AASHTO, or some other test method is used to establish the maximum dry density and optimum moisture content.

- Compactive energy for "other" method (item 12): The compactive energy in feet-pounds per cubic inch applied if some test method is used other than the standard AASHTO or modified AASHTO. If standard or modified AASHTO is used, leave this space blank.

- In situ dry density (percent of optimum) (item 13): The number of tests conducted as well as the mean, minimum, maximum, and standard deviation of field measurements of in-place dry density for the subgrade as a percentage of the maximum lab dry density. In situ dry density may be measured successfully by several procedures, including the "rubber-balloon method" (AASHTO T205 (ASTM D2167)), the "sand cone method" (AASHTO T191 (ASTM D1556)), or "nuclear methods" (AASHTO T238) (AASHTO 1986b; AASHTO 1997; AASHTO 2014d; ASTM 2015c; ASTM 2015d).

- In situ moisture content (percent of optimum) (item 14): The number of tests conducted and the mean, minimum, maximum, and standard deviation of field measurements of in-place subgrade moisture content as a percent of the optimum moisture content obtained in the laboratory. This moisture content data is to be based on the same tests as for the dry density data. Values should be recorded to the nearest tenth of a percent (0.1 percent).

- In situ dry density (pounds per cubic foot) (item 15): The number of tests conducted as well as the mean, minimum, maximum, and standard deviation of field measurements of in-place dry density in pounds per cubic foot for the subgrade. This data item need not be

entered if both the maximum laboratory dry density and the in situ dry density as a percent of maximum have been reported.

- In situ moisture content (item 16): The number of tests conducted as well as the mean, minimum, maximum, and standard deviation of field measurements of in-place subgrade moisture in percent of dry weight of the material. This moisture content data is to be based on the same tests as for the dry density data and need not be entered if the optimum laboratory moisture content and the in situ moisture content as a percent of optimum have been reported. Values should be recorded to the nearest tenth of a percent (0.1 percent).

Subgrade (Continued) (SPS-10 Data Sheet 27)

The data on this data sheet is a continuation of the data from SPS-10 data sheet 26.

Individual data items are as follows:

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- Relative density of cohesionless free-draining soil (items 2 and 3): For cohesionless free-draining soils only. If the subgrade soil has more than 12 percent by weight passing the no. 200 (75-µm) sieve or is otherwise known to not be free-draining, enter "N" in these spaces. Otherwise, the following values are requested:

    - Minimum and maximum densities in pounds per cubic foot (to the nearest tenth (0.1 lb/ft^3)) as determined by test method ASTM D2049 (measured density) (ASTM 1969).
    - Mean relative density in percent (to the nearest tenth (0.1 percent)) and number of tests conducted.
    - Minimum and maximum mean relative densities in percent (to the nearest tenth (0.1 percent)).
    - Standard deviation of relative density in percent (to the nearest tenth (0.1 percent)).
    - Calculated relative densities and standard deviation of relative density: Related to the in situ dry densities in pounds per cubic foot recorded on SPS-10 data sheet 21 and are calculated using those field densities and the minimum and maximum densities from test method ASTM D2049 (ASTM 1969).

- Soil suction (item 4): A value for soil suction (negative pore water pressure) to the nearest tenth of a ton per square foot (0.1 tsf) determined by AASHTO T273 (AASHTO 1986c).

- Expansion index (item 5): The expansion index as determined by test method ASTM D4829 (ASTM 2021). The expansion index has been included as a data item as it appears to offer high potential for explaining the effects of expansive soils on pavement performance in future predictive models.

- Swell pressure (items 6 and 7): A value to the nearest pounds per square inch for swell pressure and a code to identify the test used. Codes are provided on SPS-10 data sheet 27.

- Percent by weight finer than 0.02 mm (item 8): The percent by weight (to the nearest tenth (0.1 percent)) of the subgrade sample having soil grains finer in size than 0.02 mm. This value is generally obtained by hydrometer analysis (test method ASTM D422) (ASTM 1963). This data item is only required in "freeze zones" where frost is expected to penetrate into the subgrade.

- Average rate of heave during standard laboratory freezing test (item 9): The average rate of heave in millimeters per day to the nearest tenth (0.1 mm/d) of the subgrade soil as measured by a standard laboratory freeze test. This data item is only required in freeze zones where frost is expected to penetrate into the subgrade.

- Frost susceptibility classification code (item 10): The frost susceptibility classification of the subgrade soil. The codes appear on SPS-10 data sheet 27. A value for the average rate of heave is required for the classification, although percent by weight finer than 0.02 mm is indicative of and significant to the heave rate. This data item is only required in freeze zones where frost is expected to penetrate the subgrade.

QC Measurements (SPS-10 Data Sheet 28)

The purpose of this data sheet is to record the results of nuclear density tests or surface profile measurements if the participating HA uses either for construction control or acceptance. For nuclear density tests, the test section should be treated as the sampling union if a random sampling technique is used. Reported profilograph readings should be based on measurements on the test section and prorated to units of inches per mile. Measurements over 500 ft (0.1 mi) centered around the test section may also be used.

Individual data items are as follows:

- Nuclear density measurements (item 1): Space is provided to enter the results of nuclear density tests on the binder course and surface course layers. Enter information only for the layers on the test sections that were tested. For each layer tested, enter the measurement method (backscatter, direct transmission, and air gap), the number of measurements, the average, maximum, minimum, and standard deviation of the density measurements (pounds per cubic foot), and the corresponding layer number from SPS-10 data sheet 4.

- Manufacturer of nuclear density gauge (item 2): Indicate the name of the manufacturer of the nuclear density gauge used for the reported measurements.

- Nuclear density gauge model number (item 3): Enter the manufacturer's model designation of the gauge used.

- Nuclear density gauge identification number (item 4): Enter the ID number of the nuclear density gauge used.

- Nuclear gauge count rate for standardization (item 5): Enter the gauge count rate used for standardization.

- Profilograph measurements (item 6): Report the results of any profilograph measurements performed on the overlay finished surface layer. For each measurement performed, report the type of profilograph (Rainhard or California), profile index, interpretation method (manual, mechanical, or computer), height of blanking band, and the cutoff height. The mechanical interpretation method refers to readings from mechanical counters located on some devices. Enter mechanical computer reading only if the profilograms are not interpreted either by manual or computer methods.

- Surface profile used as basis of incentive payment (item 7): A yes ("Y") or no ("N") field to indicate if the surface profile was or was not used as a contractual basis for incentive payments to the construction contractor.

Field Thickness (SPS-10 Data Sheet 29)

This data sheet is used to record the results of the layer thickness measurements within the test section from before and after elevation measurements. Results of these measurements should be provided for five offset points at every station along the project that was measured. The station number should be entered as the test section relative station number. Offset distance should be entered in inches and measured from the outside shoulder lane edge joint or edge stripe. Space is provided to enter elevation for two types of layers within the test section. If individual layer thicknesses are not measured, enter the layer thicknesses in the column corresponding to the layer for which after the placement surface elevation was measured. For example, if the surface elevation was only measured for the surface course, then the layer thickness should be entered on SPS-10 data sheet 29 under the surface course column. Enter the layer number of any layer for which layer thickness is shown. Use more than one data sheet as required.

Notes and Comments (SPS-10 Data Sheet 30)

This data sheet is provided for reporting miscellaneous notes and comments, further descriptions of entries on other data sheets, or construction-related data that are not covered on other data sheets. Comments on this data sheet should address features or occurrences that may influence the performance of the test section, such as comments from the site AC inspector concerning marginal or questionable batches that were either rejected or used on the test sections.

Also, this data sheet may be used to provide additional comments on items included in other data sheets. In these cases, the items and data sheet number pertaining to these comments should be indicated on this data sheet.

In addition, this data sheet can be used to report other types of QC measurements performed on the test section not covered in the other construction data sheets. For example, if profile or ride quality acceptance procedures are not based on profilograph measurements, this information could be provided on this data sheet. In this case, specify the type, manufacture, model number of measurement equipment used, and a reference to the standard test procedure employed (such as ASTM, AASHTO, or an HA's test method.)

Milled Sections (SPS-10 Data Sheet 31)

The information on this data sheet applies to the test sections that are milled for the entire lane width prior to overlay placement.

Individual data items are as follows:

- Manufacturer of milling machine (item 1): Indicate the manufacturer of the milling machine.

- Milling machine model designation (item 2): Indicate the model number and designation of the milling machine.

- Width of cutting head (item 3): Enter the width of the cutting head employed on the milling machine to the nearest 0.1 inch.

- Milled depth (item 4): Enter the measured average final milled depth to the neared 0.1 inch. The milled depth should be measured at the outside (adjacent to the shoulder) and the inside edge (along the center line or adjacent lane) of the milled area every 25 ft. Measurements should be made from the surface of the pavement adjacent to the milled surface. For surfaces with significant macrotexture, the measurement should be made to the nominal bottom milled surface (bottom of valleys between peaks in the macrotexture). Enter the number of measurements as well as the maximum, minimum, and standard deviation of the measurements in the space provided.

- Macrotexture (item 5): Indicate the general roughness of the surface as defined by the macrotexture. Fine macrotexture designates a surface with an average or typical peak height (the distance between values and peaks).

- Estimate of extent of test section delaminated (item 6): This data item refers to delaminations in the milled surface due to chipping of chunks from the surface sized 2 inches^2 or greater. This occurrence may happen when material separates from an interface between pavement layers and becomes dislodged. Estimate the extent of delamination due to milling as a percentage of the delaminated surface area in the study lane. If the extent of delaminations is large (> 30 percent) or is localized, provide a sketch of the milled surface using SPS-10 data sheet 30.

- Height of ridge between parallel passes (item 7): If the width of the cutting head is less than the full lane width, indicate the height of any longitudinal ridge remaining between parallel passes of the milling machine in the study lane to the nearest 0.1 inch. If a distinguishable ridge does not exist, enter zero.

- Other comments (item 8): If there are other comments, please indicate the comment in the field provided.

- Were patches placed after milling (item 9): Enter a yes (“Y”) or no (“N”) to indicate whether patches were placed after the milling was completed.

- Length of time milled surface was opened to traffic (item 10): If the milled pavement surface was opened to traffic prior to placement of the replacement material layer, enter the length of time, in hours, it was opened to general traffic. If the milled surface was not opened to traffic, enter a zero.

- Was adjacent travel lane milled to same depth as test lane (item 11): This field indicates if the adjacent travel lane was eventually milled to the same depth as the test section lane. If the lane next to the test section was not milled or not milled to the same depth as the travel lane, then indicate no and record the total width of pavement that was milled to the same depth as the travel lane to the nearest 0.1 ft.

- General comments (item 12): Provide any general comments pertaining to the milling operation that may be useful in interpreting the subsequent performance of the overlay, such as unusual events, equipment problems, and climatic events.

Improvement Listing (SPS-10 Data Sheet 32)

This data sheet is to be completed each time construction activities are performed on a test section.

Individual data items are as follows:

- Date completed (item 1): The month, day, and year that the pavement improvements were finished and subsequently opened to traffic (not the date when the project was accepted).

- Work type code (item 2): A code to identify the type of maintenance work accomplished (table 20).

- Work quantity (item 3): The quantity of work applied to the section in appropriate units (table 20).

- Thickness (item 4): For improvements that alter the thickness of the pavement structure (such as overlays, etc.), enter the thickness of the rehabilitation activity to the nearest tenth of an inch. For items that do not alter the thickness of the pavement structure, enter "N" to indicate the data item is not applicable.

- Cost (item 5): The cost of the improvement is reported in $1,000 per lane mile. The cost includes only pavement structure cost. Nonpavement costs, such as cut-and-fill work as well as work on bridges, culverts, lighting, and guardrails, should be excluded.

Pre-overlay Surface Preparation Sketch (SPS-10 Data Sheet 33)

This data sheet is used to sketch the approximate locations of pre-overlay preparation treatments applied to the test section. It should also be used to describe any discontinuities existing or treatments placed after completion of milling. The approximate location of patches, sealed cracks, leveling course, and other features of the surface prior to placement of the overlay layers should be sketched. On milled sections, this data sheet only needs to be completed if patches

were placed, cracks were sealed, or delaminations were present in the surface after milling. This sketch will help identify the location of pertinent features on the test section surface prior to overlay placement and those features that may not have been recorded by the distress photography performed prior to the start of construction.

PMA Pre-overlay (Patching) (SPS-10 Data Sheet 34)

The information on this data sheet applies to AC patches placed for preparation of the test sections as part of the rehabilitation construction operations. One data sheet should be completed per test section. The information on this data sheet provides a summary of the patching operations on a test section. Information on the location of patches should be sketched on SPS-10 data sheet 34.

- Date patching operation began (item 1): The date the patching operation on the test section began.

- Date patching operation completed (item 2): The date the patching operation on the test section was completed.

- Primary distress occurrence patched (item 3): Indicate the code number from table 25 for the primary, i.e., most prevalent, distress occurrence patched. If the code descriptions provided in table 25 do not adequately describe the primary distress, describe the distress or occurrence being patched in the space provided. The distress terminology and definitions contained in the *Distress Identification Manual for the Long-Term Pavement Performance Program* should be used as a guide to distress interpretations (Miller and Bellinger 2014).

- Secondary distress occurrence patched (item 4): Indicate the code number from table 25 for the second most prevalent distress occurrence patched. If the code descriptions provided in table 25 do not adequately describe the primary distress, describe the distress or occurrence being patched in the space provided. The distress terminology and definitions contained in the *Distress Identification Manual for the Long-Term Pavement Performance Program* should be used as a guide to distress interpretations (Miller and Bellinger 2014).

- Summary of patching (item 5): Summarize the number of patches placed and the area of patching by type of patch, including only those patches placed in the test sections.

- Method used to determine location and sizes of patches (item 6): Enter the code number corresponding to the primary method used to determine the location and extent of patches. Codes are provided on SPS-10 data sheet 34.

- Method used to form patch boundary (item 7): Enter the code number corresponding to the type of equipment used to form the boundary of the patch. For example, if saw cuts were made and an air hammer was used to remove the material from within the patch area, then saw cuts should be indicated since they were used to form the patch boundary. Codes are provided on SPS-10 data sheet 34.

- Compaction equipment (item 8): Enter the code numbers provided on SPS-10 data sheet 34 for the type of equipment used to compact the patches. Space is provided for two responses if more than one type of compaction equipment was used.

- Patch material (item 9): Enter the code corresponding to the general classification of material used in the surface of the patches. Codes are provided on SPS-10 data sheet 34.

- Minimum time from material placement to opening to traffic (item 10): Indicate the minimum time, to the nearest hour, from the completion of patch placement to the opening to traffic.

- Maximum material temperature for traffic opening (item 11): If the opening of a patched area to traffic is specified in terms of the maximum allowable temperature of the patch material, indicate the highest allowable temperature. Leave blank if temperature was not used as a criteria for opening the patched section to traffic.

- Air temperature during placement operations (item 12): Enter the highest and lowest air temperature, in Fahrenheit, during the patching operations.

- Predominant road surface moisture condition during placement operations (item 13): Indicate the predominant moisture condition of the pavement surface during patching operations. Moist is considered as some moisture visible on the pavement surface, but the entire surface of the pavement is not wet, and no standing water is present.

SPS-10 PMA Pre-overlay (Sealing) (SPS-10 Data Sheet 35)

This data sheet is for reporting the details of sealing individual cracks to prevent moisture intrusion into the underlying layers.

Individual data items are as follows.

- Date sealing began (item 1): The date the patching operation on the test section began.

- Date sealing completed (item 2): The date the patching operation on the test section was completed.

- Average crack severity level (item 3): The average severity level of the cracks in the test section. Codes are provided on SPS-10 data sheet 35. The *Distress Identification Manual for the Long-Term Pavement Performance Program* should be used to determine the definition of the various severity levels (Miller and Bellinger 2014).

- Primary type of cracks (item 4): A code entered to describe the primary type of cracking prevalent over the monitored test section and evaluated in item 2. Codes are provided in table 25. A complete description of each type of crack listed in table 25 is available in the *Distress Identification Manual for the Long-Term Pavement Performance Program* (Miller and Bellinger 2014).

- Type of material used to seal cracks (item 5): A code entered to record the type of material used to seal the cracks in the pavement surface. Codes are provided on SPS-10 data sheet 35. If a proprietary crack/joint sealant or some other type not coded is used, space is provided to record additional information to identify the material.

- Ambient conditions at time of crack sealing (item 6): The low and high air temperatures observed during crack sealing activities in Fahrenheit and a code entered to indicate whether the surface was dry or wet at the time the cracks were sealed.

- Approximate total length of cracks sealed (item 7): The approximate total linear feet of individual cracks sealed within the test section to the nearest foot.

- Method used to clean cracks prior to sealing (item 8): A code entered to record the procedure used to clean the debris from cracks prior to sealing. Codes are provided on SPS-10 data sheet 35.

Seal Coat Application Data for Pavements with Asphalt Concrete Surfaces (SPS-10 Data Sheet 36)

SPS-10 data sheets 36 and 37 are for recording data on seal coat and surface treatment applications. If more than one seal coat or surface treatment is applied, then one set (SPS-10 data sheets 36 and 37) should be completed for each coat or layer. Repeat SPS-10 data sheets 36 and 37 for each coat or layer.

Individual data items are as follows.

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- Date work began (item 2): The month, day, and year the maintenance operation began.

- Date work completed (item 3): The month, day, and year the maintenance operation was completed.

- Primary reason for seal coat (item 4): Identify the primary purpose for placing the seal on the test section. Codes are available on SPS-10 data sheet 36, and space is given for entering a reason other than those for which codes are provided.

- Percent of test section sealed (item 5): The percent of the test section surface area over which the seal coat has been placed. For the LTPP test sections, the percent of the monitored test section in the outside lane is to be entered.

- Type of seal coat (item 6): The type of seal coat (slurry, aggregate, fog, etc.) that was applied to the pavement surface. Codes are provided on SPS-10 data sheet 36. Space is provided to specify a different type of seal coat, where applicable. If more space is needed, attach a separate piece of paper to SPS-10 data sheet 36. If multiple coats are applied, repeat SPS-10 data sheets 3 and 4 for each seal.

- Type/grade of bituminous material in seal coat (item 7): Table 19 provides a comprehensive list of possible types and grades, as taken from information published by the Asphalt Institute. Additional space is provided to include the manufacturer name and the manufacturer's name for the material

- Application rate for bituminous or other cementing material (item 8): The amount of bituminous material, to the nearest tenth of a gallon, placed per square yard (0.1 gal/yd^2) of pavement (water added to emulsified asphalt is included).

- Application rate for aggregate (item 9): The amount by weight of aggregate, to the nearest tenth of a pound (0.1 lb), including mineral filler placed per square yard of pavement (0.1 lb/yd^2).

- Approximate finished surface treatment thickness (item 10): The approximate thickness of the applied seal coat, to the nearest tenth of an inch (0.1 inch).

- Ambient conditions at time seal coat applied (item 11): Air temperature in Fahrenheit and a code entered to indicate whether the surface was dry or wet at the time the seal coat was applied (provided on SPS-10 data sheet 36).

- Average crack severity level (item 12): The average severity level of the cracks in the test section. The codes are provided on SPS-10 data sheet 36. The *Distress Identification Manual for the Long-Term Pavement Performance Program* should be used to identify the definitions for the severity levels (Miller and Bellinger 2014).

- Primary type of cracks (item 13): A code entered to describe the primary type of cracking prevalent in the test section and evaluated in item 10. Codes are provided in table 25. A complete description of each crack type listed in table 25 is available in the *Distress Identification Manual for the Long-Term Pavement Performance Program* (Miller and Bellinger 2014).

Seal Coat Application Data for Pavements with Asphalt Concrete Surfaces, Continued (SPS-10 Data Sheet 37)

This data sheet is a continuation of the seal coat data recorded on SPS-10 data sheet 36.

Individual data items are as follows.

- Layer number (item 1): The number of the layer for which the data on this data sheet is being provided (to be taken from SPS-10 data sheet 4).

- Gradation of aggregate (item 2): The percent of aggregate (including mineral filler) passing various standard sieve sizes to the nearest percent. Values will likely not be available for all 13 sieve sizes listed. The objective of this list is to provide space for a sufficient number of sieve sizes to accommodate testing and specification practice for most State and Provincial HAs.

- Aggregate precoated (item 3): A code entered to indicate whether the aggregate used in the seal coat was coated with bituminous material prior to placement. Codes are provided on SPS-10 data sheet 37.

- Roller used for seating aggregate (item 4): A code entered for indicating what type of roller was used for seating the aggregate into the asphalt. Codes appear on SPS-10 data sheet 37.

- Estimated time allowed for seal coat to cure prior to traffic application (item 5): A code, as provided on SPS-10 data sheet 37, used to identify the approximate length of time between the seal coat application and the opening of the section to traffic (usually from the completion of rolling or seating the aggregate; if no aggregate was placed, then from the time the liquid was applied).

- Condition of surface before sealing (item 6): A code (provided on SPS-10 data sheet 37) entered to indicate whether the surface of the existing pavement was clean, moderately clean, or dirty when the seal coat was placed.

- Initial existing pavement surface preparation (item 7): A code entered to indicate the method of initial preparation for the existing pavement surface. The codes appear on SPS-10 data sheet 37, and space is provided to describe a method not coded, where applicable. Attach a separate piece of paper if more space is needed.

- Final preparation of existing pavement surface (item 8): A code entered to record the final surface preparation used on the existing AC surface prior to seal coat application. The codes for various surface preparation methods appear on SPS-10 data sheet 37.

LTPP SPS-10 DATA SHEET 1 PROJECT IDENTIFICATION	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. DATE OF DATA COLLECTION OR UPDATE (month/year) [__ __/__ __ __ __]

2. HIGHWAY AGENCY DISTRICT NUMBER [__ __]

3. COUNTY OR PARISH [__ __ __]

4. FUNCTIONAL CLASS (table 4) [__ __]

5. ROUTE NUMBER [__ __ __ __ __]

6. ROUTE SIGNING (See route signing codes in table 26.) [__ __]

7. ROUTE QUALIFIER [__ __]

No Qualifier or Not Signed	1	Alternate	2
Business Route	3	Bypass Business	4
Spur	5	Loop	6
Proposed	7	Temporary	8
Truck Route	9	None of the Above	10

8. ALTERNATE ROUTE NAME (specify) [_____]

9. NUMBER OF THROUGH LANES (one direction) [__]

10. DATE OPEN TO TRAFFIC [__ __/__ __ __ __]

11. CONSTRUCTION COSTS PER LANE MILE (in $1,000s) [__ __ __ __ __]

12. MILEPOINT (project start) [__ __ __ __ __ . __ __]

13. ELEVATION (feet) [__ __ __ __ __ __]

14. ADDITIONAL LOCATION INFORMATION (significant landmarks): [_____
_____
_____]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 2 PROJECT STATIONS	STATE CODE [__ __] PROJECT ID [__ __ __ __]

ORDER	1. TEST SECTION ID NO.	REFERENCE PROJECT STATION NUMBER		4. CUT-FILL TYPE[1]
		2. START	3. END	
1	__ __ __ __	0 + 0 0. 0	__ __ __+__ __.__	__
2	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
3	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
4	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
5	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
6	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
7	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
8	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
9	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
10	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
11	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
12	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
13	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
14	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
15	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
16	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
17	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
18	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
19	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__
20	__ __ __ __	__ __ __+__ __.__	__ __ __+__ __.__	__

5. DIRECTION OF TRAVEL [__]

Note 1. Indicate the type of subgrade section the test section is located on:
Cut.....1 Fill.....2 At Grade ..... 3 Cut and Fill 4
If cut-fill transition is located in a test section, enter test section station of the cut-fill transition location.

6. INTERSECTION BETWEEN TEST SECTION ON THE PROJECT

ROUTE	PROJECT STATION NO.	RAMPS		INTERSECTION		
		EXIT	ENT	STOP	SIGNAL	UNSIG
_____	__ __ __ __+__ __	___	___	___	___	___
_____	__ __ __ __+__ __	___	___	___	___	___
_____	__ __ __ __+__ __	___	___	___	___	___
_____	__ __ __ __+__ __	___	___	___	___	___

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 3 GENERAL INFORMATION	STATE CODE [__ __] PROJECT ID [__ __ __ __]

LAYOUT

1. LANE WIDTH (feet) [__ __]

2. LANE NUMBER MONITORED (outside lane = 1) [__]

3. DIRECTION OF TRAVEL [__]
   East Bound ..... 1 West Bound 2
   North Bound ..... 3 South Bound ..... 4 Both Directions 5

4. SPEED LIMIT (mph) [__ __]

MEDIAN

5. MEDIAN TYPE [__]
   None ..... 1 Unprotected 2
   Curbed ..... 3 Positive Barrier—Unspecified 4
   Positive Barrier—Flexible ..... 5 Positive Barrier—Semirigid 6
   Positive Barrier—Rigid 7

6. MEDIAN WIDTH (feet) [__ __]

DRAINAGE

7. SUBSURFACE DRAINAGE LOCATION [__]
   Continuous Along Test Section 1
   Intermittent 2

8. SUBSURFACE DRAINAGE TYPE [__]
   No Subsurface Drainage ..... 1 Well System 5
   Longitudinal Drains ..... 2 Drainage Blanket with
   Transverse Drains ..... 3 Longitudinal Drains 6
   Drainage Blanket 4
   Other (specify) _____ 7

9. DIAMETER OF LONGITUDINAL DRAINPIPES (inches) [__ __ __.__]

10. SPACING OF LATERALS (feet) [__ __ __]

SHOULDER		INSIDE SHOULDER	OUTSIDE SHOULDER
11. SURFACE TYPE		[__]	[__]
Turf 1	Concrete 4		
Granular 2	Surface Treatment 5		
Asphalt Concrete 3	Other (specify) _____ 6		
12. TOTAL WIDTH (feet)		[__ __]	[__ __]
13. PAVED WIDTH (feet)		[__ __]	[__ __]
14. SHOULDER BASE TYPE (table 9)		[__ __]	[__ __]
15. SHOULDER SURFACE THICKNESS (inches)		[__ __]	[__ __]
16. SHOULDER BASE THICKNESS (inches)		[__ __]	[__ __]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 4 LAYER	STATE CODE [__ __] PROJECT ID [__ __ __ __]

LAYER DESCRIPTIONS

1. LAYER NUMBER	2. LAYER DESCRIPTION	3. MATERIAL TYPE	4. LAYER THICKNESSES (inches)			
			MEAN	MINIMUM	MAXIMUM	STANDARD DEVIATION
1	SUBGRADE (7)	[__ __]				
2	[__ __]	[__ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
3	[__ __]	[__ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
4	[__ __]	[__ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
5	[__ __]	[__ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
6	[__ __]	[__ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
7	[__ __]	[__ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
8	[__ __]	[__ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
9	[__ __]	[__ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
10	[__ __]	[__ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
11	[__ __]	[__ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
12	[__ __]	[__ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
13	[__ __]	[__ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
14	[__ __]	[__ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
15	[__ __]	[__ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]

5. DEPTH BELOW SURFACE TO "RIGID" LAYER (feet) [__ __.__]
   (Rock, stone, dense shale)

NOTES:

- Layer 1 is subgrade soil. The highest numbered layer is the pavement surface.

- Layer description codes:
  Overlay = 01; Seal Coat = 02; Original Surface = 03; Hot-Mix Asphalt Concrete (HMAC) Layer (Below Surface Layer) = 04; Base Layer = 05; Subbase Layer = 06; Subgrade = 07; Interlayer = 08; Porous Friction Course = 09; Surface Treatment = 10; Embankment (Fill) = 11.

- The material type classification codes for surface, base or subbase, subgrade, and seal coat or interlayer materials appear in table 8, table 9, table 10, and table 11, respectively.

- Enter the average thickness of each layer as well as the minimum, maximum, and standard deviation of the thickness measurements, if known.

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 5 AGE AND MAJOR IMPROVEMENTS	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. DATE OF LATEST CONSTRUCTION/RECONSTRUCTION (Month/year) [__ __/__ __ __ __]

2. DATE SUBSEQUENTLY OPENED TO TRAFFIC (Month/year) [__ __/__ __ __ __]

3. LATEST CONSTRUCTION/RECONSTRUCTION COST PER LANE MILE (in $1,000s)[1] [__ __ __ __ __]

MAJOR IMPROVEMENTS SINCE LATEST CONSTRUCTION/RECONSTRUCTION (items 4–8)

4.	5.	6.	7.
YEAR	WORK TYPE CODE (table 20)	WORK QUANTITY (table 20 for units)	THICKNESS (inches)
[__ __ __ __]	[__ __]	[__ __ __ __ __]	[__ __.__]
[__ __ __ __]	[__ __]	[__ __ __ __ __]	[__ __.__]
[__ __ __ __]	[__ __]	[__ __ __ __ __]	[__ __.__]
[__ __ __ __]	[__ __]	[__ __ __ __ __]	[__ __.__]
[__ __ __ __]	[__ __]	[__ __ __ __ __]	[__ __.__]

8. MAJOR IMPROVEMENT TYPE OTHER
[_____]

ADDITIONAL ROADWAY WIDENING INFORMATION (items 9–12)

9. YEAR WHEN ROADWAY WIDENED[2] [__ __ __ __]

10. ORIGINAL NUMBER OF LANES (one direction) [__]

11. FINAL NUMBER OF LANES (one direction) [__]

12. LANE NUMBER OF ADDED LANE [__]

NOTES:
1. Cost includes pavement structure cost. Nonpavement costs, such as cut-and-fill work as well as work on bridges, culverts, lighting, and guardrails, should be excluded.

2. A lane created by roadway widening should not be used for LTPP unless the pavement structure under the entire lane was constructed at the same time and is uniform.

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 6 SNOW REMOVAL/DEICING	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. FREQUENCY OF SNOW REMOVAL AT TEST SITE [__ __]
   (number of occurrences)

2. FREQUENCY OF APPLICATION OF DEICING CHEMICALS ON THE TEST SITE [__ __]
   (number of occurrences)

3. WHAT TYPE OF DEICERS HAVE BEEN USED ON THIS TEST SECTION? [__]
   Sodium Chloride (NaCl).....1
   Calcium Dichloride ($CaCl^2$) 2
   NaC1 + $CaCl^2$.....3
   Calcium Magnesium Acetate (CMA)...4
   Other (specify) _____ 5

4. HAS THE USE OF ANY OF THESE DEICERS BEEN DISCONTINUED SINCE THE TEST SECTION WAS OPEN TO TRAFFIC? [__]
   NaCl 1
   $CaCl^2$ 2
   NaC1 + $CaCl^2$.....3
   CMA.....4
   Other (specify) _____ 5

   IF YES, IN WHAT YEAR? [__ __ __ __]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 7 HPMS DATA ITEMS	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. HPMS SAMPLE NUMBER [__ __ __ __ __ __ __ __ __ __ __ __]

2. HPMS SECTION SUBDIVISION [__]

3. URBAN CODE [__ __ __ __ __]
   Small Urban Sections 99998
   Rural Area Sections..... 99999

4. FACILITY TYPE [__]
   One-Way Roadway 1
   Two-Way Roadway..... 2

5. ACCESS CONTROL [__]
   Full Access Control..... 1
   Partial Access 2
   No Access Control..... 3

6. OWNERSHIP (See ownership codes in table 27) [__]

7. HIGH-OCCUPANCY VEHICLE (HOV) TYPE (HOV operations type) [__]
   Full-Time HOV 1
   (site has 24-h exclusive HOV lanes, no other use permitted)
   Part-Time HOV 2
   (normal through lanes used for exclusive HOV during specified periods)
   Part-Time HOV 3
   (shoulder/parking lanes used for exclusive HOV during specified periods)

8. HOV LANES [__]

9. PEAK LANES [__]

10. COUNTER PEAK LANES [__]

11. RIGHT-TURN LANES (See turn lane codes in table 28) [__]

12. LEFT-TURN LANES (See turn lane codes in table 28) [__]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 8 HPMS DATA ITEMS (Continued)	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. TOLL CHARGED [__]
   - Toll charged in one direction only 1
   - Toll charged in both directions 2
   - No toll charged 3

2. TOLL TYPE [__]
   - Toll lanes but no special tolls (e.g., HOT lanes) 1
   - HOT lanes 2
   - Other special tolls 3

3. WIDENING OBSTACLES (See widening obstacles codes in table 29.) [__ __ __]

4. WIDENING POTENTIAL [__]

5. TERRAIN TYPE [__]
   - Level 1
   - Rolling 2
   - Mountainous 3

6. CURVE CLASSIFICATION [__]
   - Under 3.5 Degrees ..... A
   - 3.5–5.4 Degrees ..... B
   - 5.5–8.4 Degrees C
   - 8.5–13.9 Degrees ..... D
   - 14.0–27.9 Degrees ..... E
   - 28 Degrees or More ..... F

7. GRADE CLASSIFICATION [__]
   - 0.0–0.4 ..... A
   - 0.5–2.4 ..... B
   - 2.5–4.4 C
   - 4.5–6.4 ..... D
   - 6.5–8.4 ..... E
   - 8.5 or Greater ..... F

8. PERCENT PASSING SIGHT DISTANCE [__ __ __]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 9 PMA AGGREGATE PROPERTIES	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

2. TYPE OF AGGREGATE [__]

Untreated	1	RAP	2
RAS	3	Combined	4

COMPOSITION OF COARSE AGGREGATE (items 3, 4, and 5)

					TYPE	PERCENT
Crushed Stone	1	Crushed Slag	4	3.	[__]	[__ __ __]
Gravel	2	Manufactured Lightweight	5	4.	[__]	[__ __ __]
Crushed Gravel	3			5.	[__]	[__ __ __]
Other (specify) [_____]	6					

6. GEOLOGIC CLASSIFICATION OF COARSE AGGREGATE [__ __]
(See geologic classification codes in table 12.)

COMPOSITION OF FINE AGGREGATE (items 7, 8, and 9)

			TYPE	PERCENT
Natural Sand	1	7.	[__]	[__ __ __]
Manufactured Sand (from crushed gravel or stone)	2	8.	[__]	[__ __ __]
		9.	[__]	[__ __ __]
Recycled Concrete	3			
Other (specify) [_____]	4			

10. TYPE OF MINERAL FILLER [__]

Stone Dust	1	Portland Cement	3
Hydrated Lime	2	Fly Ash	4
None	5		
Other (specify) [_____]	6		

AGGREGATE DURABILITY TEST RESULTS (items 13–16)
(See durability test type codes in table 16.)

TYPE OF AGGREGATE	TYPE OF TEST	RESULTS
11. COARSE	[__ __]	[__ __ __.__ __ __]
12. COARSE	[__ __]	[__ __ __.__ __ __]
13. COARSE	[__ __]	[__ __ __.__ __ __]
14. COMBINED COARSE AND FINE	[__ __]	[__ __ __.__ __ __]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 10 PMA AGGREGATE PROPERTIES (Continued)	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

2. TYPE OF AGGREGATE [__]
   Untreated ..... 1 RAP 2
   RAS ..... 3 Combined 4

3. POLISH VALUE OF COARSE AGGREGATES [__ __]
   (surface layer only) (AASHTO T279, ASTM D3319) (AASHTO 2018; ASTM 2011b)

4. ANGULARITY COARSE ONE FACE [__ __ __.__]

5. ANGULARITY COARSE TWO FACES [__ __ __.__]

6. ANGULARITY FINE [__ __ __.__]

7. SOUNDNESS COARSE [__ __ __.__]

8. SOUNDNESS FINE [__ __ __.__]

9. COARSE AGGREGATE TOUGHNESS [__ __ __.__]

10. DELETERIOUS MATERIALS [__ __ __.__]

11. CLAY CONTENT [__ __ __.__]

12. THIN ELONGATED PARTICLES [__ __.__]

13. GRADATION OF COMBINED AGGREGATES

Sieve Size or No.	Percent Passing	Sieve Size or No.	Percent Passing
2 inches	[__ __ __]	No. 4	[__ __]
1 ½ inches	[__ __ __]	No. 8	[__ __]
1 inch	[__ __ __]	No. 10	[__ __]
7/8 inch	[__ __ __]	No. 16	[__ __]
¾ inch	[__ __ __]	No. 30	[__ __]
5/8 inch	[__ __ __]	No. 40	[__ __]
½ inch	[__ __ __]	No. 50	[__ __]
3/8 inch	[__ __ __]	No. 80	[__ __]
		No. 100	[__ __]
		No. 200	[__ __]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 11 PMA AGGREGATE PROPERTIES (Continued)	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

2. TYPE OF AGGREGATE [__]
   Untreated ..... 1 RAP 2
   RAS ..... 3 Combined 4

ABSORPTION OF AGGREGATE (items 2 and 3)

3. COARSE AGGREGATE (AASHTO T85 OR ASTM C127) (AASHTO 2014a; ASTM 2015a) [__.__ __ __]

4. FINE AGGREGATE (AASHTO T84 OR ASTM C128) (AASHTO 2013b; ASTM 2015a) [__.__ __ __]

BULK SPECIFIC GRAVITIES (items 4–7)

5. COARSE AGGREGATE (AASHTO T85 OR ASTM C127) (AASHTO 2014a; ASTM 2015a) [__.__ __ __]

6. FINE AGGREGATE (AASHTO T84 OR ASTM C127) (AASHTO 2013b; ASTM 2015a) [__.__ __ __]

7. MINERAL FILLER (AASHTO T100 OR ASTM D854) (AASHTO 2015a) [__.__ __ __]

8. AGGREGATE COMBINATION (calculated—equation 1) [__.__ __ __]

9. EFFECTIVE SPECIFIC GRAVITY OF AGGREGATE COMBINATION [__.__ __ __]
   (calculated—equation 2)

10. THEORETICAL MAXIMUM SPECIFIC GRAVITY OF THE RAS [__.__ __]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 12 PMA BINDER	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

2. TYPE OF BINDER [__]
   Untreated ..... 1 RAP 2
   RAS ..... 3 Combined 4

3. ASPHALT GRADE (Specify the design Superpave PG grading.) PG[__ __]–[__ __]

4. ASPHALT GRADE (if not PG grade) (See asphalt code sheet in table 19.) [__ __]
   Other (specify) [_____]

5. SOURCE (See supply code sheet in table 17.) [__ __]
   Other (specify) [_____]

6. SPECIFIC GRAVITY OF ASPHALT CEMENT [__.__ __ __]
   (AASHTO T228, ASTM D70) (AASHTO 2009b; ASTM 2018b)

7. VISCOSITY OF ASPHALT AT 140 °F (poises) [__ __ __ __ __ __]
   (AASHTO T202, ASTM D2171) (AASHTO 2015e; ASTM 2018c)

8. VISCOSITY OF ASPHALT AT 275 °F (centistokes) [__ __ __ __.__ __]
   (AASHTO T201, ASTM D2170) (AASHTO 2015d; ASTM 2018d)

9. PENETRATION AT 77 °F, 100 g, 5 s (tenths of a millimeter) [__ __ __]
   (AASHTO T49, ASTM D5) (AASHTO 2015c; ASTM 2020b)

ASPHALT MODIFIERS (See type code in table 18) (items 11 and 12)	TYPE	QUANTITY (percent)
10. MODIFIER no. 1	[__ __]	[__ __.__]
11. MODIFIER no. 2	[__ __]	[__ __.__]

   Other (specify) [_____]

12. DUCTILITY AT 77 °F (centimeters) [__ __ __]
    (AASHTO T51, ASTM D113) (AASHTO 2009a; ASTM 2017b)

13. DUCTILITY AT 39.2 °F (centimeters) [__ __ __]
    (AASHTO T51, ASTM D113) (AASHTO 2009a; ASTM 2017b)

14. TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2 °F (centimeters per minute) [__ __ __]

15. PENETRATION AT 39.2 °F, 200 g, 60 s (tenths of a millimeter) [__ __ __]
    (AASHTO T49, ASTM D5) (AASHTO 2015c; ASTM 2020b)

16. RING AND BALL SOFTENING POINT (Fahrenheit) [__ __ __]
    (AASHTO T53, ASTM D36) (AASHTO 2011; ASTM 2014a)

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 13 PMA BINDER AGED	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

2. TYPE OF BINDER [__]
   Untreated ..... 1 RAP 2
   RAS ..... 3 Combined 4

3. TEST PROCEDURE USED TO MEASURE AGING EFFECTS [__]
   ASTM D1754—Thin Film Oven Test (ASTM 2020c) 1
   ASTM D2872—Rolling Thin Film Oven Test (ASTM 2019d) 2
   Other (specify)[_____] 3
   Field Aged—For Binder Extracted From Cores Taken in the Field.....4

4. SPECIFIC GRAVITY OF ASPHALT CEMENT [__.__ __ __]
   (AASHTO T228, ASTM D70) (AASHTO 2009b; ASTM 2018b)

5. VISCOSITY OF ASPHALT AT 140 °F (poises) [__ __ __ __ __ __]
   (AASHTO T202, ASTM D2171) (AASHTO 2015e; ASTM 2018c)

6. VISCOSITY OF ASPHALT AT 275 °F (centistokes) [__ __ __ __.__ __]
   (AASHTO T201, ASTM D2170) (AASHTO 2015d; ASTM 2018d)

7. DUCTILITY AT 77 °F (centimeter) [__ __ __]
   (AASHTO T51, ASTM D113) (AASHTO 2009a; ASTM 2017b)

8. DUCTILITY AT 39.2 °F (centimeter) [__ __ __]
   (AASHTO T51, ASTM D113) (AASHTO 2009a; ASTM 2017b)

9. PENETRATION AT 77 °F, 100 g, 5 s (tenths of a millimeter) [__ __ __]
   (AASHTO T49, ASTM D5) (AASHTO 2015c; ASTM 2020b)

10. PENETRATION AT 39.2 °F, 200 g, 60 s (tenths of a millimeter) [__ __ __]
    (AASHTO T49, ASTM D5) (AASHTO 2015c; ASTM 2020b)

11. RING AND BALL SOFTENING POINT (Fahrenheit) [__ __ __]
    (AASHTO T53, ASTM D36) (AASHTO 2011)

12. WEIGHT LOSS (percent) [__.__]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 14 AC DSR, BBR, DIRECT TENSION	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

2. TYPE OF BINDER [__]
   Untreated ..... 1 RAP 2
   RAS ..... 3 Combined 4

3. DSR COMPLEX MODULUS AND PHASE ANGLE (kilopascal, degree)
   (Tank asphalt) (AASHTO TP5) (AASHTO 1998) [__ __ __ __.__ __] [__ __]

4. DSR COMPLEX MODULUS AND PHASE ANGLE (kilopascal, degree)
   (RTFO asphalt) (AASHTO TP5) (AASHTO 1998) [__ __ __ __.__ __] [__ __]

5. DSR COMPLEX MODULUS AND PHASE ANGLE (kilopascal, degree)
   (PAV asphalt) (AASHTO TP5) (AASHTO 1998) [__ __ __ __ __.__ __] [__ __]

6. BBR STIFFNESS MODULUS AND SLOPE (megapascal, ratio)
   (PAV asphalt) (AASHTO TP5) (AASHTO 1998) [__ __ __ __] [__ __ __ __.__ __ __]

7. DIRECT TENSION TENSILE STRENGTH AND TENSILE STRAIN (kilopascal, ratio)
   (PAV asphalt) (AASHTO TP5) (AASHTO 1998) [__ __ __ __ __.__] [__ __ __.__ __]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 15 RAP	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

2. TYPE OF AGGREGATE [__]
   RAP ..... 1 RAS 2

RAP

3. PROCEDURE USED TO BREAK UP AND/OR REMOVE THE RAP [__]
   Scarifying ..... 1 Ripping.....3
   Grid Rolling..... 2 Cold Milling.....4
   Other (specify)[_____] 5

4. RAP PROCESSING [__]
   None 1
   Crushed and Screened 2
   Pulverized by Hammermill.....3
   Pulverized by Grid or V-Cleated Roller 4
   Other (specify)[_____] 5

RAS

5. TYPE OF RAS [__]
   Manufactured Shingle Waste.....1
   Postconsumer Asphalt Shingles.....2
   None 3

BOTH

6. PERCENT OF BINDER IN THE RAP/RAS BY MASS (percent) [__.__ __]

7. WAS AN ADDITIVE ADDED TO THE STOCKPILE TO MAINTAIN WORKABILITY (Y/N) [__]

   If yes, what quantity? (percent by mass) [__.__ __]

   Provide type of additive [_____]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 16 PMA LABORATORY MIX DESIGN	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

2. MAXIMUM SPECIFIC GRAVITY (no air voids) (figure 5) [__.__ __ __]

3. BULK SPECIFIC GRAVITY (ASTM D1188) (ASTM 2007a) [__.__ __ __]

4. OPTIMUM ASPHALT CONTENT (percent by weight of total mix) [__ __.__]

5. PERCENT AIR VOIDS (figure 6) [__ __ __.__]

6. MARSHALL STABILITY (pounds) [__ __ __ __]
   (AASHTO T245, ASTM D1559) (AASHTO 2015f; ASTM 1989)

7. NUMBER OF BLOWS [__ __]

8. MARSHALL FLOW (hundredths of an inch) [__ __ __ __]
   (AASHTO T245, ASTM D1559) (AASHTO 2015f; ASTM 1989)

9. HVEEM STABILITY (AASHTO T246, ASTM D1560) (AASHTO 2010b; ASTM 2015f) [__ __ __]

10. HVEEM COHESIOMETER VALUE (grams per 25 mm of width) [__ __ __ __]
    (AASHTO T246, ASTM D1560) (AASHTO 2010b; ASTM 2015f)

11. VOIDS IN MINERAL AGGREGATE (percent) (figure 7) [__ __.__]

12. EFFECTIVE ASPHALT CONTENT (percent) (figure 8) [__ __.__]

13. SUPERPAVE GYRATORY COMPACTION NDESIGN [__ __ __]

14. GYRATION RATIO (figure 9) [__.__ __]

15. ASPHALT GRADE (Specify the design Superpave PG grading.) PG[__ __]–[__ __]
    Other (specify)[_____]

HAMBURG WHEEL-TRACKING TEST

16. CONDITIONING (AASHTO T324) Wet.....1 Dry.....2 [__]

17. DEFORMATION AT 20,000 PASSES (inches) [__.__ __ __]

18. TEST TEMPERATURE [__ __.__]

19. TENSILE STRENGTH RATIO (AASHTO T283) (AASHTO 2014e) [__ __.__]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 17 PMA LABORATORY MIX DESIGN (Continued)	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

2. FLOW NUMBER (AASHTO TP79) (AASHTO 2015g) [__.__ __]

3. FLOW NUMBER TEMPERATURE [__ __ __]

4. PLANNED PRODUCTION TEMPERATURE [__ __ __.__]

5. PLANNED FIELD COMPACTION TEMPERATURE [__ __ __.__]

RECYCLED DESIGN INFORMATION

6. DESIGN ASPHALT BINDER CONTENT OF MIX WITHOUT RAS/RAP (percent) [__ __.__]

7. PERCENT RAS IN MIXTURE (percent) [__ __.__]

8. PERCENT OF SHINGLE ASPHALT BINDER IN THE RAS BY MASS (percent) [__.__ __]

9. PERCENT RAP IN MIXTURE (percent) [__ __.__]

10. PERCENT ASPHALT IN RAP BY MASS (percent) [__ __.__]

11. PERCENT OF RAP/RAS BINDER IN THE MIX BY MASS (percent) (binder replacement) [__.__ __]

12. AMOUNT OF NEW UNTREATED AGGREGATE ADDED (percent) [__ __.__]
    (percent by weight of combined aggregate in recycled mix)

13. RECYCLING AGENT (RA) (See type code in table 23.) TYPE: [__ __] QUANTITY: [__ __]

14. AMOUNT OF NEW ASPHALT CEMENT ADDED (percent) [__ __.__]
    (percent by weight of recycled mixture)

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 18 PMA LABORATORY MIX DESIGN WARM MIX	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

2. TYPE OF WARM-MIX TECHNOLOGY [__]
   Foaming Process.....1
   Foaming Additive.....2
   Chemical Additive.....3
   Organic Additive.....4
   None.....5
   Other (specify)[_____] 6

   Name Brand (specify)[_____]

3. FORM OF WMA ADDITIVE [__]
   Liquid..... 1 Water Injection.....3
   Solid..... 2 None.....4
   Other (specify)[_____] 5

4. DOSAGE RATE (percent by total weight of binder) [__ __]

5. METHOD OF INTRODUCING ADDITIVE TO THE MIX [__]
   Terminal.....1
   Storage Tank at Production plant.....2
   In-Line.....3
   Conveyor/Vane/Collar Feed System.....4
   Water Injection.....5
   None.....6
   Other (specify)[_____] 7

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 19 PMA MIXTURE PROPERTIES	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

2. TYPE OF SAMPLES [__]
   Mixed in Field, Compacted in Laboratory 1
   Mixed and Compacted in Field 2

3. MAXIMUM SPECIFIC GRAVITY (no air voids) (figure 4)) [__.__ __ __]

4. BULK SPECIFIC GRAVITY (ASTM D1188) (ASTM 2007a)
   MEAN [__.__ __ __] NUMBER OF TESTS [__ __]
   MINIMUM [__.__ __ __] MAXIMUM [__.__ __ __]
   STANDARD DEVIATION [__.__ __ __]

5. ASPHALT CONTENT (percent by weight of total mix)
   (AASHTO T164, ASTM D2172) (AASHTO 2014b; ASTM 2017d)
   MEAN [__.__ __ __] NUMBER OF TESTS [__ __]
   MINIMUM [__.__ __ __] MAXIMUM [__.__ __ __]
   STANDARD DEVIATION [__.__ __ __]

6. PERCENT AIR VOIDS (figure 6)
   MEAN [__.__ __ __] NUMBER OF TESTS [__ __]
   MINIMUM [__.__ __ __] MAXIMUM [__.__ __ __]
   STANDARD DEVIATION [__.__ __ __]

7. VOIDS IN MINERAL AGGREGATE (percent) (figure 7)
   MEAN [__.__ __ __] NUMBER OF TESTS [__ __]
   MINIMUM [__.__ __ __] MAXIMUM [__.__ __ __]
   STANDARD DEVIATION [__.__ __ __]

8. EFFECTIVE ASPHALT CONTENT (percent) (figure 8)
   MEAN [__.__ __ __] NUMBER OF TESTS [__ __]
   MINIMUM [__.__ __ __] MAXIMUM [__.__ __ __]
   STANDARD DEVIATION [__.__ __ __]

9. TYPE ASPHALT PRODUCTION PLANT [__]
   Batch Plant ..... 1 Drum Mix Plant.....2
   Other (specify) [_____]3

10. TYPE OF ANTISTRIPPING AGENT (See type codes in table 24.) [__ __]
    Other (specify) [_____]

11. ANTISTRIPPING AGENT LIQUID OR SOLID CODE [__]
    Liquid ..... 1 Solid 2

12. AMOUNT OF ANTISTRIPPING AGENT [__ __ __.__]
    (If the antistripping agent is a liquid, enter amount as percent of asphalt cement weight. If the antistripping agent is a solid, enter amount as percent of aggregate weight.)

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 20 PMA MIXTURE PROPERTIES (Continued)	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

2. TYPE OF SAMPLES [__]
   Mixed in Field, Compacted in Laboratory 1
   Mixed and Compacted in Field 2

3. TYPE ASPHALT PRODUCTION PLANT [__]
   Batch Plant ..... 1 Drum Mix Plant.....2
   Other (specify) [_____]3

4. TYPE OF ANTISTRIPPING AGENT (See type codes in table 24.) [__ __]
   Other (specify) [_____]

5. ANTISTRIPPING AGENT LIQUID OR SOLID CODE [__]
   Liquid ..... 1 Solid 2

6. AMOUNT OF ANTISTRIPPING AGENT [__ __ __.__]
   (If the antistripping agent is a liquid, enter amount as percent of asphalt cement weight. If the antistripping agent is a solid, enter amount as percent of aggregate weight.)

7. MOISTURE SUSCEPTIBILITY TEST TYPE [__]
   AASHTO T165 (ASTM D1075) (AASHTO 2002b; ASTM 2011a) 1
   Texas Freeze-Thaw Pedestal Test (Kennedy et al. 1982).....2
   Texas Boiling Test (Kennedy, Roberts, and Anagnos 1984)) 3
   Revised Lottman Procedure (AASHTO T283) (AASHTO 2014e).....4
   Other (specify)[_____] 5

8. MOISTURE SUSCEPTIBILITY TEST RESULTS
   HVEEM STABILITY NO. [__ __]
   PERCENT STRIPPED [__ __]
   TENSILE STRENGTH RATIO (AASHTO T283) (AASHTO 2014e) [__.__ __]
   INDEX OF RETAINED STRENGTH (AASHTO T165) (AASHTO 2002b) [__ __ __]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 21 SUPERPAVE MIXTURE PROPRERTIES	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

2. TYPE OF SAMPLES [__]
   Mixed in Field, Compacted in Laboratory 1
   Mixed and Compacted in Field 2

3. FREQUENCY SWEEP (COMPLEX MODULUS, MEGAPASCALS PERCENT PHASE ANGLE, δ)
   4 ºC[__ __ __][__ __.__] 20 ºC[__ __ __][__ __.__] 40 ºC[__ __ __][__ __.__]

4. UNIAXIAL STRAIN (AXIAL STRESS, KILOPASCALS and STRAIN, MILLIMETERS OF MOVEMENT/MILLIMETER OF LENGTH)
   4 ºC[__ __ __][__ __.__] 20 ºC[__ __ __][__ __.__] 40 ºC[__ __ __][__ __.__]

5. VOLUMETRIC STRAIN (CONFINING PRESSURE, KILOPASCALS and AXIAL STRAIN, MILLIMETERS OF MOVEMENT/MILLIMETER OF LENGTH)
   4 ºC[__ __ __][__ __.__] 20 ºC[__ __ __][__ __.__] 40 ºC[__ __ __][__ __.__]

6. SIMPLE SHEAR

	4 ºC	20 ºC	40 ºC
AXIAL STRESS, kilopascals	[__ __ __]	[__ __ __]	[__ __ __]
SHEAR STRESS, kilopascals	[__ __ __]	[__ __ __]	[__ __ __]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 22 PMA CONSTRUCTION	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

2. DATE OPERATIONS BEGAN (dd/mmm/yyyy) [__ __ /__ __ __ /__ __ __ __]

3. DATE PAVING COMPLETED (dd/mmm/yyyy) [__ __ /__ __ __ /__ __ __ __]

EQUIPMENT

4. MIXING PLANT TYPE [__]
   Batch..... 1 Drum Mix.....2
   Other (specify) [_____]3

5. MIXING PLANT NAME [_____]

6. TYPE OF MATERIALS TRANSFER EQUIPMENT USED [__]
   None 1
   Windrow Elevator 2
   Surge Volume/Remixing MTV 3
   Other (specify) [_____] 4
   BRAND [_____]

TACK COAT

7. TACK COAT USED (Y/N) [__]

8. TACK COAT TYPE (table 19.) [__ __]
   Other (specify) [_____]

9. TACK COAT DILUTION (percent) [__ __]

10. APPLICATION RATE (gallons per square yard) [__.__ __]

PLACEMENT INFO

11. HAUL DISTANCE (miles) [__ __ __] HAUL TIME (minutes) [__ __ __]

12. SINGLE-PASS LAYDOWN WIDTH (feet) [__ __.__]

13. TRANSVERSE JOINT LOCATION (station in meters) [__+__ __.__]

14. LONGITUDINAL SURFACE JOINT LOCATION [__]
    Between Lanes ..... 1 Within Lane.....2

15. LONGITUDINAL JOINT OFFSET FROM OUTSIDE SHOULDER (feet) [__ __.__]

16. SIGNIFICANT EVENTS (disruptions, rain, equipment problems, etc.)
    [_____]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 23 PMA CONSTRUCTION (Continued)	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

TEMPERATURE DATA (items 2–5)

2. MIXING TEMPERATURE (Fahrenheit) [__ __ __]
3. PRODUCTION PLANT EXHAUST TEMPERATURE (Fahrenheit) [__ __ __]
4. MEAN DELIVERY TEMPERATURE (Fahrenheit) [__ __ __]
5. LAYDOWN TEMPERATURES (Fahrenheit)
   MEAN [__ __ __] NUMBER OF TESTS [__ __ __]
   MINIMUM [__ __ __] MAXIMUM [__ __ __]
   STANDARD DEVIATION [__ __ __. __]

ROLLER DATA (items 6–22)

	ROLLER CODE	ROLLER DESCRIPTION	GROSS WGT (tons)	TIRE PRES. (psi)	FREQ. (vibrations/minute)	AMPLITUDE (inches)	SPEED (mph)
6.	A	STEEL WHL TANDEM	__ __.__				
7.	B	STEEL WHL TANDEM	__ __.__				
8.	C	STEEL WHL TANDEM	__ __.__				
9.	D	STEEL WHL TANDEM	__ __.__				
10.	E	PNEUMATIC TIRED	__ __.__	__ __ __.			
11.	F	PNEUMATIC TIRED	__ __.__	__ __ __.			
12.	G	PNEUMATIC TIRED	__ __.__	__ __ __.			
13.	H	PNEUMATIC TIRED	__ __.__	__ __ __.			
14.	I	SINGLE DRUM VIBR	__ __.__		__ __ __ __.	.__ __ __	__ __.__
15.	J	SINGLE DRUM VIBR	__ __.__		__ __ __ __.	.__ __ __	__ __.__
16.	K	SINGLE DRUM VIBR	__ __.__		__ __ __ __.	.__ __ __	__ __.__
17.	L	SINGLE DRUM VIBR	__ __.__		__ __ __ __.	.__ __ __	__ __.__
18.	M	DOUBLE DRUM VIBR	__ __.__		__ __ __ __.	.__ __ __	__ __.__
19.	N	DOUBLE DRUM VIBR	__ __.__		__ __ __ __.	.__ __ __	__ __.__
20.	O	DOUBLE DRUM VIBR	__ __.__		__ __ __ __.	.__ __ __	__ __.__
21.	P	DOUBLE DRUM VIBR	__ __.__		__ __ __ __.	.__ __ __	__ __.__
22.	Q	OTHER _____					

COMPACTION DATA (items 23–31)

BREAKDOWN:	FIRST LIFT	SECOND LIFT	THIRD LIFT	FOURTH LIFT
23. ROLLER CODE no. (A–Q)	[__]	[__]	[__]	[__]
24. COVERAGES	[__ __]	[__ __]	[__ __]	[__ __]
INTERMEDIATE:				
25. ROLLER CODE no. (A–Q)	[__]	[__]	[__]	[__]
26. COVERAGES	[__ __]	[__ __]	[__ __]	[__ __]
FINAL:				
27. ROLLER CODE no. (A–Q)	[__]	[__]	[__]	[__]
28. COVERAGES	[__ __]	[__ __]	[__ __]	[__ __]
	[__ __ __]	[__ __ __]	[__ __ __]	[__ __ __]
29. AIR TEMPERATURE (Fahrenheit)				
30. COMPACTED THICKNESS (inches)	[__.__]	[__.__]	[__.__]	[__.__]
31. CURING PERIOD (days)	[__ __]	[__ __]	[__ __]	[__ __]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 24 UNBOUND	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

2. AASHTO SOIL CLASSIFICATION (See codes in table 13.) [__ __]

3. ATTERBERG LIMITS (AASHTO T90 or ASTM D4318) (AASHTO 2020c; ASTM 2017f)
   PI [__ __] LL [__ __] PL [__ __]

4. MAXIMUM LAB DRY DENSITY (pounds per cubic foot) [__ __ __]

5. OPTIMUM LAB MOISTURE CONTENT (percent) [__ __.__]

6. TEST USED TO MEASURE MAXIMUM DRY DENSITY [__]
   Standard AASHTO T99 ..... 1 ASTM D558 (ASTM 2019b) 4
   Modified AASHTO T180..... 2 ASTM D4223 (ASTM 2020d) 5
   AASHTO T134 (Soil-cement)..... 3
   Other (specify) [_____] 6

7. COMPACTIVE ENERGY FOR "OTHER" METHOD (feet-pounds per cubic inch) [__ __.__]

8. IN SITU DRY DENSITY (pounds per cubic foot)
   MEAN [__ __ __ __.__] NUMBER OF SAMPLES [__ __ __]
   MINIMUM [__ __ __ __.__] MAXIMUM [__ __ __ __.__]
   STANDARD DEVIATION [__ __ __ __.__]

9. IN SITU MOISTURE CONTENT (percent of dry weight)
   MEAN [__ __ __ __.__] NUMBER OF SAMPLES [__ __ __]
   MINIMUM [__ __ __ __.__] MAXIMUM [__ __ __ __.__]
   STANDARD DEVIATION [__ __ __ __.__]

10. COMPRESSIVE STRENGTH (pounds per square inch)
    MEAN [__ __ __ __.__] NUMBER OF TESTS [__ __ __]
    MINIMUM [__ __ __ __.__] MAXIMUM [__ __ __ __.__]
    STANDARD DEVIATION [__ __ __ __.__]

11. TYPE OF COMPRESSION TEST [__]
    AASHTO T167 (ASTM D1074) (AASHTO 2010a; ASTM 2017c).....1
    AASHTO T24 (ASTM D1633) (AASHTO 2015b; ASTM 2017e) 2
    AASHTO T220 (AASHTO 1966) 3
    AASHTO T234 (ASTM D2850) (AASHTO 1970; ASTM 2015e) 4
    Other (specify) [_____] 5

12. CONFINING PRESSURE (pounds per square inch)[1] [__ __.__]

13. CALCIUM CARBONATE CONTENT (percent) (ASTM D4373) (ASTM 2014c) [__ __ __]

Note 1: If the test is unconfined, enter "0.0"

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 25 UNBOUND (Continued)	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

2. CALIFORNIA BEARING RATIO (CBR) (AASHTO T193 OR ASTM D3668) [__ __ __]
   (AASHTO 2013d; ASTM 1978)

3. RESISTANCE (*R*-value) (AASTHO T190 (ASTM D2844) (AASHTO 2014c; ASTM 2018e) [__ __ __]

4. MODULUS OF SUBGRADE REACTION (*K*-value) (pounds per square inch) [__ __ __]

5. TYPE OF TEST [__]
   AASHTO T221 (ASTM D1195) (AASHTO 1990; ASTM 2009) 1
   AASHTO T222 (AASHTO 1981a) 2

6. STABILIZING AGENT 1 TYPE CODE [__] PERCENT [__ __.__]

7. STABILIZING AGENT 2 TYPE CODE [__] PERCENT [__ __.__]

STABILIZING AGENT TYPE CODES

Asphalt Cement 1	Lime 5
Emulsified Asphalt 2	Fly Ash, Class C.....6
Cutback Asphalt 3	Fly Ash, Class N 7
Portland Cement 4	
Other (specify) [_____] 8	

8. GRADATION OF COMBINED AGGREGATES

Sieve Size or No.	Percent Passing	Sieve Size or No.	Percent Passing
2 inches	[__ __ __]	No. 4	[__ __]
1 ½ inches	[__ __ __]	No. 8	[__ __]
1 inches	[__ __ __]	No. 10	[__ __]
7/8 inches	[__ __ __]	No. 16	[__ __]
¾ inch	[__ __ __]	No. 30	[__ __]
5/8 inch	[__ __ __]	No. 40	[__ __]
½ inch	[__ __ __]	No. 50	[__ __]
3/8 inch	[__ __ __]	No. 80	[__ __]
		No. 100	[__ __]
		No. 200	[__ __]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 26 SUBGRADE	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

2. AASHTO SOIL CLASSIFICATION (table 13.) [__ __]

3. CALIFORNIA BEARING RATIO (CBR) [__ __ __]
   (AASHTO T193 or ASTM D1883) (AASHTO 2013d; ASTM 2016a)

4. RESISTANCE (*R*-value) (AASHTO T190 (ASTM D2844)) (AASHTO 2014c; ASTM 2018e) [__ __ __]

5. MODULUS OF SUBGRADE REACTION (*K*-value) (pounds per square inch) [__ __ __]

6. TYPE OF TEST [__]
   AASHTO T221 (ASTM D1195) (AASHTO 1990; ASTM 2009) 1
   AASHTO T222 or ASTM D1196 (AASHTO 1981a; ASTM 2012).....2

7. PLASTICITY INDEX (AASHTO T90 or ASTM D4318) (AASHTO 2020c; ASTM 2017f) [__ __]

8. LIQUID LIMIT (AASHTO T89 or ASTM D4318) (AASHTO 2013c; ASTM 2017f) [__ __]

9. MAXIMUM LABORATORY DRY DENSITY (pounds per cubic foot) [__ __ __]

10. OPTIMUM LABORATORY MOISTURE CONTENT (percent) [__ __.__]

11. TEST USED TO MEASURE MAXIMUM DRY DENSITY [__]
    Standard AASHTO (T-99) ..... 1 Modified AASHTO (T-180) 2
    Other (specify)_____ 3

12. COMPACTIVE ENERGY FOR "OTHER" METHOD (feet-pounds per cubic inch) [__ __.__]

13. IN SITU DRY DENSITY (percent of optimum)
    MEAN [__ __ __ __.__] NUMBER OF TESTS [__ __ __]
    MINIMUM [__ __ __ __.__] MAXIMUM [__ __ __ __.__]
    STANDARD DEVIATION [__ __ __ __.__]

14. IN SITU MOISTURE CONTENT (percent of optimum)
    MEAN [__ __ __ __.__] NUMBER OF TESTS [__ __ __]
    MINIMUM [__ __ __ __.__] MAXIMUM [__ __ __ __.__]
    STANDARD DEVIATION [__ __ __ __.__]

15. IN SITU DRY DENSITY (pounds per cubic foot)
    MEAN [__ __ __ __.__] NUMBER OF TESTS [__ __ __]
    MINIMUM [__ __ __ __.__] MAXIMUM [__ __ __ __.__]
    STANDARD DEVIATION [__ __ __ __.__]

16. IN SITU MOISTURE CONTENT (percent of dry weight)
    MEAN [__ __ __ __.__] NUMBER OF TESTS [__ __ __]
    MINIMUM [__ __ __ __.__] MAXIMUM [__ __ __ __.__]
    STANDARD DEVIATION [__ __ __ __.__]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 27 SUBGRADE (Continued)	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__ __]

RELATIVE DENSITY OF COHESIONLESS FREE-DRAINING SOILS (ASTM D2049) (ASTM 1969)

2. MEASURED DENSITIES FROM LABORATORY TESTS (pounds per cubic foot):
   MINIMUM [__ __ __ __.__]
   MAXIMUM [__ __ __ __.__]

3. RELATIVE DENSITIES (percent):
   MEAN [__ __ __ __.__] NUMBER OF TESTS [__ __ __]
   MINIMUM [__ __ __ __.__] MAXIMUM [__ __ __ __.__]
   STANDARD DEVIATION [__ __ __ __.__]

4. SOIL SUCTION (ton per square foot) (AASHTO T273) (AASHTO 1986c) [__ __ __ __.__]

5. EXPANSION INDEX (ASTM D4829) (ASTM 2021) [__ __ __]

   SWELL PRESSURE (pounds per square inch)
6. TEST VALUE [__ __ __]

7. TEST CODE [__]
   AASHTO T190 or ASTM D2844 (AASHTO 2014c; ASTM 2018e).....1
   AASHTO T258, Method 1 (AASHTO 1981b) 2
   Other _____ 3

8. PERCENT BY WEIGHT FINER THAN 0.02 MM[1] [__ __ __.__]

9. AVERAGE RATE OF HEAVE DURING STANDARD
   LABORATORY FREEZING TEST (millimeters per day)[1] [__ __ __.__]

10. FROST SUSCEPTIBILITY CLASSIFICATION CODE[1] [__]
    Negligible ..... 1 Medium 4
    Very Low..... 2 High.....5
    Low..... 3 Very High.....6

NOTE 1: These data are only required in freeze zones where frost may be expected to penetrate the subgrade.

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 28 QC MEASUREMENTS	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. NUCLEAR DENSITY MEASUREMENTS

Layer Type	Binder Course	Surface Course
Measurement Method (A, B, C)	[__]	[__]
Number of Measurements	[__ __]	[__ __]
Average (pounds per cubic foot)	[__ __ __ __.__]	[__ __ __ __.__]
Maximum (pounds per cubic foot)	[__ __ __ __.__]	[__ __ __ __.__]
Minimum (pounds per cubic foot)	[__ __ __ __.__]	[__ __ __ __.__]
Standard Deviation (pounds per cubic foot)	[__ __ __ __.__]	[__ __ __ __.__]
Layer Number	[__ __]	[__ __]

Note: measurement method: backscatter = A; direct transmission = B air gap = C.

2. MANUFACTURER OF NUCLEAR DENSITY GAUGE [_____]

3. NUCLEAR DENSITY GAUGE MODEL NUMBER [_____]

4. NUCLEAR DENSITY GAUGE IDENTIFICATION NUMBER [_____]

5. NUCLEAR GAUGE COUNT RATE FOR STANDARDIZATION [__ __ __ __ __]

6. PROFILOGRAPH MEASUREMENTS

Measured Layer Number				[__ __]
Profilograph Type		California.....1	Rainhard..... 2	[__]
Profile Index (inches per mile)				[__ __ __.__]
Interpretation Method	Manual.....1	Mechanical.....2	Computer..... 3	[__]
Height of Blanking Band (inches)				[__.__ __]
Cutoff Height (inches)				[__.__ __]

7. SURFACE PROFILE USED AS BASIS OF INCENTIVE PAYMENT (Y/N) [__]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 29 FIELD THICKNESS	STATE CODE [__ __] PROJECT ID [__ __ __ __]

LAYER THICKNESS MEASUREMENTS (inches) SHEET __ OF __

		LAYER NUMBER (from SPS-10 data sheet 4)			
STATION NUMBER	OFFSET (inches)	[__ __]	[__ __]	[__ __]	[__ __]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
[__+__ __]	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
[__+__ __]	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
[__+__ __]	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
[__+__ __]	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
[__+__ __]	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
[__+__ __]	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
[__+__ __]	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]
	[__ __ __]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]	[__ __ __.__]

PREPARER ____________ EMPLOYER ______________ DATE ________

LTPP SPS-10 DATA SHEET 30 NOTES AND COMMENTS	STATE CODE [__ __] PROJECT ID [__ __ __ __]

Provide any miscellaneous comments and notes concerning construction operations that may influence the ultimate performance of the test sections or may cause undesired performance differences between the test sections. Also, include any QC measurements or data for which space is not provided on the other data sheets. Indicate the basis for such measurements, such as an ASTM, AASHTO, or HA standard test designation.

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 31 MILLED SECTIONS	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. MANUFACTURER OF MILLING MACHINE (specify) [_____]

2. MILLING MACHINE MODEL DESIGNATION (specify) [_____]

3. WIDTH OF CUTTING HEAD (inches) [__ __ __ __.__]

4. TOTAL MILLED DEPTH (inches)

Location	No. Measurements	Maximum	Minimum	Standard Deviation	Average
Inside Lane Edge	[__ __]	[__ __.__]	[__ __.__]	[__.__]	[__ __.__]
Outside Lane Edge	[__ __]	[__ __.__]	[__ __.__]	[__.__]	[__ __.__]

MILLED SURFACE CHARACTERISTICS

5. Macrotexture [__]
   Fine Macrotexture (≤ ¼ inch)..... 1 Coarse Macrotexture (> ¼ inch) 2
6. Estimate of Extent of Test Section Surface Delaminated (percent) [__ __ __]
7. Height of Ridge Between Parallel Passes (inches) [__ __.__]
8. Other Comments _____

9. WERE PATCHES PLACED AFTER MILLING? (Y/N) [__]
   (If yes, complete SPS-10 data sheet 34)

10. LENGTH OF TIME MILLED SURFACE WAS OPEN TO TRAFFIC (hours) [__ __ __ __]

11. WAS ADJACENT TRAVEL LANE MILLED TO SAME DEPTH AS TEST LANE? [__]
    If no, width milled same depth as test lane (feet) [__ __.__]

12. GENERAL COMMENTS _____

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 32 IMPROVEMENT LISTING	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. DATE COMPLETED (dd/mmm/yyyy)	2. WORK TYPE CODE (table 20)	3. WORK QUANTITY (units from table 20)	4. THICKNESS (inches)	5. COST ($1,000s/lane mile)
[__ __/__ __ __/__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]	[__ __ __]
[__ __/__ __ __/__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]	[__ __ __]
[__ __/__ __ __/__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]	[__ __ __]
[__ __/__ __ __/__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]	[__ __ __]
[__ __/__ __ __/__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]	[__ __ __]
[__ __/__ __ __/__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]	[__ __ __]
[__ __/__ __ __/__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]	[__ __ __]
[__ __/__ __ __/__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]	[__ __ __]
[__ __/__ __ __/__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]	[__ __ __]
[__ __/__ __ __/__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]	[__ __ __]
[__ __/__ __ __/__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]	[__ __ __]

PREPARER ____________________ EMPLOYER __________________________ DATE _______________

LTPP SPS-10 DATA SHEET 33 PRE-OVERLAY SURFACE PREPARATION SKETCH	STATE CODE [__ __] PROJECT ID [__ __ __ __]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 34 PMA PRE-OVERLAY—PATCH	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. DATE PATCHING BEGAN (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]

2. DATE PATCHING COMPLETED (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]

3. PRIMARY DISTRESS OCCURRENCE PATCHED (table 25) [__ __]
   Other (specify) _____
   _____

4. SECONDARY DISTRESS OCCURRENCE PATCHED (table 25) [__ __]
   Other (specify) _____
   _____

5. SUMMARY OF PATCHING

	NUMBER	TOTAL AREA (square feet)
Surface Only	[__ __]	[__ __ __ __]
Surface and partial base replacement	[__ __]	[__ __ __ __]
Full Depth	[__ __]	[__ __ __ __]

6. METHOD USED TO DETERMINE LOCATION AND SIZES OF PATCHES [__]
   Deflection.....1 Coring.....2 Visual.....3
   Other.....4 (specify)_____

7. METHOD USED TO FORM PATCH BOUNDARIES [__]
   None.....1 Saw Cut.....2 Air Hammer.....3 Cold Milling.....4
   Other.....5 (specify)_____

8. COMPACTION EQUIPMENT [__] [__]
   None.....1 Pneumatic Roller.....2 Vibratory Plate Compactor..3
   Vibratory Roller.....4 Steel Wheel Roller...5 Truck Tire.....6
   Hand Tools.....7 Other.....8 (specify) _____

9. PATCH MATERIAL [__]
   Hot Mix Asphalt Concrete.....1
   Plant Mix with Cutback Asphalt, Cold Laid.....2
   Plant Mix with Emulsified Asphalt, Cold Laid.....3
   Road Mix with Cutback Asphalt.....4
   Road Mix with Emulsified Asphalt.....5
   Portland Cement Concrete (PCC).....6
   Other (specify) _____ 7

10. MINIMUM TIME FROM PLACEMENT TO OPENING TO TRAFFIC (hours) [__ __]

11. MAXIMUM MATERIAL TEMP FOR TRAFFIC OPENING (IF USED) (Fahrenheit) [___ __ __]

12. AIR TEMPERATURE DURING PLACEMENT OPERATIONS
    High Temperature (Fahrenheit) [__ __ __]
    Low Temperature (Fahrenheit) [__ __ __]

13. PREDOMINANT ROAD SURFACE MOISTURE CONDITION DURING PLACEMENT OPERATIONS
    Dry.....1 Moist.....2 Wet.....3 [__]

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 35 PMA PRE-OVERLAY—CRACK SEALING	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. DATE CRACK SEALING BEGAN (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]

2. DATE CRACK SEALING COMPLETED (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]

3. AVERAGE CRACK SEVERITY LEVEL [__]
   (See *Distress ID Manual for the LTPP* (Miller and Bellinger 2014).)
   Low.....1 Moderate.....2 High 3

4. PRIMARY TYPE OF CRACKS (See table 25 for type codes.) [__ __]
   (See *Distress ID Manual for the LTPP* for description (Miller and Bellinger 2014).)

5. TYPE OF MATERIAL USED TO SEAL CRACKS [__]
   Asphalt Cement 1
   Emulsified Asphalt Cement..... 2
   Cutback Asphalt Cement..... 3
   Emulsified Asphalt Cement
   Slurry Seal 4
   Emulsified Asphalt Cement
   With Sand.....5
   Proprietary Crack/Joint
   Sealant.....6
   Modified Asphalt 7
   Other (specify) [_____]8

   IF 6 OR 7 ABOVE, COMPLETE FOLLOWING:
   MANUFACTURER NAME [_____]
   MANUFACTURER SEALANT NAME [_____]

6. AMBIENT CONDITIONS AT TIME OF CRACK SEALING
   AIR TEMPERATURES (Fahrenheit) LOW [__ __ __]
   HIGH [__ __ __]

   SURFACE MOISTURE Dry.....1 Wet .....2 [__]

7. APPROXIMATE TOTAL LENGTH OF CRACKS SEALED (feet) [__ __ __ __]

8. METHOD USED TO CLEAN CRACKS PRIOR TO SEALING [__]
   None 1
   Compressed Air..... 2
   Routing..... 3
   Steel Wire Brush 4
   Brooming 5
   Hot Air Lance.....6
   Other (specify) [_____]7

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA **SHEET 36** **SEAL COAT APPLICATION DATA**	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__]

2. DATE SEALING BEGAN (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]

3. DATE SEALING COMPLETED (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]

4. PRIMARY REASON FOR SEAL COAT [__]
   Seal Cracks ..... 1 Raveling 4
   Improve Skid Resistance ..... 2 Unknown 5
   Bleeding 3
   Other (specify) [_____] 6

5. PERCENT OF TEST SECTION SEALED [__ __ __]

6. TYPE OF SEAL COAT [__]
   Fog Seal ..... 1 Sand Seal 4
   Slurry Seal ..... 2 Cape Seal 5
   Aggregate Seal 3
   Other (specify) [_____] 6

7. TYPE/GRADE OF BITUMINOUS MATERIAL IN SEAL COAT [__ __]
   (See table 19 for type code.)
   Description of "other cement" [_____]

   MANUFACTURER NAME [_____]
   MANUFACTURER MATERIAL NAME [_____]

8. APPLICATION RATE FOR BITUMINOUS OR OTHER CEMENTING MATERIAL [__.__]
   (Gallons per square yard)

9. APPLICATION RATE FOR AGGREGATE (including mineral filler where applicable) [__ __.__]
   (Pounds per square yard)

10. APPROXIMATE FINISHED SURFACE TREATMENT THICKNESS (inches) [__.__]

11. AMBIENT CONDITIONS AT TIME SEAL COAT APPLIED
    AIR TEMPERATURE (Fahrenheit) [__ __ __]
    SURFACE MOISTURE Dry ..... 1 Wet ..... 2 [__]

12. AVERAGE CRACK SEVERITY LEVEL [__]
    (See *Distress ID Manual for the LTPP* (Miller and Bellinger 2014).)
    Low ..... 1 Moderate ..... 2 High 3

13. PRIMARY TYPE OF CRACKS (See table 25 for type codes.) [__ __]
    (See *Distress ID Manual for the LTPP* for description (Miller and Bellinger 2014).)

PREPARER _____ EMPLOYER _____ DATE _____

LTPP SPS-10 DATA SHEET 37 SEAL COAT APPLICATION DATA (CONTINUED)	STATE CODE [__ __] PROJECT ID [__ __ __ __]

1. LAYER NUMBER (from SPS-10 data sheet 4) [__]

2. GRADATION OF AGGREGATE (including mineral filler where applicable)

Sieve Size or No.	Percent Passing	Sieve Size or No.	Percent Passing
1 inch	[__ __ __]	No. 10	[__ __]
¾ inch	[__ __ __]	No. 16	[__ __]
5/8 inch	[__ __ __]	No. 30	[__ __]
½ inch	[__ __ __]	No. 50	[__ __]
3/8 inch	[__ __ __]	No. 100	[__ __]
No. 4	[__ __]	No. 200	[__ __]
No. 8	[__ __]		

3. AGGREGATE PRECOATED? (Y/N) [__]

4. ROLLER USED FOR SEATING AGGREGATE [__]
   None ..... 1 Steel Wheel 3
   Slurry Seal ..... 2 Unknown.....4
   Other (specify) [_____] 5

5. ESTIMATED TIME ALLOWED FOR SEAL COAT TO CURE PRIOR TO TRAFFIC APPLICATION [__]
   None ..... 1 1 to 3 D.....5
   4 H or Less ..... 2 3 to 7 D.....6
   4 to 8 H..... 3 > 7 D 7
   8 to 24 H..... 4

6. CONDITION OF SURFACE BEFORE SEALING [__]
   Clean..... 1 Moderately Clean ....2 Dirty.....3

7. INITIAL EXISTING PAVEMENT SURFACE PREPARATION [__]
   None ..... 1 Cold Mill 3
   Sweep Clean Only ..... 2 Shot Blast 4
   Other (specify) [_____] 5

8. FINAL PREPARATION OF EXISTING PAVEMENT SURFACE [__]
   None (other than identified in no. 7 above).....1
   Primarily Air Blast 2
   Primarily Water Blast 3
   Primarily Sand Blast.....4
   Sand Blast and Air Blast.....5
   Other (specify) [_____] 6

PREPARER _____ EMPLOYER _____ DATE _____

APPENDIX A. STANDARD CODES

Table 3. Table of standard codes for States, the District of Columbia, Puerto Rico, American Protectorates, and Canadian Provinces.

State/Province	Code
Alabama	01
Alaska	02
Arizona	04
Arkansas	05
California	06
Colorado	08
Connecticut	09
Delaware	10
District of Columbia	11
Florida	12
Georgia	13
Hawaii	15
Idaho	16
Illinois	17
Indiana	18
Iowa	19
Kansas	20
Kentucky	21
Louisiana	22
Maine	23
Maryland	24
Massachusetts	25
Michigan	26
Minnesota	27
Mississippi	28
Missouri	29
Montana	30
Nebraska	31
Nevada	32
New Hampshire	33
New Jersey	34
New Mexico	35
New York	36
North Carolina	37
North Dakota	38
Ohio	39
Oklahoma	40
Oregon	41
Pennsylvania	42

State/Province	Code
Rhode Island	44
South Carolina	45
South Dakota	46
Tennessee	47
Texas	48
Utah	49
Vermont	50
Virginia	51
Washington	53
West Virginia	54
Wisconsin	55
Wyoming	56
American Samoa	60
Guam	66
Puerto Rico	72
Virgin Islands	78
Alberta	81
British Columbia	82
Manitoba	83
New Brunswick	84
Newfoundland	85
Nova Scotia	86
Ontario	87
Prince Edward Island	88
Quebec	89
Saskatchewan	90

Table 4. Functional class codes.

Functional Class	Code
Rural: Principal arterial—interstate	01
Rural: Principal arterial—other	02
Rural: Minor arterial	06
Rural: Major collector	07
Rural: Minor collector	08
Local collector	09
Urban: Principal arterial—interstate	11
Urban: Principal arterial—other freeways or expressways	12
Urban: Other principal arterial	14
Urban: Minor arterial	16
Urban: Collector	17
Urban: Local	19

Table 5 contains experiment type definitions for the LTPP General Pavement Studies (GPS).

Table 5. Experiment type definitions—General Pavement Studies (GPS).

Experiment	Definition
(01) Asphalt concrete pavement with granular base	Acceptable pavements for this study include a dense-graded HMAC surface layer, with or without other HMAC layers, placed over an untreated granular base. One or more subbase layers may also be present but are not required. A treated subgrade is classified as a subbase layer. Also allowed in this study are full-depth AC pavements, which are defined as an HMAC surface layer combined with one or more subsurface HMAC layers beneath the surface layer with a minimum total thickness of 152 mm (6 inches) placed directly upon a treated or untreated subgrade. Two or more consecutive lifts of the same mixture design are to be treated as one layer. Seal coats or porous friction courses are allowed on the surface but not in combination, i.e., a porous friction course placed over a seal coat is not acceptable. Seal coats are permissible on top of granular layers. At least one layer of dense-graded HMAC is required regardless of the existence of seal coats or porous friction courses.
(02) Asphalt concrete pavement with bound base	Acceptable pavements for this study include a dense-graded HMAC surface layer with or without other HMAC layers placed over a bound base layer. To properly account for a variety of bound base types in the sampling design, two classifications of binder types, bituminous and non-bituminous, are defined as factor levels. Bituminous binders include asphalt cements, cutbacks, emulsions, and road tars. Non-bituminous binders include all hydraulic cements (those which harden by a chemical reaction with water and are capable of hardening under water), lime, fly ashes, and natural pozzolans, or combinations thereof. Stabilized bases with lower quality materials, such as sand asphalt or soil cement, are also allowed. Stabilization practices of primary concern for this study are those in which the structural characteristics of the material are improved due to the cementing action of the stabilizing agent. Thus, the description of the study actually refers to treatments improving the structural properties of the base materials. Two or more consecutive lifts of the same mixture design are to be treated as one layer. One or more subbase layers may be present but are not required. Seal coats or porous friction courses are permitted on the surface but not in combination, i.e., a porous friction course placed over a seal coat is not acceptable. Project selection may be on either fine- or coarse-grained subgrades.
(03) Jointed plain concrete pavement (JPCP)	Acceptable jointed, unreinforced PCC slab placed over an untreated granular base, HMAC, or stabilized base. One or more subbase layers may also be present but are not required. The joints may have either smooth dowel bars or no load transfer devices. A seal coat is permissible above a granular base layer. Jointed slabs with load transfer devices other than dowel bars and pavements placed directly upon a treated or untreated subgrade are also not acceptable.

Experiment	Definition
(04) Jointed reinforced concrete pavement (JRCP)	Acceptable projects include jointed reinforced PCC pavements with doweled joints spaced between 20 and 65 ft (66 and 213 m). The slab may rest directly upon a base layer or upon unstabilized coarse-grained subgrade. A base layer and one or more subbase layers may exist but are not required. A seal coat is also permissible over a granular base layer. JRCP placed directly upon a fine-grained soil/aggregate layer or a fine-grained subgrade will not be considered for this study. JRCPs without load transfer devices or using devices other than smooth dowel bars at the joints are not acceptable.
(05) Continuously reinforced concrete pavement (CRCP)	Acceptable projects include continuously reinforced PCC pavements placed directly upon a base layer or upon an unstabilized coarse-grained subgrade. One or more subbase layers can exist but are not required. A seal coat (prime coat) is permissible just above a granular base layer. CRCP's placed directly upon a fine-grained soil/aggregate layer or a fine-grained subgrade is not acceptable for this study.
(06) Asphalt concrete overlay of asphalt concrete pavement	Pavements in the GPS-6A, 6B, 6C, 6D, and 6S experiments include a dense-graded HMAC surface layer with or without other HMAC layers placed over an existing AC pavement. The designation GPS-6A refers to those sections that were overlaid prior to acceptance in the GPS program. The GPS-6B, 6C, 6D, and 6S designation refers to LTPP sections on which an overlay was placed after the section had been accepted into the LTPP program. Seal coats or porous friction courses are allowed but not in combination. Fabric interlayers and stress-absorbing membrane interlayers (SAMIs) are permitted between the original surface and the overlay. The total thickness of HMAC used in the overlay is required to be at least 25.4 mm (1.0 inch).
(07) Asphalt concrete overlay of concrete pavement	Pavements classified in the GPS-7A, 7B, 7C, 7D, 7F, 7R, and 7S experiments primarily consist of JPCP, JRCP, and CRCP pavements in which a dense-graded HMAC surface layer with or without other HMAC surface layers was constructed. The exception is the GPS-7R classification that was added to account for PCC pavement test sections rehabilitated using concrete pavement restoration (CPR) techniques. (To date, no test sections have been classified in the 7R category.) The designation GPS-7A refers to sections that were overlaid prior to acceptance in the GPS program. The GPS-7B, 7C, 7D, 7F, and 7S designation refers to those test sections on which an overlay was placed after the section had been accepted into the LTPP program. The PCC slab may rest upon a combination of the base and/or subbase layers. The existing concrete slab can also be placed directly on lime- or

Experiment	Definition
	cement-treated fine or coarse-grained subbase or on untreated coarse-grained subgrade soil. Slabs placed directly on an untreated fine-grained subgrade are not acceptable. Seal coats or porous friction courses are permissible but not allowed in combination. Fabric interlayers and SAMIs are acceptable when placed between the original surface (concrete) and the overlay. Overlaid pavements involving aggregate interlayers and open-graded AC interlayers are not included in this study. The total thickness of HMAC used in the overlay is required to be at least 38 mm (1.5 inches).
(09) Unbonded overlays of concrete pavement	Acceptable projects for this study include unbonded JPCP, JRCP, or CRCP overlays with a thickness of 129 mm (5 inches) or more placed over an existing JPCP, JRCP, or CRCP pavement. An interlayer used to prevent bonding of the existing and the overlay slabs is required. The overlaid concrete pavement can rest on a base and/or a subbase or directly upon the subgrade.

Table 6 contains experiment type definitions for the LTPP SPS.

Table 6. Experiment Type Definitions—SPS.

Experiment	Definition
(01) Structural factors for flexible pavements	The experiment on strategic study of structural factors for flexible pavements (SPS-1) examines the performance of specific HMAC-surfaced pavement structural factors under different environmental conditions. Pavements within SPS-1 must start with the original construction of the entire pavement structure or removal and complete reconstruction of an existing pavement. The pavement structural factors included in this experiment are the in-pavement drainage layer, surface thickness, base type, and base thickness. The experiment design stipulates a traffic loading level in the study lane greater than 100,000—80 kN (18 kip)—ESAL per year. The combination of the study factors in this experiment result in 24 different pavement structures. The experiment is designed using a fractional factorial approach to enhance implementation practicality, permitting the construction of 12 test sections at one site with the complementary 12 test sections to be constructed at another site within the same climatic region on a similar subgrade type.
(02) Structural factors for rigid pavements	The experiment on strategic study of structural factors for rigid pavements (SPS-2) examines the performance of specific JPCP structural factors under different environmental conditions. Pavements within SPS-2 must start with the original construction of the entire pavement structure or removal and complete reconstruction of an existing pavement. The pavement structural factors included in this experiment are the in-pavement drainage layer, PCC surface thickness, base type, PCC flexural strength, and lane width. The experiment requires that all

Experiment	Definition
	test sections be constructed with perpendicular doweled joints (spaced 4.9 m (15 ft) apart) and stipulate a traffic loading level in the lane greater than 200,000 ESAL/yr. The experiment is designed using a fractional factorial approach to enhance implementation practicality, permitting construction of 12 test sections at 1 site with the complementary 12 test sections to be constructed at another site within the same climatic region on a similar subgrade type.
(03) Preventive maintenance effectiveness of flexible pavements	The experiment on preventive maintenance effectiveness of flexible pavements (SPS-3) examines the performance of four preventive maintenance treatments (cracking seal, chip seal, slurry seal, and thin overlay) on AC-surfaced pavement sections in the four climatic regions on the two classes of subgrade soil. The experimental design stipulates that the effectiveness of each of the four treatments be evaluated independently. The effectiveness of combinations of treatments is not considered. Therefore, each site includes four treated test sections in addition to a control section. In most cases, the control, or the do-nothing section, is classified as a GPS test section.
(04) Preventive maintenance effectiveness of jointed concrete pavements	The experiment on preventive maintenance effectiveness of jointed concrete pavements (SPS-4) was designed to study the effects of crack/joint sealing and undersealing on jointed PCC pavement structures. Both JRCP and JPCP are included in the study. Undersealing is included as an optional factor and is only performed on a section in which the need for undersealing is indicated. The experiment design stipulates that the effectiveness of each of the two treatments be evaluated independently. The effectiveness of combining treatments is not considered. Each test site includes two treated test sections in addition to a control section. The treatment sections on joint/crack seal test sites consist of one section in which all joints have no sealant and one in which a water-tight seal is maintained on all cracks and joints.
(05) Rehabilitation of asphalt concrete pavements	The experiment on rehabilitation of AC pavements (SPS-5) examines the performance of eight combinations of AC overlays on existing AC-surfaced pavements. The rehabilitation treatment factors included in the study are intensity of surface preparation, recycled versus virgin AC overlay mixture, and overlay thickness. The experiment design includes all four climatic regions and conditions of existing pavement. The experiment design stipulates a traffic loading level in the study lane greater than 100,000 ESALs/yr.
(06) Rehabilitation of jointed portland cement concrete pavements	The experiment on rehabilitation of jointed PCC pavements (SPS-6) examines the performance of seven rehabilitation treatment options as a function of climatic region, type of pavement (plain and reinforced), and condition of existing pavement. The rehabilitation methods include: surface preparation (a limited preparation and full CPR) with a 102-mm (4-inch) thick AC overlay or without an overlay, crack/break and seat with two AC overlay thicknesses (102 and 203 mm (4 and 8 inches)),

Experiment	Definition
	and limited surface preparation with a 102-mm (4-inch) thick AC overlay with sawed and sealed joints.
(07) Bonded concrete overlays of concrete pavements	The experiment on bonded concrete overlays on concrete pavements (SPS-7) examines the performance of eight combinations of bonded PCC treatment alternatives as a function of the climatic region, pavement type (jointed and continuously reinforced), and condition of existing pavement. The rehabilitation treatment factors include combinations of surface preparation methods (cold milling plus sand blasting and shot blasting), bonding agents (neat cement grout or none), and overlay thickness (76 and 127 mm (3 and 5 inches)). The experiment design stipulates a traffic loading level in the study lane greater than 200,000 ESALs/yr.
(08) Environmental effects in the absence of heavy loads	The experiment on environmental effects in the absence of heavy loads (SPS-8) examines the effect of climatic factors in the four climatic regions and subgrade type (frost susceptible, expansive, fine, and coarse) on pavement sections, incorporating flexible and rigid pavement designs that are subjected to limited traffic loading. The experiment design requires either two flexible pavement structures or two rigid pavement structures to be constructed at each site. The two flexible pavement sections consist of a 102-mm (4-inch) AC surface on a 102-mm (8-inch) thick untreated granular base, and a 178-mm (7-inch) thick AC surface over a 305-mm (12-inch) thick granular base. Rigid pavement test sections consist of doweled JPCP with 203-mm (8-inch) and 279-mm (11-inch) PCC surface thickness on a 152-mm (6-inch) thick dense-graded granular base. The pavement structures included in this study match pavement structures included in the SPS-1 and 2 experiments. The experiment design stipulates that traffic volume in the study lane be at least 100 vehicles per day but not more than 10,000 ESALs/yr. The flexible and rigid pavement sections may be constructed at the same site or at different sites.
(09) Validation of SHRP asphalt specifications and mix design	The SPS-9P pilot effort started at the end of the SHRP program to get some experience in implementing the Superpave specifications. Test sections classified as SPS-9P were constructed using a very limited set of guidelines. In some instances, specifications were based on interim Superpave specifications that were changed later. Many of the test sections were constructed before material sampling and testing guidelines were established. The SPS-9A experiment, Superpave asphalt binder study, requires construction of a minimum of two test sections at each project site. Construction can include new construction, reconstruction, or overlay. The minimum test sections consist of the HAs' standard mix, the Superpave level 1-designed standard mix, and Superpave mix with alternate binder grade either higher or lower than the specified Superpave binder (Cominsky 1994).

Experiment	Definition
	The minimum two test sections at some sites results from the HA's declaration that the Superpave test section is the same as the standard HA mixture. This model will provide the opportunity to evaluate and improve the practical aspects of implementing Superpave mix design. This design allows a hands-on field trial by interested HAs, comparison of the performance of the Superpave mixes against mixes designed with current HAs' asphalt specifications, asphalt-aggregate specifications, and mix design procedures as well as test the sensitivity of the Superpave asphalt binder specifications relative to low-temperature cracking, fatigue, or permanent deformation distress factors.
(10) Warm mix asphalt	The experiment on WMA was designed to study the effects of WMA layers on existing and newly constructed pavements. The experiment design includes all four climatic regions. The experiment design stipulates a mixture produced at or below 275 °F or a mixture produced at temperatures at least 30 °F below the production temperature of the HMA control. The WMA mixture is as follows: • Chemical additives are defined as water-free (non-aqueous) chemistry packages that modify the AC binder properties to enhance coating, adhesion, and workability at reduced temperatures, including surfactants, fatty-acid chemical additives, cationic surface-active agents, and rheology modifiers. • Organic additives are plant-based, wax-based, or sulfur-extended materials designed to provide viscosity reduction, aid in asphaltene dispersion, and act as a lubricant at mixing temperatures below that of standard HMA. • Foaming additives are defined as water-containing materials added to the mixture to foam the asphalt. The most common foaming additive is synthetic zeolite. Zeolite contains 20-30 percent water that is released at temperatures above the boiling point of water. The water from the zeolite foams the asphalt binder. The foaming process category covers all WMA types that utilize assemblies/modifications to the plant to foam AC binder without additives, including foaming nozzles, expansion chambers, vortex mixers, and shearing devices. While the other categories may be added to the mix using some type of nozzle or other addition, the key distinction between the foaming process category and others is the absence of additives. WMA technologies that fall into the foaming process category only use water.

Table 7 contains pavement type codes for the LTPP program.

Table 7. Pavement type codes.

Type of Pavement	Code
AC-surfaced pavements	—
AC with granular base	01
AC with bituminous-treated base	02
AC with non-bituminous-treated base	07
AC overlay on AC pavement	03
AC overlay on JPCP pavement	28
AC overlay on JRCP pavement	29
AC overlay on CRCP pavement	30
Other	10
PCC-surfaced pavements	—
JPCP—Placed directly on untreated subgrade	11
JRCP—Placed directly on untreated subgrade	12
CRCP—Placed directly on untreated subgrade	13
JPCP—Placed directly on treated subgrade	14
JRCP—Placed directly on treated subgrade	15
CRCP—Placed directly on treated subgrade	16
JPCP over unbound base	17
JRCP over unbound base	18
CRCP over unbound base	19
JPCP over bituminous-treated base	20
JRCP over bituminous-treated base	21
CRCP over bituminous-treated base	22
JPCP over non-bituminous-treated base	23
JRCP over non-bituminous-treated base	24
CRCP over non-bituminous-treated base	25
JPCP overlay on JPCP pavement	31
JPCP overlay on JRCP pavement	33
JPCP overlay on CRCP pavement	35
JRCP overlay on JPCP pavement	32
JRCP overlay on JRCP pavement	34
JRCP overlay on CRCP pavement	36
CRCP overlay on JPCP pavement	38
CRCP overlay on JRCP pavement	39
CRCP overlay on CRCP pavement	37
JPCP overlay on AC pavement	04
JRCP overlay on AC pavement	05
CRCP overlay on AC pavement	06
Prestressed concrete pavement	40
Other	49
Composite pavements (wearing surface included in initial construction)	—
JPCP with AC wearing surface	51
JRCP with AC wearing surface	52

Type of Pavement	Code
CRCP with AC wearing surface	53
Other	59

—Header line.

Note: Composite pavements are pavements originally constructed with an AC wearing surface over a PCC slab (AASHTO 1986a).

Table 8. Pavement surface material type classification codes.

Material Type	Code
Hot-mixed, hot-laid AC, dense graded	01
Hot-mixed, hot-laid AC, open graded (porous friction course)	02
Sand asphalt	03
PCC (JPCP)	04
PCC (JRCP)	05
PCC (CRCP)	06
PCC (prestressed)	07
PCC (fiber reinforced)	08
Plain PCC (only used for SPS-7 overlays of CRCP)	90
Plant-mix (emulsified asphalt) material, cold laid	09
Plant-mix (cutback asphalt) material, cold laid	10
Single-surface treatment	11
Double-surface treatment	12
Recycled AC	—
Hot, central plant mix	13
Cold laid, central plant mix	14
Cold laid, mixed in place	15
Heater scarification/recompaction	16
Recycled PCC	—
JPCP	17
JRCP	18
CRCP	19
Other	20
WMA, dense graded	91
WMA, open graded	92
WMA, gap graded	93

—Header line.

Table 9. Base and subbase material type classification codes.

Material Type	Code
Gravel (uncrushed)	22
Crushed stone, gravel, or slag	23
Sand	24
Soil-aggregate mixture (predominantly fine-grained soil)	25
Soil-aggregate mixture (predominantly coarse-grained soil)	26
Soil cement	27

Material Type	Code
Asphalt-bound base or subbase materials	—
Dense-graded, hot-laid, central plant mix	28
Dense-graded, cold-laid, central plant mix	29
Dense-graded, cold-laid, mixed in place	30
Open-graded, hot-laid, central plant mix	31
Open-graded, cold-laid, central plant mix	32
Open graded, cold laid, mixed in place	33
Recycled AC, plant mix, hot laid	34
Recycled AC, plant mix, cold laid	35
Recycled AC, mixed in place	36
Sand asphalt	46
Cement-aggregate mixture	37
Lean concrete (< 3 sacks of cement per cubic yard)	38
Recycled PCC	39
Sand-shell mixture	40
Limerock, caliche (soft carbonate rock)	41
Lime-treated subgrade soil	42
Cement-treated subgrade soil	43
Pozzolanic-aggregate mixture	44
Cracked and seated PCC layer	45
Other	49

—Header line.

Table 10. Subgrade soil description codes.

Soil Description	Code
Fine-grained subgrade soils	—
Clay (LL > 50)	51
Sandy clay	52
Silty clay	53
Silt	54
Sandy silt	55
Clayey silt	56
Coarse-grained subgrade soils	—
Sand	57
Poorly graded sand	58
Silty sand	59
Clayey sand	60
Gravel	61
Poorly graded gravel	62
Clayey gravel	63
Shale	64
Rock	65

—Header line.

Table 11. Material type codes for thin seals and interlayers.

Material Type	Code
Grout	70
Chip seal coat	71
Slurry seal coat	72
Fog seal coat	73
Woven geotextile	74
Nonwoven geotextile	75
SAMI	77
Dense-graded AC interlayer	78
Aggregate interlayer	79
Open-graded AC interlayer	80
Chip seal with modified binder (does not include crumb rubber)	81
Sand seal	82
Asphalt-rubber seal coat (SAMI)	83
Sand asphalt	84
Other	85
Thin seal interlayer	86
Plain PCC (only used for SPS-7)	90

Table 12. Geologic classification codes.

Geologic Classification	Code
Igneous	—
Granite	01
Syenite	02
Diorite	03
Gabbro	04
Peridotite	05
Felsite	06
Basalt	07
Diabase	08
Sedimentary	—
Limestone	09
Dolomite	10
Shale	11
Sandstone	12
Chert	13
Conglomerate	14
Breccia	15
Metamorphic	—
Gneiss	16
Schist	17
Amphibolite	18
Slate	19

Geologic Classification	Code
Quartzite	20
Marble	21
Serpentine	22
Other rock type (specify if possible or unknown)	30
Glacial soils	—
Glacial soils	31
Boulder clay	32
Glacial sands and gravels	33
Laminated silts and laminated clays	34
Varved clays	35
Ground moraine	36
Fluvio-glacial sands and gravels	37
Other glacial soils	38
Residual soils	—
Plateau gravels	40
River gravels	41
Alluvium	42
Alluvial clays and/or peat	43
Alluvial silt	44
Other alluvial soils	45
Coastal shingle and beach deposits	46
Wind-blown sand	47
Loess (collapsible soil)	48
Shale, siltstone, mudstone, claystone	49
Expansive soils	50
Residual soils	51
Residual soils derived from granites, gneisses, and schists	52
Residual soils derived from limestone, sandstone, and shale	53
Other residual soils	54
Coquina	55
Shell	56
Marl	58
Caliche	59
Other	60

—Header line.

Table 13. Soil and soil-aggregate mixture type codes, AASHTO classification.

Mixture Type	Code
A-1-a	01
A-1-b	02
A-3	03
A-2-4	04
A-2-5	05
A-2-6	06

Mixture Type	Code
A-2-7	07
A-4	08
A-5	09
A-6	10
A-7-5	11
A-7-6	12

Table 14 contains the codes associated with the portland cement types.

Table 14. Portland cement type codes.

Type	Code
Type I	41
Type II	42
Type III	43
Type IV	44
Type V	45
Type IS	46
Type ISA	47
Type IA	48
Type IIA	49
Type IIIA	50
Type IP	51
Type IPA	52
Type N	53
Type NA	54
Other	55

Table 15 contains PCC admixture codes for the LTPP program.

Table 15. PCC admixture codes.

Admixture	Code
Water-reducing (AASHTO M194, type A) (AASHTO 2013a)	01
Retarding (AASHTO M194, type B) (AASHTO 2013a)	02
Accelerating (AASHTO M194, type C) (AASHTO 2013a)	03
Water-reducing and retarding (AASHTO M194, type D) (AASHTO 2013a)	04
Water-reducing and accelerating (AASHTO M194, type E) (AASHTO 2013a)	05
Water-reducing, high range (AASHTO M194, type f) (AASHTO 2013a)	06
Water-reducing, high range, and retarding (AASHTO M194, type G)	07
Air-entraining admixture (AASHTO M154) (AASHTO 2012)	08
Natural pozzolans (AASHTO M295, Class N) (AASHTO 2019a)	09
Fly ash, class F (AASHTO M295) (AASHTO 2019a)	10
Fly ash, class C (AASHTO M295) (AASHTO 2019a)	11
Other (chemical)	12
Other (mineral)	13

Table 16. Aggregate durability test type codes.

Description	AASHTO	ASTM	Code
Resistance to abrasion of small-size coarse aggregate by use of the Los Angeles machine (percent weight loss)	T96 (AASHTO 2002a)	C131 (ASTM 2020a)	01
Soundness of aggregate by freezing and thawing (percent weight loss)	T103 (AASHTO 2008)	—	02
Soundness of aggregate by use of sodium sulfate or magnesium sulfate (percent weight loss)	T104 (AASHTO 1999)	C88 (ASTM 2018a)	03
Resistance to degradation of large-size coarse aggregate by abrasion and impact in the Los Angeles machine (percent weight loss)	—	C535 (ASTM 2016b)	04
Potential volume change of cement-aggregate combinations (percent expansion)	—	C342 (ASTM 1997)	05
Evaluation of coarse aggregates' frost resistance in air-entrained concrete by critical dilution procedures (number of weeks of frost immunity)	—	C682 (ASTM 1994)	06
Potential alkali reactivity of cement aggregate combinations (average percent expansion)	—	C227 (ASTM 2010b)	07
Potential reactivity of aggregates (reduction in alkalinity—Millimoles per liter)	—	C289 (ASTM 2007b)	08
Test for clay lumps and friable particles in aggregates (percent by weight)	T112 (AASHTO 2000)	C142 (ASTM 2017a)	09
Test for potential alkali reactivity of carbonate rocks for concrete aggregates (percent change in specimen length)	—	C586 (ASTM 2019a)	11

—No data.

Table 17. Codes for asphalt refiners and processors in the United States.

Admixture	Code
Belcher Refining Co.—Mobile Bay, AL	78
Hunt Refining Co.—Tuscaloosa, AL	01
Chevron USA, Inc.—Kenai, AK	02
Mapco Alaska Petroleum—North Pole, AK	03
Intermountain Refining Cl.—Fredonia, AZ	04
Berry Petroleum Company—Stevens, AZ	05
Cross Oil and Refining Company—Smackover, AZ	06
Lion Oil Company—El Dorado, AZ	07
McMillan Ring, Free Oil Cl.—Norphlet, AZ	08

Admixture	Code
Chevron USA, Inc.—Richmond, CA	09
Conoco, Inc.—Santa Maria, CA	10
Edgington Oil Co., Inc.—Long Beach, CA	11
Golden Bear Division, Witco Chemical Corp.—Oildate, CA	12
Golden West Refining, Co.—Santa Fe Springs, CA	13
Huntway Refining Co.—Benicia, CA	14
Huntway Refining Co.—Wilmington, CA	15
Lunday-Thagard Co.—South Gate, CA	79
Newhall Refining Co. Inc.—Newhall, CA	16
Oxnard Refining—Oxnard, CA	17
Paramount Petroleum Corp.—Paramount, CA	80
Powerline Oil Co.—Martinez, CA	81
San Joaquin Refining Cl.—Bakersfield, CA	18
Shell Oil Co.—Martinez, CA	19
Superior Processing Co.—Santa Fe Springs, CA	20
Colorado Refining Co.—Commerce City, CO	82
Conoco, Inc., Commerce City—CO	21
Amoco Oil, Inc.—Savannah, GA	22
Young Refining Corp.—Douglasville, GA	23
Chevron USA, Inc.—Barber's Point, HI	24
Clark Oil and Refining Corp.—Blue Island, IL	25
Shell Oil Co.—Wood River, IL	26
Unacol Corp.—Lemont, IL	27
Amoco Oil, Co.—Whiting, IN	28
Laketon Refining Corp.—Laketon, IN	83
Young Refining Corp.—Laketon, IN	29
Derby Refining Co.—El Dorado, KS	30
Total Petroleum, Inc.—Arkansas City, KS	31
Ashland Petroleum Co.—Catlettsburg, KY	32
Atlas Processing Co.—Shreveport, LA	33
Calumet Refining Co.—Princeton, LA	34
Exxon Co.—Baton Rouge, LA	35
Marathon Petroleum Co.—Garyville, LA	36
Marathon Petroleum Co.—Detroit, MI	37
Ashland Petroleum Co.—St. Paul, MN	38
Koch Refining Co.—Rosemount, MN	39
Chevron USA, Inc.—Pascagoula, MS	40
Ergon Refining Inc.—Vicksburg, MS	41
Southland Oil Co.—Lumberton, MS	42
Southland Oil Co.—Sanderson, MS	43
Cenex—Laurel, MT	44
Conoco, Inc.—Billings, MT	45
Exxon Co.—Billings, MT	46
Chevron USA, Inc.—Perth Amboy, NJ	47

Admixture	Code
Exxon Co.—Linden, NJ	48
Giant Industries, Inc.—Gallup, NM	85
Navahoe Refining Co.—Artesia, NM	49
Cibro Petroleum Products Co.—Albany, NY	86
Ashland Petroleum Co.—Canton, OH	50
Standard Oil Co.—Toledo, OH	51
Sohio Oil Co. (BP America)—Toledo, OH	87
Kerr-McGee Refining Co.—Wynnewood, OK	52
Sinclair Oil Corp.—Tulsa, OK	53
Sun Co.—Tulsa, OK	54
Total Petroleum Inc.—Ardmore, OK	55
Chevron USA, Inc.—Portland, OR	56
Atlantic Refining and Marketing Corp.—Philadelphia, PA	57
United Refining Co.—Warren, PA	58
Mapco Petroleum, Inc.—Memphis, TN	59
Charter International Oil Co.—Houston, TX	60
Chevron USA, Inc.—El Paso, TX	61
Coastal Refining and Marketing, Inc.—Corpus Christi, TX	88
Coastal States Petroleum Co.—Corpus Christi, TX	62
Diamond Shamrock Corp.—Sunray, TX	63
Exxon Co. USA—Baytown, TX	64
Fina Oil and Chemical Co.—Big Spring, TX	65
Fina Oil and Chemical Co.—Port Arthur, TX	89
Hill Petroleum Co.—Houston, TX	90
Shell Oil Co.—Deer Park, TX	66
Star Enterprise—Port Arthur and Port Neches, TX	91
Texaco Refining and Marketing, Inc.—Port Arthur and Port Neches, TX	67
Trifinery—Corpus Christi, TX	92
Unocal Corp.—Nederland, TX	68
Valero Refining Co.—Corpus Christi, TX	69
Phillips 66 Co.—Woods Cross, UT	70
Chevron USA Inc.—Seattle, WA	71
Sound Refining, Inc.—Tacoma, WA	72
US Oil and Refining Co.—Tacoma, WA	73
Murphy Oil USA, Inc.—Superior, WI	74
Big West Oil Co.—Cheyenne, WY	75
Little America Refining Co.—Casper, WY	93
Sinclair Oil Corp.—Sinclair, WY	76
Other	77
Alon Israel Oil Company LTD—Bakersfield, CA	94
Alon Israel Oil Company LTD—Krotz Springs, LA	95
Alon Israel Oil Company LTD—Big Spring, TX	96
American Refining Group Inc.—Bradford, PA	97
FJ Management Inc.—North Salt Lake, UT	98

Admixture	Code
BP PLC—Prudhoe Bay, AK	99
BP PLC—Whiting, IN	100
BP PLC—Texas City, TX	101
BP PLC—Los Angeles, CA	102
BP PLC—Ferndale, WA	103
BP Husky Refining LLC, Toledo, OH	104
Transworld Oil USA, Inc.—Lake Charles, LA	105
Calumet Lubricants, Co—Cotton Valley, LA	106
Calumet Lubricants, Co—Princeton, LA	107
Calumet Lubricants, Co—Superior, WI	108
Calumet Lubricants, Co—Shreveport, LA	109
CHS, Inc.—Laurel, MT	110
Chalmette Refining LLC—Chalmette, LA	111
Chevron Corp.—El Segundo, CA	112
Chevron Corp.—Honolulu, HI	113
Chevron Corp.—Salt Lake City, UT	114
PDV America Inc.—Lake Charles, LA	115
PDV American Inc.—Corpus Christi, TX	116
CVR Energy—Coffeyville, KS	117
ConocoPhillips—Prudhoe Bay, AK	118
ConocoPhillips—Rodeo, CA	119
ConocoPhillips—Wilmington, CA	120
ConocoPhillips—Belle Chasse, LA	121
ConocoPhillips—Westlake, LA	122
ConocoPhillips—Linden, NJ	123
ConocoPhillips—Ponca City, OK	124
ConocoPhillips—Sweeny, TX	125
ConocoPhillips—Ferndale, WA	126
Continental Refining Co. LLC—Somerset, KY	127
Countrymark Coop Inc.—Mount Vernon, IN	128
Deer Park Refining LTD PTNRSHP—Delaware City, DE	129
Delek Group LTD—Tyler, TX	130
Access Industries—Channelview, TX	131
Ergon Inc.—Newell, WV	132
Excel Paralubes—Westlake, LA	133
Exxon Mobil Corp.—Torrance, CA	134
Exxon Mobil Corp.—Joliet, IL	135
Exxon Mobil Corp.—Beaumont, TX	136
Koch Industries Inc.—North Pole, AK	137
Koch Industries Inc.—Saint Paul, MN	138
Koch Industries Inc.—Corpus Christi, TX	139
Foreland Refining Corp.—Ely, NV	140
Hollyfrontier Corp.—El Dorado, KS	141
Hollyfrontier Corp.—Woods Cross, UT	142

Admixture	Code
Access Industries—Houston, TX	143
Hovensa LLC—Kingshill, VI	144
Hunt Consld Inc.—Tuscaloosa, AL	145
Hunt Consld Inc.—Sandersville, MS	146
Kern Oil and Refining Co.—Bakersfield, CA	147
Blue Dolphin Energy Co—Nixon, TX	148
Husky Energy Inc.—Lima, OH	149
Delek Group LTD—El Dorado, AK	150
Sinclair Oil Corp.—Evansville, WY	151
World Oil Co—South Gate, CA	152
Marathon Petroleum Corp.—Robinson, IL	153
Marathon Petroleum Corp.—Catlettsburg, KY	154
Marathon Petroleum Corp.—Canton, OH	155
Marathon Petroleum Corp.—Texas City, TX	156
Martin Reseource Management Grp—Smackover, AK	156
Connacher Oil and Gas LTD—Great Falls, MT	157
Motiva Enterprises LLC—Convent, LA	158
Motiva Enterprises LLC—Norco, LA	159
Motiva Enterprises LLC—Port Arthur, TX	160
Hollyfrontier Corp.—Artesia, NM	161
CHS Inc.—McPherson, KS	162
Nustar Energy LP—Savanna, GA	163
Nustar Energy LP—Paulsboro, NJ	164
Nustar Energy LP—San Antonio, TX	165
Alon Israel Oil Company LTD—Paramount, CA	166
Petroleo Brasileiro SA—Pasadena, CA	167
PBF Energy Co LLC—Paulsboro, NJ	168
PDV American Inc.—Lemont, IL	169
Pelican Refining Co. LLC—Lake Charles, LA	170
Arctic Slope regional Corp.—North Pole, AK	171
Arctic Slope regional Corp.—Valdez, AK	172
Placid Oil Co—Port Allen, LA	173
Vallero Energy Corp.—Memphis, TN	174
Vallero Energy Corp.—Port Arthur, TX	175
Greka Energy—Santa Maria, CA	176
Royal Dutch/Shell Group—Saraland, AL	177
Royal Dutch/Shell Group—Martinez, CA	178
Royal Dutch/Shell Group—Saint Rose, LA	179
Royal Dutch/Shell Group—Anacortes, WA	180
Silver Eagle Refining Inc.—Woods Cross, UT	181
Silver Eagle Refining Inc.—Evanston, WY	182
Texas Oil and Chemical Co.—Silsbee, TX	183
Northern Tier Energy LLC—Saint Paul, MN	184
Suncor Energy Inc.—Commerce City East, CO	185

Admixture	Code
Sunoco Inc.—Philadelphia, PA	186
Tesoro Corp.—Kenai, AK	187
Tesoro Corp.—Ewa Beach, HI	188
Tesoro Corp.—Martinez, CA	189
Tesoro Corp.—Wilmington, CA	190
Tesoro Corp.—Mandan, ND	191
Tesoro Corp.—Salt Lake City, UT	192
Tesoro Corp.—Anacortes, WA	193
PBF Energy Co. LLC—Toledo, OH	194
Total SA—Port Arthur, TX	195
BTB Refining LLC—Corpus Christi, TX	196
Compagnie Nationale A Portefeuilli—Tacoma, WA	197
Valero Energy Corp.—Meraux, LA	198
Valero Energy Corp.—Sunray, TX	199
Valero Energy Corp.—Three Rivers, TX	200
Valero Energy Corp.—Benicia, CA	201
Valero Energy Corp.—Wilmington Asphalt Plant, CA	202
Valero Energy Corp.—Wilmington Refinery, CA	203
Valero Energy Corp.—Ardmore, OK	204
Valero Energy Corp.—Houston, TX	205
Valero Energy Corp.—Texas City, TX	206
Valero Energy Corp.—Norco, LA	207
Ventura Refining and Transmission LLC—Thomas, OK	208
Western Refining Inc.—El Paso, TX	209
Western Refining Inc.—Bloomfield, NM	210
Western Refining Inc.—Gallup, NM	211
WRB Refining LP—Wood River, IL	212
WRB Refining LP—Borger, TX	213
CVR Energy—Wynnewood, OK	214
Black Elk Refining LLC—New Castle, WY	215

Note: Codes 1–93 (Oil and Gas 1989) updated October 1993; codes 94–215 (Energy Information Administration 2012).

Table 18. Asphalt cement modifier codes.

Modifier	Code
Stone dust	01
Lime	02
Portland cement	03
Carbon black	04
Sulfur	05
Lignin	06
Natural latex	07
Synthetic latex	08
Block copolymer	09

Modifier	Code
Reclaimed rubber	10
Polyethylene	11
Polypropylene	12
Ethylene-vinyl acetate	13
Polyvinyl chloride	14
Asbestos	15
Rock wool	16
Polyester	17
Manganese	18
Other mineral salts	19
Lead compounds	20
Carbon	21
Calcium salts	22
RAs	23
Rejuvenating oils	24
Amines	25
Fly ash	26
Other	27

Table 19. Grades of asphalt, emulsified asphalt, and cutback asphalt codes.

Type	Code
Asphalt cements	—
AC-2.5	01
AC-5	02
AC-10	03
AC-20	04
AC-30	05
AC-40	06
AR-1000 (AR-10 by AASHTO designation)	07
AR-2000 (AR-20 by AASHTO designation)	08
AR-4000 (AR-40 by AASHTO designation)	09
AR-8000 (AR-80 by AASHTO designation)	10
AR-16000 (AR-160 by AASHTO designation)	11
200-300 pen	12
120-150 pen	13
85-100 pen	14
60-70 pen	15
40-50 pen	16
Other asphalt cement grade	17
Emulsified asphalts	—
RS-1	18
RS-2	19
MS-1	20
MS-2	21

Type	Code
MS-2h	22
HFMS-1	23
HFMS-2	24
HFMS-2h	25
HFMS-2s	26
SS-1	27
SS-1h	28
CRS-1	29
CRS-2	30
CMS-2	31
CMS-2h	32
CSS-1	33
CSS-1h	34
Other emulsified asphalt grades	35
Cutback asphalts—rapid curing, medium curing (MC), slow curing	—
30 (MC only)	36
70	37
250	38
800	39
3000	40
Other cutback asphalt grade	99

Notes: Taken from *Manual Series No. 5 (MS-5): A Brief Introduction to Asphalt,* and *Specification Series No. 2 (SS-2): Specifications for Paving and Industrial Asphalts* (the Asphalt Institute 1974; the Asphalt Institute 1987).

Table 20. Maintenance and rehabilitation work type codes.

Type	Code
Crack sealing (linear feet)	01
Transverse joint sealing (linear feet)	02
Lane-shoulder, longitudinal joint sealing (linear feet)	03
Full-depth joint repair patching of PCC (square yards)	04
Full-depth patching of PCC pavement other than at joint (square yards)	05
Partial-depth patching of PCC pavement other than at joint (square yards)	06
PCC slab replacement (square yards)	07
PCC shoulder restoration (square yards)	08
PCC shoulder replacement (square yards)	09
AC shoulder restoration (square yards)	10
AC shoulder replacement (square yards)	11
Grinding/milling surface (square yards)	12
Grooving surface (square yards)	13
Pressure grout subsealing (no. of holes)	14
Slab jacking depressions (no. of depressions)	15
Asphalt subsealing (no. of holes)	16
Spreading of sand or aggregate (square yards)	17
Reconstruction (removal and replacement) (square yards)	18

Type	Code
AC overlay (square yards)	19
PCC overlay (square yards)	20
Mechanical premix patch (using motor grader and roller) (square yards)	21
Manual premix spot patch (hand spreading and compacting with roller) (square yards)	22
Machine premix patch (placing premix with paver, compacting with roller) (square yards)	23
Full-depth patch of AC pavement (removing damaged material, repairing supporting material, and repairing) (square yards)	24
Patch potholes—hand spread, compacted with truck (no. of holes)	25
Skin patching (hand tools/hot pot to apply liquid asphalt and aggregate) (square yards)	26
Strip patching (using spreader and distributor to apply hot liquid asphalt and aggregate) (square yards)	27
Surface treatment, single layer (square yards)	28
Surface treatment, double layer (square yards)	29
Surface treatment, three or more layers (square yards)	30
Aggregate seal coat (square yards)	31
Sand seal coat square yards)	32
Slurry seal coat (square yards)	33
Fog seal coat (square yards)	34
Prime coat (square yards)	35
Tack coat (square yards)	36
Dust layering (square yards)	37
Longitudinal subdrains (linear feet)	38
Transverse subdrainage (linear feet)	39
Drainage blanket (square yards)	40
Well system	41
Drainage blankets with longitudinal drains	42
Hot-mix recycled AC (square yards)	43
Cold-mix recycled AC (square yards)	44
Heater scarification, surface recycled AC (square yards)	45
Fracture treatment of PCC pavement as base for new AC surface (square yards)	46
Fracture treatment of PCC pavement as base for new PCC surface (square yards)	47
Recycled PCC (square yards)	48
Pressure relief joints in PCC pavements (linear feet)	49
Joint load transfer restoration in PCC pavements (linear feet)	50
Mill off existing AC pavement and overlay with AC (square yards)	51
Mill off existing AC pavement and overlay with PCC (square yards)	52
Other	53
Partial-depth patching of PCC pavement at joints (square yards)	54

Type	Code
Mill existing pavement and overlay with hot-mix recycled AC (square yards)	55
Mill existing pavement and overlay with cold-mix recycled AC (square yards)	56
Saw and seal (linear feet)	57
Mill off existing AC pavement and overlay with WMA (square yards)	58
WMA overlay (square yards)	59
WMA with RAP and/or RAS (square yards)	60

Table 21 contains maintenance location codes for the LTPP program.

Table 21. Maintenance location codes.

Location	Code
Outside lane (number 1)	01
Inside lane (number 2)	02
Inside lane (number 3)	03
All lanes	09
Shoulder	04
All lanes plus shoulder	10
Curb and gutter	05
Side ditch	06
Culvert	07
Other	08

Note: LTPP only studies outside lanes.

Table 22 contains maintenance materials type codes for the LTPP program.

Table 22. Maintenance materials type codes.

Type	Code
Preformed joint fillers	01
Hot-poured joint and crack sealer	02
Cold-poured joint and crack sealer	03
Open-graded AC	04
Hot-mix AC laid hot	05
Hot-mix AC laid cold	06
Sand asphalt	07
PCC (overlay replacement)	—
Joint plain (JPCP)	08
Joint reinforced (JRCP)	09
Continuously reinforced (CRCP)	10
PCC (patches)	11
Hot liquid asphalt and aggregate (seal coat)	12
Hot liquid asphalt and mineral aggregate	13
Hot liquid asphalt and sand	14

Type	Code
Emulsified asphalt and aggregate (seal coat)	15
Emulsified asphalt and mineral aggregate	16
Emulsified asphalt and sand	17
Hot liquid asphalt	18
Emulsified asphalt	19
Sand cement (using portland cement)	20
Lime-treated or stabilized materials	21
Cement-treated or stabilized materials	22
Cement grout	23
Aggregate (gravel, crushed stone, or slag)	24
Sand	25
Mineral dust	26
Mineral filler	27
Other	28

—Header line.

Table 23. Recycling agent type codes.

Type	Code
RA 1	42
RA 5	43
RA 25	44
RA 75	45
RA 250	46
RA 500	47
Other	48

Note: The RA groups shown in this table are defined in ASTM D4552 (ASTM 2020e).

Table 24. Antistripping agent type codes.

Type	Code
Permatac	01
Permatac Plus	02
Betascan Roads	03
PaveBond®	04
PaveBond Special	05
PaveBond Plus	06
BA 2000	07
BA 2001	08
Unichem “A”	09
Unichem “B”	10
Unichem “C”	11
AS4115	12
AS4112	13
AS4113	14
Portland cement	15

Type	Code
Hydrated lime:	—
Mixed dry with asphalt cement	16
Mixed dry with dry aggregate	17
Mixed dry with wet aggregate	18
Slurried lime mixed with aggregate	19
Hot lime slurry (quick lime slaked and slurried at job site)	20
No-Strip Chemicals A-500	21
No-Strip Chemical Works ACRA RP-A	22
No-Strip Chemical Works ACRA Super Conc.	23
No-Strip Chemical Works ACRA 200	24
No-Strip Chemical Works ACRA 300	25
No-Strip Chemical Works ACRA 400	26
No-Strip Chemical Works ACRA 500	27
No-Strip Chemical Works ACRA 512	28
No-Strip Chemical Works ACRA 600	29
Darakote®	30
De Hydro H86C	31
Emery 17065	32
Emery 17319	33
Emery 17319–6880	34
Emery 17320	35
Emery 17321	36
Emery 17322	37
Emery 17339	38
Emery 1765–6860	39
Emery 6886B	40
Husky Anti-Strip	41
Indulin AS-Special	42
Indulin AS-1	43
Jetco AD-8	44
Kling®	45
Kling-Beta ZP-251	46
Kling-Beta L-75	47
Kling-Beta LV	48
Kling-Beta 1000	49
Kling-Beta 200	50
Nacco Anti-Strip	51
No Strip	52
No Strip Concentrate	53
Redi-Coat 80-S	54
Redi-Coat 82-S	55
Silicone	56
Super AD-50	57
Tap Co 206	58

Type	Code
Techni H1B7175	59
Techni H1B7173	60
Techni H1B7176	61
Techni H1B7177	62
Tretolite™ DH-8	63
Tretolite H-86	64
Tretolite H-86C	65
Tyfo A-45	66
Tyfo A-65	67
Tyfo A-40	68
Edoco 7003	69
Other	70
No antistripping agent used	00

AS = Aquashield™.

Table 25. Distress types.

Type	Code
AC pavement	—
Alligator cracking	01
Block cracking	02
Edge cracking	03
Longitudinal cracking	04
Reflection cracking	05
Transverse cracking	06
Patch deterioration	07
Potholes	08
Rutting	09
Shoving	10
Bleeding	11
Polished aggregate	12
Raveling and weathering	13
Lane shoulder dropoff	14
Water bleeding	15
Pumping	16
Other	17
PCC pavement	—
Corner breaks	20
Durability cracking	21
Longitudinal cracking	22
Transverse cracking	23
Joint seal damage	24
Spalling	25
Map cracking/scaling	26
Polished aggregate	27

Type	Code
Popouts	28
Punchouts	29
Blowouts	30
Faulting	31
Lane/shoulder dropoff	32
Lane/shoulder separation	33
Patch deterioration	34
Water bleeding/pumping	35
Slab settlement	36
Slab upheaval	37
Other	38

—Header line.

Table 26. Route signing codes.

Type	Code
Not signed	1
Interstate	2
United States	3
State	4
Off-interstate business marker	5
County	6
Township	7
Municipal	8
Parkway marker or forest route marker	9
None of the above	10

Table 27. Ownership codes.

Type	Code
State HA	1
County HA	2
Town or township HA	3
City or municipal HA	4
State park, forest, or reservation agency	11
Local park, forest, or reservation agency	12
Other State agency	21
Other local agency	25
Private (other than railroad)	26
Railroad	27
State toll road	31
Local toll authority	32
Other public instrumentality (i.e., airport)	40
Indian Tribe Nation	50
Other Federal agency	60

Type	Code
Bureau of Indian Affairs	62
U.S. Fish and Wildlife Service	63
U.S. Forest Service	64
National Park Service	66
Tennessee Valley Authority	67
Bureau of Land Management	68
Bureau of Reclamation	69
U.S. Army Corps of Engineers	70
U.S. Air Force	72
U.S. Navy/Marines	73
U.S. Army	74
Other	80

Table 28. Turn lane codes.

Type	Code
No intersection where a right turning movement is permitted exists on the section	1
Turns permitted; multiple exclusive right-turning lanes exist. Through movements are prohibited in these lanes. Multiple turning lanes allow for simultaneous turns from all turning lanes	2
Turns permitted; a continuous exclusive right-turning lane exists from intersection to intersection. Through movements are prohibited in this lane	3
Turns permitted; a single exclusive right-turning lane exists	4
Turns permitted; no exclusive right-turning lanes exist	5
No right turns are permitted during the peak period	6

Table 29 contains widening obstacle codes for the LTPP program.

Table 29. Widening obstacles codes.

Type	Code
No obstacles	X
Dense development	A
Major transportation facilities	B
Other public facilities	C
Terrain restrictions	D
Historic and archaeological sites	E
Environmentally sensitive areas	F
Parkland	G

The types of widening obstacles are defined as follows:

- No obstacles—No obstacles to widening.

- Dense development—Refers to the density and size of buildings to be acquired, the number of people that would need to be relocated, and the number of businesses that would need to be acquired. (Even though dense development may be higher in urban areas, such development should not be used as an obstacle for all urban areas and should be evaluated relative to the conditions in the area where the section is located.)

- Major transportation facilities—Includes major rail lines, canals, airports, and major natural gas and oil pipelines whose location relative to the roadway section would limit expansion of the existing roadway.

- Other public facilities—Includes hospitals, museums, libraries, major public office buildings, schools, and universities.

- Terrain restrictions—Relates to geographic features that would make it very difficult to add lanes, requiring significant excavation, fill, or tunneling (which applies to both horizontal and vertical terrain restrictions).

- Historic and archaeological sites—Includes such things as historic buildings, historic land, large monuments, cemeteries, and known archaeological sites.

- Environmentally sensitive areas—Includes such areas as scenic landmarks, wetlands, bodies of water, and areas inhabited or used by protected species. Scenic routes and byways are included in the category and are those national and State routes that have been identified and listed as official designations.

- Parkland—Includes national, State, and local parks.

APPENDIX B. DEVIATION REPORTS

Appendix B contains blank copies of the deviation report. Deviation reports will contain the following:

- Project summary sheet—The project summary sheet will summarize the classification information in terms of:

  - Experiment number.
  - State or Province.
  - LTPP region (western, southern, north Atlantic, and north central).
  - Climate zone (dry, freeze, no freeze, etc.).
  - Subgrade classification (fine or coarse).
  - Construction start and end dates.

  The project summary sheet will also note if deviations in the site location or construction occurred. Data collection and processing status along with report status is also included.

- Site location guideline deviations—Site location guideline deviations will contain a summary on any deviation from the site location guidelines on individual or all test sections within the SPS-10 project. Engineering judgment will be used to evaluate the impact of nonuniformities and deviations on test section performance.

- Construction guideline deviations—Construction guideline deviations will contain a summary on any deviation from the construction guidelines on individual or all test sections within the SPS-10 project. Engineering judgment will be used to evaluate the impact of nonuniformities and deviations on test section performance.

- Data collection and materials sampling and testing deviations—Data collection and materials sampling and testing deviations will contain a summary on any deviation from the data collection and materials sampling and testing on individual or all test sections within the SPS-10 project. Engineering judgment will be used to evaluate the impact of nonuniformities and deviations on test section performance.

- Other deviations—Other deviations will contain a summary on any deviations not covered by the previous sections of the deviation report.

LTPP SPS-10 Project Deviation Report **Project Summary Sheet**	State Code __ __ Project Code __ __ __ __
Project Classification Information	
SPS Experiment Number:	State or Province
LTPP Region:	☐ North Atlantic ☐ North Central ☐ Southern ☐ Western
Climate Zone:	☐ Dry Freeze ☐ Dry No-Freeze ☐ Wet Freeze ☐ Wet No-Freeze
Traffic:	☐ High ☐ Low
Construction Start Date:	Construction End Date:
Deviation Summary	
Site Location Deviations:	☐ No Deviations ☐ Minor Deviations ☐ Significant Deviations
Construction Deviations:	☐ No Deviations ☐ Minor Deviations ☐ Significant Deviations
Data Collection and Processing Status Summary	
Inventory Data:	☐ Complete Submission ☐ Incomplete ☐ Data Not Available ☐ N/A
Materials Data:	☐ All Scheduled Samples Obtained and Tested ☐ Incomplete/No Test Data
Construction Data:	☐ All Required Data Obtained ☐ Incomplete/Missing Data Elements
Historical Traffic Data:	☐ All Required Historical Estimates Submitted ☐ Required Estimates Not Submitted ☐ N/A
Traffic Monitoring Equipment (installed onsite):	☐ WIM ☐ Automated Vehicle Classification ☐ Automatic Traffic Recorder ☐ No Equipment Installed
Traffic Monitoring:	☐ Preferred ☐ Continuous ☐ Minimum ☐ Below Minimum ☐ Site Related
Traffic Monitoring Data:	☐ Monitoring Data Submitted ☐ No Monitoring Data Submitted
FWD Measurements:	☐ Preconstruction Tests Performed ☐ Construction Tests Performed ☐ Postconstruction Tests Performed
Profile/Texture Measurements:	☐ Preconstruction Tests Performed ☐ Postconstruction Tests Performed
Distress Measurements:	☐ Preconstruction Tests Performed ☐ Postconstruction Tests Performed
Rehabilitation Data:	☐ Complete Submission ☐ Incomplete ☐ Data Not Available ☐ N/A
Report Status	
Materials Sampling and Test Plan:	☐ Document Prepared ☐ Final Submitted to FHWA
Construction Report:	☐ Document Prepared ☐ Final Submitted to FHWA

Page ____ of ____ Preparer: _____ Date: _____

LTPP SPS-10 Project Deviation Report **Site Location Guideline Deviations**	State Code __ __ Project Code __ __ __ __

☐ Comments Pertain to All Test Sections on Project
☐ Comments Pertain Only to Section(s) (specify): _____

Site Location Guidelines Deviation Comments:

Page ____ of ____ Preparer: _____ Date: _____

LTPP SPS-10 Project Deviation Report **Construction Guideline Deviations**	State Code __ __ Project Code __ __ __ __

☐ Comments Pertain to All Test Sections on Project
☐ Comments Pertain Only to Section(s) (specify): _____

Construction Guidelines Deviation Comments:

Page ____ of ____ Preparer: _____ Date: _____

LTPP SPS-10 Project Deviation Report **Data Collection and Materials** **Sampling and Testing Deviations**	State Code __ __ Project Code __ __ __ __

☐ Comments Pertain to All Test Sections on Project
☐ Comments Pertain Only to Section(s) (specify): _____

Data Collection and Materials Sampling and Testing Comments:

Page ____ of ____ Preparer: _____ Date: _____

LTPP SPS-10 Project Deviation Report **Other Deviations**	State Code __ __ Project Code __ __ __ __

☐ Comments Pertain to All Test Sections on Project
☐ Comments Pertain Only to Section(s) (specify): _____

Other Deviation Comments:

Page ____ of ____ Preparer: _____ Date: _____

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