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STRATEGIC HIGHWAY RESEARCH PROGRAM

SPECIFIC PAVEMENT STUDIES
MATERIALS SAMPLING AND TESTING REQUIREMENTS FOR EXPERIMENT SPS-8
STUDY OF ENVIRONMENTAL EFFECTS IN THE ABSENCE OF HEAVY LOADS

STRATEGIC HIGHWAY RESEARCH PROGRAM
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PREFACE

This report contains guidelines for the development and implementation of a material sampling and testing program for each test site included in the Specific Pavement Studies' experiment SPS-8, Study of Environmental Effects in the Absence of Heavy Loads. These guidelines will help the SHRP regional office develop recommendations for a material sampling and testing plan tailored for the individual test site. The SHRP regional office and the participating highway agency must coordinate the activities associated with the development and implementation of the recommended field sampling and testing plan to ensure compliance with the plan objectives and thus achieve the study's goals.

This report should be used in conjunction with the SHRP Guide for Field Material Sampling, Testing and Handling to perform the field material drilling and sampling work. Copies of these guidelines should be available during the on-site sampling and testing operations. All persons involved in the field sampling and testing operations for the SPS-8 experiment must be familiar with its content, particularly the types and numbers of samples to be obtained from the different test sections and pavement layers.

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1. INTRODUCTION

1.1 OVERVIEW

This report provides guidelines for the development and implementation of a material sampling and testing program for each of the test sites included in the Specific Pavement Studies' experiment SPS-8, Study of Environmental Effects in the Absence of Heavy Loads. These guidelines will be used by the SHRP regional office to develop recommendations for a field testing and material sampling and laboratory testing plan tailored to the individual test site.

The SPS-8 experiment requires the construction of two flexible pavement test sections with similar details and materials at each of twelve sites and also the construction of two rigid pavement test sections at each of twelve test sites. The flexible and rigid test sections may be constructed at the same site. Test sites for the flexible and rigid pavements are equally distributed among the four climatic regions. The experimental design and construction considerations for this experiment are described in the document, "Specific Pavement Studies: Experimental Design and Research Plan for Experiment SPS-8, Study of Environmental Effects in the Absence of Heavy Loads," August 1991. Construction features and details for this experiment are described in the document, "Specific Pavement Studies: Construction Guidelines for Experiment SPS-8, Study of Environmental Effects in the Absence of Heavy Loads," March 1992. In spite of attempts to control uniformity in construction, some variation within and between sites will exist. Therefore, it is important to develop and implement a sampling and testing plan that will provide the information necessary to evaluate such variations and their effect on performance.

To obtain materials characterization required for the SPS-8 experiment, the following steps are required:

1. Review of project site layout and soil profile logs.

2. Formulation of a plan for field sampling and laboratory testing. This plan should take into account site conditions, construction schedule, and the laboratory material testing requirements necessary

to characterize the properties of the pavement materials. An adequate number of field tests must be performed and sufficient samples must be obtained to assure that all laboratory material characterization tests can be performed.

3. Development of a field sampling and testing plan report. This report should identify sampling area locations, field test locations, type and number of samples from each location and material. The report should include tables that identify the field tests to be performed at each location and the laboratory tests to be performed on each sample.

4. Field sampling and testing of materials. In reporting this activity, changes made in the field to the sampling and testing plan must be recorded.

5. Testing of material samples in the laboratory and reporting of test results.

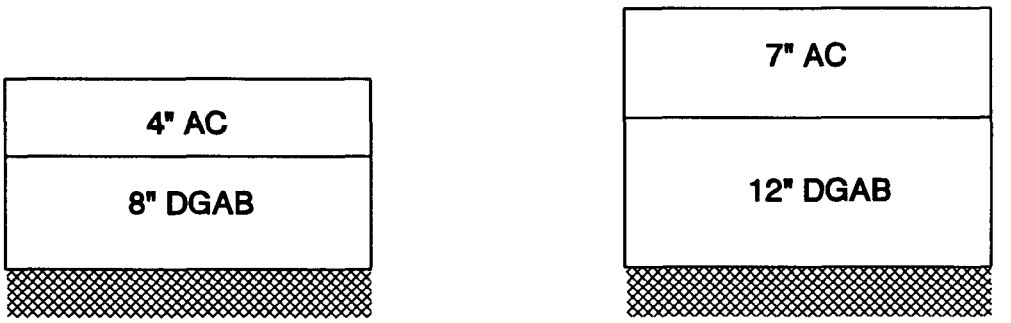
6. Compilation and storage of data. This will include compilation of field sampling, field test data and laboratory material test data and entry of this data into the National Pavement Performance Database.

The SPS-8 experiment was developed to investigate the performance of selected flexible and rigid pavement structures constructed on different subgrade types in different environmental regions. For flexible pavements, the structural factors include different surface layer and base layer thicknesses. For rigid pavements, only the concrete slab thickness is considered. Characterization of the material properties and the variations in these properties between and within the test sections is required to evaluate causes of performance differences between test sections and provide a basis for improving the environmental effects models and thus improving current structural design methods. Materials characterization includes those parameters used in current pavement design models and mechanistic analysis models, and the engineering properties generally required to assess the characteristics and behavior of materials.

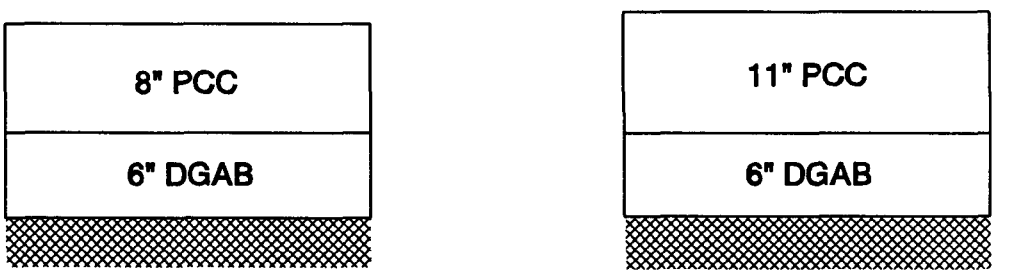
1.2 MINIMUM REQUIREMENTS

The material sampling and testing plan must be tailored to the specific features encountered on each project. For example, uniformity in subgrade materials along the test site may vary from one site to another. Also, the participating highway agency may construct supplemental test sections at the site in addition to those required for the SPS-8 experiment. To accommodate these differences, the sampling and testing plan for one site may vary from that required for another site. For illustration, the material sampling and testing requirements for two test sites, one incorporating the flexible pavement sections and another site incorporating the rigid pavement sections are presented in this report. Each test site consists of two flexible and two rigid pavement test sections. Flexible pavement sections at a test site are designated Sections 1 and 2, Sections 3 and 4, or Sections 5 and 6 for pavements constructed on active fine-grained, inactive fine-grained, or coarse-grained subgrade soils, respectively. Rigid pavement sections at a test site are designated Sections 7 and 8, Sections 9 and 10, or Sections 11 and 12 for pavements constructed on active fine-grained, inactive fine-grained, or coarse-grained subgrade soils, respectively. The combinations of pavement layer materials and thicknesses for the flexible or rigid sections required at a test site are illustrated in Figure 1.

The test site layout shown in Figure 2 will be used to illustrate the materials sampling and testing requirements for this experiment. For this site, each test section is constructed with the same pavement structure and materials over a 600 feet length to allow for 500 feet monitoring length and 50 feet of the same design and details at each end for sampling and testing. The two test sections are separated by 100 feet distance to allow for changes in thickness. Locations for subgrade and base course testing are distributed throughout each test section. The materials sampling areas are located outside the 500 feet monitoring portion of the sections but within the 50 feet distance designated for sampling and testing. The sampling areas are numbered consecutively as illustrated in Figure 2.



Flexible Test Sections



Rigid Test Sections

AC = Asphalt Concrete

PCC = Portland Cement Concrete

DGAB = Dense Graded Aggregate Base

Figure 1. Pavement cross sections for SPS-8 test sites with flexible and rigid pavements.

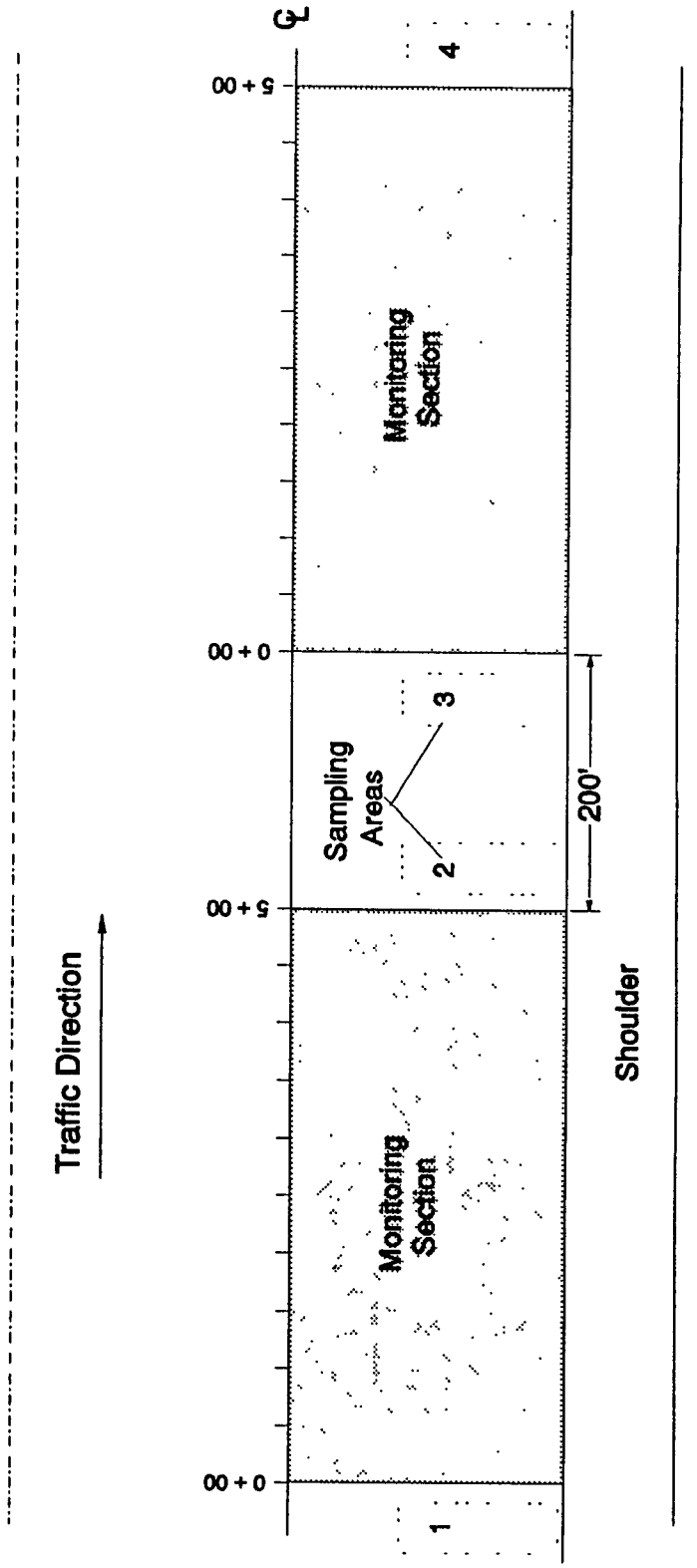
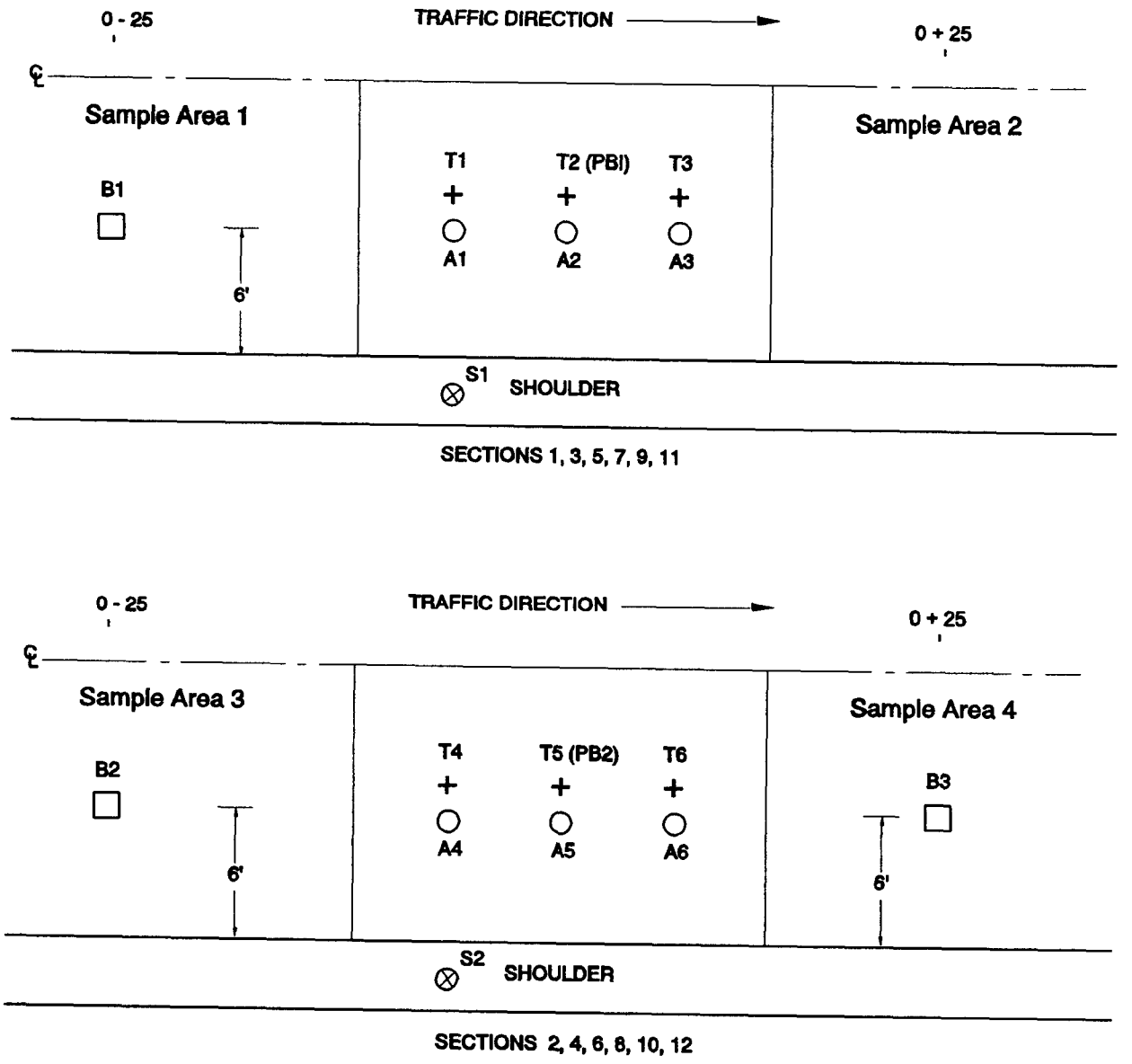


Figure 2. Example of a site layout with sampling areas.

The layouts presented are based on the construction sequence, i.e. completion of subgrade preparation, base course, and surface course. The first testing and sampling will be of the prepared subgrade at the locations illustrated in Figure 3. After construction of the granular base layer, in-placetesting for density and moisture content determination together with retrieval of bulk samples will be performed at the locations illustrated in Figure 4. Finally, cores will be taken from the finished surface course at the locations illustrated in Figures 5 and 6 for the flexible and rigid test sections, respectively. In addition, bulk samples of the uncompacted asphalt or fresh portland cement concrete, as appropriate, will be obtained during construction.

The guidelines for formulating field materials sampling and laboratory testing plans for the SPS-8 experiment have been developed based on the experience gained from the materials testing program developed for the General Pavement Studies and the need for better characterization of the engineering properties of the materials within the test sites. The field testing and material sampling plan should adequately address the field and laboratory testing needs. Therefore, a sufficient number of field tests must be performed and a sufficient number of samples must be obtained from each test site to enable adequate characterization of the pavement materials. The field testing and sampling plan illustrated in this report identifies the number of field tests and samples required to achieve this objective.



LEGEND

- □ B2 - Bulk sampling location 2 ft x 2 ft to 1 ft below surface
- \+ T1 - In - place density test location
- ○ A1 - Location of Shelby tube/splitspoon sampling to 4 ft. below surface
- ⊗ S1 - Location of auger probe in shoulder
- PB1 - Location of Plate Bearing Test (Rigid Sections Only)

Figure 3. Sampling and testing locations for subgrade

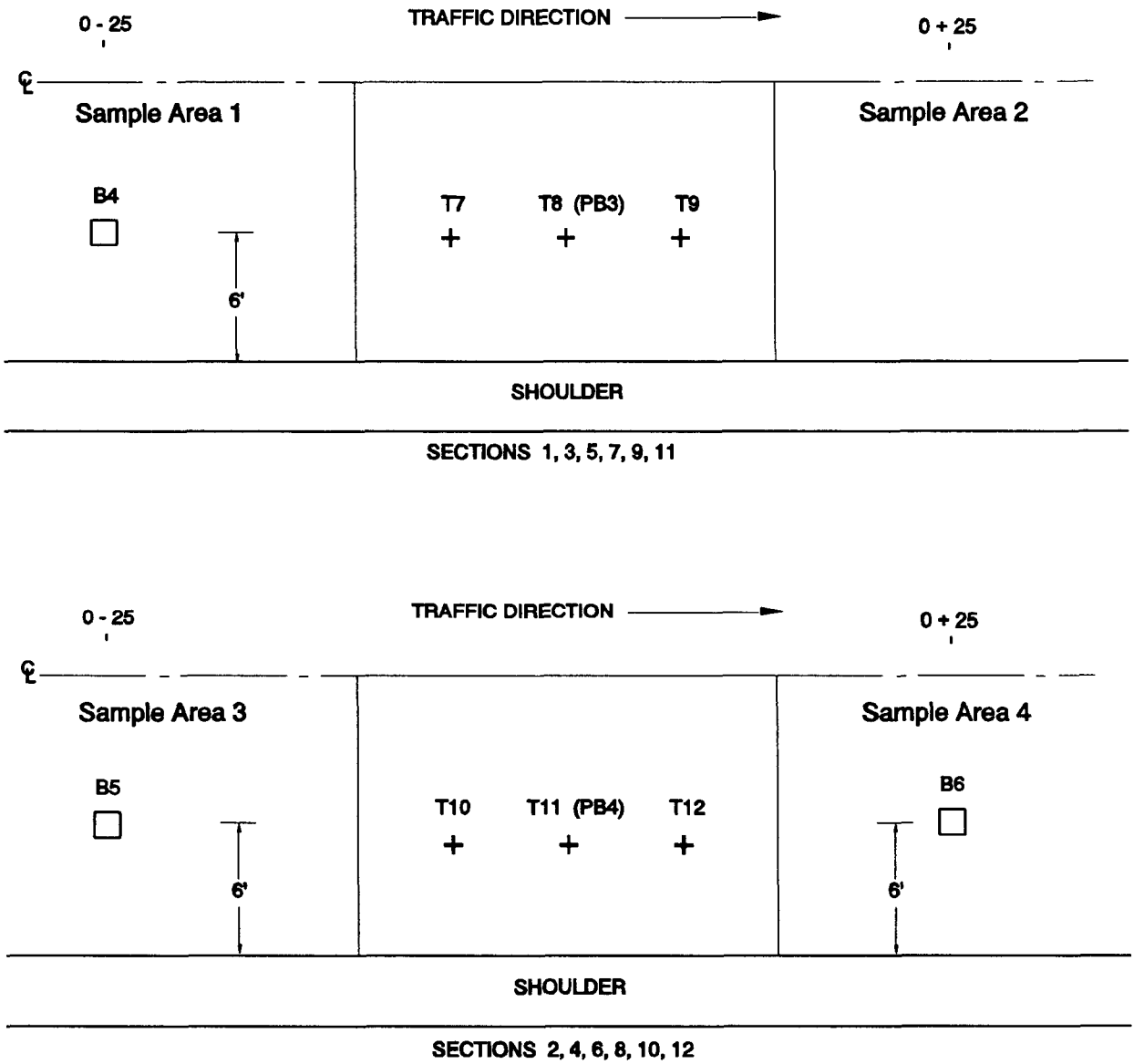


Figure 4. Sampling and testing locations for base course.

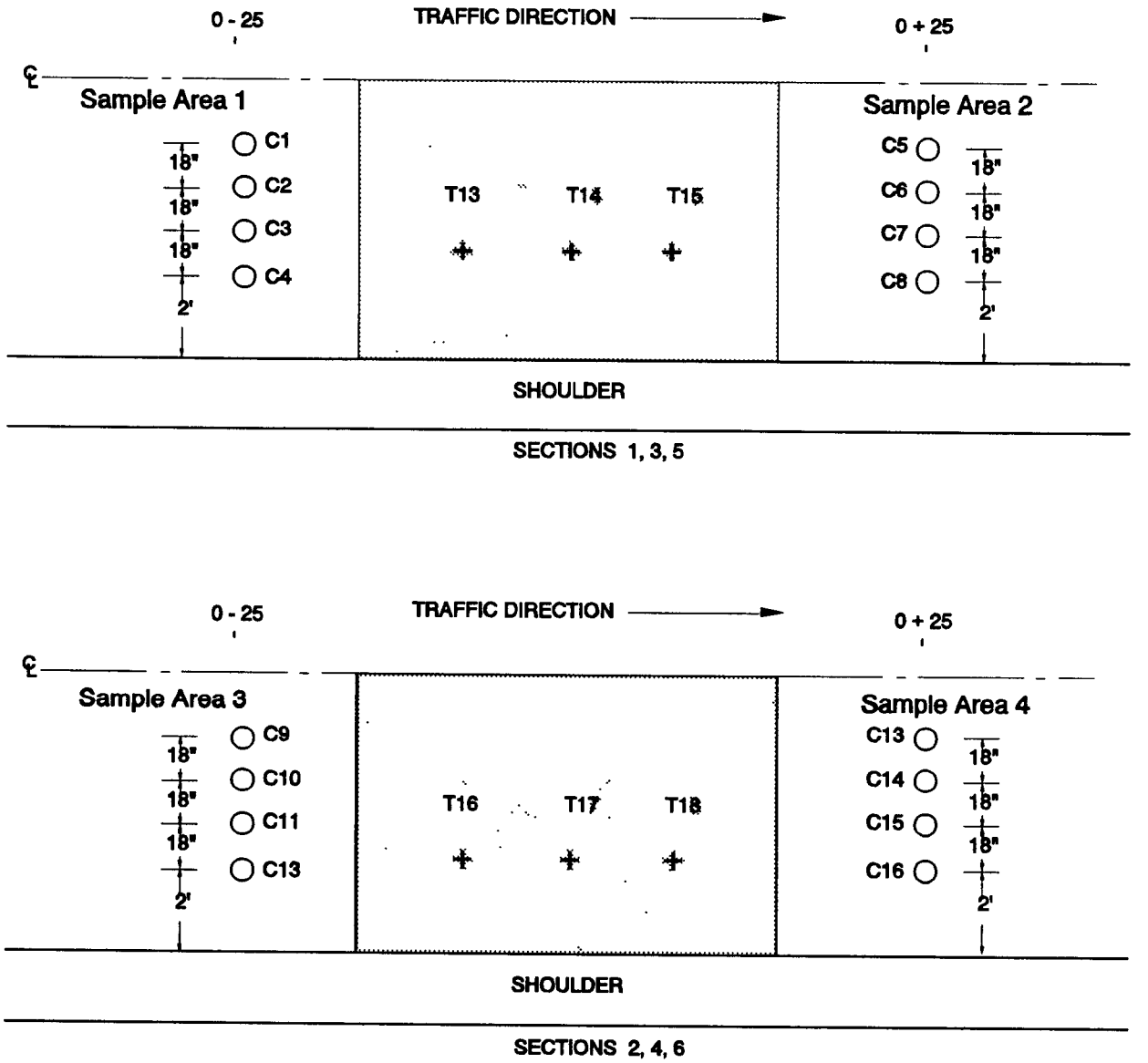
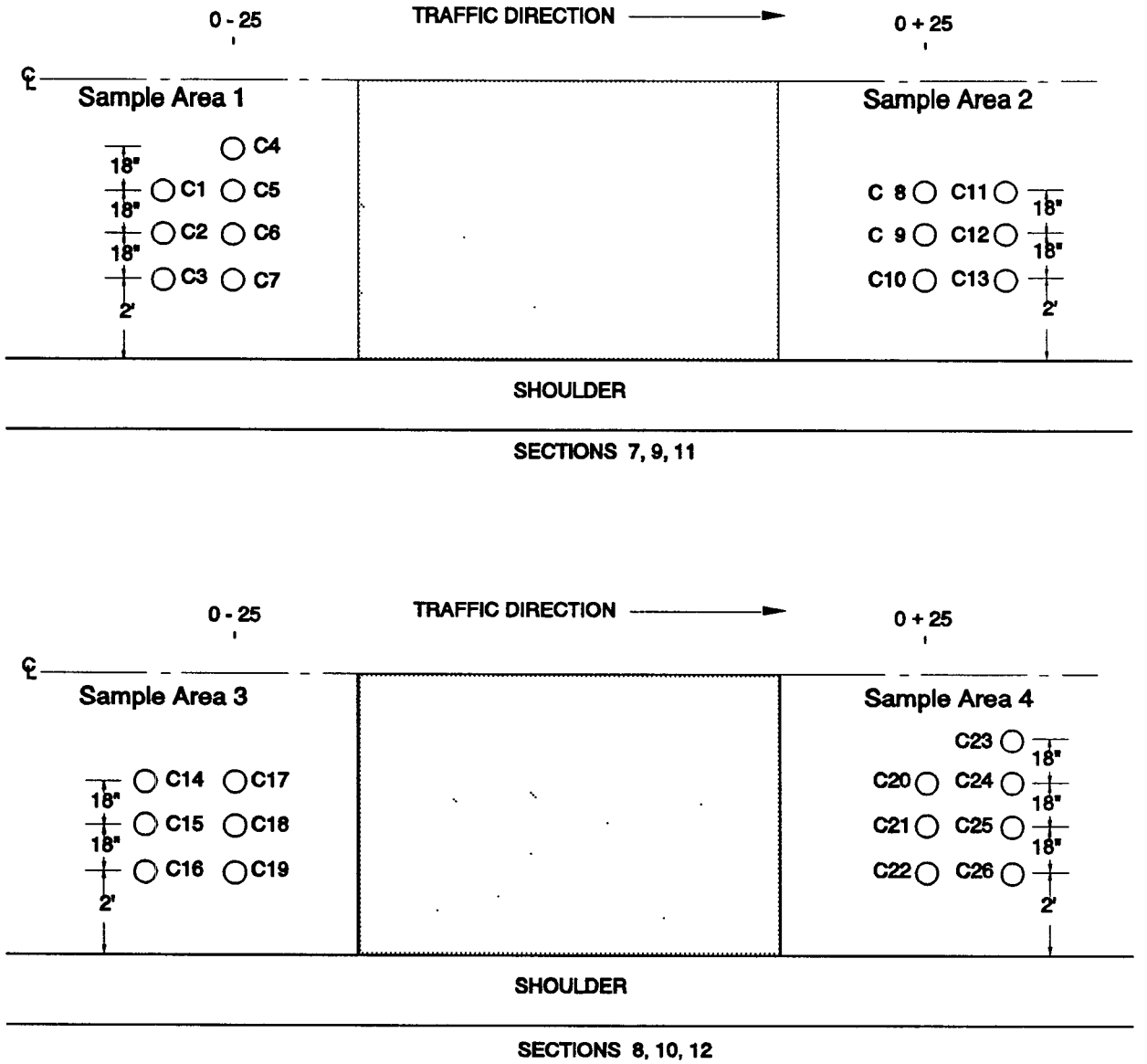


Figure 5. Sampling and testing locations for AC surface.



LEGEND

○ - 4" Diameter Core of PCC surface

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

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

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

Figure 6. Sampling and testing locations for PCC surface.

2. DEVELOPMENT OF SAMPLING AND TESTING PLANS

2.1 GENERAL

The details of the sampling and testing plan for each SPS-8 site will differ depending on subgrade variability and constraints of each specific project. The sampling plan must be tailored for the specific site conditions to account for the distance between test sections, project length, subgrade variability and other conditions unique to the site. The following guidelines are presented to help simplify the process of developing an appropriate plan for the experiment.

The material sampling and testing plan should be prepared in a coordinated manner with adequate input from the participating agency. In addition, the following documents must be reviewed prior to plan preparation:

1. Project plan and profile sheets.
2. Soil profile sheets.
3. Laboratory and field material testing requirements described in this document.
4. Other documents or information related to the project, such as field verification reports which would help determine subgrade variability along the site.

Generally, variability of the subgrade will be determined during the site selection process and should be a prime consideration in development of the final sampling and testing plan for the site. Plan and profile sheets will help determine the location of cut/fill sections and the possible variability in subgrade materials. The constraints imposed on location of test sections to avoid cut/fill transitions, bridges, culverts, substructures and side hill fills and the inclusion of supplemental test sections desired by the participating agency would require a longer project site to accommodate all test sections. This will increase the potential for variability of the subgrade soils along the site. Therefore, the actual number of subgrade sampling locations should be based on the total site length and known variations.

The overall material testing program for both field and laboratory testing is summarized in Table 1. This table lists the laboratory and field testing procedures, numbers of tests for each layer or material and the locations for obtaining the laboratory test samples or performing the field tests. These locations correspond to sampling locations identified on the sampling layouts shown in Figures 3 through 6. The material source is designated by either a sample code number which identifies both sample type and material or by a sample location number which identifies the sample type. At each sample location, materials may be obtained from one or more pavement layers.

Table 2 lists the minimum number of field tests required for each finished layer of an SPS-8 site. The codes assigned to the test locations shown in this table correspond to those indicated on the sampling layouts (Figures 3 through 6).

Table 3 lists the minimum number of material samples and sample types required from each material layer of an SPS-8 site necessary to perform the needed laboratory testing.

Subgrade sampling may vary depending on the variation in subgrade soil at the test site. However, testing and sampling of the pavement layers (above the subgrade) depends on the structural cross section of the test section. The example of subgrade sampling presented in this report may be adopted for other test sites.

Different types of samples of the pavement structure are required at each site, as follows:

- Thin-walled tube and/or splitspoon sampling of subgrade layers to 4 feet below the top of subgrade at A-Type sampling locations.
- Bulk samples of the upper 12 inches of untreated subgrade to be obtained from B-Type sampling locations.
- Bulk samples of the uncompacted Dense Graded Aggregate Base (DGAB) course to be obtained from B-Type sampling locations prior to base compaction.

Table 1. Field and Laboratory Materials Testing Plan

Material Type and Properties	SHRP Test Designation	SHRP Protocol	Tests per Layer	Material Source/ Test Location
SUBGRADE				
Sieve Analysis	SS01	P51	3	B1-B3
Hydrometer to 0.01mm	SS02	P42	3	B1-B3
Atterberg Limits	SS03	P43	3	B1-B3
Classification and Type	SS04	P52	9	A1-A6, B1-B3 -- NOTE 1
Moisture-Density Relations	SS05	P55	3	B1-B3
Resilient Modulus	SS07	P46	3	A1, A3, A5
Unit Weight	SS08	P56	6	A1-A6
Natural Moisture Content	SS09	P49	3	B1-B3
Unconfined Comp. Strength	SS10	P54	2	A2, A4
Permeability	SS11	P57	1	A2
In-Place Density		SHRP-LTPP Method	9	B1-B3, T1-T6
Plate Bearing Test (Rigid Sections Only)	SS06	P58	2	PB-1, PB-2
Depth to Rigid Layer		SHRP-LTPP Method	2	S1, S2
Expansion Index	SS12	P60	3	B1-B3
UNBOUND GRANULAR BASE				
Particle Size Analysis	UG01	P41	3	B4-B6
Sieve Analysis (washed)	UG02	P41	3	B4-B6
Atterberg Limits	UG04	P43	3	B4-B6
Moisture-Density Relations	UG05	P44	3	B4-B6
Resilient Modulus	UG07	P46	3	B4-B6
Classification	UG08	P47	3	B4-B6
Permeability	UG09	P48	3	B4-B6
Natural Moisture Content	UG10	P49	3	B4-B6
In-Place Density		SHRP-LTPP Method	6	T7-T12
Plate Bearing Test (Rigid Sections Only)	SS06	P58	2	PB-3, PB-4

Table 1. Field and Laboratory Materials Testing Plan (continued)

Material Type and Properties	SHRP Test Designation	SHRP Protocol	Tests per Layer	Material Source/ Test Location
ASPHALT CONCRETE SURFACE AND BINDER:				
Core Exam/Thickness	AC01	P01	16	ALL CORES
Bulk Specific Gravity	AC02	P02	16	ALL CORES
Maximum Specific Gravity	AC03	P03	3	BV-01, BV-02, BV-03
AC % (Extraction)	AC04	P04	3	BV-01, BV-02, BV-03
Moisture Susceptibility	AC05	P05	3	BV-01, BV-02, BV-03
Creep Compliance	AC06	P06	1	C9
Resilient Modulus	AC07	P07	3	[C1,C2,C3],[C5,C6,C7],[C13,C14,C15]
Tensile Strength	AC07	P07	3	C4 C8 C16
In-Place Density		SHRP-LTPP Method	6	T13-T18
ASPHALT CEMENT:				
Abson Recovery	AE01	P21	3	BV-01, BV-02, BV-03
Penetration (50F,77F,90F)	AE02	P22	3	BV-01, BV-02, BV-03
Specific Gravity (60F)	AE03	P23	3	BV-01, BV-02, BV-03
Viscosity at 77F	AE04	P24	3	BV-01, BV-02, BV-03
Viscosity at 140F,275F	AE05	P25	3	BV-01, BV-02, BV-03
EXTRACTED AGGREGATE:				
Specific Gravity:				
Coarse Aggregate	AG01	P11	3	BV-01, BV-02, BV-03
Fine Aggregate	AG02	P12	3	BV-01, BV-02, BV-03
Type and Classification:				
Coarse Aggregate	AG03	P13	3	BV-01, BV-02, BV-03
Fine Aggregate	AG03	P13	3	BV-01, BV-02, BV-03
Gradation of Aggregate	AG04	P14	3	BV-01, BV-02, BV-03
NAA Test for Fine Aggregate Particle Shape	AG05	P14A	3	BV-01, BV-02, BV-03
Coarse Aggregate Shape	AG06	P14B	3	BV-01, BV-02, BV-03
ASPHALT CEMENT: (FROM TANKER)				
Penetration at 50F,77F,90F	AE02	P22	3	BC-01, BC-02, BC-03 FROM PLANT
Specific Gravity (60F)	AE03	P23	3	BC-01, BC-02, BC-03 FROM PLANT
Viscosity at 77F	AE04	P24	3	BC-01, BC-02, BC-03 FROM PLANT
Viscosity at 140F,275F	AE05	P25	3	BC-01, BC-02, BC-03 FROM PLANT

Table 1. Field and Laboratory Materials Testing Plan (continued)

Material Type and Properties	SHRP Test Designation	SHRP Protocol	Tests per Layer	Material Source/ Test Location
PORTLAND CEMENT CONCRETE - AS DELIVERED (NOTE 2)				
Compressive Strength	PCO1	P61		
14 day			3	FC1 FC2 FC3
28 day			3	FC1 FC2 FC3
1 year			3	FC1 FC2 FC3
Splitting Tensile Strength	PCO2	P62		
14 day			3	FC1 FC2 FC3
28 day			3	FC1 FC2 FC3
1 year			3	FC1 FC2 FC3
Flexural Strength	PCO9	P69		
14 day			3	FC1 FC2 FC3
28 day			3	FC1 FC2 FC3
1 year			3	FC1 FC2 FC3
Air Content		ASTM C231	3	FC1 FC2 FC3
Slump		ASTM C143	3	FC1 FC2 FC3
Temperature		ASTM C1064	3	FC1 FC2 FC3
PORTLAND CEMENT CONCRETE - AS PLACED				
Compressive Strength	PCO1	P61		
14 day			3	C1, C10, C20
28 day			3	C2, C11, C21
1 year			3	C4, C13, C22
Splitting Tensile Strength	PCO2	P62		
14 day			3	C5, C14, C23
28 day			3	C6, C15, C24
1 year			3	C8, C16, C25
PCC Unit Weight	PCO5	P65	9	CORES FOR COMPRESSIVE STRENGTH TESTING
Static Modulus of Elasticity	PCO4	P64		
28 day			3	C3, C12, C26
1 year			3	C7, C17, C19
Air Content	PCO8	P68		
28 day			1	C9
Coefficient of Thermal Expansion	PCO3	P63	1	C18

NOTE 1 Visual-manual classification ONLY
NOTE 2 Each set of tests is made up of specimens molded from each of the three fresh concrete samples (FC1-FC4).

Table 2. Scope of Field Testing

MATERIAL	NUMBER OF TESTS	LOCATION DESIGNATION
Asphalt Concrete (a)		
In situ density	10	T13-T18, SA1-SA4
Portland Cement Concrete (fresh) (b)		
Air content	3	FC-1,FC-2,FC-3
Slump	3	
Temperature	3	
Unbound Base/Subbase Layers (per layer)		
In situ density, moisture content (nuclear gauge) (c)	6	T7-T12
Moisture content samples (c)	3	B4-B6
Plate Bearing Test (b)	2	PB-3, PB-4
Subgrade		
In situ density, moisture content (nuclear gauge) (c)	9	T1-T6, B1-B3
Plate Bearing Test (b)	2	PB-1, PB-2

(a) For sites with flexible test sections only
(b) For sites with rigid test sections only
(c) For sites with either flexible or rigid test sections

Table 3. Scope of Material Sampling

MATERIAL AND SAMPLE DESCRIPTION	NUMBER OF SAMPLES	SAMPLE LOCATION
Asphalt Concrete (a)		
Coring - 4" diam. cores	16	C1-C16
Bulk Sampling (100 lbs. of each mix, uncompacted)	3	BV-01, BV-02, BV-03 FROM PLANT
Portland Cement Concrete (b)		
Bulk Sampling (molded into test specimens)	3	FC-1,FC-2,FC-3
Coring - 4" diam. cores	26	C1-C26
Unbound Base/Subbase Layers (per layer) (c)		
Bulk sampling	3	B4-B6
Moisture content samples	3	B4-B6
Subgrade (c)		
Splitspoon sampling	12*	A1-A6
Thin-walled tube sampling (* 2 tubes or 2 spoons or combination per hole)	12*	A1-A6
Bulk sampling (400 lbs each sample)	3	B1-B3
Moisture content samples	9	A1-A6, B1-B3
Permeability	1	A2
Expansion Index	3	B1-B3
Shoulder Auger Probes (c) (Depth to Rigid Layer)	2	S1,S2
Asphalt Cement (a) (5 gallon samples)	3	BC-01, BC-02, BC-03 FROM PLANT

(a) For sites with flexible test sections only
(b) For sites with rigid test sections only
(c) For sites with either flexible or rigid test sections

NOTE: If different AC mixes are used for the surface course and binder course, bulk samples should be obtained from each mix.

- Bulk samples of the fresh portland cement concrete used in the surface course of the rigid test sections. These are designated as FC-Type samples for molding into laboratory specimens.
- Bulk samples of the uncompacted AC mixtures used in the surface and binder courses of the flexible test sections, designated BV-Type samples, to be obtained at the plant.
- Bulk samples of asphalt cement used in all mixtures of the flexible test sections, designated BC-Type samples, to be obtained at the plant.

The site specific field material sampling and laboratory testing plan for each SPS-8 site should include the following elements:

- Project layout plan.
- Detailed sampling layout.
- Detailed field testing layout.
- Laboratory testing plan.

Other items which may be included with the sampling and testing plan are soil profile logs, plan and profile sheets and other project-specific information which are pertinent to the plans. The recommended plan should be compiled and submitted for review and approval by SHRP prior to implementation.

The following sections provide details for each element of the field material sampling and laboratory testing plan for an SPS-8 test site.

2.2 LAYOUT PLAN

The layout plans are used to identify the location of testing and sampling areas relative to the test sections for each sampling and testing activity. Since sampling and testing is required at different stages of construction, layouts must be developed for each stage, i.e. prepared subgrade, base course, surface course. The approximate transition lengths between test sections should be indicated on the plan.

Sampling areas are designated with a code SA followed by a two digit number. The numbers are assigned consecutively starting with the first area encountered on the test site in the direction of traffic. Since testing and sampling will continue throughout construction as layers are completed, the same sample area number will be maintained throughout the construction of the SPS-8 site. Location stationing of the sampling areas are specified relative to the end of the nearest adjacent test section.

To ensure consistency in data reporting, the layer numbering scheme developed and presented in Table 4 must be followed when reporting data for the different pavement layers. In this scheme, each layer is designated by a number and absence of a layer will be designated with a layer with zero thickness.

2.3 SUBGRADE SAMPLING AND TESTING

When laying out the detailed sampling and testing plan for the subgrade or embankment (Layer Number 1 or 2), the following guidelines should be followed:

- In general, bulk sampling areas should consist of a single shallow excavation, approximately 2x2 feet and 12 inches deep.

- Sampling locations, especially A-Type locations, should not be located in cut and fill transition areas. These sampling locations must always be located completely in either a cut or fill.

- Sampling areas should be located outside the monitoring portion of the test section but in areas which are considered representative of the test section.

- Sampling for supplemental test sections, such as those representing the agency's design practice, should be incorporated in the sampling and testing plan following the overall criteria established for the SPS experiment.

- Samples of embankment fill (Layer Number 2) that are obtained as part of subgrade sampling should be clearly identified.

Table 4. Project Layer Numbering

Layer Number	Description
1	Subgrade
2	Embankment (subbase)
3	Graded Aggregate Base
4	Hot Mix Asphalt Concrete Surface (surface and binder mixes) or Portland Cement Concrete Surface

- Auger probes to a depth of 20 feet through the shoulder should be included to determine the depth to a rigid layer. The purpose of the shoulder auger probe, designated as an S-Type boring, is to determine if bedrock or other significantly dense layers exist within 20 feet of the proposed pavement surface elevation. This information is extremely important for the analysis of deflection measurements. However, shallow auger probes would not be warranted at locations where rock is known to exist at very deep depths. Therefore, maps from the U.S. Geological Survey and the U.S. Department of Agriculture, county soil surveys, and other information from soil borings for nearby bridges or other structures should be used to assess the need for these auger probes.

The primary purpose of the plan is to characterize, as closely as possible, the integrity, physical properties and engineering behavior of the subgrade materials at the test site. Therefore, the plan should reflect the variation of the subgrade at a specific site. If there is a high degree of variability at the site, the number of bulk sampling and A-Type sampling locations should be increased.

2.4 BASE COURSE SAMPLING AND TESTING

The field sampling and testing activities required to characterize the properties of the base course material (Layer Number 3) include the following:

- Bulk sampling of the uncompacted base material from B-Type sampling locations for laboratory testing
- Moisture and density testing throughout each test section
- Elevation measurements throughout each test section

2.5 SURFACE COURSE SAMPLING AND TESTING

The field sampling and testing activities required to characterize the properties of the asphalt concrete surface course material (Layer Number 4) of the flexible test sections include the following:

- Bulk sampling of the uncompacted mix from the plant for laboratory testing
- Coring outside the monitoring portion of test sections to obtain samples of the surface layers (surface and binder) for laboratory testing
- Density testing by nuclear methods throughout each test section
- Elevation measurements of the finished surface throughout each test section

The field sampling and testing activities required to characterize the properties of the portland cement concrete surface course material (Layer Number 4) of the rigid test sections include the following:

- Bulk sampling of fresh concrete and molding of test specimens for laboratory testing
- Testing of the fresh concrete during construction of the test sections for determination of slump, mix temperature and air content
- Coring outside the monitoring portion of test sections to obtain samples of the surface layer for laboratory testing
- Elevation measurements of the finished surface throughout each test section

The purpose of the surface course sampling is to characterize the as-placed properties of the asphalt concrete or portland cement concrete materials. For asphalt concrete, this includes determination of thickness, resilient modulus, tensile strength, specific gravity, and creep compliance. Tests will also be performed on the extracted aggregates and asphalt cement and the uncompacted bulk samples obtained from the plant. For portland cement concrete, tests will be performed for determination of thickness, compressive strength, splitting tensile strength, elastic modulus, unit weight, air content, and coefficient of thermal expansion.

Detailed sampling plan layouts should be prepared for use in the field following the formats shown in Figures 3 through 6. The location and type of each sample should be illustrated relative to the beginning and end of each test section.

3. FIELD MATERIAL SAMPLING AND TESTING

3.1 GENERAL

This section describes procedures and guidelines for field material sampling and testing and the handling of cores and other material samples in the field and during transfer to the laboratory for testing. These procedures should be followed as closely as possible to minimize the variability of material properties attributable to differences in field testing, sampling and handling techniques.

Throughout this document, base and subbase materials are referred to as "unbound". The terms "unbound", "untreated", and "unstabilized" are used interchangeably and refer to granular base layers containing no additional materials. Subgrade soils are classified as either active, fine-grained or coarse-grained and refer to the materials beneath a base or subbase (embankment) layer.

The field material sampling and field testing activities will provide pavement material samples for laboratory testing and will allow physical testing of each layer at each test site. Field sampling and field testing will be performed during the different phases of pavement construction to fully characterize the pavement structure constructed in each test section. This information will be used in evaluating the service life and long-term performance of the different pavement structures and details used in the experiment.

During pavement construction, samples of the asphalt concrete and the portland cement concrete mixes used in the surface layer will be collected for making laboratory test specimens. Sampling of the portland cement concrete materials will be performed at the site prior to concrete placement while sampling of the asphalt concrete should occur at the mix plant.

For the flexible test sections, a minimum of 100 lbs of each asphalt concrete mixture, including the asphalt binder and surface mixes if different, should be obtained, stored in suitable containers and shipped to the laboratory

designated by the participating highway agency for testing. The laboratory tests to be conducted on these samples are listed in Table 1.

For the rigid test sections, samples of the portland cement concrete mix used in the surface layer should be obtained and molded into specimens as follows:

- Eighteen, 6 by 12-inch cylinders. Nine of these specimens will be used for compressive strength tests and the other nine will be used for splitting tensile strength tests.

- Nine, 6x6x20-inch beams. These specimens will be used for flexural strength tests.

All PCC specimens shall be made and cured in the field in accordance with AASHTO T23, "Making and Curing Concrete Test Specimens in the Field," and in the laboratory in accordance with AASHTO T126, "Making and Curing Concrete Test Specimens in the Laboratory." The specimens shall be sent to the laboratory designated by the participating highway agency (unless the highway agency authorizes other arrangements) for curing and testing.

Characterization of the surface course materials for the flexible and rigid pavement test sections is essential for evaluating performance of the pavement. The in-place sampling of the surface consists of retrieving 4-inch diameter cores as indicated in Table 3 and illustrated on the sampling plans.

3.2 FIELD OPERATIONS

This section outlines procedures for field sampling, field testing and handling of material retrieved from the SPS-8 test site. Field operations for each site will be performed at different stages of the construction and will include the following activities:

1. SHRP regional office shall coordinate with both the participating highway agency and the contractor the field activities involved in the testing and sampling operations. With concurrence of the

participating highway agency, the SHRP Regional Engineer shall designate a representative to assist and coordinate with the participating highway agency and contractors in ensuring that the field operations are performed in accordance with the approved field sampling and testing plan.

2. On each occasion after arriving at the test site, the responsible personnel shall lay out the sampling and testing locations and perform the sampling and testing operations in an appropriate sequence.

3. SHRP field representative shall record and report problems encountered during the field operations to the SHRP Regional Engineer and obtain recommendations for resolution.

4. Test samples shall be prepared for shipping together with complete logs and other records.

Sampling and field testing operations on the prepared subgrade may be performed in the following sequence:

a) Shelby tube undisturbed sampling of subgrade material. If Shelby tube samples cannot be obtained, the SHRP Representative may direct the use of splitspoon sampling to obtain subgrade material samples.
b) auger probes in the shoulder
c) bulk sampling and moisture/density testing at the bulk sampling locations
d) plate bearing tests within the test sections (for rigid test sections only)
e) moisture/density testing within the test sections
f) repairing and recompacting the bulk sampling areas and auger boring locations

Sampling and field testing operations on the base course may be performed in the following sequence:

a) bulk sampling of base material from sampling areas prior to compaction
b) plate bearing tests within the test sections (for rigid test sections only)
c) moisture/density testing within the test sections
d) patching and cleanup as required.

Sampling and field testing operations on the finished asphalt concrete surface course of the flexible test sections may be performed in the following sequence:

a) density testing in sampling areas and within the test sections
b) retrieval of 4-inch diameter cores of asphalt concrete surface layers (surface and binder)
c) patching and cleanup

Sampling and field testing operations on the finished portland cement concrete surface course of the rigid test sections may be performed in the following sequence

a) retrieval of 4-inch diameter cores of the PCC surface layer
b) patching and cleanup

When appropriate, a different sequence of activities may be used to improve the efficiency of the operations. Locations for bulk sampling, augering, or coring that are considered unacceptable should be replaced with alternate locations and marked on the as-sampled layout plan.

3.2.1 Shelby Tube/Splitspoon Sampling of Subgrade

This activity is required after subgrade preparation and is limited to sampling of subgrade layers (Layer Numbers 1 and 2) within the test sections. These operations shall be performed in accordance with AASHTO T203, "Soil

Investigation and Sampling by Auger Borings" and AASHTO M146, "Terms Relating to Subgrade, Soil-Aggregate and Fill Materials".

Undisturbed samples of the natural subgrade or fill material shall be obtained to a depth of 4 feet below the top of the subgrade or fill using Shelby (thinwall) tube sampling. If Shelby tube samples can not be obtained, splitspoon samples may be obtained if approved by the SHRP representative. Shelby (thinwall) tube sampling shall be obtained in accordance with AASHTO T207. Splitspoon sampling shall be obtained following Section 3.4.5 of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing. If rock, boulders or other forms of dense material are encountered within four feet of the top of natural subgrade or fill, another attempt for sampling the subgrade shall be made at a different location with a longitudinal offset 5 to 10 feet. If refusal is encountered at a second location, splitspoon sampling shall be terminated.

3.2.2 Bulk Sampling of Subgrade Soils

Subgrade material shall be obtained for laboratory testing from shallow excavations made following procedures similar to those described in Section 3.5 of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing. A 400 pound bulk sample of subgrade soil is required for each sampling location and soil type.

3.2.3 Sampling of Uncompacted Aggregate

Sampling of the graded aggregate (Layer Number 3) shall be performed at B-Type sampling locations prior to compaction to avoid interruptions to construction activities. A 400 pound bulk sample of graded aggregate base material is required for each sampling location. These samples shall be obtained, bagged, and shipped to the laboratory in accordance with Section 3.5 of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing.

3.2.4 Sampling of Uncompacted AC Mix

The sampling of the uncompacted AC mixes (Layer Number 4) used in the flexible test sections shall be performed at the mix plant to avoid interruptions

to the construction activities. These samples shall be obtained in accordance with AASHTO T168 and shipped to the laboratory in suitable containers. Where sampling at the mix plant is not feasible, the AC material samples should be obtained from the hauling vehicle at the test site. If concerns about the uniformity of the AC mix arise during construction, at least two samples of 100 pounds each shall be obtained for each type of asphalt concrete. In addition, three, 5 gallon samples of each asphalt cement used in the asphalt concrete surface layer shall be obtained.

3.2.5 Sampling of As-Delivered Concrete

Sampling of the portland cement concrete mix used for the construction of the rigid test sections shall be performed in the field, during or just before concrete placement, to reduce interruption to construction activities. These samples shall be obtained in accordance with AASHTO T141 "Sampling Fresh Concrete", molded into test specimens, cured, packaged and shipped to the laboratory.

3.2.6 Coring of Pavement Surface

This activity will involve coring of the asphalt concrete or portland cement concrete pavement surface layers of the test sections at the locations shown on the field material sampling plan. Exploration logs must be prepared using Sampling Data Sheet 2 in Appendix A. This coring operation should occur after completion of the surface course construction.

Coring of rigid test sections at the locations shown in Figure 6 will occur at different times after construction to allow laboratory testing according to the schedule indicated in Table 2. The coring operations shall be carried out in accordance with AASHTO T24, "Obtaining and Testing Drilled Cores and Sawed Beams of Concrete", using the equipment and methods specified in the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing. To ensure a reasonable representation of the cores to field conditions and to allow time for shipping and conditioning prior to testing at the designated age, the following schedule should be adhered to:

- For 14-day tests, cores should be obtained 10-13 days after placement
- For 28-day tests, cores should be obtained 21-24 days after placement
- For 365-day tests, cores should be obtained 350-360 days after placement

Also, test cores should be conditioned prior to testing in accordance with procedures contained in ASTM C42 "Standard Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete." This procedure requires that the test specimens be saturated in lime-saturated water at 73.4 ± 3.0°F for at least 40 hours immediately prior to testing. Cores shall be tested promptly after removal from water storage. During the period between removal from water storage and testing, the specimens shall be kept moist by covering with a wet blanket of burlap or other suitable absorbent fabric.

It is essential for laboratory material testing of asphalt concrete cores that the direction of traffic be indicated on the test cores. Therefore, all cores of asphalt pavement layers shall be marked on the top with an arrow to show the direction of traffic. This marking should be made prior to removal of the cores from the pavement using a waterproof marking material and in a manner that will ensure visibility after coring operations. Plugs shall not be inserted in cores intended for laboratory testing. Suction cups or wire pulls have been successfully used for core extraction.

Core locations shall be as shown on the sampling plan figures developed for the test site. It is especially important that the cores be taken perpendicular to the pavement surface, i.e. at a 90 degree angle to the surface, to ensure the recovery of straight, intact, smooth-surfaced specimens suitable for laboratory testing. Details on tolerances and quality control of the coring operations are included in Section 4 of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing. All cores shall be dried before packaging.

3.2.7 Collection of Samples, Marking, Packaging, and Shipping

All samples retrieved during the sampling and testing process shall be carefully marked, packaged and shipped to the laboratory designated by the participating highway agency. The samples shall be packaged and preserved in accordance with ASTM D4220-B3 (Group B), "Preparing and Transporting Soil Samples" or other applicable procedure. Extreme care must be taken in packaging and shipping of test samples to eliminate damage to the samples or influence their properties.

3.2.8 Logs and Reports

Accurate and detailed record keeping is essential for the materials sampling and testing program. During the field sampling operations, two types of forms must be completed. These are the Field Operations Information Forms and the Sampling Data Sheets. Field Operations Information Forms are used to record general information concerning the pavement test sections and the materials samples. Sampling Data Sheets are used to record the actual information for each sampling area or sampling location. A person should be designated to record data at each site on the appropriate data sheets, insure the accuracy and integrity of the collected data and forward the data sheets to the appropriate personnel. This person should have a thorough understanding of the content of the data sheets and the procedures for completing the sheets. If these forms are completed by a person other than the SHRP representative, the data sheets must be reviewed by the SHRP representative prior to forwarding the sheets to the appropriate personnel. The Field Set Number "1" has been assigned to designate all sampling and testing operations performed during site construction and shall be used when completing the material sampling and field testing forms.

Table 5 lists the forms that should be used for recording field data and sample inventory shipping information. These forms should be completed for each sampling phase and included in the field data packet.

3.2.8.1 Core Holes - A separate log shall be completed for each core hole. The depth of penetration of each coring operation and the average length of the recovered core shall be recorded to the nearest 0.1 inch. Data sheets for these

Table 5. Forms to be Completed For Each Phase of Field Material Sampling, Handling and Testing.

Subgrade - (Field Set Number 1)
Field Operations Information Form 1 - Laboratory Shipment Samples Inventory
Field Operations Information Form 2-3 - Summary of Material Samples Sent to Each Laboratory
Sampling Data Sheet 4-1 - A-Type Bore Hole Log
Sampling Data Sheet 8-1 - In situ Density and Moisture Tests
Sampling Data Sheet 9 - Shoulder Probe Log
Sampling Data Sheet 12 - Bulk Sampling of Subgrade and Unbound Granular Materials
Sampling Data Sheet 13 - Plate Bearing Test Results (Rigid test sections only)
Base Course - (Field Set Number 1)
Field Operations Information Form 1 - Laboratory Shipment Samples Inventory
Field Operations Information Form 2-3 - Summary of Material Samples Sent to Each Laboratory
Sampling Data Sheet 8-1 - In situ Density and Moisture Tests
Sampling Data Sheet 12 - Bulk Sampling of Subgrade and Unbound Granular Materials
Sampling Data Sheet 13 - Plate Bearing Test Results (Rigid test sections only)
Surface - (Field Set Number 1)
Field Operations Information Form 1 - Laboratory Shipment Samples Inventory
Field Operations Information Form 2-3 - Summary of Material Samples Sent to Each Laboratory
Field Operations Information Form 3-1 - Laboratory Shipment Samples Inventory - Molded Concrete (Rigid test sections only)
Sampling Data Sheet 2 - Pavement Core Log At C-Type Core Locations
Sampling Data Sheet 8-1 - In situ Density and Moisture Tests (Flexible test sections only)
Sampling Data Sheet 10-1 - Sampling Uncompacted Bituminous Paving Mixtures (Flexible test sections only)
Sampling Data Sheet 11-1 - Sampling Fresh Portland Cement Concrete Mixtures Materials (Rigid test sections only)

logs are included in Appendix B. Sampling Data Sheet 2 shall be used to record pavement cores from C-Type sampling locations. These logs shall show the general type of material in accordance with terminology described in Appendix B of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing. The general code 700 shall be used to identify asphalt concrete binder and surface material. Code 730 shall be used to identify the PCC surface material. Remarks shall include the type of cooling medium, difficulties encountered in coring, defects observed in the core (such as cracks, voids and disintegration), and other pertinent observations.

3.2.8.2 A-Type Samples - Data for each A-Type sampling hole shall be recorded on Sampling Data Sheet 4. This data should include descriptions of the subgrade layers, depth of shelby tube or splitspoon samples, and other related data. Data to be recorded on this form should include the following:

1. Material type and description for each layer of untreated materials and soils in accordance with Table C.2. of the SHRP-LTPP Guide for Field Materials Sampling, Testing and Handling.
2. Thickness of any layers encountered as measured in the hole to the nearest 0.1 inch.
3. Presence and levels of any water encountered.
4. Sample numbers.

3.2.8.3 Shoulder Auger Probes - Data for shoulder auger probes shall be reported using Sampling Data Sheet 9.

3.2.8.4 Bulk Sampling of Subgrade - Data obtained during subgrade sampling shall be logged as excavation progresses and reported on Sampling Data Sheet 12. The record shall include description of the exposed subgrade and thickness of all layers to the nearest 0.1 inch, sample numbers and number of bags per sample, test numbers, any water seepage, sloughing, voids and other pertinent items.

3.2.8.5 Plate Bearing Tests - Data for plate bearing tests conducted on the subgrade of rigid test sections should be reported using Sampling Data Sheet 13. Test procedures are described in Protocol P58, Determination of the Modulus of Subgrade Reaction by Non-Repetitive Static Plate Load Test.

3.2.9 Sample Number

Each sample (core, bulk, moisture, Shelby tube, splitspoon) shall be assigned a four digit number that must be recorded on the data forms. The sample number code will consist of two letters on the left side and two numbers on the right side.

The first letter on the left identifies the sample type in one of the following categories:

C - core sample
B - bulk sample
M - moisture sample
T - Shelby tube sample
J - splitspoon sample
F - formed beams
G - formed cylinders

The second letter from the left identifies the material type of the sample in one of the following categories:

A - asphalt concrete
P - portland cement concrete
G - untreated, unbound granular base
S - subgrade soil or fill material
X - molded specimens of PCC for tests at 14 days after placement
Y - molded specimens of PCC for tests at 28 days after placement
Z - molded specimens of PCC for tests at 365 days after placement

The numbers on the right will designate the sample number. The numbers shall be assigned consecutively for each sample type. For example, cores taken at C-Type locations would be designated CA-01, CA-02, CA-03, etc. for the asphalt material and CP-01, CP-02, CP-03, etc. for the PCC material. Samples of subgrade

material taken from location A1 by Shelby tube shall be designated TS-01 and TS-02. If a bulk sample of one layer is contained in more than one bag, then the number of bags and the same bulk sample number should be recorded on each bag.

The following is a partial list of valid example combinations of letters and numbers that make up sample code numbers:

FX02 Formed portland cement concrete beams for testing at 14 days.

GZ03 Formed portland cement concrete cylinders for testing at 365 days.

CA24 Asphalt concrete cores.

CP24 Portland cement concrete cores.

BG01 Bulk samples from granular base. Assign numbers consecutively as samples are obtained, BG-01 through BG03 or higher.

BV01 Bulk samples of uncompacted asphalt concrete. Assign numbers consecutively as samples are obtained, BV-01 through BV-19 for binder materials and BV-20 or higher for surface materials.

BS01 Bulk samples of subgrade material from different test pits within the test site. Assign sample numbers consecutively (BS-01, BS-02, etc.) as samples are obtained.

MG01 Granular base samples obtained from the bulk sampling locations solely for determining natural moisture content.

MS01 Subgrade samples obtained from bulk sampling locations for moisture content determination.

TS04 Shelby tube samples from subgrade (two Shelby tubes from A-type locations, as appropriate).

JS01 Jar samples of subgrade from splitspoon sampler (two splitspoons from each A-Type location).

3.2.10 Labels and Tags

Requirements regarding labels and tags shall be as specified in Section 3.6.5.(d) of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing. The following information shall be included on tags and labels:

STATE CODE
SPS PROJECT CODE
TEST SECTION NO.
CORE/SAMPLE LOCATION (as marked on sample layout plans)
SAMPLE NUMBER (four digit code)
DATE (mm-dd-yy, sampling date)
FIELD SET (one digit number which will be 1 for the first round of sampling)

3.2.11 Packaging

Packaging shall be as specified in Section 3.6.5(e) of the SHRP-LTPP Guide for Field Material Sampling, Handling and Testing. In addition, Field Operations Information Sheets 1, 2-3 and 3-1 shall be sent with each shipment of materials samples.

3.2.12 Shipping

All samples should be shipped within 5 days to the laboratory designated by the participating highway agency. Molded PCC specimens shall be transported in accordance with section 10 "Transportation of Specimens to the Laboratory" of ASTM C31, "Making and Curing Concrete Test Specimens in the Field."

Each box shall be labeled to include the State Code, SPS Project Code, type(s) of samples, box number (for each series of boxes for the specific project to each delivery point). The boxes should be labeled "Handle with Care" or similar wording. Samples shall be protected against freezing and overheating.

3.2.13 Field Testing

Field testing includes in-situ density and moisture measurements on subgrade and untreated base layer and auger probes for determination of bed rock location if it exists within 20 feet of the pavement surface. In addition, for rigid pavement test sections field tests include plate load bearing tests on the finished subgrade and subbase surfaces and field tests on as-delivered concrete.

3.2.13.1 In-situ Density and Moisture Measurements - The in-situ nuclear testing shall be performed in accordance with Section 3.7 of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing. Sampling Data Sheet 8-1 shall be used to record the results of the nuclear density/moisture tests.

3.2.13.2 Auger Probe - Auger probes shall be carried out in accordance with Section 3.8 of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing at the locations designated on the sampling plans prepared for the test site.

3.2.13.3 Plate Load Bearing Test - Plate load bearing tests shall be performed in accordance with SHRP protocol P58. Locations for testing will be designated on the sampling and testing plans prepared for the test site. Sampling Data Sheet 13 shall be used to record the results of this test.

3.2.13.4 Density Testing of Compacted Asphaltic Mixtures - Density testing will be carried out during construction of the hot mix binder and surface courses (for flexible test sections only). Testing will be performed at locations throughout the test sections using procedures in AASHTO T-238, backscatter mode. Density results will be recorded on Sampling Data Sheet 8-1.

3.2.13.5 Field Tests on As-Delivered Concrete - Field tests shall be performed on samples of the fresh concrete (for rigid test sections only) for determination of mix temperature, slump, and air content (volumetric). Samples shall be obtained in accordance with ASTM C172, and tests performed in accordance with ASTM C1064 (temperature), ASTM C231 (air content), and ASTM C143 (slump). Results of these tests shall be recorded on Sampling Data Sheet 11-1.

3.2.14 Assembly of Data Sheets and Transmittal

The following is a description of the format that should be used for the assembly of the data sheets from each SPS-8 test site. The forms will appear in the final assembled data packet in the order illustrated in Table 5 for the appropriate construction. The title page will be the first (top) sheet of the data packet and it will include the following information:

1 - SHRP Region
2 - State
3 - State Code
4 - SPS Project Code
5 - Experiment Name
6 - Highway Number
7 - Date(s) of Field Material Sampling and Field Testing
8 - Submitting Contractor/Agency
9 - Total Sheets, including the Title Page.

To determine the number of sheets (item 9 above) all of the pages in the packet should be counted. The pages should then be numbered consecutively starting with the title page. For example, if there are 100 pages in the packet, the title page would be "page 1 of 100" followed by "page 2 of 100" and so forth until the last page would read: "page 100 of 100". This will insure that any lost sheets can be quickly identified and found.

After the packet has been assembled and numbered, the original and appropriate number of duplicates should be made. The original and one copy should be forwarded to the SHRP regional office. Also, copies should be forwarded to the participating highway agency and those laboratories designated by the agency to perform the laboratory tests on the samples.

4. LABORATORY MATERIALS TESTING

The laboratory test procedures identified in Table 1 will be used to characterize the materials obtained from each SPS-8 test site. When implementing the sampling plan for an SPS-8 site, it is imperative that a sufficient type and amount of samples be retrieved to ensure completion of all tests. Therefore, a laboratory testing plan shall always be developed in conjunction with the field material drilling and sampling plan. The plan shall consider the test sections constructed at the site (flexible, rigid, or both) and list the tests to be performed and the samples to be used for each test in a format similar to that shown in Table 1. In addition to the laboratory tests required to characterize the materials used in the SPS test sections, other tests may be required to characterize the properties of materials used on the supplemental test sections constructed at the test site. The laboratory and field test plan should address the testing requirements for both the SPS test sections and other supplemental test sections.

APPENDIX A - FIELD MATERIALS SAMPLING AND TESTING DATA FORMS

In general, the field materials sampling and testing should be performed following the guidelines provided in Operational Guide No. SHRP-LTPP-OG-006, "SHRP-LTPP Guide for Field Materials Sampling, Testing, and Handling", May 1990. However, field data forms have been revised and data sheets have been included to report data for bulk sampling of subgrade, granular material, and asphalt concrete materials performed during construction. These changes and/or additions have been made to accommodate the specific needs of the experiment.

REVISED FIELD DATA FORMS

Due to differences between the sampling requirements for GPS and SPS projects, the field materials sampling and testing data forms used in the GPS program were modified. The primary changes common to each form relate to test section number, sample location referencing, and sampling area number.

Test Section Number. The six digit test section identification numbers on the data forms have been subdivided into three, two digit fields representing the state code, SPS project code, and test section number.

Sample Location Reference System. All material sampling and field testing data forms which reference the location of a sample or test use a station, offset and sampling area number. The sampling area number is a two digit number used to reference all of the samples taken from one area of the project. The sampling numbers are developed as part of the materials sampling plan for the test site and should run in sequential order in the direction of traffic.

The station to be specified on these data forms is referenced from either the beginning or end of the test sections adjacent to the sampling area. The station number designated on the form is relative to the test section number designated on the data form. Thus, if the sampling area occurs after the referenced test section, the station number should be greater than 5+00. If the sampling area occurs in front of the designated test section, the station number should be negative. The offset distance is measured from the interface of the outside edge of the test section lane and the outside shoulder to the core location (measured from the outside edge of the pavement).

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING DATA SHEETS

Material sampling and field testing data sheets used in the SPS experiments include Sampling Data Sheets and Field Operations Information Forms. As some of those sheets and forms have been developed for other SPS experiments, the completion of only certain portions may be required for the SPS-8 experiment. Also, certain forms may be required only for the flexible test sections while others may be required only for the rigid test sections. The SPS-8 experiment requires completion, as appropriate, of the following sheets and forms:

Sampling Data Sheet 2: Pavement Core Log at C-Type Core Locations
Sampling Data Sheet 4-1: A-Type Bore Hole Log
Sampling Data Sheet 8-1: In-Situ Density and Moisture Tests
Sampling Data Sheet 9: Shoulder Probe Log
Sampling Data Sheet 10-1: Sampling Uncompacted Bituminous Paving Mixtures
Sampling Data Sheet 11-1: Sampling Fresh Portland Cement Concrete
Sampling Data Sheet 12: Bulk Sampling of Subgrade and Unbound Granular Materials
Sampling Data Sheet 13: Plate Bearing Test Results
Field Operations Information Form 1: Laboratory Shipment Samples Inventory
Field Operations Information Form 2-3: Summary of Material Samples Sent to Each Laboratory
Field Operation Information Form 3-1: Laboratory Shipment Samples Inventory - Molded Concrete

Most of the LTPP-SPS Material Sampling and Field Testing data sheets (Sampling Data Sheets and Field Operations Information Forms) use the same top block of information related to the test section and project.

SHEET NUMBER. Since multiple data sheets will be required for the samples and tests from the multiple sampling areas on the project, room is provided on all data forms to sequentially order the data sheets. The first field is the sequential number of the data sheet and the second field is the total number of data sheets submitted.

SHRP REGION. Indicate the SHRP-LTPP region in which the state or province is located: North Atlantic, North Central, Southern, or Western.

STATE. Indicate the name of the state, District of Columbia, Puerto Rico, or the Canadian Province in which the project is located.

STATE CODE. Enter the two-digit numeric code corresponding to the state or province as shown in Table C.1 of the SHRP-LTPP Guide for Field Materials Sampling, Testing and Handling.

SPS PROJECT CODE. The two digit SPS project code. The first digit (from the left) of this code should either be a 0 (zero), for the first project constructed in a state and province, or a letter starting with A, B, etc. for the second, third, etc. projects of the same SPS experiment constructed in the same state and province. The second digit corresponds to the SPS experiment number i.e. 8 for SPS-8 experiment.

TEST SECTION NO. The two digit number assigned to the test section. If a GPS project is co-located on the SPS project and the GPS data sheets are used for the material sampling and field testing, the four digit SHRP SECTION ID should be divided into two-two digit fields and the first two digits (from the left) should be entered as the SPS PROJECT CODE and the last two digits entered as the TEST SECTION NO. Enter the test section number marked on the project in the field.

SPS EXPERIMENT NO. The SPS experiment number for the project i.e. "SPS-8" for projects in the SPS-8 experiment, "Study of Environmental Effects in the Absence of Heavy Loads."

ROUTE/HIGHWAY. Record the signed designation for the route or highway where the project is located.

Lane. Drilling and sampling shall always occur on the outside lane for the SPS program. Record a "1" for sampling occurring on the outside lane and a "2" for sampling on the inside lane.

Direction. Record the direction of travel at the project site. Use the following abbreviations:

E for eastbound traffic direction

W for westbound traffic direction

N for northbound traffic direction

S for southbound traffic direction

SAMPLE/TEST LOCATION. Check "Before Section" if the sampling location is before the beginning of the test section indicated under TEST SECTION NUMBER on the form (station 0-). Check "After Section" if the sampling location is after the end of the test section indicated on the form (station 5+). Check "Within Section" if the sampling is performed within the boundaries of the monitoring length.

FIELD SET NO. The field set number is a sequentially assigned number to indicate the different time periods in which material samples and field testing were conducted on the project. These time periods usually refer to different stages in the pavement construction or life, such as prior to overlay construction, after overlay construction, etc. A field set number can apply to more than one day since sampling of SPS test sections may require more than one day. As a general rule, the same field set number should be applied to all material samples and field tests conducted in a continuous 30 day period, unless a construction event occurs between the two sampling sessions. Enter 1 for the first time that material sampling and field testing conducted on the prepared subgrade and base during construction on the project. Enter 2, 3, etc. for the second, third and subsequent sampling and field testing on this project.

SAMPLING DATA SHEET 2. PAVEMENT CORE LOG AT C-TYPE CORE LOCATIONS

This form is similar to Form S01A used for GPS test sections and is used to log data from the 4-inch diameter pavement cores extracted from C-Type core locations. Each sheet can be used to record data for cores taken from six different core hole locations in one sampling area. A separate sheet should be used to record core data from each sampling area. Space is provided in each column to record data for up to 4 layers from one core hole. The pavement surface layer core should be recorded first, followed by other layers in the column. The first column from the left should always start with the lowest numbered core hole in the sampling area.

OPERATOR. Record the coring equipment operator's name.

EQUIPMENT USED. Indicate the generic type of the coring equipment used.

CORING DATE. Record the month, date, and year when the core was taken.

SAMPLING AREA NO. The sampling area number is a two digit number used to reference all of the samples taken from one area of the project. It has the form SA-##. This number is developed as part of the materials sampling plan for the project.

CORE BARREL SIZE. Record the rated inside diameter of the core barrel to the nearest tenth of an inch.

COOLING MEDIUM. Record the material used for cooling during the coring operation.

CORE HOLE NO. Enter the core hole sample code number following the sample coding system as specified in the materials sampling plan developed for the project.

LOCATION: STATION. This is the station number of the core, relative to the test section specified under TEST SECTION NO. on the form. This number should be greater than 5+00 for sampling locations that occur after the test section specified, and less than 0+00 for sampling locations which occur before the test section specified.

LOCATION: OFFSET. This is the distance from the interface of the pavement lane and the outside shoulder to the core location (generally measured from the outside edge of the pavement). This distance should be indicated to the nearest tenth of a foot.

CORE RECOVERED. Circle the appropriate response to indicate if an intact and suitable core was recovered from the indicated core hole.

REPLACEMENT CORE HOLE NO. Record the sample number of the core that will replace a core which was deemed unacceptable during field sampling operations. This entry should only be used when a "No" was recorded in the "Core Recovered" data entry space of this form.

CORE SAMPLE NO. Record the core sample number for the recovered core.

DEPTH. Depth should be measured from the pavement surface to the bottom of the material interface in the core and expressed to the nearest tenth of an inch.

MATERIAL DESCRIPTION. Enter the appropriate material description based on the generic material type. These material descriptions are contained in Table C.2, Appendix C, of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing.

MATERIAL CODE. Enter the appropriate material code number from Table C.2 in the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing corresponding to the described type of material.

SAMPLING DATA SHEET 4-1. A-TYPE BORE HOLE LOG

This form is similar to Form S02A used for GPS test sections and is designed to record logs of A-Type Shelby tube and splitspoon sampling. The following data is recorded on this form.

OPERATOR. Record the boring equipment operator's name.

EQUIPMENT USED. Indicate the generic type of the drilling equipment used.

BORING DATE. Record the month, date, and year when the operation was performed.

SAMPLING AREA NO. The sampling area number is a two digit number used to reference all the samples taken from one area of the project. It has the form SA-##. This number is developed as part of the materials sampling plan for the project. A-Type sampling performed within the test section monitoring length will not require a sampling area number.

LOCATION: STATION. This is the station number of the bore, relative to the test section specified under TEST SECTION NO. on the form. This number should be greater than 5+00 for sampling locations that occur after the test section

specified, and less than 0+00 for sampling locations which occur before the test section specified.

LOCATION: OFFSET. This is the distance from the interface of the pavement lane and the outside shoulder to the boring location (generally measured from the outside edge of the pavement). This distance should be indicated to the nearest tenth of a foot.

BORE HOLE NO. Enter the core hole sample code number following the sample coding system specified in the material sampling plan developed for the project.

BORE HOLE SIZE. Record the borehole size (diameter) in inches to the nearest inch.

STRATA CHANGE. Record the depth of strata changes to the nearest tenth of an inch. The depth of strata changes should always be measured from the top of the pavement surface. Draw a horizontal line across the form which indicates the depth of each strata change.

Also, record the depth of sampling for each sample taken. For example, if a thin-walled tube sample was obtained at a depth from 18 inches to 36 inches, a line should be drawn at the 18 inch mark and the 36 inch mark along with the appropriate sample code number, material description, etc. See example data sheets in the SHRP-LTPP Guide for Field Materials Sampling, Testing and Handling for further clarification.

SAMPLE NUMBER. Record the sample number for splitspoon or thin-walled tube samples obtained from the subgrade.

BLOWS. **The next four columns (*# Blows, Refusal?, DLR (Driving Length to refusal, IOP (Inches of Penetration)*) shall be used only if a splitspoon sample recovery was attempted.** Standard practice for recording the blow count for splitspoon samples requires the following format: A - B - C, where:

A = number of blows for first 6 inches of penetration by the splitspoon sampler. This is considered a seating drive.

B = number of blows for second 6 inches of penetration by the splitspoon sampler.

C = number of blows for third 6 inches of penetration by the splitspoon sampler.

Record the blow count from the first 6 inches of seating penetration by the splitspoon sampler in the left most column under number of blows. ("A" from above example of blow count record). Record the blow count from the second 6 inches of penetration by the splitspoon sampler in the middle column under number of blows ("B" from above example of blow count record). Record the blow count from the third 6 inches of penetration by the splitspoon sampler in the right most column under number of blows. ("C" from above example of blow count record).

Refusal of the splitspoon sampler is defined as having advanced less than one inch with 100 blows (or no observed advance of the sampler during the application of 10 blows) or the test is aborted at the discretion of the SHRP Representative to avoid damage to the splitspoon sampler.

If the splitspoon sampler is "refused" in the first 6 inches indicate the blow count to refusal in the left most column, place a "Y" in the ***Refusal?*** column and indicate in the ***DLR*** (Driving Length to Refusal) column, the distance, measured to the nearest tenth of an inch, from the top of the pavement surface to refusal. Also, record the penetration depth of the splitspoon sampler in the ***IOP*** column (distance penetrated in "A").

If the splitspoon is refused during the second 6 inches of penetration, indicate the blow count to refusal in the middle column, place a "Y" in the ***Refusal?*** column and indicate in the ***DLR*** column the distance, measured to the nearest tenth of an inch, from the top of the pavement surface to refusal. Also, record the penetration depth of the splitspoon sampler in the ***IOP*** column (distance penetrated in "A" + "B").

If the total blow count ("A" + "B") reaches 100 before penetrating deeper than 12 inches, the splitspoon sampling procedure should be stopped and the blow count for the second 6 inch increment should be recorded in the middle column and the total depth of penetration recorded under the ***IOP*** column (the depth of

penetration shall be measured from the beginning of penetration of the splitspoon sampler.)

In the case of refusal during the third 6 inch increment, the same instructions outlined previously for the left and middle columns will be followed. The penetration depth of the splitspoon sampler will be recorded in the ***IOP*** column (distance penetrated in "B" + "C").

If the second and third 6 inch increment blow count ("B" + "C" only) reaches 100 before prior to penetrating 18 inches, the splitspoon sampling procedure should be stopped and the blow count for the third 6 inch increment recorded in under number of blows. The total depth of penetration ("B" + "C" only) should be recorded under the ***IOP*** column (measured from the beginning of penetration of the splitspoon sampler minus the 6 inch seating drive).

(REF)USAL. Record a "Y" if splitspoon sampler is refused (see explanation under ***# Blows*** above). Record a "N" if the full 18 inch sample is recovered and the splitspoon is not refused. This column is only used if a splitspoon sampler is utilized.

Refusal is defined as occurring when the splitspoon sampler advances less than one inch in 100 blows (or no observed advance of the sampler during the application of 10 blows) or when the test is aborted at the discretion of the SHRP Representative to avoid damage to the splitspoon sampler.

DLR. Driving Length to Refusal - Record the penetration of the splitspoon sampler to refusal to the nearest tenth of an inch. This value is measured from the top of the pavement surface. This column is only used if a splitspoon sampler is utilized and refused. In the case of refusal, an entry is made in the ***DLR*** and ***IOP*** columns.

IOP. Inches of Penetration - Record the distance of penetration of the splitspoon sampler after 100 blows is reached in the first 6 inches ("A"), the first and second 6 inches of penetration ("A" and "B") or the second and third 6 inches of penetration ("B" and "C") (See explanation under # Blows above). This column is only used if a splitspoon sampler is utilized.

MATERIAL DESCRIPTION. Enter the appropriate material description for each strata based on the generic material type. These material descriptions are contained in Table C.2, Appendix C, of the SHRP-LTPP Guide for Field Materials Sampling, Testing and Handling.

MATERIAL CODE. Enter the appropriate material code number for each strata from Table C.2 in the SHRP-LTPP Guide for Field Materials Sampling, Testing and Handling corresponding to the described type of material.

SAMPLING DATA SHEET 8-1. IN SITU DENSITY AND MOISTURE TESTS

This sheet is similar to Form S04 used for GPS test sections and is designed to record data from the in situ density and moisture tests performed on all unbound layers and density tests performed on bound layers with a nuclear moisture and density gauge. The following data is recorded on this form.

OPERATOR. Record nuclear density gauge operator's name.

NUCLEAR DENSITY GAUGE I.D.. Record the identification number of the nuclear density gauge.

TEST DATE. Record the month, date, and year when the test was performed.

SAMPLING AREA NO. The sampling area number is a two digit number used to reference all of the samples taken from one area of the project. This number is developed as part of the materials sampling plan for the project and has the form SA-##. Test locations within the monitoring length will not require a sampling area number.

LOCATION: STATION. This is the station number of the sampling area, relative to the test section specified under TEST SECTION NO. on the form. This number should be greater than 5+00 for sampling locations that occur after the test section specified, and less than 0+00 for sampling locations which occur before the test section specified.

LOCATION: OFFSET. This is the distance from the edge of the pavement lane and the outside shoulder to the location the test was performed (generally

measured from the edge of the pavement). This distance should be indicated to the nearest tenth of a foot.

SAMPLING LOCATION NUMBER. Enter the sampling location number shown in the material sampling plan developed for the project.

DATE OF LAST MAJOR CALIBRATION. Record the date of the last major calibration of the nuclear density gauge. All dates should be recorded as mm-dd-yy. A major calibration is defined as that calibration/verification performed as directed in Section 4 of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing. Daily calibrations performed in the field do not constitute a major calibration.

DEPTH FROM SURFACE TO THE TOP OF THE LAYER. This information may be obtained from project plans for the surface of the layer being tested or calculated from elevation measurements. Record to the nearest tenth of an inch and measure from the top of the plan pavement surface for each test performed.

LAYER NUMBER. Write in the project specified layer number for the layer being tested.

MATERIAL TYPE. Report a "G" if the material is unbound (granular); record "T" if the material is other than unbound (treated). In practice, all entries should be a "G" since treated materials are not permitted in SPS-8.

IN SITU DENSITY. For each unbound layer, record four nuclear density gauge results. These measurements should be taken at the top of each unbound layer using the direct transmission test method if possible. Record to one decimal place in pounds per cubic foot (pcf).

AVERAGE. Calculate and record the average in situ densities for each unbound layer. Record to one decimal place.

METHOD (A,B,or C). Record the test method used to perform the in situ density test as per AASHTO T238-86, "A" - Backscatter, "B" - Direct Transmission, or "C" - Air Gap. The direct transmission method ("B") should almost always be

used for unbound granular materials while backscatter may be used for asphalt concrete.

ROD DEPTH. Record the depth of the nuclear density gauge probe to the nearest tenth of an inch.

IN SITU MOISTURE CONTENT. For each unbound layer, record four in situ moisture content test results. These tests should be conducted at the top of each layer. Record as a percentage moisture content to one decimal place. The backscatter method should always be used for this measurement.

AVERAGE. Calculate and record the average of the four in situ moisture content test results for each unbound layer. Record to one decimal place.

SAMPLING DATA SHEET 9. SHOULDER PROBE LOG

This data sheet is similar to Form S05 used for the GPS test sections and is used to record the results of the shoulder auger probe to determine the depth to a rigid layer.

OPERATOR. Record the auger equipment operator's name.

EQUIPMENT USED. Indicate the generic type of the auguring equipment used.

AUGERING DATE. Record the month, date, and year when the operation was performed.

SAMPLING AREA NO. The sampling area number is a two digit number used to reference all of the samples taken from one area of the project. This number is developed as part of the materials sampling plan for the project and has the form SA-##. No sampling area number is required for probes conducted within the monitoring length.

LOCATION: STATION. This is the station number of the bore, relative to the test section specified under TEST SECTION NO. on the form. This number should be greater than 5+00 for probes located after the test section, less than 0+00 for

probes located before the test section, and between 0+00 and 5+00 for probe locations within the monitoring length.

LOCATION: OFFSET. This is the distance from the edge of the pavement lane and the outside shoulder to the auger location (generally measured from the outside edge of the pavement). For shoulder probes, this distance will be measured toward the outside edge of the shoulder. This distance should be indicated to the nearest tenth of a foot.

AUGER PROBE NUMBER. Record the auger probe number; an S1 for the first auger and increasing numbers for subsequent auger probes.

TOP OF ROCK BASED ON. Enter "Auger Refusal" if auger is refused. If the top of rock is based on some other observation, indicate the type of observation.

DEPTH FROM SURFACE. Record the depths of strata changes to the nearest tenth of a foot.

MATERIAL DESCRIPTION. Enter the appropriate material description for each strata based on the generic material type. These material descriptions are contained in Table C.2, Appendix C, of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing.

MATERIAL CODE. Enter the appropriate material code number for each strata from Table C.2 in the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing corresponding to described type of material.

REFUSAL WITHIN 20 FEET (Y/N). Record a "yes" or a "no" as appropriate to indicate if a rigid layer was encountered within 20 feet from the pavement surface.

DEPTH TO REFUSAL. Record the depth to refusal to the nearest tenth of a foot if the auger refused.

SAMPLING DATA SHEET 10-1. SAMPLING UNCOMPACTED BITUMINOUS PAVING MIXTURES

This data sheet is used to record information concerning sampling of uncompacted bituminous paving mixtures (asphalt concrete and asphalt-treated materials) for LTPP material testing purposes. Sampling shall be performed according to AASHTO T-168, except that a 100-lb sample should be used.

Due to the difficulty of determining corresponding test sections the plant sampled material was used on, in most cases a "00" should be entered as the test section number. If the test section the material is used on is known, this number should be indicated on the form.

PERSON PERFORMING SAMPLING. Record the name, title and affiliation of the person performing the sampling.

PLANT NAME. Record the common name or operator of the mix plant facility which produced the sampled material.

PLANT LOCATION. Record the location of the mix plant, including street address, town, and state.

PLANT TYPE. Indicate the general type of mix plant used to produce the mix. If a plant other than a batch or drum plant was used, indicate other and provide a description of the plant on the next line.

DESCRIPTION OF MIX PLANT. Provide a brief description of the type of mix plant noting any special features of traditional types of batch or drum plants, or a description of other mix plant types.

MANUFACTURER OF MIX PLANT. Enter the name of the mix plant manufacturer.

MODEL NUMBER. Enter the model number or model designation of the mix plant.

BATCH SIZE. Record the size of the batch the sample from which the sample was obtained.

SAMPLING LOCATION. Enter the code number shown on the data form corresponding to the location from which the sample was taken. If the sample was

taken from the roadway prior to compaction, indicate the station and offset of the sample and the respective test section number.

MIX TYPE. Enter the code number corresponding to the generic type of material (virgin asphalt concrete, recycled asphalt concrete, asphalt dense graded or permeable asphalt treated). Also note the letter code assigned each type; BV for virgin mix, BT for treated, BR for recycled. For SPS-8 flexible test sections, recycled asphalt concrete should not be used.

LAYER TYPE. Enter the code number, as shown on the form, which corresponds to the type of layer in which the material is used.

SAMPLE NUMBER. Enter the sample number for the sample. This is a 4 digit code which signifies the generic type of material, virgin or recycled, and a sequential number for each sample of each material type obtained. For materials incorporating all virgin materials, the sample type designation shall begin with the letters BV (Bulk Virgin). For materials incorporating recycled materials, the designator shall begin with BR (Bulk Recycled). These letter designations are followed with a two digit number sequentially assigned to each sample, for each type of material, for example BV-01 is the first sample of virgin asphalt concrete.

APPROXIMATE SAMPLE SIZE. Enter the approximate weight of the sample obtained, to the nearest pound.

DATE SAMPLED. Enter the date the material sample was obtained.

LOCATION SAMPLE SHIPPED TO. Record the location the sample was shipped to from the field. In many cases this should be the laboratory which will perform the testing.

DATE SHIPPED. Enter the date the material was shipped to the location indicated on the form.

GENERAL REMARKS. Provide any general remarks concerning the obtained sample (is it representative), comments concerning the quality or uniformity of the mix, or any other pertinent miscellaneous comments.

SAMPLING DATA SHEET 11-1. SAMPLING FRESH PORTLAND CEMENT CONCRETE

This data sheet is used to record information concerning sampling of fresh portland cement concrete for LTPP material testing purposes. Sampling shall be performed according to AASHTO T-141, "Sampling Fresh Concrete".

PERSON PERFORMING SAMPLING. Record the name, title and employer of the person performing the sampling.

SAMPLING LOCATION. Enter the code number from the sampling and testing plan corresponding to the location from which the sample was taken.

SAMPLE NUMBER. This is a 4 digit code starting with the letters FC (bulk fresh portland cement concrete) and followed with a sequentially assigned two digit number, which uniquely designates each bulk portland cement concrete sample.

PCC MIX TEMPERATURE WHEN SAMPLED. Enter the PCC mix temperature in degrees Fahrenheit at the time the sample was obtained.

AMBIENT TEMPERATURE WHEN SAMPLED. Enter the ambient temperature in degrees Fahrenheit at the time the sample was obtained.

SPECIMEN NUMBER. This is a 4 digit code starting with the letters "F" (formed beams) or "G" (formed cylinders of PCC) followed by a designator for curing interval prior to testing, "X", "Y", or "Z" for 14 day, 28 day and 365 day curing, respectively. This two letter combination is followed by a sequentially assigned two digit number, which uniquely designates each concrete beam or cylinder specimen.

TIME. Enter the time of day when the corresponding specimen was formed.

TEMPERATURE. Enter the temperature of the PCC mix when the specimen was formed.

SLUMP. Enter the slump test results of the material sampled, if tested.

AIR CONTENT. Enter the air content of the material sampled, if tested.

DATE SHIPPED. Enter the date the material was shipped to the laboratory indicated on the form.

GENERAL REMARKS. Provide any general remarks concerning the obtained sample (is it representative), comments concerning the quality or uniformity of the mix, or any other pertinent miscellaneous comments.

SAMPLING DATA SHEET 12. BULK SAMPLING OF SUBGRADE AND UNBOUND GRANULAR MATERIALS

This form is similar to Form S03 used for GPS test sections and is designed to record data from the field sampling of materials from shallow excavations made in prepared subgrade and uncompacted graded layers during construction. The following data is recorded on this form:

TECHNICIAN. Record the name of the technician who retrieved the samples and recorded the information on the data form.

EQUIPMENT USED. Indicate the generic type of the equipment used to excavate the material.

EXPLORATION DATE. Record the month, date, and year when the operation was performed.

SAMPLING AREA NO. The sampling area number is a two digit number used to reference all of the samples taken from one area of the project. It has the form SA-##. This number is developed as part of the materials sampling plan for the project.

LOCATION: STATION. This is the station number of the sampling area, relative to the test section specified under TEST SECTION NO. on the form. This number should be greater than 5+00 for sampling locations that occur after the test section specified, and less than 0+00 for sampling locations which occur before the test section specified.

LOCATION: OFFSET. This is the distance from the edge of the pavement lane and the outside shoulder to the outside edge of the sampling area (generally measured from the outside edge of the pavement). This distance should be indicated to the nearest tenth of a foot.

SAMPLING LOCATION NUMBER. Enter the sampling location number shown in the material sampling plan developed for the project.

EXCAVATION SIZE. Record the length and width of the excavation to the nearest half foot.

STRATA CHANGE. Record the depth of strata changes to the nearest tenth of an inch. The depth of strata changes should always be measured from the top of the pavement surface. Draw a line across the form to indicate strata changes.

MOISTURE SAMPLE NUMBER. Record sample numbers for samples taken from unbound base, subbase and subgrade for moisture content testing.

BULK SAMPLE NUMBER. Record the sample number for bulk samples taken from the unbound pavement layers and the subgrade.

MATERIAL DESCRIPTION. Enter the appropriate material description for each strata based on the generic material type. These material descriptions are contained in Table C.2, Appendix C, of the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing.

MATERIAL CODE. Enter the appropriate material code number for each strata from Table C.2 in the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing corresponding to the described type of material.

SAMPLING DATA SHEET 13. PLATE BEARING TEST RESULTS

This form is designed to record data from the field plate bearing tests made on prepared subgrade, compacted graded layers, and compacted permeable asphalt treated layers at locations within the monitoring length of test sections during construction. The following data is recorded on this form:

TECHNICIAN. Record the name of the technician who performed the testing and recorded the information on the data form.

TEST DATE. Record the month, date, and year when the operation was performed.

LOCATION: STATION. This is the station number of the test location, relative to the test section specified under TEST SECTION NO. on the form. This number should be between 0+00 and 5+00.

LOCATION: OFFSET. This is the distance from the edge of the pavement lane (at the outside shoulder) to the test location. This distance should be indicated to the nearest tenth of a foot.

SAMPLING LOCATION NUMBER. Enter the sampling location number shown in the material sampling plan developed for the project.

MATERIAL DESCRIPTION. Enter the appropriate material description for surface on which the test is performed based on the material type. These material descriptions are contained in Table 5.

MATERIAL CODE. Enter the appropriate material code number for each strata from Table C.2 in the SHRP-LTPP Guide for Field Materials Sampling, Handling and Testing corresponding to the described type of material.

LAYER NUMBER. Enter the layer number of the material on which the test was performed.

AVERAGE DEFLECTION. Enter the average total movement resulting from the incremental pressure change.

UNCORRECTED MODULUS OF SOIL REACTION. Enter the ratio of the pressure increment to the average deflection, in pounds per square inch per inch.

CORRECTED MODULUS OF SOIL REACTION. Enter the modulus of soil reaction corrected for plate bending in accordance with protocol P58.

FIELD OPERATION INFORMATION FORM 1. LABORATORY SHIPMENT SAMPLES INVENTORY

This form is intended to provide a record of field activity and no information from this form will be included in the data base. This form is similar to Form S06 used for GPS test sections and provides the necessary information on where each sample was shipped for testing. Also, it provides a detailed inventory of material samples shipped to each materials testing laboratory. At least one form should be completed for each sampling area on the project. The inventory should be made in the following sequence of sample location numbers, starting from the pavement surface layer in each case:

1. Samples from C-Type locations, starting from cores of pavement surface layers.
2. Samples from A-Type bore holes and any additional similar bore holes.
3. Samples from shallow excavations.

Sample location numbers, sample numbers and sampling area numbers should be obtained from the appropriate Sampling Data Sheets. "Sample size" should be used to record the number of bags of bulk samples or the number of jar samples bearing a single sample number in each case. The bulk sample from one layer can be placed in more than one bag, if necessary. However, the sample number should be the same on all of these bags with an indication of the number of bags on the labels and in the column of the "Sample size." For core samples, record only diameter of the core in the "Sample size" column in inches.

Enter core, bulk, moisture, tube or splitspoon in the "Sample type" column as appropriate. Enter AC, PCC, Base, Subbase or Subgrade in the "Sample material" column as appropriate. The "Sample condition" should indicate a brief description as to the overall quality of the sample - cores: good, poor, fractured; bulk samples: satisfactory, wet, insufficient quantity, contaminated.

Since more than one laboratory may be used to test samples in the SPS program, room is provided on this form to indicate up to three laboratories to receive samples from each sampling area. Enter the laboratory number, as noted at the bottom of the form, each sample is sent to under the LAB column.

Typically, samples will include:

- All AC or PCC cores from C-Type locations.

- Bulk samples and jar samples of granular (untreated) layers and subgrade from B-Type locations and test pits.

- Thin-walled tube samples and splitspoon samples from the subgrade.

FIELD OPERATION INFORMATION FORM 2-3. SUMMARY OF MATERIAL SAMPLES SENT TO EACH LABORATORY

This form provides a summary of the information provided on Field Operations Information Form 1 by testing laboratory. It is similar to Form S06A used for GPS test sections. A separate form should be completed for each set of samples sent to each separate laboratory.

This form requires the samples to be aggregated into layers designated with a layer number. The layer number assigned to each layer (1 for subgrade, 2 for embankment, 3 for unbound base, 4 for surface) is shown in the left hand column. A description of the pavement layer material and sample type is provided in the next column on the right, followed by the total number of samples by sample type.

FIELD OPERATION INFORMATION FORM 3-1. LABORATORY SHIPMENT SAMPLES INVENTORY -MOLDED CONCRETE

No information from this form will be included in the data base, it is intended to provide a record of fresh PCC sampling and molded PCC test specimens. It is used to provide a detailed inventory of material samples shipped to the materials testing laboratory. One form should be completed for all fresh PCC sampling areas within the experiment.

Sample location numbers, sample numbers and sampling area numbers should be obtained from Sampling Data Sheet 11-1.

The bottom portion of this form "MOLDED PCC SPECIMENS SENT TO LABORATORY" provides for the total number of molded cylinder and beams. This form requires the samples to be summarized according the layer number of their source. The

layer number is assigned from the subgrade to the surface. A description of the specimen type is provided in the next column on the right, followed by the total number of samples by sample type.

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING SHEET NUMBER _____ OF _____

PAVEMENT CORE LOG AT C-TYPE CORE LOCATIONS

SAMPLING DATA SHEET 2

SHRP REGION _____ STATE _____ *STATE CODE* __ __

SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __

ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __

SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* __

OPERATOR_____ EQUIPMENT USED_____ *CORING DATE* ___-___-___

SAMPLING AREA NO SA-_____ CORE BARREL Size _____ Cooling Medium_____

Note: Record information for all cores extracted from each core hole in one column in the table below. Use a separate sheet for each sampling area. "Depth" should be measured from the pavement surface to the bottom of the core and recorded to the nearest tenth of an inch.

CORE HOLE NUMBER						
LOCATION: (a) STATION						
(b) OFFSET (Feet, O/S)						
Core Recovered?	*YES/NO*	*YES/NO*	*YES/NO*	*YES/NO*	*YES/NO*	*YES/NO*
Replacement Core Hole No.						
Core Size (inch Diam.)	*4/6*	*4/6*	*4/6*	*4/6*	*4/6*	*4/6*
Core Sample No.						
Depth (Inches)						
Material Description						
Material Code						
Core Size (inch Diam)	*4/6*	*4/6*	*4/6*	*4/6*	*4/6*	*4/6*
Core Sample No.						
Depth (Inches)						
Material Description						
Material Code						
Core Size (inch Diam.)	*4/6*	*4/6*	*4/6*	*4/6*	*4/6*	*4/6*
Core Sample No.						
Depth (Inches)						
Material Description						
Material Code						
Core Size (inch Diam.)	*4/6*	*4/6*	*4/6*	*4/6*	*4/6*	*4/6*
Core Sample No.						
Depth (Inches)						
Material Description						
Material Code						
Remarks						

GENERAL REMARKS: _____

CERTIFIED VERIFIED AND APPROVED DATE

_____ _____ _____-_____-19___

Field Crew Chief SHRP Representative Month- Day- Year

Affiliation:_____ Affiliation:_____

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING SHEET NUMBER _____ OF _____

A-TYPE BORE HOLE LOG

SAMPLING DATA SHEET 4-1

SHRP REGION _____ STATE _____ *STATE CODE* __ __

SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __

ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __

SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* 1

☐ Within Section

OPERATOR_____ EQUIPMENT USED_____ *BORING DATE*___-___-___

SAMPLING AREA NO: SA-_____ *LOCATION: STATION*_____ *OFFSET*_____ *feet from °/s*

BORE HOLE NUMBER:_____ *BORE HOLE SIZE:* _____ (inch Diam.)

Scale (Inches)	*Strata Change (Inches)*	*Sample Number* (1)	*#Blows*(2) 6"	6"	6"	*Ref? Y/N* (3)	*DLR (Inches)* (4)	*IOP* (5)	*Material Description*	*Material Code*
_____										
10.0										
_____										
20.0										
_____										
30.0										
_____										
0.0										
_____										
50.0										

1. Record sample numbers for splitspoon/thin-walled tube samples taken from the subgrade.
2. For splitspoon samples, record the number of blows for the first, second and third 6 inches of penetration.
3. ***Refused*** - If the splitspoon is refused, place a Y in the ***REFUSAL*** column and complete ***Driving Length To Refusal*** column. Refusal is defined as less than 1 inch of penetration with 100 blows.
4. ***Driving Length To Refusal*** - Record penetration to refusal of splitspoon from the top of the pavement surface.
5. ***Inches Of Penetration*** - Record from start of splitspoon sampling procedure if 100 blows is reached before one foot of penetration. If penetration exceeds 12 inches before 100 blows is reached, enter middle 6 inches plus depth of penetration into the last 6 inches when 100 blows was reached (not including seating drive); record to nearest tenth of an inch.

GENERAL REMARKS:_____

CERTIFIED _____ VERIFIED AND APPROVED _____ DATE _____-_____-19___

Field Crew Chief SHRP Representative Month- Day- Year

Affiliation:_____ Affiliation:_____

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING SHEET NUMBER _____ OF _____

IN SITU DENSITY AND MOISTURE TESTS

SAMPLING DATA SHEET 8-1

SHRP REGION _____ STATE _____ *STATE CODE* __ __

SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __

ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __

SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* __

☐ Within Section

OPERATOR_____ *NUCLEAR DENSITY GAUGE I.D.*_____ *TEST DATE*___-___-____

SAMPLING AREA NO: SA-_____ *LOCATION: STATION*_____ *OFFSET*_____*feet from °/s*

*LOCATION NO:*_____ DATE OF LAST MAJOR CALIBRATION___-___-___

Note: Use additional sheets if necessary

DEPTH FROM SURFACE TO THE TOP OF THE LAYER, INCHES (From Plans)							
LAYER NUMBER							
MATERIAL TYPE: (Unbound=G Other=T)							
IN SITU DENSITY, pcf (AASHTO T238-86)	1						
	2						
	3						
	4						
AVERAGE							
Method (A,B,or C)							
Rod Depth, inches							
IN SITU MOISTURE CONTENT, % (AASHTO T239-86)	1						
	2						
	3						
	4						
AVERAGE							

GENERAL REMARKS:_____

CERTIFIED _____ Field Crew Chief Affiliation:_____

VERIFIED AND APPROVED _____ SHRP Representative Affiliation:_____

DATE _____-____-19___ Month- Day- Year

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING SHEET NUMBER _____ OF _____

SHOULDER PROBE LOG

SAMPLING DATA SHEET 9

P REGION _____ STATE _____ *STATE CODE* __ __

EXPERIMENT NO _____ *SPS PROJECT CODE* __ __

ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __

SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* __

☐ Within Section

OPERATOR_____ EQUIPMENT USED_____ *AUGERING DATE*___-____-____

*AUGER PROBE NUMBER*_____ *LOCATION STATION*:_____ *OFFSET*:_____*feet from °/s*

TOP OF ROCK BASED ON:_____

Scale (feet)	*Depth from Surface (Feet)*	*Material Description*	*Material Code*
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

REFUSAL WITHIN 20 FEET (Y/N):_____ *DEPTH TO REFUSAL*:_____*(FEET)*

GENERAL REMARKS:_____

CERTIFIED VERIFIED AND APPROVED DATE

_____ _____ _____-____-19___

Field Crew Chief SHRP Representative Month- Day- Year

Affiliation:_____ Affiliation:_____

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING SHEET NUMBER _____ OF _____

SAMPLING UNCOMPACTED BITUMINOUS PAVING MIXTURES

SAMPLING DATA SHEET 10-1

SHRP REGION _____ STATE _____ *STATE CODE* __ __

SPS EXPERIMENT NUMBER _____ *SPS PROJECT CODE* __ __

ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __

FIELD SET NO. 1

PERSON PERFORMING SAMPLING

NAME _____ EMPLOYER _____

TITLE _____

MIX PLANT

PLANT NAME _____

PLANT LOCATION _____

PLANT TYPE Batch..... 1 Drum..... 2 Other (Specify)..... 3 [__]

DESCRIPTION OF MIX PLANT _____

MANUFACTURER OF ASPHALT PLANT _____

MODEL NUMBER _____

BATCH SIZE _____

SAMPLING LOCATION [___]

Conveyor Belt..... 1 Stockpile..... 2 Haul Truck..... 3 Funnel Device..... 4
Roadway Prior to Compaction ..... 5 Station __ + __ __ Offset ____ (feet from O/S)
Other..... 6 (specify) _____

MIX TYPE "Virgin" Asphalt Concrete (BV).. 1 Recycled Asphalt Concrete (BR).. 2 [___]
Asphalt Treated Dense Graded (BT).. 3 Permeable Asphalt Treated (BT).. 4 [___]

LAYER NUMBER [___]

LAYER TYPE BINDER COURSE ...3 SURFACE COURSE... 4 [___]
SURFACE FRICTION LAYER ... 5 BASE COURSE ... 6

SAMPLE NUMBER (MIX TYPE letter codes and sequential numbering) [___ ___ ___ ___]

APPROXIMATE SAMPLE SIZE (lbs) ___ ___ ___

DATE SAMPLED (Month - Day - Year) [__ __ - __ __ - __ __]

LOCATION SAMPLE SHIPPED TO _____

DATE SHIPPED (Month-Day-Year) [__ __ - __ __ - __ __]

GENERAL REMARKS: _____

_____

_____

CERTIFIED VERIFIED AND APPROVED DATE

_____ _____ _____-____-19___

eld Crew Chief SHRP Representative Month- Day- Year

...filiation:_____ Affiliation:_____

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING SHEET NUMBER _____ OF _____

SAMPLING FRESH PORTLAND CEMENT CONCRETE MIXTURES

SAMPLING DATA SHEET 11-1

SHRP REGION _____ STATE _____ *STATE CODE* __ __

SPS EXPERIMENT NUMBER _____ *SPS PROJECT CODE* __ __

ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __

FIELD SET NO. __

PERSON PERFORMING SAMPLING

NAME _____ EMPLOYER _____

TITLE _____

SAMPLING LOCATION [__]

Batch Plant ..... 1 Hauling Truck before Paving 2

Hauling Truck during Paving ..... 3 Paver 4

Other ..... 5 (specify) _____

SAMPLE NUMBER (FC-- for PCC, BL-- for LCB) [__ __ __ __]

TIME SAMPLED (Military Time) [__ __ __ __]

DATE SAMPLED (Month - Day - Year) [__ __ - __ __ - __ __]

PCC MIX TEMPERATURE WHEN SAMPLED (°F) [__ __ __]

AMBIENT TEMPERATURE WHEN SAMPLED (°F) [__ __ __]

AIR CONTENT (PERCENT) [__.__]

UMP (INCHES) [__.__]

SPECIMENS FORMED FROM SAMPLE	SPECIMEN NUMBER	
CYLINDERS	[G __ __ __]	[G __ __ __]
	[G __ __ __]	[G __ __ __]
	[G __ __ __]	[G __ __ __]
	[L __ __ __]	[L __ __ __]
	[L __ __ __]	[L __ __ __]
	[L __ __ __]	[L __ __ __]
BEAMS	[F __ __ __]	[F __ __ __]

LABORATORY ID CODE [__ __ __ __]

DATE SHIPPED [__ __ - __ __ - __ __]

NOTES : **X** denotes 14 day cure **Y** denotes 28 day cure **Z** denotes 365 day cure

GENERAL REMARKS: _____

_____

_____

CERTIFIED _____ VERIFIED AND APPROVED _____ DATE _____-_____-19___

Field Crew Chief Affiliation: _____ SHRP Representative Affiliation: _____ Month- Day- Year

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING SHEET NUMBER _____ OF _____

BULK SAMPLING OF SUBGRADE AND UNBOUND GRANULAR MATERIALS

SAMPLING DATA SHEET 12

SHRP REGION _____ STATE _____ *STATE CODE* __ __

SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __

ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __

SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* 1

TECHNICIAN_____ EQUIPMENT _____ *EXPLORATION DATE*___-___-___

SAMPLING AREA NO: SA-_____ *LOCATION: STATION*_____ *OFFSET*_____*feet from °/s*

*SAMPLING LOCATION NUMBER*_____

PIT SIZE: (a) *Length*_____feet (b) *Width*_____feet

LAYER NUMBER:_____ (SUBGRADE _____ GRADED AGGREGATE BASE _____)

Scale (Inches)	*Strata Change (Inches)*	*Moisture Sample No.*	*Bulk Sample No.*	*Material Description*	*Material Code*
4					
12					
16					

GENERAL REMARKS:_____

_____

CERTIFIED

_____

Field Crew Chief

Affiliation:_____

VERIFIED AND APPROVED

_____

SHRP Representative

Affiliation:_____

DATE

_____-____-19___

Month- Day- Year

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING SHEET NUMBER _____ OF _____

PLATE BEARING TEST RESULTS

SAMPLING DATA SHEET 13

SHRP REGION _____ STATE _____ *STATE CODE* __ __

SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __

ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __

SAMPLE/TEST LOCATION: ☐ Within Section *FIELD SET NO.* 1

TECHNICIAN_____ *TEST DATE*___-___-___

*LOCATION: STATION*_____ *OFFSET*_____*feet from °/s*

*SAMPLING LOCATION NUMBER*_____

LAYER NUMBER:_____

(SUBGRADE _____ GRADED AGGREGATE BASE _____ PERMEABLE ASPHALT TREATED BASE _____)

1. AVERAGE TOTAL DEFLECTION (INCHES) __.__ __ __

2. UNCORRECTED MODULUS OF SOIL REACTION (PSI/INCH) __ __ __ __.__

CORRECTED MODULUS OF SOIL REACTION (PSI/INCH) [__ __ __ __.__]

NOTE: DATA SHEETS FOR THIS TEST PROTOCOL MUST BE COMPLETED AND ATTACHED TO THIS FORM.

GENERAL REMARKS:_____

_____

_____

_____

CERTIFIED

_____

Field Crew Chief

Affiliation:_____

VERIFIED AND APPROVED

_____

SHRP Representative

Affiliation:_____

DATE

_____-____-19___

Month- Day- Year

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING SHEET NUMBER _____ OF _____

LABORATORY SHIPMENT SAMPLES INVENTORY

FIELD OPERATIONS INFORMATION FORM 1

SHRP REGION _____ STATE _____ *STATE CODE* __ __

SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __

ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __

SAMPLE/TEST LOCATION: ☐ Before Section ☐ After Section *FIELD SET NO.* __

☐ Within Section

FIELD WORK COMPLETED ON ____-____-____

Note: Use additional sheets if necessary. Include summary information (Field Operations Information Form 2-3) and "as actual" sampling location plan sheets with this material samples inventory. Enter the sampling area number in the left hand column. If sampling is "Within Section" enter the test section number preceded by the letter "S" such that S2 is section 2.

SA #	SAMPLE LOCATION	SAMPLE NUMBER	SAMPLE SIZE	SAMPLE TYPE	SAMPLE MATERIAL	SAMPLE CONDITION	LAB*

Enter number of laboratory, as specified below, each sample was sent to:

Lab No.(1) _____

Lab No.(2) _____

Lab No.(3) _____

GENERAL REMARKS:_____

_____

_____

CERTIFIED VERIFIED AND APPROVED DATE

_____ _____ _____-_____-19___

Field Crew Chief SHRP Representative Month- Day- Year

Affiliation:_____ Affiliation:_____

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING SHEET NUMBER _____ OF _____

SUMMARY OF MATERIAL SAMPLES SENT TO EACH LABORATORY

FIELD OPERATIONS INFORMATION FORM 2-3

SHRP REGION _____ STATE _____ *STATE CODE* __ __

SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __

ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __

FIELD SET NO. __

LABORATORY _____ WORK COMPLETED ON ____-____-____

NOTE: This is a summary of material samples sent to each laboratory based on the information from Field Operations Information Form 1. Complete one form for each laboratory that material samples were sent.

LAYER NO. (From Subgrade)	MATERIAL/SAMPLE TYPE	TOTAL NUMBER OF SAMPLES
4	PCC CORES:	4" Diameter_____
4	PCC Molded Cylinders	_____
4	PCC Molded Beams	_____
4	AC CORES:	4" Diameter_____
4	AC BULK SAMPLES: 100 Pound Samples	_____
3	UNBOUND BASE SAMPLES: (a) BAGS (BULK)_____ (b) JARS (MOISTURE)_____	
2	EMBANKMENT (FILL) SAMPLES: (a) BAGS (BULK)_____ (b) JARS (MOISTURE)_____	
1	SUBGRADE SAMPLES: (a) BAGS (BULK)_____ (b) JARS (MOISTURE)_____	

(c) THIN-WALLED TUBES_____ (d) SPLITSPOON _____ JARS

GENERAL REMARKS:_____

_____

_____

_____

CERTIFIED VERIFIED AND APPROVED DATE

_____ _____ _____-____-19___

Field Crew Chief SHRP Representative Month- Day- Year

filiation:_____ Affiliation:_____

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING SHEET NUMBER _____ OF _____

LABORATORY SHIPMENT SAMPLES INVENTORY - MOLDED CONCRETE

FIELD OPERATIONS INFORMATION FORM 3-1

SHRP REGION _____ STATE _____ *STATE CODE* __ __

SPS EXPERIMENT NO _____ *SPS PROJECT CODE* __ __

ROUTE/HIGHWAY_____ Lane_____ Direction_____ *TEST SECTION NO.* __ __

FIELD SET NO. __

FIELD WORK COMPLETED ON ____-____-____

Note: Use one form for all fresh PCC samples collected for all sampling areas. Use additional sheets if necessary. Include "as actual" sampling location plan sheets with this material samples inventory.

SAMPLE LOCATION	SPECIMEN NUMBERS OF MOLDED SPECIMENS

LABORATORY ID CODE [__ __ __ __]

MOLDED PCC SPECIMENS SENT TO LABORATORY

LAYER NO. (From Subgrade)	SPECIMEN TYPE	TOTAL NUMBER OF SAMPLES
4	PCC Molded Cylinders	
4	PCC Molded Beams	

GENERAL REMARKS:_____

CERTIFIED _____ Field Crew Chief Affiliation:_____

VERIFIED AND APPROVED _____ SHRP Representative Affiliation:_____

DATE _____-____-19___ Month- Day- Year

APPENDIX B

SHRP PROTOCOL P58

DETERMINATION OF THE MODULUS OF SUBGRADE REACTION BY NON-REPETITIVE PLATE LOAD TEST

SHRP PROTOCOL P58
For SHRP Test Designation: SS06

DETERMINATION OF THE MODULUS OF SUBGRADE REACTION BY NON-REPETITIVE STATIC PLATE LOAD TEST

This protocol describes the test method for performing a non-repetitive static plate load test on subgrade, subbase, or base materials. The results of this test are intended to provide data to compute the modulus of subgrade reaction, k, for use in the evaluation of rigid pavements. This protocol is based on AASHTO T222-81 (1986), Standard Method for Nonrepetitive Static Plate Load Test of Soils and Flexible Pavement Components, for Use in Evaluation and Design of Airport and Highway Pavements.

The test shall be performed in accordance with AASHTO standard method T222-81 (1986), as modified herein. Those sections of the AASHTO standard included in this protocol by reference and without modification shall be strictly followed. All other sections of this protocol shall be followed as written herein.

The test shall be performed on subgrade, unbound base, and permeable asphalt treated base materials at locations shown in the SPS field sampling and testing plans prepared for the project.

3. APPARATUS

3.1.3 DELETE existing Note and ADD the following Note:

Note - A minimum of four different plate sizes will be used to perform the test.

4. PROCEDURE

4.3 DELETE existing text and ADD the following:

Seating Procedure No. 2 shall be used.

4.3.1 DELETE

4.4 DELETE existing text and ADD the following:

Without releasing the seating load, Load Application Procedure No. 2 shall then be followed.

4.4.1 DELETE

5. RECORD THE TESTS

Record the following on Forms T58 and T59.

5.1 Sample identification shall include: SHRP Region, State, State code, SPS Experiment Number, SPS Project Code, Test Section Number, Field Set Number, Sampling Area Number, Layer Number, and Location Number.

5.2 Test identification shall include: SHRP Test Designation, SHRP Protocol Number, and the Test Date.

5.3 Test Results

5.3.1 A continuous listing of all load, deflection, and temperature data, as prescribed in Section 3, shall be recorded on Form T58. Calculations shall be recorded on Form T59.

5.3.2 Comments shall include appropriate SHRP standard comment code(s) as shown on page E.1-3 of the SHRP-LTPP Laboratory Material Testing Guide and additional notes as required.

6. CALCULATION AND PLOTTING OF LOAD DEFLECTION RELATIONSHIPS

6.4 DELETE

SHRP-LTPP MATERIAL SAMPLING AND TESTING
FIELD TEST DATA
TEST DATA SHEET T58

SUBGRADE SOILS/UNBOUND AND PERMEABLE ASPHALT TREATED BASES

DETERMINATION OF THE MODULUS OF SUBGRADE REACTION BY NON-REPETITIVE STATIC PLATE LOAD TEST

SHRP TEST DESIGNATION: SS06/SHRP PROTOCOL P58

LABORATORY PERFORMING TEST: _____

LABORATORY IDENTIFICATION CODE: __ __ __ __

SHRP REGION: _____ STATE: _____ STATE CODE: __ __

SPS EXPERIMENT NO.: _____ SPS PROJECT CODE: __ __

TEST SECTION NO.: __ __

TEST DATE: __ __ - __ __ - 19__ __ FIELD SET NO.: __

SAMPLING AREA NO.: SA-____

LOCATION NUMBER: __ __ __

LAYER NUMBER: __

Time min	Temp F	Load lbs	Deflection (x 0.001 in)				Time min	Temp F	Load lbs	Deflection (x 0.001 in)			
			1	2	3	Avg				1	2	3	Avg

SHRP-LTPP MATERIAL SAMPLING AND TESTING
FIELD TEST DATA
TEST DATA SHEET T59

SUBGRADE SOILS/UNBOUND AND PERMEABLE ASPHALT TREATED BASES

DETERMINATION OF THE MODULUS OF SUBGRADE REACTION
BY NON-REPETITIVE STATIC PLATE LOAD TEST

SHRP TEST DESIGNATION: SS06/SHRP PROTOCOL P58

LABORATORY PERFORMING TEST: _____
LABORATORY IDENTIFICATION CODE: __ __ __ __

SHRP REGION: _____ STATE: _____ STATE CODE: __ __
SPS EXPERIMENT NO.: _____ SPS PROJECT CODE: __ __
TEST SECTION NO.: __ __
TEST DATE: __ __ - __ __ - 19__ __ FIELD SET NO.: __
SAMPLING AREA NO.: SA-____
LOCATION NUMBER: __ __ __
LAYER NUMBER: __

1. Average Deflection = average total movement between the zero and 10 psi increment

= __ . __ __ __ inches

$\hat{k}'_u$ = uncorrected modulus of soil reaction

= 10 psi / average deflection, in

= __ __ __ __. psi/in (pci)

3. k = modulus of soil reaction corrected for bending of bearing plates

= __ __ __ __. pci (from Figure 3 of AASHTO T222-81)

COMMENTS:

(a) CODE __ __ __ __ __ __ __ __ __ __

(b) NOTE_____

_____

GENERAL REMARKS:

_____

_____

CERTIFIED _____
oratory Chief
...iliation: _____

VERIFIED AND APPROVED _____
SHRP Representative
Affiliation: _____

DATE ____-___-19___
Month-Day-Year