

Brent Rauhut Engineering Inc.



18 November 1996

SPS-9
MS

ms
Mr. Monte Symons
Pavement Performance Division - LTPP (HNR-40)
Federal Highway Administration
Turner-Fairbanks Highway Research Center
6300 Georgetown Pike, Room F-215
McLean, Virginia 22101

Subject: Final Report - Construction of SPS-9 Project (2809) on IH-55 in Panola County, Mississippi

Dear Monte,

Enclosed is the Final Report for the Specific Pavement Studies (SPS-9) project on IH-55 in Panola County, Mississippi. This report documents the construction of the SUPERPAVE™ Asphalt Binder Study test sections at this location, as well as the monitoring of the project to date.

Please feel free to contact me should you have any questions or comments regarding any of the information included in this report.

Sincerely,

A handwritten signature in black ink, appearing to read 'Mark P. Gardner', is written over a white background.

Mark P. Gardner, P.E.
Project Engineer, SRCO

MPG:dmj

Enclosure: As stated.

c.w/Enc: Al Crawley, MSDOT
John Miller, PCS/LAW-Kennesaw, GA

c.w/o Enc: Brent Rauhut, SRCO

Morris Reinhardt, RE/SRCO

Brent Rauhut Engineering Inc.

MS .
SPS-9A



26 June 1995

Mr. Alfred B. Crawley
Research & Development Engineer
Mississippi Department of Transportation
P.O. Box 1850
Jackson, Mississippi 39215-1850

Subject: Mississippi SPS-9A Project (280900) Materials Sampling and Testing Plan

Dear Mr. Crawley:

Enclosed is the plan for materials sampling and testing activities for the Mississippi SPS-9A project, located in the southbound lanes of IH-55 near Como, Mississippi. This plan has been prepared to identify details of the materials sampling, field testing, and laboratory materials testing to occur as part of the SPS-9A project construction.

If you have any questions or comments regarding the information provided in this plan, please do not hesitate to contact me. A copy of this document is also being provided to Mr. Monte Symons of the FHWA, for review and approval.

Sincerely,

A handwritten signature in black ink, appearing to read 'Mark P. Gardner', written over a white background.

Mark P. Gardner
Project Engineer, SRCO

MPG:dmj

Enclosure: As stated.

c.w/Enc: Monte Symons, FHWA/LTPP-DC
John Avent, MS-DOT

Gonzalo Rada, PCS/LAW

c.w/o Enc: Morris Reinhardt, RE-SRCO

**MATERIAL SAMPLING
AND
TESTING PLAN**

**MISSISSIPPI SPS-9A PROJECT 280900
PANOLA COUNTY, MISSISSIPPI
IH-55, SOUTHBOUND**

PREPARED BY:

**BRENT RAUHUT ENGINEERING INC.
FHWA/LTPP SOUTHERN REGION COORDINATION OFFICE
8240 MOPAC, SUITE 220
AUSTIN, TEXAS 78759**

JUNE 1995

**MATERIAL SAMPLING AND TESTING PLAN
MISSISSIPPI SPS-9A PROJECT (280900), IH-55 SOUTHBOUND
PANOLA COUNTY, MISSISSIPPI**

INTRODUCTION

As part of their participation in the FHWA/LTPP studies, the State of Mississippi will construct an SPS-9A project to validate the SHRP asphalt specification and mix design. This project will consist of four test sections with similar details and materials on IH-55, in the Southbound lane, in Panola County, Mississippi. It is the intent of this document to provide a complete plan for the material sampling, testing, and laboratory material testing that will occur as a part of this project.

This document has been prepared in accordance with draft guidelines provided by the Federal Highway Administration entitled "Specific Pavement Studies Material Sampling and Testing Requirements for Experiment SPS-9A, SUPERPAVE™ Asphalt Binder Study, February 1995". Recognizing the apparent variability in the construction of roadway projects, the goal of this effort is to develop a sampling and testing plan for the project materials that will be consistent with other projects in this experiment, and therefore make the information obtained suitable for analysis.

The SPS-9A experiment is the first part of a multi-stage approach to the SPS-9 experiment, "Validation of SHRP Asphalt Specification and Mix Design". The experiment is designed for immediate implementation to provide agencies with hands-on experience with methods and requirements developed under the SHRP program. The primary objectives of SPS-9A are to validate the SHRP binder specifications, to allow direct comparison of asphalt mixtures designed using Agency procedures and the newly developed SUPERPAVE™ procedures, and to provide initial data for use in refining the mixture performance models also developed as part of the SHRP research. In order to accomplish these objectives, three basic test sections are included within each project; one using the Agency's current mix design, one using the SUPERPAVE™ mix design system, and one using a SUPERPAVE™ Alternate binder. In addition, Mississippi has elected to construct a fourth section as a supplement, to evaluate a wider array of the PG graded binders. The SPS-9A experiment requires the construction of test sections at a given project with similar details, materials, and construction quality. It is anticipated that some variation between sections will exist. The purpose of the sampling and testing plan is to provide the information necessary to evaluate such variations and their effect on performance.

This sampling and testing plan has been developed by Brent Rauhut Engineering, Inc. the Southern Region Coordination Office under contract to the Federal Highway Administration. If, during the construction activities, any questions arise regarding the sampling and/or testing to be conducted, one should first coordinate these questions with the Mississippi Department of Transportation, who may refer them to the Southern Region Coordination Office.

This document has been prepared in four distinct parts, each covering a particular area of this rather formidable exercise. The sections are:

- A. General Layout Information
- B. Materials Sampling and Testing - Preconstruction
- C. Materials Sampling and Testing - During Construction
- D. Materials Sampling and Testing - Postconstruction

"Preconstruction" sampling activities are defined as those occurring for the purpose of defining existing conditions and material properties prior to placement of the overlay. "During construction" activities begin once material production and placement activities are underway, and continue through the coring activities at time $t = 0$ (to be explained in Section C). "Postconstruction" sampling and testing activities include sampling of the overlay materials over time (cores) to document changes in material properties. Specific samples to be obtained, and laboratory testing needs for each sample, are defined for each of these time periods in Sections B, C and D.

SECTION A
GENERAL LAYOUT INFORMATION

SECTION A

GENERAL LAYOUT INFORMATION

This section of the plan provides a description of the SPS-9A project in terms of the location of the test sections along the roadway. Note that since the sections are in the southbound lane, stations decrease from the beginning of the project to the end. Table A-1 lists the test sections in order of project stationing, providing an indication of the overlay mix to be used.

Figure A-1 depicts the layout of the test sections along the roadway and shows the placement of each material type and the location of each test section within the material placement.

The referenced project stationing was provided by the Mississippi DOT in the form of preliminary project sketches. If there are significant changes in alignment or stationing, this plan should be reviewed closely to determine if revisions are warranted.

TABLE A-1. TEST SECTION LAYOUT

| Section (Cell ID) | Overlay Material | Begin Station | End Station |
|----------------------|--|------------------|----------------|
| 280901 | Agency Mix (PG64-22 HTSC) | 1428 + 50 | 1423 + 50 |
| 280902 | SUPERPAVE™ Mix (PG64-22) | 1407 + 50 | 1402 + 50 |
| 280903 | Alternate SUPERPAVE™ Binder (PG58-22) | 1379 + 50 | 1374 + 50 |
| 280904 | Supplemental Binder Mix (PG76-22) | 1331 + 50 | 1326 + 50 |

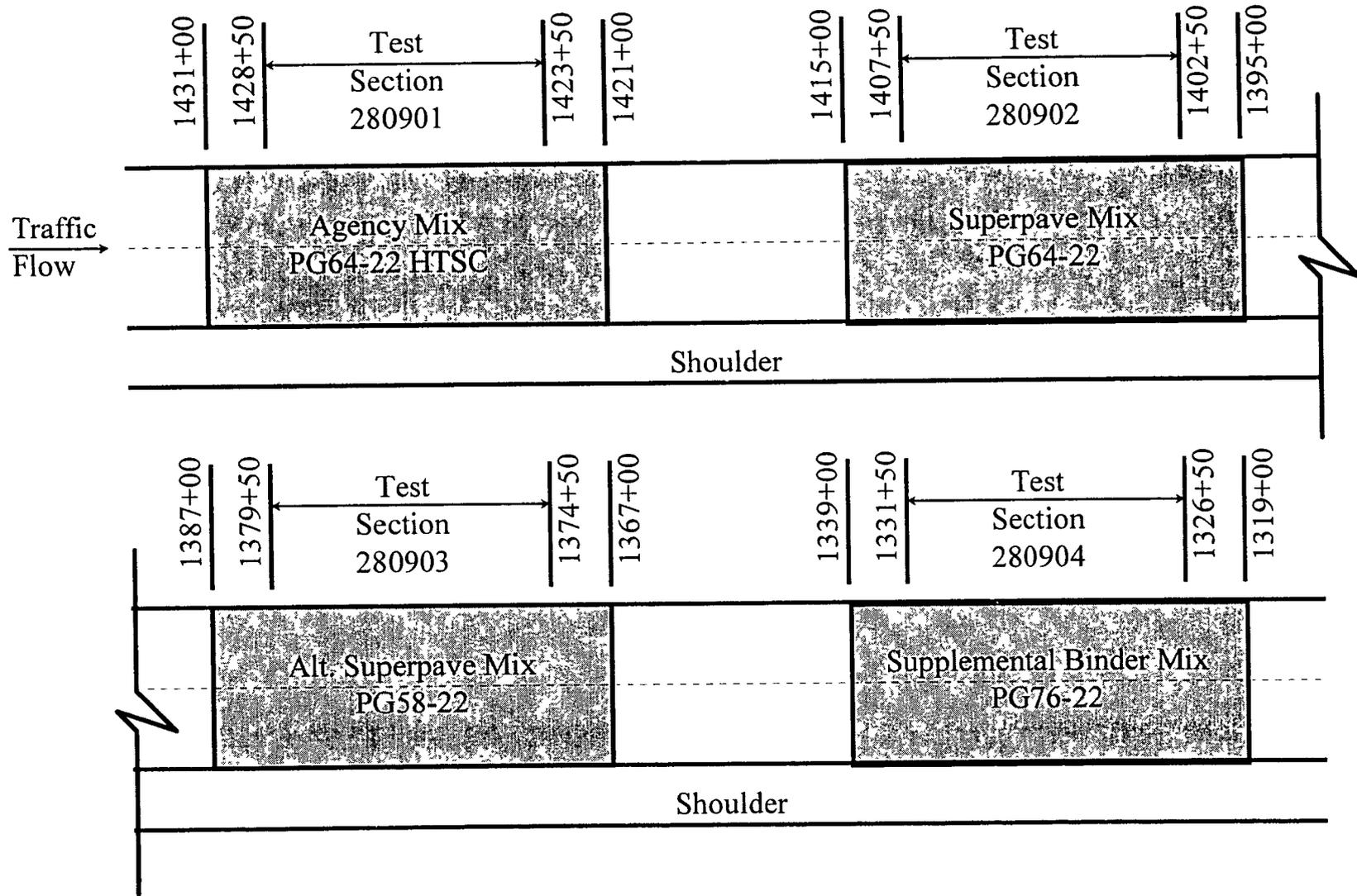


FIGURE A-1. LAYOUT OF TEST SECTIONS MISSISSIPPI SPS-9A (280900)

SECTION B
MATERIAL SAMPLING AND TESTING
PRECONSTRUCTION

SECTION B
MATERIAL SAMPLING AND TESTING
PRECONSTRUCTION

This section of the plan provides for the material sampling and testing activities that occur prior to construction. As the Mississippi SPS-9A project will be an overlay, the objective of this sampling will be to confirm the type and thickness of existing pavement materials and obtain samples of the subgrade for classification testing.

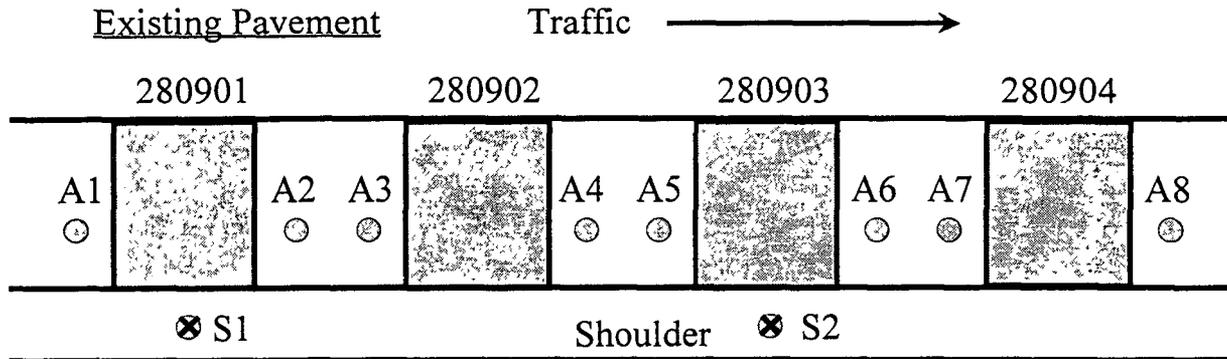
Table B-1 provides the scope of preconstruction material sampling. As may be seen, only minimal sampling is proposed, consisting of cores of the existing asphalt concrete, visual observation of the existing base materials and sampling of the subgrade. There are a total of 8 sampling locations, numbered A1 through A8. The sampling locations are shown in Figure B-1.

Samples that are obtained should be labeled accordingly and wrapped in protective wrapping to prevent damage in transit. Sample labels will be provided by the Southern Region Coordination Office, who will have a representative on site to assist with the sampling and data collection activities. Plastic, resealable bags should be used for subgrade samples, to retain the moisture content for testing. Bubble-wrap or similar material should be used to protect the core samples.

All laboratory testing for the preconstruction samples will occur at the Mississippi DOT laboratory. Table B-2 provides an indication of the laboratory tests to be performed on the preconstruction samples.

TABLE B-1. SCOPE OF PRECONSTRUCTION MATERIAL SAMPLING

| Material And Sample Description | Nº. Of Samples | Sample Location | Sample Number |
|---|---------------------------|----------------------------|-------------------------------------|
| Asphalt Concrete Coring - 4" Diam. Cores | 8 | A1-A8 | CA01-CA08 |
| Unbound Granular Base - Lime-Treated | 8 | A1-A8 | BG01, 03, 05, 07, 09, 11, 13, 15 |
| Unbound Granular Subbase | 8 | A1-A8 | BG02, 04, 06, 08, 10, 12, 14, 16 |
| Subgrade | | | |
| Bulk Sampling | 8 | A1-A8 | BS01-BS08 |
| Moisture Content Samples | 8 | A1-A8 | MS01-MS08 |



⊙ A-type core locations - 152 mm OD core of bound layers, auger to 1.2 m below top of subgrade

⊗ Shoulder auger probe to 6 m below surface

**FIGURE B-1. PRECONSTRUCTION SAMPLING LAYOUT
MISSISSIPPI SPS-9A (280900)**

TABLE B-2. PRECONSTRUCTION MATERIALS TESTING

| Test Type | LTPP Designation | LTPP Protocol | Min. Nº. of Tests | Sample Designation |
|---|------------------|---------------|-------------------|--------------------|
| Surface Bound Layers: Core Examination/Thickness | AC01 | P01 | 8 | A1-A8 |
| Base: Classification (Visual) | UG08 | Note 1 | 3 | A2,A4,A6 |
| Subbase: Classification (Visual) | UG08 | Note 1 | 3 | A2,A4,A6 |
| Subgrade: Sieve Analysis | SS01 | P51 | 3 | A1,A3,A5 |
| Atterberg Limits | SS03 | P43 | 3 | A1,A3,A5 |
| Classification | SS04 | P52 | 3 | A1,A3,A5 |
| Natural Moisture Content | SS09 | P49 | 3 | A1,A3,A5 |
| Depth to Rigid Layer | | Note 2 | 3 | S1,S2 |

Notes:

1. Visually classify materials in accordance with Appendix C of the SHRP-LTPP Guide for Field Materials Sampling, Testing and Handling.
2. Follow procedures contained in Appendix C of the SHRP-LTPP Guide for Field Materials Sampling, Testing and Handling.

SECTION C
MATERIAL SAMPLING AND TESTING
DURING CONSTRUCTION

SECTION C
MATERIAL SAMPLING AND TESTING
DURING CONSTRUCTION

This portion of the sampling and testing plan deals with field material sampling and laboratory testing during overlay construction. Most of the "during-construction" sampling involves collection of bulk samples from the plant during mix production. Other sampling and testing activities include elevation measurements for documentation of layer thickness and coring just subsequent to construction to evaluate as-placed properties. It is important to note that only the HMAC surface materials are to be sampled and tested. HMAC binder and/or base layers will not be tested and are not included in the following discussions. Samples will be used to evaluate the properties of the paving mixtures produced and will be compared to properties measured from core samples after material placement.

The goal of this phase of the sampling effort is to investigate differences in material properties from mix design, production and placement. As such, the scope of the sampling activities requires collection of bulk samples at various times in the process, for preparation as test specimens. Samples of the constituent materials and the resulting HMAC mixtures are to be collected. These samples are to be compacted in the SHRP Gyratory Compactor (SGC) for volumetric and performance testing. It is anticipated that performance testing will be conducted at SUPERPAVE™ Regional Test Centers, once they are "on-line". At this time, there is no mechanism in place for conducting the performance testing. As such, samples should be stored in a safe environment awaiting testing. If the SHA does not have suitable storage available, then the samples may be transported to the Materials Reference Library (MRL) for storage.

A summary of the bulk sampling activities by test section is provided in Table C-1. For discussion purposes, bulk sampling activities are divided into five general areas. These are:

1. Laboratory Testing - For the SUPERPAVE™ mix to be used on Section 280902, once the final mix design is complete, a bulk sample should be blended in the laboratory to final mix design proportions and compacted in the SHRP Gyratory Compactor (SGC) to N_{design} gyrations into 34, 152 mm diameter by 115 mm height cylindrical specimens. These specimens will be used for volumetric and performance testing, as shown in Table C-2.
2. Quality Control Tests - For each of the four surface mixtures, a 60 kg sample of the mix should be obtained from the haul vehicle on site. These samples will be reheated and compacted in the SGC to N_{max} gyrations to form 6 test specimens of each mix. Testing on these samples is shown on Table C-3.
3. Field Performance Tests - For the SUPERPAVE™ mix placed at Section 280902, 360 kg of mix should be sampled from the haul vehicles. These samples will be compacted in the SGC to N_{design} gyrations into 34 test specimens for volumetric and performance testing, as shown on Table C-2.

4. Mix Design Verification - For each of the four test sections, samples of the constituent materials should be sampled at the plant and shipped to the laboratory to be mixed and tested. One 10-liter sample of the asphalt cement and ten 25 kg samples of the combined aggregate will be required for each surface mix. Testing to be performed on these samples is shown on Table C-4.
5. MRL Sampling - Sampling and information related to the handling of bulk samples for the LTPP Materials Reference Library (MRL) is itemized on Table C-5.

In addition to the bulk samples, cores of the HMAC materials are needed just after placement for volumetric and/or performance testing, to quantify as-placed properties. Table C-6 provides an indication of the number of cores and time intervals for each of the test sections. Figure C-1 provides an indication of the general coring area for each section at an SPS-9A project. Each coring area is further subdivided into six coring "intervals", as depicted in Figure C-2. Each interval corresponds to a time period, with Interval A corresponding to the immediate postconstruction cores. Intervals B-F correspond to time periods of 6 months, 12 months, 18 months, 24 months and 48 months, respectively. The sampling for these intervals (B-F) will be discussed in Section D of this document.

The coring layout within each interval for Sections 01, 03 and 04 is also shown on Figure C-2. The coring layout within each interval for Section 02 (the SUPERPAVE™ section) is shown in Figure C-3. The thirty-four cores scheduled in Interval A will be used for volumetric and performance testing.

In summary, 8 cores will be obtained from each of Section 01, 03 and 04 during Interval A, immediately following construction. Testing to be performed on these cores is shown in Table C-7. Thirty-four cores shall be obtained from Test Section 02 during Interval A, immediately following construction. Testing to be performed on these cores is shown in Table C-8.

The final "during-construction" field testing activities include elevation and Dipstick® cross-profile measurements before and after overlay placement. Elevation measurements should be performed at 15 m intervals, across the pavement surface at intervals of 0, 0.9, 1.8, 2.7 and 3.6 m from the outside lane edge. Care should be taken to measure the elevation at the same location before and after overlay placement, to ensure accurate calculation of the overlay thickness. Dipstick® cross-profile measurements were obtained prior to construction. A second set of measurements will be taken just prior to the placement of the surfacing layers. A third and final set of measurements will be taken after completion of the surfacing placement. Collection of elevation and Dipstick® cross-profile data will be conducted by the Regional Coordination Office representative on site and as such are not itemized in the following tables or figures.

TABLE C-1. SUMMARY OF BULK SAMPLING BY TEST SECTION

| Test Section | Material Type | Testing | Bulk Sampling | Testing Lab | Ref. Table |
|--------------|--|--|--------------------------------------|--|------------|
| 280901 | Agency Mix (PG64-22 HTSC) | Quality Control (Volumetric) | 60 kg Mix | SHA | C-3 |
| | | Mix Design Verification (Volumetric) | 10 liter Asphalt 250 kg Aggregate | SHA | C-4 |
| | | Materials Ref. Library | 20 liter Asphalt 250 kg Aggregate | MRL | C-5 |
| 280902 | SUPERPAVE™ (PG64-22) | Lab. Mix Design (Volumetric & Performance) | 300 kg Mix | SHA | C-2 |
| | | Quality Control (Volumetric) | 60 kg Mix | SHA | C-3 |
| | | Performance Testing (Volumetric & Performance) | 360 kg Mix | SHA, LTPP Contract, SUPERPAVE™ Reg. Test Center | C-2 |
| | | Mix Design Verification (Volumetric) | 10 liter Asphalt 250 kg Aggregate | SHA | C-4 |
| | | Materials Ref. Library | 20 liter Asphalt 250 kg Aggregate | MRL | C-5 |
| 280903 | Alt. SUPERPAVE™ Binder (PG58-22) | Quality Control (Volumetric) | 60 kg Mix | SHA | C-3 |
| | | Mix Design Verification (Volumetric) | 10 liter Asphalt 150 kg Aggregate | SHA | C-4 |
| | | Materials Ref. Library | 20 liter Asphalt 250 kg Aggregate | MRL | C-5 |
| 280904 | Supplemental Binder (PG76-22) | Quality Control (Volumetric) | 60 kg Mix | SHA | C-3 |
| | | Mix Design Verification (Volumetric) | 10 liter Asphalt 250 kg Aggregate | SHA | C-4 |
| | | Materials Ref. Library | 20 liter Asphalt 250 kg Aggregate | MRL | C-5 |

**TABLE C-2. TESTS ON COMPACTED BULK SAMPLES OF MATERIALS
FROM TEST SECTION 02**

| Test Name | Test Desig. | Protocol | Nº of Tests | Material Source/ Material Sample |
|---|-------------|-------------------|-------------|--|
| HMA Specimen Compaction by Participating Highway Agency | | | | |
| Gyratory Compaction @ N_{Design} (Lab samples) | | AASHTO M002 | 34 | BA01-BA34* |
| Gyratory Compaction @ N_{Max} (Field samples) | | AASHTO M002 | 6 | BA35-BA40* |
| Gyratory Compaction @ N_{Design} (Field samples) | | AASHTO M002 | 34 | BA41-BA74* |
| Volumetric Tests by Participating Highway Agency | | | | |
| Bulk Specific Gravity | AC02 | LTPP P02 | 12 | DA01,DA18,DA34, DA35-DA41, DA58,DA74 |
| Asphalt Content (Extraction) (Performed on uncompacted material from bulk sample) | AC04 | LTPP P04 | 9 | BA01,BA18,BA34, BA35,BA37,BA40, BA41,BA58,BA74 |
| Aggregate Gradation (Extracted Aggregate) | AG04 | LTPP P14 | 3 | BA18,BA37,BA58 |
| Maximum Specific Gravity | AC03 | LTPP P03 | 3 | BA18,BA37,BA58 |
| Volumetric Calculations by Participating Highway Agency | | | | |
| Volume Percent of Air Voids | | AASHTO PP19 | 74 | All Compacted Specimens |
| Percent Voids in Mineral Aggregate | | AASHTO PP19 | 74 | |
| Voids Filled with Asphalt | | AASHTO PP19 | 74 | |
| LTPP Performance Tests by LTPP Contract Laboratory | | | | |
| Creep Compliance | AC06 | LTPP P06 | 16 | DA01-DA04, DA31-DA34, DA41-DA44, DA71-DA74 |
| Indirect Tensile Strength | AC07 | LTPP P07 | 4 | DA05,DA30,DA45,DA70 |
| Resilient Modulus | AC07 | LTPP P07 | 4 | DA06,DA29,DA46,DA69 |
| SUPERPAVE™ Shear Tester Performance Tests by SUPERPAVE™ Regional Test Center | | | | |
| Frequency Sweep at Constant Height | | AASHTO M003, P005 | 4 | DA11,DA24,DA51,DA64 |
| Simple Shear at Constant Height | | AASHTO M003, P005 | 4 | DA10,DA25,DA50,DA65 |
| Uniaxial Strain | | AASHTO M003, P005 | 4 | DA08,DA27,DA48,DA67 |
| Volumetric Test | | AASHTO M003, P005 | 4 | DA07,DA28,DA47,DA68 |
| Repeated Shear at Constant Stress Ratio | | AASHTO M003, P005 | 4 | DA09,DA26,DA49,DA66 |
| SUPERPAVE™ Indirect Tensile Tests by SUPERPAVE™ Regional Test Center | | | | |
| Indirect Tensile Creep Compliance | | AASHTO M005 | 12 | DA12-DA14, DA21-DA23, DA52-DA54, DA61-DA63 |
| Indirect Tensile Strength | | AASHTO M005 | 12 | DA15-DA20, DA55-DA60 |

Notes:

- a For purposes of this table, a single specimen is compacted from each bulk sample. Test specimen DA01 is produced from BA01, etc. Up to three specimens can be produced from the sample, depending on its size.

**TABLE C-3. QUALITY CONTROL RELATED TESTS
ON COMPACTED SPECIMENS FROM TEST SECTION 01, 03
(To Be Performed by the Participating Highway Agency)**

| Test Name | Test Desig. | Protocol | Nº. of Tests | Material Source/ Material Sample |
|---|-------------|-------------|--------------|-------------------------------------|
| HMA Specimen Compaction | | | | |
| Gyratory Compaction @ N_{Max} (Field samples) | | AASHTO M002 | 6 | BA01-BA06* |
| Volumetric Tests | | | | |
| Bulk Specific Gravity | AC02 | LTPP P02 | 6 | DA01-DA06 |
| Asphalt Content (Extraction) | AC04 | LTPP P04 | 2 | BA02, BA04 |
| Aggregate Gradation (Extracted Aggregate) | AG04 | LTPP P14 | 2 | BA02, BA04 |
| Maximum Specific Gravity | AC03 | LTPP P03 | 2 | BA02, BA04 |
| Volumetric Calculations | | | | |
| Volume Percent of Air Voids | | AASHTO PP19 | 6 | DA01-DA06 |
| Percent Voids in Mineral Aggregate | | AASHTO PP19 | 6 | |
| Voids Filled with Asphalt | | AASHTO PP19 | 6 | |

Notes:

- a. A single test specimen is produced from each bulk HMA mix sample. Test specimen DA01 is produced from sample BA01, etc

TABLE C-4. SUPERPAVE™ AGGREGATE, BINDER AND MIXTURE DESIGN TESTS ON HMA SURFACE LAYER MATERIALS FROM ALL TEST SECTIONS (To Be Performed by Participating Highway Agency)

| Test Name | Test Desig. | Protocol | Nº. Tests | Material Source |
|---|-------------|-----------------|-----------|-----------------|
| Aggregate Tests* | | | | |
| Aggregate Gradation (Extracted Aggregate) | AG04 | LTPP P14 | 1 | BU01 |
| Specific Gravity of Coarse Aggregate | AG01 | LTPP P11 | 1 | |
| Specific Gravity of Fine Aggregate | AG02 | LTPP P12 | 1 | |
| Specific Gravity of -200 Material | | AASHTO T100 | 1 | |
| Coarse Aggregate Angularity | | Penn DOT TM 621 | 1 | |
| Fine Aggregate Angularity | | ASTM C1252 | 1 | |
| Toughness | | AASHTO T96 | 1 | |
| Soundness | | AASHTO T104 | 1 | |
| Deleterious Materials | | AASHTO 112 | 1 | |
| Clay Content | | AASHTO T176 | 1 | |
| Thin, Elongated Particles | | ASTM D4791 | 1 | |
| Asphalt Cement | | | | |
| Penetration @ 5°C | | AASHTO T49 | 3 | BC01 |
| Penetration @ 25°C & 46°C | AE02 | LTPP P22 | 3 | |
| Viscosity @ 60°C & 135°C | AE05 | LTPP P25 | 2 | |
| Specific Gravity @ 16°C | AE03 | LTPP P23 | 2 | |
| Dynamic Shear @ 3 Temperatures | | AASHTO TP5 | 2 | |
| Creep Stiffness | | AASHTO TP1 | 2 | |
| Brookfield Viscosity @ 135°C & 165°C | | ASTM D4402 | 1 | |
| Rolling Thin Film Oven (RTFOT) | | AASHTO T240 | b | |
| Dynamic Shear on RTFOT Residue @ 3 Temperatures | | AASHTO TP5 | 3 | |
| Pressure Aging (PAV) of RTFOT Residue | | AASHTO PP1 | b | |
| Creep Stiffness of RTFOT-PAV Residue @ 2 Temperatures | | AASHTO TP1 | 2 | |
| Dynamic Shear on RTFOT-PAV Residue @ 3 Temperatures | | AASHTO TP5 | 2 | |
| Direct Tension on RTFOT-PAV Residue @ 2 Temperatures | | AASHTO TP3 | 2 | |
| Mixed and Compacted HMA | | | | |
| Gyratory Compaction @ Design Asphalt Content @ N_{Design} | | AASHTO M002 | 3 | BC01,BU01-BU03 |
| Gyratory Compaction @ 7% Air Voids | | AASHTO M002 | 6 | BC01,BU04-BU09 |
| Moisture Susceptibility | AC05 | AASHTO T283 | 1 | DA04-DA09 |
| Bulk Specific Gravity | AC02 | LTPP P02 | 3 | DA01,DA03 |
| Maximum Specific Gravity | AC03 | LTPP P03 | 1 | BC01,BU10 |
| Volumetric Calculations | | | | |
| Volumetric Percent of Air Voids | | AASHTO PP19 | 3 | DA01,DA02,DA03 |
| Percent Voids in Mineral Aggregate | | AASHTO PP19 | 3 | |
| Voids Filled With Asphalt | | AASHTO PP19 | 3 | |

Notes:

- a. Only one set of aggregate tests required for each unique aggregate combination used on the project.
- b. Sufficient material should be conditioned for the required tests

**TABLE C-5. BULK MATERIAL SAMPLES TO BE SHIPPED TO
THE LTPP MATERIAL REFERENCE LIBRARY**

| Material | Number |
|---|-----------------------------------|
| Asphalt Cement Collected from the Plant in 20-Liter Pails (Surface Mix Only) | 1 for Each Type of Binder |
| Combined Coarse and Fine Aggregate Obtained from the Plan and Stored in 20-Liter Pails (Surface Mix Only) | 10 for Each Aggregate Combination |

Notes:

The MRL will provide containers and will pay for shipping costs.

Contact the MRL at (702) 358-7574 prior to construction to make arrangements for sample containers and to receive specific shipping instructions.

Only one sample of each unique asphalt binder used in the SPS-9A mixes is needed. If the same binder is used in more than one mix, then only one sample of that binder should be obtained.

A copy of LTPP Field Operations Information Form 1 should be completed and attached to all MRL shipments. Another copy of the form should be mailed separately to the MRL.

TABLE C-6. NUMBER OF CORES AND CORING TIME INTERVALS FROM SPS-9A STUDY TEST SECTION

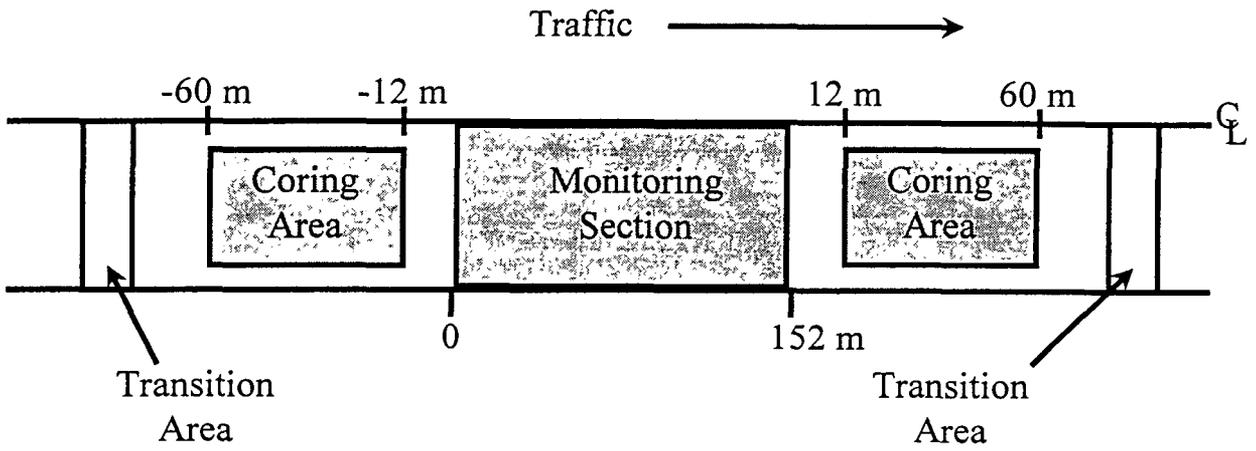
| Project Type | Test Section No. | Time After Paving, Months - Interval Identifier - | | | | | |
|--------------|---|--|----------|-----------|-----------|-----------|-----------|
| | | 0 -A- | 6 -B- | 12 -C- | 18 -D- | 24 -E- | 48 -F- |
| Main Study | Section 280901 Agency Binder (PG64-22-HTSC) | 8 (V) | 8 (V) | 8 (V) | 8 (V) | 8 (V) | 8 (V) |
| | Section 280902 SUPERPAVE™ Binder (PG64-22) | 34 (S*) | 8 (V) | 8 (V) | 8 (V) | 8 (V) | 8 (V) |
| | Section 280903 Alternate SUPERPAVE™ Binder (PG58-22) | 8 (V) | 8 (V) | 8 (V) | 8 (V) | 8 (V) | 8 (V) |
| | Section 280904 Supplemental Binder (PG76-22) | 8 (V) | 8 (V) | 8 (V) | 8 (V) | 8 (V) | 8 (V) |

Note: The numbers in the cells represent the number of 152 mm diameter cores needed to perform the required tests.

V = Volumetric and binder stiffness tests on cores

S* = Performance testing at t=0 months will be performed on 3 sets of specimens;

- compacted specimen from design mixtures produced in the laboratory
- compacted specimen from bulk samples obtained during construction
- cores obtained immediately following construction.



**FIGURE C-1. CORING AREAS FOR SPS-9A TEST SECTIONS
MISSISSIPPI SPS-9A (280900)**

Test Sections 01, 03, 04

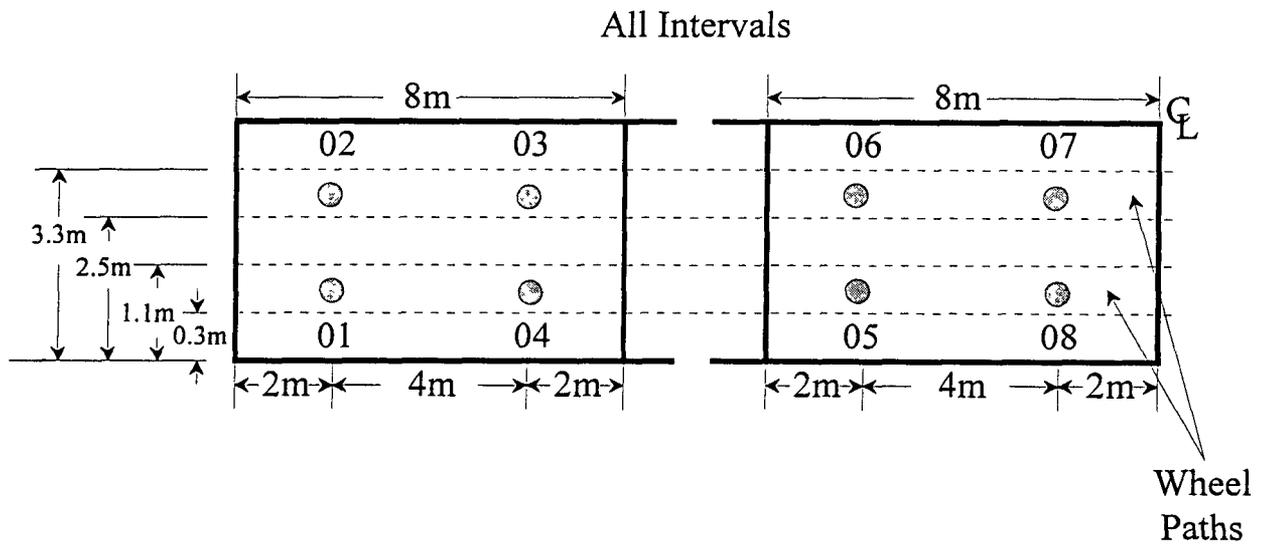
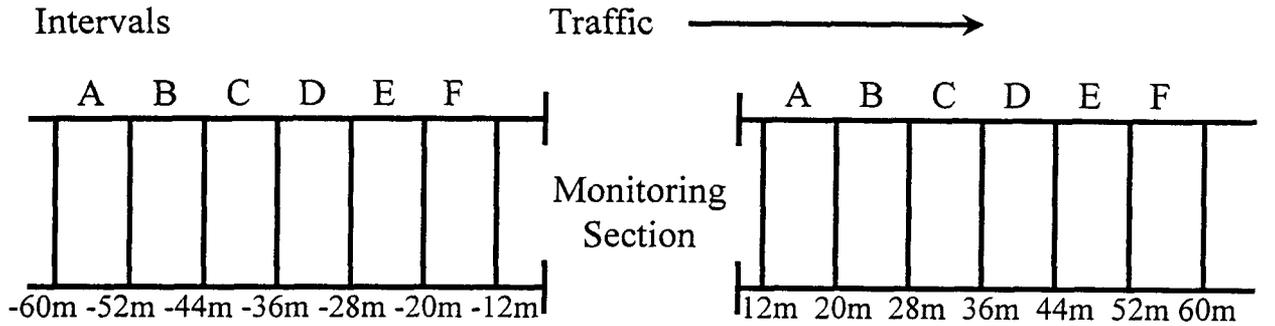


FIGURE C-2. CORING PLAN FOR MAIN STUDY
 TEST SECTIONS 01, 03 AND 04
 MISSISSIPPI SPS-9A (280900)

**TABLE C-7. LABORATORY MATERIAL TESTS TO BE PERFORMED
ON CORES FROM TEST SECTIONS 01, 03 AND 04
IMMEDIATELY AFTER CONSTRUCTION
(To Be Performed by the Participating Highway Agency)**

| Test Name | Test Desig. | Protocol | Nº. of Tests | Material Source ^b |
|---|-------------|-------------|--------------|------------------------------------|
| Core Examination/Thickness | AC01 | LTPP P01 | 8 | All Cores |
| Volumetric Analysis | | | | |
| Bulk Specific Gravity | AC02 | LTPP P02 | 8 | All Cores |
| Asphalt Content (Extraction) | AC04 | LTPP P04 | 8 | All Cores |
| Aggregate Gradation (Extracted Aggregate) | AG04 | LTPP P14 | 1 | C01 _t |
| Volumetric Calculations^a | | | | |
| Volume Percent of Air Voids | | AASHTO PP19 | 8 | C01 _t -C08 _t |
| Percent Voids in Mineral Aggregate | | AASHTO PP19 | 8 | |
| Voids Filled with Asphalt | | AASHTO PP19 | 8 | |
| Recovered Asphalt Cement | | | | |
| Asph Recovery | AE01 | LTPP P21 | 8 | C01 _t -C08 _t |
| Penetration @ 5°C | | AASHTO T49 | 3 | |
| Penetration @ 25°C & 46°C | AE02 | LTPP P22 | 3 | |
| Viscosity @ 60°C & 135°C | AE05 | LTPP P25 | 2 | |
| Specific Gravity @ 16°C | AE03 | LTPP P23 | 2 | |
| Dynamic Shear @ 3 Temperatures ^c | | AASHTO TP5 | 2 | |
| Creep Stiffness @ 2 Temperatures ^c | | AASHTO TP1 | 2 | |
| Direct Tension @ 2 Temperatures ^c | | AASHTO TP3 | 2 | |

Notes:

- a. Use the maximum theoretical specific gravity determined from tests on bulk uncompacted samples obtained during construction. Use specific gravity of aggregate components from tests on unmixed aggregates.
- b. The cores shown in this table are for each test section to be tested at each designated testing time interval *t*, where *t* represents the sampling time interval after construction as follows:
 - t* = A at time 0 immediately following construction
 - t* = B at 6 months after construction
 - t* = C at 12 months after construction
 - t* = D at 18 months after construction
 - t* = E at 24 months after construction
 - t* = F at 48 months after construction
 For example, core C01E is obtained and tested 24 months after construction.
- c. The test temperatures should be the same as those used for the tests on the RTFOT-PAV conditioned samples performed during the initial binder grading.

TABLE C-8. TESTS TO BE RUN ON CORE SAMPLES FROM TEST SECTION 02 IMMEDIATELY AFTER CONSTRUCTION

| Test Name | Test Desig. | Protocol | Nº. of Tests | Material Source/ Material Sample ^b |
|---|-------------|-------------------|--------------|--|
| Volumetric Tests by Participating Highway Agency | | | | |
| Core Examination and Thickness | AC01 | LTPP P01 | 34 | All Cores |
| Bulk Specific Gravity | AC02 | LTPP P02 | 34 | All Cores |
| Asphalt Content (Extraction) ^a | AC04 | LTPP P04 | 8 | C01t-C04t, C31t-C34t |
| Aggregate Gradation (Extracted Aggregate) ^a | AG04 | LTPP P14 | 2 | C02t, C33t |
| Volumetric Calculations by Participating Highway Agency | | | | |
| Volume Percent of Air Voids | | AASHTO PP19 | 34 | All Cores |
| Percent Voids in Mineral Aggregate | | AASHTO PP19 | 34 | |
| Voids Filled with Asphalt | | AASHTO PP19 | 34 | |
| Recovered Asphalt Cement Tests by Participating Highway Agency | | | | |
| Abson Recovery | AE01 | LTPP P21 | 8 | C01t-C04t, C31t-C34t |
| Penetration @ 5°C | | AASHTO T49 | 3 | |
| Penetration @ 25°C & 46°C | AE02 | LTPP P22 | 3 | |
| Viscosity @ 60°C & 135°C | AE05 | LTPP P25 | 2 | |
| Dynamic Shear @ 3 Temperatures | | AASHTO TP5 | 2 | |
| Creep Suffness @ 2 Temperatures | | AASHTO TP1 | 2 | |
| Direct Tension @ 2 Temperatures | | AASHTO TP3 | 2 | |
| LTPP Performance Tests by LTPP Contract Laboratory | | | | |
| Creep Compliance | AC06 | LTPP P06 | 8 | C01t-C04t, C31t-C34t |
| Indirect Tensile Strength | AC07 | LTPP P07 | 2 | C05t, C30t |
| Resilient Modulus | AC07 | LTPP P07 | 2 | C06t, C29t |
| SUPERPAVE™ Shear Tester Performance Tests by SUPERPAVE™ Regional Test Center | | | | |
| Frequency Sweep at Constant Height | | AASHTO M003, P005 | 2 | C11t, C24t |
| Simple Shear at Constant Height | | AASHTO M003, P005 | 2 | C10t, C25t |
| Uniaxial Strain | | AASHTO M003, P005 | 2 | C08t, C27t |
| Volumetric Test | | AASHTO M003, P005 | 2 | C07t, C28t |
| Repeated Shear at Constant Stress Ratio | | AASHTO M003, P005 | 2 | C09t, C26t |
| SUPERPAVE™ Indirect Tensile Tests by SUPERPAVE™ Regional Test Center | | | | |
| Indirect Tensile Creep Compliance | | AASHTO M005 | 4 | C12t-C14t, C21t-C23t |
| Indirect Tensile Strength | | AASHTO M005 | 4 | C15t-C17t, C18t-C20t |

Notes:

- a. These tests to run on cores after completion of the LTPP performance tests performed by the LTPP contract laboratory
- b. These are cores from each test section at time intervals $t = A$ (0 months), $t = C$ (12 months), $t = E$ (24 months) and $t = F$ (48 months) after construction.

SECTION D
MATERIAL SAMPLING AND TESTING
POSTCONSTRUCTION

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MATERIAL SAMPLING AND TESTING
POSTCONSTRUCTION

Materials sampling after construction consists solely of coring at time intervals of 6 months, 12 months, 18 months, 24 months and 48 months. These time periods correspond to intervals B-F, as discussed in Section C of this document and presented in Figures C-2 and C-3. These core samples will be tested to determine volumetric and binder stiffness properties, to evaluate their change with time. The testing to be performed on these core samples is shown in Table D-1.

**TABLE D-1. LABORATORY MATERIAL TESTS TO BE PERFORMED
ON CORES FROM ALL TEST SECTIONS AT TIME INTERVALS B-F
AFTER CONSTRUCTION
(To Be Performed by the Participating Highway Agency)**

| Test Name | Test Desig. | Protocol | Nº. of Tests | Material Source ^b |
|---|-------------|-------------|--------------|------------------------------------|
| Core Examination/Thickness | AC01 | LTPP P01 | 8 | All Cores |
| Volumetric Analysis | | | | |
| Bulk Specific Gravity | AC02 | LTPP P02 | 8 | All Cores |
| Asphalt Content (Extraction) | AC04 | LTPP P04 | 8 | All Cores |
| Aggregate Gradation (Extracted Aggregate) | AG04 | LTPP P14 | 1 | C01 _t |
| Volumetric Calculations^a | | | | |
| Volume Percent of Air Voids | | AASHTO PP19 | 8 | C01 _t -C08 _t |
| Percent Voids in Mineral Aggregate | | AASHTO PP19 | 8 | |
| Voids Filled with Asphalt | | AASHTO PP19 | 8 | |
| Recovered Asphalt Cement | | | | |
| Asph Recovery | AE01 | LTPP P21 | 8 | C01 _t -C08 _t |
| Penetration @ 5°C | | AASHTO T49 | 3 | |
| Penetration @ 25°C & 46°C | AE02 | LTPP P22 | 3 | |
| Viscosity @ 60°C & 135°C | AE05 | LTPP P25 | 2 | |
| Specific Gravity @ 16°C | AE03 | LTPP P23 | 2 | |
| Dynamic Shear @ 3 Temperatures ^c | | AASHTO TP5 | 2 | |
| Creep Stiffness @ 2 Temperatures ^c | | AASHTO TP1 | 2 | |
| Direct Tension @ 2 Temperatures ^c | | AASHTO TP3 | 2 | |

Notes:

- a. Use the maximum theoretical specific gravity determined from tests on bulk uncompacted samples obtained during construction. Use specific gravity of aggregate components from tests on unmixed aggregates.
- b. The cores shown in this table are for each test section to be tested at each designated testing time interval *t*, where *t* represents the sampling time interval after construction as follows:
 - t* = A at time 0 immediately following construction
 - t* = B at 6 months after construction
 - t* = C at 12 months after construction
 - t* = D at 18 months after construction
 - t* = E at 24 months after construction
 - t* = F at 48 months after construction
 For example, core C01E is obtained and tested 24 months after construction.
- c. The test temperatures should be the same as those used for the tests on the RTFOT-PAV conditioned samples performed during the initial binder grading.