Operational Guide No.
SHRP-LTPP-OG-001

National Research Council

STRATEGIC HIGHWAY RESEARCH PROGRAM

DATA COLLECTION GUIDE FOR LONG-TERM PAVEMENT PERFORMANCE STUDIES

STRATEGIC HIGHWAY RESEARCH PROGRAM
818 Connecticut Avenue NW
Washington, DC 20006

January 17, 1990

Revised December 15, 1989

PREFACE

This work was accomplished through January 1988 by the Federal Highway Administration, Contract No. DTFH61-85-C-0095, as part of the "transition plan" to support development of planning for Long Term Pavement Performance (LTPP) implementation pending Strategic Highway Research Program (SHRP) funding by Congress. The original Data Collection Guide (January 1988 version) reflected the current state of planning by SHRP for the LTPP studies, as well as for field monitoring required for other research studies of Asphalt Characteristics, Maintenance Cost Effectiveness, and Cement and Concrete.

The data collection guide was developed primarily for the Strategic Highway Research Program, but was made sufficiently broad for use as a guide for other data collection activities as well. The Data Collection Guide has been, and will continue to be further revised and improved to reflect the results from continuing development of SHRP over the next several years. Recent revisions have been developed by Texas Research and Development Foundation, Austin, Texas, under the Strategic Highway Research Program Contract SHRP-87-P001.

Important contributions have resulted from reviews by dozens of representatives of State Highway Agencies, the FHWA, the Strategic Highway Research Program Contractors and Expert Task Groups, the Transportation Research Board, and industry groups.

Revised December 15, 1989

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

CHAPTER 1. INTRODUCTION

PURPOSES FOR LONG-TERM PAVEMENT PERFORMANCE (LTPP) DATA COLLECTION GUIDE

The primary purpose for this Data Collection Guide is to provide a uniform basis for data collection during long-term monitoring of the performance of pavement test sections under study by the Strategic Highway Research Program. It is expected, because of the national and international interest in the SHRP, that the data collection procedures herein will be adopted by other federal, state, and local highway and roadway agencies in this country and abroad, so that the resultant data bases may offer broad opportunities for evaluating and understanding pavement performance.

One of the primary difficulties in utilization of data collected in the past has been lack of uniformity in the data. Another serious deficiency has been the omission of data that is significant to the performance of the pavements. The Long-Term Pavement Performance experiments have been carefully designed to ensure appropriate distributions of significant variables to support the objectives of these studies. This data collection guide has been developed to support these experiment designs, as well as to provide a uniform basis for the collection of other detailed data that has not been identified as a necessity for the Long-Term Pavement Performance Studies. The philosophical approach taken has been to identify those data items that are considered to be of high priority for achieving the goals of the Long-Term Pavement Performance Studies, but to provide also for a very comprehensive set of other data items that may be desirable in the National Pavement Data Base for other purposes such as pavement management, very detailed studies of pavement components, construction techniques, design features, and so forth, as well as other studies that may be conceived in the future.

This guide is intended to provide sufficient detail for implementation of the LTPP studies, but it is recognized that future modifications and additions will be necessary as the requirements for instrumentation and of other SHRP research areas become more defined, and as automated distress and performance measurements are applied. Emphasis has been given to ensuring that the data items identified will be satisfactory in the long term so that critical data will not be missing from the National Pavement Data Base when it is to be utilized in the future for the development of pavement performance models.

THE SHRP LONG-TERM PAVEMENT PERFORMANCE (LTPP) STUDIES

The "pavement community", faced in the 1970's with rapid deterioration of pavements nationwide, recognized the critical need for better understanding of those parameters that affect pavement performance, especially those related to rehabilitated pavements. It became apparent that the only chance of success was to mount an organized and massive study that could be continued for sufficient years to "let the pavements tell us how they perform" over their lifetime and over a diversity of environmental conditions, traffic, materials, designs, construction techniques and quality control, maintenance strategies, and other important parameters. This led to direction from the Congress of the United States in the Surface Transportation Act of 1978 to the Secretary of Transportation to study and investigate "...the need for long-term or continuous monitoring of roadway deterioration to determine the relative damage attributable to traffic and environmental factors." This offered an opportunity to begin a serious initiative, which was undertaken by the FHWA Office of Planning in the form of concepts for a "Long-Term Pavement Monitoring (LTM)" program, drawing strongly on the opinions and ideas from other offices of the FHWA. It was decided to approach LTM as a cooperative program between the FHWA, AASHTO, and participating state DOTs. An LTM pilot study was structured as a cooperative program between the FHWA, AASHTO, and eight selected states, and was implemented in 1982 to monitor selected pavements from those eight states.

Concurrent with the FHWA activities, the Transportation Research Board was conducting a study, called the "Strategic Transportation Research Study (STRS)", to develop a strategy for a major new research emphasis on key technological gaps with a potential for high payoff. The results of this study were published in TRB Special Report 202, "America's Highways, Accelerating the Search for Innovation." One of the primary recommendations from the study was the long-term monitoring of in-service highways. As it became clear that the major agencies involved in pavement design, construction, and management were recognizing the need for a national data base to include long-term data from highway monitoring, these agencies joined together to develop these plans mutually and in cooperation.

AASHTO approved the recommendations of the Strategic Transportation Research Study and established the "Strategic Highway Research Program (SHRP)" to carry them out. As the result of broad-based enthusiasm for such a program expressed at a national workshop on long-term pavement monitoring sponsored by the FHWA in October 1984, the FHWA offered to fund "transition activities" to maintain the momentum until SHRP was approved by Congress and funded in its own right. A SHRP Advisory Committee for Pavement Performance was appointed to provide guidance for this transition planning to include experiment designs and implementation planning.

The objective for LTPP studies established by the "Strategic Transportation Research Study" and adopted by the advisory committee for pavement performance as their goal was:

> "To increase pavement life by investigation of various designs of pavement structures and rehabilitated pavement structures, using different materials and under different loads, environments, subgrade soil, and maintenance practices."

The specific objectives developed by the advisory committee are:

1. Evaluate existing design methods.

2. Develop improved design methodologies and strategies for the rehabilitation of existing pavements.

3. Develop improved design equations for new and reconstructed pavements.

4. Determine the effects of (1) loading, (2) environment, (3) material properties and variability, (4) construction quality and (5) maintenance levels on pavement distress and performance.

5. Determine the effects of specific design features on pavement performance.

6. Establish a national long-term pavement data base to support SHRP objectives and future needs.

It was their expectation that accomplishment of these objectives will resolve most of the difficulties currently experienced in implementing successful pavement management systems.

The research team and the Advisory Committee drew heavily on the previous work and planning on the Long-Term Pavement Monitoring Program to develop an overall LTPP Study Program with three potential types of studies. These included General Pavement Studies (GPS), Specific Pavement Studies (SPS), and Accelerated Pavement Testing (APT). The General Pavement Studies involve several experiments that embraces a large array of site selection factors, and is expected to produce a broad range of products and results. The Specific Pavement Studies will have its own set of more limited goals, construction needs, and experimental approaches; and are generally aimed at more intensive studies of a few independent variables for each of a number of study topics. The other category of study is the Accelerated Pavement Testing Program. The APT could include either road tests, or the FHWA accelerated loading facility (ALF), however neither of these is being considered for implementation at this time.

The great majority of test sections for the GPS will be selected from existing highways, but it is expected that most of the test sections used in the SPS will be specially designed and constructed pavements having characteristics needed for the specific studies. The majority of sections for a specific study will usually be built at a single location, except where environmental variations are desired. The reason for selecting a single location is to maintain as much uniformity as possible, such as in subgrade, traffic, and environmental factors. It is expected that there will also be a number of specially designed and constructed sections for the GPS to fill important cells for which existing highway sections are not available.

While considered separately for clarity of understanding and planning, it should be noted that the results from GPS and SPS will be very interactive and some of the test sections will be shared between experiments.

CATEGORIES OF DATA TO BE COLLECTED

It is necessary to organize data collection activities and the formation of a data base in logical segments that promote communication, efficiency in data collection, and efficiency in handling files within the data base. For data collection purposes, the data to be collected has been categorized as follows:

1. Inventory data
2. Monitoring data
3. Traffic Data
4. Environmental Data
5. Maintenance data
6. Rehabilitation data

In addition to these six categories, another form of categorization has been applied to identify a "minimum data set" that is considered to be the most desirable data set for fulfilling the requirements of the LTPP objectives. The minimum data set includes the dependent variables representing performance of pavements, and those independent variables expected to significantly affect pavement performance. Numerous other data elements are to be collected where possible and will be included as data elements in the National Pavement Data Base. The minimum set of data to be collected for LTPP purposes is referred to as high priority data. However, the absence of certain high priority data items will not be a cause for rejection of the project from the National Pavement Data Base. High priority data elements are identified for inventory and rehabilitation data with asterisks (*). It has been tentatively assumed that the other categories of data will be generally high priority.

Another type of high priority data is identified for inventory data in the guide with a pound mark (#). These are data elements that are high priority, but will be obtained by SHRP after the test sections are selected. These are generally data elements related to material properties that will be obtained through material sampling and testing.

Inventory Data

The basic inventory data includes that data necessary to: 1) identify the test section, 2) describe the geometric details of its construction and the material properties of its structural constituents, and 3) identify construction costs and costs of subsequent maintenance and repair prior to the long-term monitoring effort. See Table 1.1 for a list of inventory data elements. All of this data, with the exception of certain material properties which change over time or environment such as subgrade strength and moisture content, should remain constant throughout the monitoring period unless the pavement is resurfaced or rehabilitated during the period. In the latter case, the test section becomes for practical purposes a new pavement structure with new surface conditions, so the basic inventory data must be revised to describe these new conditions, while retaining the original data for reference in long-term cost analyses and studies of the effects of rehabilitation on deterioration rates. The additional rehabilitation data elements recommended for collection in the event this occurs during the monitoring period are discussed subsequently.

Monitoring Data

The monitoring data includes distress and serviceability measurements and deflection testing results. This data is to be collected on a periodic basis to provide a historical data base for developing relationships between distress, performance, traffic and axle loads, age, maintenance and other significant variables. It is expected that

Table 1.1. Items of inventory data to be collected.

1. <u>Test Section Identification</u>:

Route Number	Functional Class
State, County, and District	Location of Test Section
Lane Monitored	Direction of Travel
	Experiment Code

2. <u>Geometric Details and General Information</u>:

Number of Lanes	Shoulder Width
Lane Width	Shoulder Structure
Type of Pavement	PCC Shoulder Joint Information
Type of Subsurface Drainage	Year Originally Constructed
Location of Subsurface Drains	Identification of Layer Materials
Thickness of Layers	Thicknesses of Overlays or Final Layer
Depth to Rigid Layer	Year Widened
Years When Major Improvements Occurred	Joint Spacing, Reservoir Width, Sealant Type, and Forming Method
Identification of Materials Used in Overlay or Reconstruction	Type of Load Transfer (Aggregate interlock or Dowels)
Dowel Bar Diameter, Length Spacing, Coating, and Installation Method	Tie Bar Diameter, Length, and Spacing

3. <u>Material Properties</u>:

a. <u>Subgrade Soil</u>:

Soil Type and Classification	Liquid Limit
% Passing No. 40 Sieve	Plasticity Index
% Passing No. 200 Sieve	In Situ Dry Density
California Bearing Ratio	In Situ Moisture Content
R-Value	Swell Potential
Modulus of Reaction	Frost Susceptibility
Maximum Laboratory Dry Density	Resilient Moduli
Optimum Laboratory Moisture Content	Relative Density
	Soil Suction
	Rate of Heave

b. <u>Base and Subbase Layers (Unbound or Stabilized)</u>:

Soil Type and Classification	Maximum Lab Dry Density
In Situ Dry Density	Optimum Lab Moisture Content
In Situ Moisture Content	Material Gradation
Resilient Moduli	Percent of Stabilizing Agent
Type of Treatment (Cement, Lime, etc.)	California Bearing Ratio
Compressive Strength	Resistance (R-Value)
	Modulus of Subgrade Reaction

Table 1.1. Items of inventory data to be collected (continued).

3. Material Properties (Continued):

c. Asphalt Concrete Layers:

- Asphalt Grade
- Asphalt Content
- Penetration of Original Asphalt
- Source and Specific Gravity of Asphalt
- Viscosity and Ductility of Original Asphalt
- Softening Point of Asphalt
- Type of Asphalt Modifiers
- Original Stability
- Properties of Laboratory Aged Asphalt
- Resilient Moduli
- Tensile Strength
- Creep Compliance
- Type and Amount of Anti-Stripping Additives
- Compaction Data
- Initial Air Voids
- Voids in Mineral Aggregate
- Types of Coarse and Fine Aggregates
- Geological Classifications of Coarse Aggregates
- Polish Value of Coarse Aggregate
- Gradations of Coarse and Fine Aggregates
- Bulk Specific Gravities of Aggregates
- Effective Specific Gravity of Aggregate
- Aggregate Durability
- Type of Asphalt Plant
- In-Place Mixture Properties
- Moisture Susceptibility
- Laydown Temperatures
- Mixing Temperatures

d. Portland Cement Concrete Layers:

- Type, Amount, Yield Strength, and Placement of Reinforcing Steel
- Mix Design Information
- Coarse Aggregate Type and Gradation
- Fine Aggregate Type and Gradation
- Insoluble Residue
- Bulk Specific Gravities
- Method for Curing and Finishing
- Modulus of Rupture
- Elastic Modulus
- Compressive Strength
- Tensile Strength
- Concrete Admixtures
- Type of Paver
- Slump
- Type of Cement
- Alkali Content of Cement
- Entrained Air
- Aggregate Durability

4. Historical Pavement Related Cost Data:

- Initial Construction Cost
- Costs for Major Improvements
- Maintenance Costs

deflection, skid, distress, and serviceability measurements will be made every two years, except when they may be required more frequently when the rate of deterioration is accelerating as damage becomes severe or on selected sections during critical seasonal changes such as spring thaw. Monitoring data elements are listed in Table 1.2.

Traffic Data

Traffic data are to be collected separately for the lane (or lanes) to be monitored. As each lane experiences different traffic and environmental effects (to a lesser degree), each should be considered as a separate test section. For SHRP LTPP, data is planned for collection only for the outside lanes in one direction.

The traffic data includes Average Annual Daily Traffic (AADT); percent heavy trucks; distribution of traffic by vehicle classes; and distribution of axle loads for single, tandem, and tridem axles.

Although data forms have been included, it is expected for SHRP LTPP that data for individual vehicles will be collected automatically and will eventually be transferred by telephone to a central location on call. Once these automatic systems are in place, traffic data will likely be collected quarterly, or even more frequently. However, the data will be stored on an annual basis.

Data for individual vehicles requires considerable computer storage, so it is expected to be stored "off-line" rather than directly in the National Pavement Data Base. Appropriate summary data such as numbers of axles in certain weight categories, vehicles in certain classes, equivalent axle loads, etc. are expected to be calculated from the raw data and stored in the National Pavement Data Base. The raw data will be available for use when needed.

The traffic data file will include both historical data prior to initiation of the monitoring activity, as well as the traffic collected throughout the monitoring period. As there have been changes in the

Table 1.2. Items of monitoring data to be collected.

1. Distress and Performance Measurements:

   a. Asphalt Concrete Pavements (With or Without Overlays):

      - Alligator Cracking
      - Longitudinal Cracking
      - Rut Depth
      - Roughness
      - Raveling and Weathering
      - Crack Between Lane and Shoulder
      - Misc. Distress Types (Not Collected for LTPP)
      - Transverse Cracking
      - Block Cracking
      - Skid Resistance (To Monitor Reductions)
      - Bleeding (Flushing)
      - Pumping and Water Bleeding
      - Reflection Cracking
      - Patch Deterioration
      - Lane to Shoulder Dropoff
      - Potholes

   b. Portland Cement Concrete Pavements:

      - Slab Cracking (Various Types)
      - Joint and Crack Faulting
      - Pumping and Water Bleeding
      - Lane/Shoulder Separation and Dropoff
      - Joint Seal Damage
      - Reactive Aggregate Distress
      - Skid Resistance (To Monitor Reductions)
      - Roughness
      - Blow-ups
      - Spalling
      - Scaling and Map Cracking
      - Punchouts
      - Patch Deterioration
      - Joint Deterioration
      - Corner Breaks
      - Misc. Distress Types (Not Collected for LTPP)

   c. Portland Cement Concrete Pavements with Asphalt Concrete Overlays:

      - Reflection Cracking
      - Rut Depth
      - Pot Holes in Overlays
      - Raveling
      - Pumping and Water Bleeding
      - Skid-Resistance (To Monitor Reductions)
      - Roughness
      - Flushing
      - Lane/Shoulder Separation and Dropoff

2. Deflection Testing Results:

   - Type of Deflection Device
   - Locations of Sensors
   - Applied Load and Frequency
   - Measured Deflections Under Load (Each Sensor)
   - Air and Pavement Temperatures

vehicle classifications for which data is collected, some conversions for historical data will likely be required for consistency.

Environmental Data

The environmental data will include that data necessary to characterize the environment in which the pavement has existed since its construction and on through the monitoring period. The environmental data elements to be collected include:

- Weather Station Identification/Location.
- Average Monthly Temperature.
- Average Maximum Daily Temperature by Month.
- Average Minimum Daily Temperature by Month.
- Average Monthly Precipitation.
- Average Monthly Percent Sunshine.
- Average Monthly Wind Speed.
- General Type of Environment.
- Average Annual Number of Days of Precipitation.
- Latitude.
- Longitude.
- Freezing Index.
- Average Number of Annual Freeze-Thaw Cycles.
- Elevation Above Sea Level.
- Average Annual Deicing Salt Application.
- Highest Monthly Mean Solar Radiation.
- Lowest Monthly Mean Solar Radiation.
- Thornthwaite Moisture Index.

Maintenance Data for SHRP LTPP General Pavement Studies

The determination of data elements to be collected to reflect maintenance activities on LTPP test sections included in the General Pavement Studies (GPS) has been one of the more difficult tasks in planning the LTPP program and in the development of the Data Collection Guide. The complications include the wide variations in maintenance policy and data collection procedures among various State Highway Agencies, and the need to coordinate maintenance activities within the test sections themselves.

A maintenance control zone will be established around each SHRP monitoring test section. This zone will be established to closely coordinate "routine" or "preventative" maintenance activities and reduce the influence of other activities on the performance of the test section.

A State Highway Agency may decide to provide more extensive maintenance for the project in which the test section is located, and will be free to do whatever they wish for pavements outside the maintenance control zone. However they will be asked to comply with a maintenance policy which requires coordination with the Regional SHRP Office. If this is not done, the value of the data obtained from a test section after it has been monitored for a number of years will be greatly reduced, and the possibility of a final set of measurements at that level of deterioration prior to covering the manifestations of distress may be lost. In general, more extensive maintenance activities than those allowed prior to the decision point should be deferred as long as possible to allow the collection of critical data as deterioration accelerates. It was the expectation of the Joint Pavement Performance/Maintenance Subcommittee that these decisions and agreements could be worked out as long as SHA and SHRP personnel approach the decision with mutual respect for the needs of each other and a cooperative spirit.

Maintenance Data for SHRP LTPP Specific Pavement Studies/Other Detailed Maintenance Studies

Very detailed studies of the effects of various maintenance techniques on pavement performance are to be undertaken by SHRP through its "Maintenance Cost Effectiveness" studies. These studies will include monitoring of specially constructed field test sections by the LTPP group and collection of very detailed data on maintenance materials and construction techniques, as well as pavement performance data to be routinely collected for all LTPP test sections. Consequently, the maintenance data sheets have been designed to support the detailed data requirements of these and other detailed maintenance studies.

Maintenance Data Elements

The elements of maintenance data to be collected appear in Table 1.3. While the various State Highway Agencies may commonly collect maintenance

Table 1.3. Items of maintenance data to be collected.

HISTORICAL MAINTENANCE DATA

Identification of Case Number and Year Accomplished
Work Type and Quantities
Location of Pavement
Maintenance Material Identification
Thickness (Where Applicable)

MAINTENANCE MONITORING DATA

1. Asphalt Concrete Surfaced Pavements:

Seal Coat

Date of Work
Reason for Seal Coat
Average Crack Severity
Percent of Test Section Sealed
Type of Seal Coat
Asphalt Type and Application Rate
Aggregate Type and Gradation
Finished Treatment Thickness
Seal Coat Mixture Data
Roller Used to Seat Aggregate
Time Curing Allowed
Surface Preparation
Weather Conditions During Work

Crack Sealing

Date of Work
Length of Cracks Sealed
Average Crack Severity
Surface Preparation
Material Used to Seal Cracks
Material Manufacturer
Weather Conditions During Work

Patching

Date of Work
Reason for Patching
Extent of Patch Placement
Method Used to Determine Locations and Sizes
Material Used to Patch Pavement
Method of Compaction

2. Portland Concrete Surfaced Pavements:

Patching or Slab Replacement

Reasons for Patching or Slab Replacement
Patch Boundary Determination
Extent of Patch or Slab Placement
Method for Cutting Boundaries
Method of Material Removal
PCC Mixture Data
Concrete Admixture
Type/Amount of Reinforcing
Bonding Agent
Joint Forming Data
Consolidation, Finishing, and Curing Data
Air Temperature Placement
Strength

Table 1.3. Items of maintenance data to be collected (continued).

Method for Final Curing
Maximum Jackhammer Size
Type/Gradation of
Aggregate
Curing Period

Joint Resealing

Date of Work
Method of Sealant Removal
Method of Sidewall
Preparation
Type of Joint Sealant
Manufacturer Information
Sealant Reservoir Dimensions
Bond Breaker Under Sealant
Depth of Sealant Placement

Diamond Grinding

Date of Work
Reasons for Grinding
Extent of Grinding
Average Groove Width/Depth
Cutting Head Width
Average Spacing Between Blades
Machinery Manufacturer

3. Cost Data:

Maintenance Type
Units
Quantities
Average Cost Per Unit
Total Cost

data and report it in other units and in other formats, it will be critically important that these data elements be utilized for the test sections and that the units and guidelines established in this manual be applied.

Rehabilitation Data

The data collected will pertain to rehabilitation that has occurred after initiation of monitoring for the test section. Most rehabilitation procedures such as recycling or overlay produce a test section having a modified pavement structure, while other procedures such as undersealing may be considered to restore the existing pavement structure. Reworking shoulders and placement of edge drains are other examples of improvements that may be made without changing the primary pavement structure; however, any such rehabilitation converts the pavement from an "original pavement" to a "rehabilitated pavement". The data elements to be collected for rehabilitation appear in Table 1.4.

ORGANIZATION OF PROCEDURES AND DATA SHEETS

It was necessary to organize this Data Collection Guide in some logical manner so that it can be readily followed with minimal confusion. The approach selected was to organize the procedures and data sheets by each of the six major categories of data described above. Each major category is discussed in a chapter; however, the inventory data category is seperated into two chapters, one for data to be supplied by the State Highway Agency project files and the other for data to be collected by SHRP during materials sampling and testing activities. The chapters are organized so that the data sheets appear last, following the descriptions and instructions for filling out the data elements. These descriptions and instructions are organized in numerical order by data sheet number.

Table 1.4. Items of rehabilitation data to be collected

1. Revised Layer Description Information:

   Thicknesses/Material Types
   Date of Work

2. Asphalt Concrete Surfaced Pavements:

   a. Asphalt Concrete Surface Recycling:

      1) Hot Mix Recycled Asphalt Concrete, Hot or Cold Laid:

         Grade of Added Asphalt
         Amount of Asphalt Added
         Penetration of Reclaimed, Added and Combined Asphalt
         Source and Specific Gravity of Added Asphalt
         Viscosity of Reclaimed, Added and Combined Asphalt
         Ductility of Combined Asphalt
         Softening Point of Combined Asphalt
         Laboratory Aged Properties for Combined Asphalt
         Combined Asphalt Content
         Type and Amount of Recycling Agent
         Types of Coarse and Fine Aggregates Added
         Geological Classifications of Coarse Aggregate Added
         Gradations of Coarse and Fine Aggregates Added
         Amount of New Untreated Aggregate Added
         Gradation of Combined Aggregate
         Bulk Specific Gravities of Combined Aggregates
         Effective Specific Gravity of Combined Aggregates
         Voids in Mineral Aggregate - Recycled Mixture
         Air Voids in Recycled Mixture
         Stability of Recycled Mixture
         Optimum Asphalt Content
         Bulk Specific Gravity of Mixture
         Maximum Specific Gravity of Mixture
         Resilient Moduli of Recycled Mixture
         Tensile Strength of Recycled Mixture
         Creep Compliance of Recycled Mixture
         Moisture Susceptibility
         Type and Amount of Anti-Stripping Agent
         Type of Asphalt Plant
         Procedure of Existing Pavement Removal/Processing
         Mixing and Laydown Temperatures
         Compaction Data

Table 1.4. Items of rehabilitation data to be collected (continued).

2) Cold Mix Recycled Asphalt Concrete:

Grade of Added Asphalt
Penetration of Reclaimed, Added and Combined Asphalt
Source and Specific Gravity of Asphalt Added
Viscosity of Reclaimed, Added and Combined Asphalt
Softening Point of Combined Asphalt
Type/Amount of Recycling Agent
Types of Coarse and Fine Aggregates Added
Geological Classifications of Coarse Aggregates Added
Gradations of Coarse and Fine Aggregates Added
Amount of New Untreated Aggregate Added
Gradation of Combined Aggregate
Bulk Specific Gravities of Combined Aggregates
Effective Specific Gravity of Combined Aggregates
Asphalt Content of Recycled Mixtures
Air Voids in Recycled Mixture
Voids in Mineral Aggregate - Recycled Mixture
Bulk Specific Gravity of Recycled Mixture
Effective Specific Gravity of Recycled Mixture
Effective Asphalt Content
Stability of Recycled Mixture
Resilient Moduli of Recycled Mixture
Tensile Strength of Recycled Mixture
Creep Compliance of Recycled Mixture
Moisture Susceptibility
Type and Amount of Anti Stripping Agent
Type of Asphalt Plant
Procedure of Existing Pavement Removal/ Processing
Method of Spreading Mixture
Compaction Data

3) Heater Scarification:

Type of Scarification Process
Depth of Scarification
Type/Application Rate of Rejuvenating Agent
Method of Compaction
Type of Surface Treatment
Curing Time Prior to Surface Application

4) Seal Coat/Friction Course Application

Type of Seal Coat/Friction Course
Type/Grade of Asphalt

Table 1.4. Items of rehabiltation data to be collected (continued).

Application Rate for Asphalt
Gradation/Application Rate of Aggregate
Weather Conditions During Work
Surface Preparation
Rollers Used
Curing Time Allowed

b. <u>Asphalt Concrete Overlay</u>

Type of Coarse Aggregate
Type of Fine Aggregate
Gradation of Combined Aggregate
Bulk Specific Gravities of Aggregates
Effective Specific Gravity of Aggregates
Asphalt Grade/Source
Asphalt Content
Penetration, Viscosity, Ductility, Specific Gravity, and Softening Point of Asphalt
Type/Amount of Asphalt Modifiers
Penetration, Viscosity, Ductility and Softening Point of Laboratory Aged Asphalt
Maximum Specific Gravity of Mixture
Bulk Specific Gravity of Mixture
In-Place Air Voids
Voids in Mineral Aggregate
Effective Asphalt Content
Marshall Stability & Flow
Hveem Stability and Cohesiometer Value
Resilient Moduli of Mixture
Tensile Strength of Mixture
Creep Compliance of Mixture
Moisture Susceptibility
Type/Amount of Anti-Stripping Agent
Type of Asphalt Plant
Mixing Temperature
Laydown Temperature
Compaction Data

3. <u>Portland Cement Concrete Surface Pavements</u>

a. <u>PCC Overlays</u>
Type of PCC Overlay
Type of Paver Used
Curing/Finishing Methods
Shear Strength of Interface
Mix Design Data
Type, Amount and Placement of Reinforcing Steel
Bonding Condition
Surface Preparation
Overlay Thickness

Table 1.4. Items of rehabilitation data to be collected (continued).

Flexural, Compressive, and Tensile Strengths of Concrete
Aggregate Types, Gradations, and Specific Gravities
Joint Spacing and Load Transfer System

b. <u>Pressure Relief Joints</u>

Average Relief Joint Interval
Joint Dimensions
Method of Cutting and Removal of Concrete
Reason for Relief Joint Installation
Type of Joint Sealant
Type of Joint Filler

c. <u>Subsealing</u>
Type of Mixture Used in Subsealing
Asphalt Cement Data
Portland Cement Grout Mix Data
Strength/Fluidity of Grout
Curing Period
Method Used to Determine Area to be Undersealed
Maximum Allowable Pump Pressure
Monitoring Method
Slabs in Test Section
Number of Holes per Slab
Volume of Material Pumped per Hole
Number of Holes Adjacent to Joint or Crack
Curing Time

d. <u>Subdrainage</u>
Type of Subdrains
Extent of Subdrains
Type of Drainage Pipe
Placement of Drainage Pipe
Type/Gradation of Primary Filter
Permeability of Primary Filter
Type/Location of Secondary Filter
Average Outlet Interval
Purpose for Drainage Installation

e. <u>Load Transfer Restoration</u>
Type of Load Transfer Restoration
Frequency of Installation
Number of Devices per Lane
Location of Dowels or Shear Devices
Length/Diameter of Retrofit Dowel Bars
Type of Backfill Material
Bonding Agent
Load Transfer Efficiency Before/After

f. <u>Crack and Seat Rehabilitation</u>
Existing Pavement Condition

Table 1.4. Items of rehabilitation data to be collected (continued).

Last Profile/Roughness Measurement
Presence of "D" Cracking
Average PCC Breakage Size
Breakage Pattern
Breaker Type
Proof Roller Used
Broken Pavement Exposure to Traffic
Deflection Testing Information
Broken Pavement Surface Preparation

g. Recycled Portland Cement Concrete

Break Up Equipment
Piece Size After Breaking
Piece Separation Methods
Type of Paver
Curing/Finishing Method
Temperatures During Work
Curing Period
Joint Spacing/Load Transfer/Reinforcement
Joint Sealant Data
Reinforcing Steel Type/Amount/Location/Strength
Mixture Design Data
Type and Gradations of Aggregate Added
Bulk Specific Gravity of Aggregate Added
Durability of Aggregate Added
Specific Gravity and Gradations of Combined Aggregate
Flexural, Compressive, and Tensile Strength of Recycled Concrete Mixture

4. Shoulder Restoration

a. AC Shoulder Restoration

Date of Work
Shoulder Restored
Type of Restoration Performed
Type of Materials Used
Thickness of AC Removed by Milling
Overlay Thickness
Restored Shoulder AC Thickness
Restored Shoulder Width
Joint Sealant Data

b. PCC Shoulder Restoration

Type of Existing Shoulder System
Shoulder/Lane Tie System
Shoulder Width/Thickness
Type of Lane/Shoulder Joint
Lane/Shoulder Joint Sealant

Table 1.4. Items of rehabilitation data to be collected (continued).

5. Rehabilitation Cost Data

   Date of Work
   Type (Code)
   Unit (Code)
   Cost Per Unit
   Total Cost

CHAPTER 2. INVENTORY DATA COLLECTION FOR LTPP

This chapter provides data sheets and instructions for their use in collecting inventory data that should remain essentially constant over the monitoring period (unless the pavement is rehabilitated). Exceptions are material properties which change over time, such as asphalt concrete stiffness, in situ strength, and moisture content of base, subbase, and subgrade materials. These properties may be monitored on selected projects on a more frequent basis. The inventory data sheets appear in numerical sequence at the end of this chapter.

The inventory data sheets are those from the original LTM Data Collection Guide (Ref. 1), modified to reflect evolution in planning for long-term monitoring of pavements. This was done partially to maintain some consistency with the LTM pilot study data bases, but primarily to take advantage of the work already accomplished for the FHWA during the LTM studies, and during studies for NCHRP Project 1-19 (Ref. 2).

The data sheets provide for collection of detailed information on variability of materials and layer thicknesses, as such variability is known to contribute heavily to pavement deterioration. It is recognized that replicate test data is often unavailable, so single test results in these cases should be entered as the mean and other values left blank. However, whenever possible, data on variability should be obtained.

As discussed previously, spaces have been provided for a broad array of data elements, but it is recognized that much of the data will not be available. However, available data should be entered (even data that is not identified as minimum) and every effort should be taken to obtain data indicated by an asterisk (*). When the data element is not applicable to or represents something that does not exist on the test section (i.e., reinforcement data for a plain concrete pavement), enter an "N" to indicate that the data element is not applicable. If the data element is applicable, but the value is unknown (i.e., not available in project records), enter a "U" to indicate that the value is unknown. Many data items will require codes to be entered. Unless otherwise noted in the following instructions, the codes are listed or referenced on the data sheets.

DATA SECTION COMMON FOR ALL DATA SHEETS

A common set of project identification data appears in the upper right hand corner of every data sheet. These data items are described below.

State Assigned ID

The State assigned ID is an identification number assigned by the State Highway Agency (SHA) used solely to facilitate filing of the projects for the SHA's convenience, and may be cross-referenced with the construction project number. A State Highway Agency can use any system for assigning these identification numbers.

State Code

The State code is a number used to identify the state or Canadian province in which the pavement section is located (see Table A.1, Appendix A for codes).

SHRP Section ID

The SHRP section ID is a four-digit identification number assigned by SHRP. This number is used to facilitate the computer filing of the projects and will identify the section in the field. It will be cross-referenced with the State assigned ID.

PROJECT AND SECTION IDENTIFICATION (SHEET 1)

This data sheet is to be filled out from project records for each test section for which long-term monitoring is planned.

1. Date of Data Collection or Update: A set of numbers to identify the month and year in which the inventory data was collected. The number to identify the month is in numerical sequence of the months as they occur during the year (enter 03 for March, etc.). The two digits identifying the year are the last two digits of the year (83 for 1983, etc.).

2. State Highway Agency (SHA) District Number: A number used to identify the SHA district in which the pavement test section is located.

3. County or Parish: A number used to identify the county or parish where the pavement section is located. County codes may be found in Federal Information Processing Standards Publications 6, "Counties of the States of the United States".

4. Functional Class: A number used to identify the functional classification of the highway for which the pavement section is a sample (see Appendix A, Table A.2).

5. Route Signing: A code to identify the letter designation that precedes the number of the highway where the SHA project is located.

6. Route Number: The number assigned to the highway where the SHA project is located (e.g., I-280).

7. LTPP Experiment Code: A code indicating which of the nine General Pavement Studies (GPS) experiments described in Table A.3, Appendix A for the LTPP program that the pavement section fits. If not part of the LTPP GPS, the experiment type may be entered as "00." Other codes may be introduced later for Specific Pavement Studies (SPS).

8. Type of Pavement: A code identifying the general type of pavement structure (such as asphalt concrete pavement with granular base, jointed plain concrete pavement, etc.) The pavement type codes are listed in Appendix A, Table A.4.

9. Number of Through Lanes: A number indicating the total number of through lanes (exclusive of ramps and access roads) in the direction of travel.

10. Direction of Travel: The general direction of traffic flow along the entire route which includes the test section.

Section Location Starting Point: The locations of the starting point of the test section are to be identified by milepoint, elevation, latitude, and longitude.

11. Milepoints are to be determined by adjusting the value posted on the nearest milepost to the starting point. For example, if the direction of travel (preceding data element) is in the same direction as increasing mileposts for a given roadway, and the starting point was 0.29 miles from the preceding milepost (Mile 114), the milepoint for the starting point of the test section would be 114.29. Milepoints are to be given to the nearest hundredth of a mile.

12. Elevations are to be entered to the nearest foot. Survey measurements are not required - the intent is to obtain a reasonable estimate. In many cases, the elevations can be taken off the construction plans.

13. & 14. Latitude and Longitude (North and West, respectively) are to be given in degrees, minutes, and seconds to the nearest hundredth of a second when this type of accuracy is possible. This value may be determined at a later date through the use of advanced photogrammetric methods.

15. Space is provided to enter Additional Location Information (Significant Landmarks). This type of information will be useful for field crews locating the project during monitoring activities.

16. HPMS Sample Number: This is the twelve-digit "Section/Grouped Data Identification" assigned to any section of highway in the Highway Performance Monitoring System (HPMS). It provides a unique identification for a test section and may be obtained from those SHA personnel servicing the HPMS.

17. HPMS Section Subdivision: A single digit code used to identify a further subdivision of an original HPMS section, generally included as a thirteenth digit to the HPMS sample number.

GEOMETRIC, SHOULDER AND DRAINAGE INFORMATION (SHEET 2)

The data to be entered on this data sheet may be obtained from as-built plans and/or project files, but values should be checked at the site whenever possible through visual observation.

1. Lane Width: The width of the lane to be monitored, to the nearest whole number of feet.

2. Monitoring Site Lane Number: A number that identifies which lane is to be monitored. Lanes are identified as indicated on the data sheet. Although a highway agency may wish to monitor more than one lane, each lane should be considered as a separate "test section", with its own data (although much data may actually be common such as environmental, materials, and thickness design data). For the LTPP Studies, only the outside lane will be studied, so the code "1" should be entered.

3. Subsurface Drainage Location: A code indicating whether the subsurface drainage is continuous along the section or was provided at intermittent locations. Enter "N" if no subsurface drainage is provided.

4. Subsurface Drainage Type: A code indicating the type of subsurface drainage provided. A space is provided for describing another type of subsurface drainage if different from those for which codes are provided.

Shoulder Data: Spaces are provided to enter data describing both the outside and inside shoulder. If there are no inside shoulders, enter "N" for those spaces pertaining to inside shoulders.

5. Shoulder Surface Type: Codes indicating the type of shoulder surfaces for the outside and inside shoulders.

6. Total Width: The total (paved and unpaved) widths of the outside and inside shoulders to the nearest whole number of feet.

7. Paved Width: The paved widths of the outside and inside shoulders to the nearest whole number of feet.

8. Shoulder Base Type: Codes identifying the types of base material used in the shoulders (See Table A.6, Appendix A for codes).

9. Shoulder Surface Thickness: The average thicknesses of the inside and outside shoulder surfaces to the nearest tenth of an inch.

10. Shoulder Base Thickness: The average base thicknesses along the shoulders to the nearest tenth of an inch.

Additional Data for PCC Shoulders: Spaces are provided for entering joint and reinforcing data for shoulders with PCC surfaces.

11. Average Joint Spacing: Average joint spacing for PCC shoulders to the nearest whole foot. If joints were not provided, enter "N".

12. Skewness of Joints: The average deviation of the contraction joint across the shoulder from a right angle with the edge. This is measured in feet to the nearest tenth. If joints are not skewed, enter "N".

13. Joints Match Pavement Joints?: Codes to indicate whether the joints in the shoulder were constructed to match the joints in the adjacent pavement slab.

14. Reinforced?: Codes to indicate whether the PCC shoulder slab is reinforced or not.

15. Diameter of Longitudinal Drainpipes: The inside diameter to the nearest tenth of an inch of the longitudinal drainpipes used for subsurface drainage. If there is no longitudinal drainage, enter "N".

16. Spacing of Laterals: The average spacing in feet for subdrainage laterals. Enter "N" if there are no subdrainage laterals.

LAYER DESCRIPTIONS (SHEET 3)

This data sheet is to be filled out from project records for each test section for which long-term monitoring is planned. As all subsequent data sheets refer back to this one, special care should be taken in filling it out.

Layer Numbers

Nine or fewer layers may be identified, with Number 1 as the subgrade and the last number identifying the surface layer.

Layer Description

A layer description code is to be entered for each of the layers in the system. For Hot Mixed Asphalt Concrete (HMAC) layers, separate lifts having the same mixture are not to be identified as separate layers. Where HMAC is used as a base for PCC pavement, it should be described by Code 05.

Many highway agencies cover poor subgrade soils with one to three feet of select material. Such an embankment should be reported as a subbase, Code 06.

Material Type Classification

A code identifying the type of materials in each layer of the pavement structure, including the subgrade should be entered for material type classification. Codes for surfacing materials, base and subbase materials, subgrade soils, and thin seals and interlayers are identified in Tables A.5, A.6, A.7, and A.8, respectively. Embankment fill (Layer Description Code 11) refers to nonselect or select fill used to build up the roadbed, and appropriate codes are to be used to identify the materials.

Layer Thickness

Four numbers can be provided to indicate the minimum, maximum, mean, and standard deviation of thickness for each specific layer in inches (enter to the nearest tenth of an inch). If only a single specified design value for thickness is available from project records, enter it as the "mean value". For SHRP LTPP, a number of bore holes will be made for sampling materials, so careful thickness measurements are to be made, and the mean thickness will be verified or revised and variability information added as a result of these field measurements. See Appendix B for standard deviation equation. (Detailed data is not to be filled out on subsequent data sheets for seal coats, interlayers, porous friction courses or HMAC layers 0.75 inch or less in thickness).

Layer Type

A letter code to indicate the set of data sheets required to be filled out for a particular layer should be entered for layer type. This data item is meant to be used purely for the convenience of the person(s) filling out the data forms to avoid potential confusion over which data sheets are required for a given project. Layer type codes and the descriptions of required sheets are shown in Note 4 on the data sheet.

Depth Below Surface to "Rigid" Layer

A number should be entered to indicate the mean depth from the pavement surface to the top of a relatively rigid rock, stone, or dense shale formation (enter to nearest tenth of a foot). If such a formation does not exist, enter "N" in the space provided. If such a layer was not encountered at the depths bored, or it is not known whether it exists or not, enter a "U" for unknown.

AGE AND MAJOR PAVEMENT IMPROVEMENTS (SHEET 4)

This data sheet is to be filled out from project records for each test section for which long-term monitoring is planned.

1. Date of Latest (Re)Construction: Month and year in which construction of the pavement to be monitored was completed. The first two digits represent the numerical sequence of the month as it occurs during the year and the second two digits are the last two digits in the year.

2. Date Subsequently Opened to Traffic: The month and year that the pavement was originally opened to traffic (not the date when project was accepted). The first two digits represent the numerical sequence of the month as it occurs during the year and the second two digits are the last two digits in the year.

3. Latest (Re)Construction Cost Per Lane Mile: The total average original construction or reconstruction cost in thousands of dollars per lane-mile for the project that includes the test section, exclusive of non-pavement costs such as bridges, culverts, lighting, and guard rails. This cost is to be reported as a cost indexed to the year reported in the data entry for "Date of Latest (Re)Construction".

Major Improvements Since Latest (Re)Construction: Space is provided for identifying six major improvement activities by year in which they were accomplished. This does not include bridges, culverts, lighting, etc.

4. Year: The last two digits of the year in which the major improvement occurred.

5. Work Type Code: A code to identify the type of maintenance work accomplished (Appendix A, Table A.17).

6. Work Quantity: The quantity of work in appropriate units (refer to Table A.17 for units).

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

8. Total Cost: The costs for the major improvements, exclusive of non-pavement costs, reported in thousands of dollars per lane-mile.

Additional Roadway Widening Information: The following data items are applicable only if the roadway has been widened.

9. Year when Roadway Widened: The last two digits in the year (82 for 1982, etc.) when the roadway was widened. If the roadway has not been widened, enter "N".

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

11. Final Number of Lanes: The final number of lanes after the roadway has been widened. If the roadway has not been widened, enter "N".

12. Lane Number of Lane Added: Lane number added when roadway was widened. The outside lane is Lane 1, the next lane is Lane 2, etc. If the roadway has not been widened, enter "N".

PORTLAND CEMENT CONCRETE LAYERS, JOINT DATA (SHEET 5)

This sheet is to be filled out from project records for each PCC layer identified on Sheet 3, except for continuously reinforced concrete pavements (CRCP) without joints. Where dowels or other mechanical load transfer devices are not provided at joints, enter "N" in the spaces for describing these devices.

1. Layer Number: The portland cement concrete layer for which a description is being provided (from Sheet 3).

2. and 3. Average Contraction Joint Spacing: The average spacing in feet (to the nearest tenth of a foot) between consecutive contraction joints (length of the concrete slab) of the pavement under survey. A space is provided to write in a description of any Random Joint Spacing.

4. Built-in Expansion Joint Spacing: The mean spacing in feet between consecutive expansion joints of the pavement under survey. If there are no expansion joints in the original construction, enter "N".

5. Skewness of Joints: The average deviation of the contraction joint across the slab from a right angle with the edge, measured in feet per lane. If joints are not skewed, enter "N".

6. Transverse Contraction Joint Load Transfer System: The mechanism by which a portion of the moving load is transferred across the transverse contraction joint to the adjacent slab. A space is provided to write in a description of another load transfer system if different from those for which codes are provided.

7. Round Dowel Diameter: The outer diameter of the round dowel bars used as the load transfer device across a contraction joint of the pavement under survey. This number is to be entered to the nearest hundredth of an inch.

8. Dowel or Mechanical Load Transfer Device Spacing: The average center-to-center distance in inches between mechanical load transfer devices (round or I-beam dowels, star lugs, etc.) across the contraction joint of the PCC layer being described.

9. Average Intermediate Sawed Joint Spacing: The average distance between joints that have been sawed at intervals between contraction joints (called "warping joints" by some SHAs) for jointed reinforced concrete pavements. The distance is to be entered to the nearest tenth of a foot. If no intermediate sawed joints have been provided, enter "N".

10. and 11. Dimensions for I-Beam Dowel Bars: The Height and Width of I-beam dowel bars to the nearest hundredth of an inch. If I-beam dowel bars were not used, enter "N".

12. Distance of Nearest Dowel (or Mechanical Load Transfer Device) From Outside Lane-Shoulder Edge: The distance of the nearest dowel or mechanical load transfer device from the outside lane-shoulder edge to the nearest tenth of an inch.

13. Dowel Length: The mean length in inches of the round or I-beam dowel bars across contraction joints in the PCC layer being described.

14. Dowel Coating: The material covering the dowel bar surfaces when installed in the concrete slab. A space is provided to write in a description if some dowel coating was used other than those for which codes are provided.

15. Method Used to Install Mechanical Load Transfer Devices: The method used to install the dowels, I-beams, or other mechanical load transfer device. Space is provided for describing another method if the method used differs from those for which codes are provided.

PORTLAND CEMENT CONCRETE LAYERS, JOINT DATA (CONTINUED) (SHEET 6)

This sheet is for continuation of Sheet 5 to provide additional information on the joints in a PCC layer, and is to be filled out for each PCC layer identified on Sheet 3, except for CRCP pavements without joints. These additional data items are described below.

1. Layer Number: The portland cement concrete layer for which a description is being provided (from Sheet 3).

2. Method Used to Form Transverse Joints: A code to be entered which describes whether the contraction joints were constructed by sawing the hardened slab at the proper time, or by placing an insert in the slab surface while the concrete is plastic, or by any other construction method used to form the joint. Space is provided for describing another method if none of those for which codes were provided was used.

3. Type of Longitudinal Joint: A code to be entered which indicates how the longitudinal joint between the lanes was formed. Space is provided for describing another way of forming the joints if none of those for which codes are provided was used.

4. Type of Shoulder-Traffic Lane Joint: A code to be entered which describes how the joint between the concrete shoulder and the traffic lane was formed. "Tied concrete curb" indicates that a curb was provided in lieu of a shoulder. Space is provided for describing another way of forming the joints if none of those for which codes are provided was used.

5. Transverse Joint Sealant Type: The type of joint sealant used in the transverse joints. Space is provided for describing another type of sealant if none of those for which codes were provided was used.

6. and 7. Transverse Joint Sealant Reservoir: The mean as-constructed Width and Depth of the transverse joint sealant reservoir to the nearest hundredth of an inch.

8. and 9. Longitudinal Joint Sealant Reservoir: The average Width and Depth of the as-built longitudinal joint sealant reservoir to the nearest hundredth of an inch. If butt or keyed joints were used without a sealant reservoir, enter "0.00" in both of the spaces provided.

10. Tie Bar Diameter: The nominal diameter of the tie bars used across longitudinal joints between lanes entered to the nearest hundredth of an inch.

11. Tie Bar Length: The mean length in inches of the tie bars used across the longitudinal joint between the lanes.

12. Tie Bar Spacing: The mean center-to-center spacing between consecutive tie bars across the longitudinal joint between the lanes to the nearest tenth of an inch.

13. and 14. Shoulder-Traffic Lane Joint Sealant Reservoir: The average Width and Depth of the as-built joint sealant reservoir between the shoulder and traffic lane. If butt or keyed joints were used without a sealant reservoir, enter "0.00" in both of the spaces provided.

15., 16., and 17. Shoulder-Traffic Lane Joint Tie Bars: The outer Diameter of the tie bars across the joint between the shoulder and the traffic lane to the nearest hundredth of an inch, the mean Length of the tie bars to the nearest inch, and the average center-to-center distance (Spacing) in inches between consecutive tie bars across the concrete shoulder-traffic lane joint. If no concrete shoulder exists, enter "N" for these data entry spaces.

PORTLAND CEMENT CONCRETE LAYERS, REINFORCING STEEL DATA (SHEET 7)

This sheet is to be filled out from project records for each reinforced PCC layer identified on Sheet 3.

1. Layer Number: The reinforced portland cement concrete layer for which a description is being provided (from Sheet 3).

2. Type of Reinforcing: The type of reinforcing used in the PCC layer being described. A space is provided for entering a written description of a reinforcing type other than deformed bars or welded wire fabric.

3. Transverse Bar Diameter: The nominal diameter of the transverse bars to the nearest hundredth of an inch.

4. Transverse Bar Spacing: The mean center-to-center spacing between transverse bars to the nearest tenth of an inch.

5. Longitudinal Bar Diameter: The nominal diameter of the longitudinal bars to the nearest hundredth of an inch.

6. Design Percentage of Longitudinal Steel: The percentage of reinforcing steel of the PCC cross-section required in the design to the nearest hundredth of one percent.

7. Depth to Reinforcement From Slab Surface: The mean depth (to the nearest tenth of an inch) of the concrete cover over the reinforcing steel.

8. Longitudinal Bar Spacing: The mean center-to-center spacing between longitudinal bars to the nearest tenth of an inch.

9. Yield Strength of Reinforcing: The mean yield strength of the reinforcing steel of the bars to the nearest tenth of a kip per square inch. If tests were not conducted for the steel used, enter the minimum yield strength allowed for the grade of steel used.

10. Method Used to Place Reinforcement: The method used to install reinforcing steel bars or wire fabric during pavement construction. These methods include presetting the reinforcement on chairs, placing it mechanically by means of special equipment used for that purpose, or by

placing them between layers of concrete. A space is also provided to describe another method of placement if a code was not provided for the method used.

11. Lap Length of Longitudinal Steel Splices: The length to the nearest inch of the longitudinal reinforcing steel overlap at a CRCP construction joint. If the rigid pavement is not CRCP, enter "N".

PORTLAND CEMENT CONCRETE LAYERS, MIXTURE DATA (SHEET 8)

This data sheet is to be filled out from project records for each PCC layer identified on Sheet 3.

1. Layer Number: The portland cement concrete layer for which a description is being provided (from Sheet 3).

2., 3., 4., and 5. Mix Design: The oven dry weights in pounds of Coarse Aggregate, Fine Aggregate, Cement, and the weight of Water provided by the mix design for a cubic yard of concrete.

6. Type Cement Used: The type of cement used in the slab concrete. These cement type codes appear in Table A.11 in Appendix A.

7. Alkali Content of Cement: The alkali content of the cement to the nearest tenth of one percent.

8., 9., and 10. Entrained Air Content: The Mean, Minimum, and Maximum values of entrained air (percent of mixture volume) as measured (by Test Methods AASHTO T121, AASHTO T152, AASHTO T196, ASTM C138, ASTM C173, or ASTM C231) during construction to the nearest tenth of one percent.

11., 12., and 13. Admixtures: The Types and Amounts (in percent by weight of cement to the nearest thousandth) of admixtures used in the concrete. The codes for concrete admixtures appear in Table A.12 in Appendix A, and space has been provided for identifying an admixture type for which a code was not provided.

14., 15., 16., 17., and 18. Slump: The Mean of the slump measurements made, the Maximum and Minimum values, the Standard Deviation from the mean, all to the nearest tenth of an inch, and the Number of Tests from which the values are obtained. The slump test is described in AASHTO T119 or ASTM C143. The maximum and minimum values and standard deviation of slump should be left blank if only one test result is available. The equation for standard deviation is given in Appendix B.

PORTLAND CEMENT CONCRETE LAYERS, MIXTURE DATA (CONTINUED) (SHEET 9)

This data sheet is to be filled out from project records for each PCC layer identified on Sheet 3.

1. Layer Number: The portland cement concrete layer for which a description is being provided (from Sheet 3).

2., 3., and 4. Composition of Coarse Aggregate: The types and percentages by weight of up to three separate materials in the coarse aggregate (that portion of an aggregate retained on the No. 4 sieve) used in the concrete mix. Space is provided for description of another type if none of the types for which codes are provided were used. Where only one type of material was used, enter its type code and 100 in the top set of data spaces, leaving the others blank.

5. Geologic Classification of Coarse Aggregate: The geologic classification of the natural stone used as coarse aggregate in the concrete. These codes appear in Table A.9 and provide identification as to which of the three major classes of rock the coarse aggregate belongs to and the type of rock within those classes. If a "blend" was used, enter the code for the geological classification for the material representing the majority of the coarse aggregate. If a "crushed slag", "manufactured lightweight", or "recycled concrete" was used as course aggregate, enter "N".

6., 7., and 8. Composition of Fine Aggregate: The types and percentages by weight of materials in the fine aggregate (passing the No. 4 sieve and retained on the No. 200 sieve). Space is provided for identifying another type if none of those for which codes are provided was used. Where only one type of material was used, enter its type code and 100 in the top set of data spaces, leaving the others blank.

9. Insoluble Residue: The percentage of insoluble residue (non-carbonate material) as determined using ASTM D3042.

10. Gradation of Coarse Aggregate: The percent of course aggregate passing various standard sieve sizes to the nearest one percent. It is not expected that values will be available for all sieve sizes shown - the objective is to provide sufficient sieve sizes to accommodate testing and specification practices for most agencies.

11. Gradation of Fine Aggregate: The percent of fine aggregate passing various standard sieve sizes to the nearest one percent. It is not expected that values will be available for all sieve sizes shown - the objective is to provide sufficient sieve sizes to accommodate testing and specification practices for most agencies.

12. and 13. Bulk Specific Gravities: The mean bulk specific gravities (to the nearest thousandth) for coarse aggregate and fine aggregate. The bulk specific gravities for the aggregate fractions are measured using these laboratory procedures: a) Coarse Aggregate - AASHTO T85 or ASTM C127, and b) Fine Aggregate - AASHTO T84 or ASTM C128.

PORTLAND CEMENT CONCRETE LAYERS, MIXTURE DATA (CONTINUED) (SHEET 10)

This data sheet is for continuation of the data on Sheet 9, and is to be filled out for each PCC layer identified on Sheet 3. These additional data entries are discussed below.

1. Layer Number: The portland cement concrete layer for which a description is being provided (from Sheet 3).

2. Type of Paver Used: A code to indicate whether a slip-form or side-form paver was used to place the concrete. The codes appear on the data sheet along with a space to describe a different type not listed. Enter "N" if a paver was not used (i.e., roller compacted concrete).

3., 4., 5., and 6. Aggregate Durability Test Results: The type of durability tests used and the results in tenths recorded in units specified for the test. Three of these sets are for coarse and one for the combination of coarse and fine aggregates. The durability test type codes and the units for reporting appear in Table A.13.

7. Method Used to Cure Concrete: The method used to cure the concrete pavement. Space is provided for identifying another curing method if none of those with codes was used.

8. Method Used to Texture Concrete: A code to indicate how the concrete surface was textured. Space is provided for identifying another texturing method if none of those with codes was used.

9., 10., 11., 12., and 13. Elastic Modulus: The Minimum, Maximum, Mean, and Standard Deviation of elastic moduli of the concrete in kips per square inch and the Number of Tests performed. The elastic moduli can be obtained either through compression testing of cylindrical samples collected and tested during construction, or through relationships published by the ACI and others relating elastic modulus to compressive strength. In the event that only one test result is available, enter it as the "mean value". The standard deviation should be left blank unless at least four test results are available. See Appendix B for standard deviation equation. The ACI formula in general use (ACI 318 - 83, Section 8.5) is:

$$E_c = 57{,}000\ (f_c)^{1/2} \qquad (2.1)$$

where:

E_c = Modulus of Elasticity, psi

f_c = 28-Day Compressive Strength, psi

14. Method for Determination of Elastic Modulus: The test method used for measuring the elastic modulus of the mix; ASTM C469 (drilled core specimens), ASTM C469 (molded cylinders), ACI (Equation 2.1 above) or some other test procedure.

PORTLAND CEMENT CONCRETE LAYERS, STRENGTH DATA (SHEET 11)

This data sheet is used to provide strength data on cylinders or beams molded from plastic concrete during construction, and is to be filled out for each PCC layer identified on Sheet 3. These data entries are discussed below.

1. Layer Number: The portland cement concrete layer for which a description is being provided (from Sheet 3).

2. to 8. Flexural Strength: The Type of Test (third-point or center-point loading), the Age of the sample at testing, the Number of Tests performed, and the Minimum, Maximum, Mean, and Standard Deviation of flexural strength tests, in psi. Testing for SHRP LTPP test sections which are to be built after 1988 should be done using third-point loading (AASHTO T97 or ASTM C78). The standard deviation of the flexural strength is to be calculated as shown in Appendix B.

9. to 14. Compressive Strength: The Age of sample at testing, the Number of Tests performed, and the Minimum, Maximum, Mean, and Standard Deviation of compressive strength in psi, measured according to AASHTO T22 or ASTM C39. See Appendix B for standard deviation equation.

15. to 20. Splitting Tensile Strength: The Age of the sample at testing, the Number of Tests, and the Minimum, Maximum, Mean, and Standard Deviation of splitting tensile strength in psi, measured according to AASHTO T198 or ASTM C496. See Appendix B for standard deviation equation.

PLANT MIXED ASPHALT BOUND LAYERS, AGGREGATE PROPERTIES (SHEET 12)

This sheet is to be filled out from project records for each asphalt concrete layer identified on Sheet 3 that is thicker than 0.75 inches. Detailed mixture data is not considered necessary for thin seal coats, porous friction treatments, etc. Although various SHAs discriminate between fine and coarse aggregates on the basis of different sieve sizes, the following definition (Ref. 20) is to be applied for SHRP studies: All aggregate retained on the No. 8 sieve is coarse aggregate and all aggregate passing the No. 8 sieve is fine aggregate. "Mineral filler" is defined (ASTM D242) as that portion passing the No. 30 sieve (at least 95 percent must pass the No. 50 sieve and at least 70 percent must also pass the No. 200 sieve).

1. Layer Number: The asphalt concrete layer for which a description is being provided (from Sheet 3).

2., 3., and 4. Composition of Coarse Aggregate: The type and percentage by weight of materials in the coarse aggregate used in the asphalt concrete mix. Space is provided for identifying a type of coarse aggregate other than those with codes. Where only one type of material is used, enter the type code and 100 in the top set of data spaces, leaving the others blank.

5. Geologic Classification of Coarse Aggregate: The geologic classification of the natural stone used as coarse aggregate in the concrete. These codes appear in Table A.9 and provide identification as to which of the three major classes of rock the coarse aggregate belongs to and the type of rock within those classes. If a "blend" was used, enter the code for the geological classification for the material representing the majority of the coarse aggregate. If a "crushed slag", "manufactured lightweight", or "recycled concrete" was used as course aggregate, enter "N".

6., 7., and 8. Composition of Fine Aggregate: The type and percentage by weight of materials in the fine aggregate (passing the No. 8

sieve and retained on the No. 200 sieve). Space is provided for identifying another type if none of those for which codes are provided was used. Where only one type of material was used, enter its type code and 100 in the top set of data spaces, leaving the others blank.

9. Type of Mineral Filler: The type of mineral filler used. The codes appear on the data sheet, including space for entering some other type for which a code has not been provided.

10., 11., 12., and 13. Aggregate Durability Test Results: The type of durability tests used and the results in tenths recorded in units specified for the test. Three of these sets are for coarse and one for the combination of coarse and fine aggregates. The durability test type codes appear in Table A.13.

14. Polish Value of Coarse Aggregates: The accelerated polish value of the coarse aggregates used in the surface layer, as determined by AASHTO T279 (ASTM D3319).

PLANT MIXED ASPHALT BOUND LAYERS, AGGREGATE PROPERTIES (CONTINUED) (SHEET 13)

This data sheet is for continuation of data on Sheet 12, and is to be filled out for each AC layer identified on Sheet 3. These additional data items are described below.

1. Layer Number: The asphalt cement concrete layer for which a description is being provided (from Sheet 3).

2. Gradation of Combined Aggregates: The percent passing on various standard sieve sizes to the nearest one percent. It is not expected that values will be available for all eighteen sieve sizes; the object is to provide sufficient sieve sizes to accommodate testing and specification practice for most agencies.

3., 4., 5., and 6. Bulk Specific Gravities: The mean bulk specific gravities (to the nearest thousandth) for coarse aggregate, fine aggregate, mineral filler, and the aggregate combination. The bulk specific gravities for the aggregate fractions are measured using the laboratory procedures indicated below:

a. Coarse Aggregate - AASHTO T85 or ASTM C127
b. Fine Aggregate - AASHTO T84 or ASTM C128
c. Mineral Filler - AASHTO T100 or ASTM D854

The bulk specific gravity for the aggregate combination (usually called simply "bulk specific gravity of aggregate") is calculated as follows (Ref. 19):

$$G_{sb} = \frac{P_1 + P_2 + P_3}{P_1/G_1 + P_2/G_2 + P_3/G_3} \qquad (2.2)$$

where:

G_{sb} = Bulk specific gravity for the total aggregate

P_1, P_2, P_3 = Percentages by weight of coarse aggregate, fine aggregate, and mineral filler

G_1, G_2, G_3 = Specific gravities of coarse aggregates, fine aggregates, and mineral filler

7. Effective Specific Gravity of Aggregate Combination: The mean calculated effective specific gravity to the nearest thousandth. This calculation requires the maximum specific gravity (no air voids) of the paving mixture, which is obtained by Test Method AASHTO T209 or ASTM D2041. The effective specific gravity of the aggregate is calculated as follows (Ref. 19):

$$G_{se} = \frac{100 - P_b}{100/G_{mm} - P_b/G_b} \qquad (2.3)$$

where:

G_{se} = Effective specific gravity of aggregate

P_b = Asphalt cement, percent by total weight of mixture

G_b = Specific gravity of asphalt

G_{mm} = Maximum specific gravity of paving mixtures (no air voids)

PLANT MIXED ASPHALT BOUND LAYERS, ASPHALT CEMENT PROPERTIES (SHEET 14)

This data sheet is to be filled out from project records for each asphalt concrete layer identified on Sheet 3 that is thicker than 0.75 inches.

1. Layer Number: The asphalt concrete layer to be described on this sheet (from Sheet 3).

2. Asphalt Grade: The grade of asphalt cement used (See Table A.16). Space is provided on the data sheet for identifying another grade of asphalt cement not appearing in Table A.16.

3. Source: The source for the asphalt cement. A list of asphalt refiners and processors is provided in Table A.14, Appendix A as taken from the Oil and Gas Journal, March 24, 1986. Space is provided to specify other sources which may not be included in the table provided.

4. Specific Gravity of Asphalt Cement: The mean specific gravity of the asphalt cement (to the nearest thousandth) when it is available. If unavailable, a typical specific gravity for asphalt cements produced at the source refinery may be entered. If source is unknown, enter 1.010 as a reasonable estimate. This specific gravity is measured as specified by AASHTO T228 (or ASTM D70).

<u>Original Asphalt Cement Properties</u>: The following data items should be provided when available for the original asphalt cement, tested prior to its use in the construction.

5. <u>Viscosity of Asphalt at 140 °F</u>: The results in poise from kinematic viscosity testing using Test Method AASHTO T202 (or ASTM D2171) on samples of the original asphalt cement prior to its use in construction of the pavement section.

6. <u>Viscosity of Asphalt at 275 °F</u>: The results in centistokes (to the nearest hundredth) from absolute viscosity testing using Test Method AASHTO T201 (or ASTM D2170) on samples of the original asphalt cement.

7. <u>Penetration at 77 °F</u>: The penetration (in tenths of a millimeter) from testing the original asphalt cement in the mixture at 77 °F, using a 100 gram load and a five-second load duration with Test Method AASHTO T49 (or ASTM D5) on samples of the original asphalt cement material.

8. and 9. <u>Type of Asphalt Modifiers</u>: Codes to identify up to two modifiers added to the asphalt cement for whatever purpose. A list of possible asphalt cement modifiers and codes for data entry are provided on Table A.15, Appendix A. If a material other than those listed in Table A.15 is used, space is provided to record the pertinent information. If no modifier was used, enter "N".

<u>Quantity of Asphalt Modifier</u>: The quantities of modifier in <u>percent of asphalt cement weight</u>. Some modifiers (such as lime) may be specified in terms of "percent of aggregate weight", but they must be converted to percent of asphalt cement weight for uniformity. Space is provided for up to two types of modifiers. If no modifier was used, enter "N".

10. Ductility at 77 °F: The ductility in centimeters as measured by Test Method AASHTO T51 at 77 °F (or ASTM D113).

11. Ductility at 39.2 °F: The ductility in centimeters of the original asphalt cement material at 39.2 °F, using the procedures of Test Method AASHTO T51 (or ASTM D113).

12. Test Rate for Ductility Measurement at 39.2 °F: The test speed in centimeters per minute for the ductility measurement taken at 39.2 °F.

13. Penetration at 39.2 °F: The penetration value using a 200 gram weight and 60 second loading duration, tested in accordance with Test Method AASHTO T49 (or ASTM D5) on samples of the original asphalt cement, prior to its use as a construction material.

14. Ring and Ball Softening Point: The softening point of the asphalt cement in degrees Farenheit as measured with the ring-and-ball apparatus used in Test Method AASHTO T53, on samples of the original asphalt cement prior to its use as a construction material.

PLANT MIXED ASPHALT BOUND LAYERS, ASPHALT CEMENT PROPERTIES (CONTINUED) (SHEET 15)

This data sheet is for continuation of the data on Sheet 14, and is to be filled out for each asphalt concrete layer identified on Sheet 3 that is thicker than 0.75 inches. These additional data entries are discussed below.

1. Layer Number: The asphalt concrete layer for which a description is being provided (from Sheet 3).

Laboratory Aged Asphalt Cement Properties: The following data items should be provided for laboratory aged asphalt cement samples, using virgin asphalt cement samples aged in accordance with the provisions of

Test Method AASHTO T179 (or ASTM D1754) or Test Method AASHTO T240 (or ASTM D2872). Space is provided on the data sheet to indicate the aging process used, if other than those stated above.

2. Test Procedure Used to Measure Aging Effects: The test procedure used to "age" the asphalt cement in the laboratory, and to measure the effects of the aging.

3. Viscosity of Asphalt at 140 °F: The mean of the results in poise from viscosity testing on laboratory aged asphalt cement samples using Test Method AASHTO T202 (or ASTM D2171).

4. Viscosity of Asphalt at 275 °F: The mean of the results in centistokes (to the nearest hundredth) from viscosity testing using Test Method AASHTO T201 (or ASTM D2170) on laboratory aged asphalt cement samples.

5. Ductility at 77 °F: The mean ductility in centimeters as measured by Test Method AASHTO T51 (or ASTM D113) on laboratory aged samples of the asphalt cement.

6. Ductility at 39.2 °F: The mean ductility in centimeters of laboratory aged asphalt specimens at 39.2 °F, using the procedures of Test Method AASHTO T51 (or ASTM D113).

7. Test Rate for Ductility Measurement at 39.2 °F: The test rate to the nearest tenth of a centimeter per minute for ductility determination at 39.2 °F.

8. Penetration at 77 °F: The mean penetration (in tenths of millimeters) from testing the asphalt cement used in the mixture at 77 °F, using a 100 gram load and a 5 second load duration, in accordance with Test Method AASHTO T49 (or ASTM D5).

9. Penetration at 39.2 °F: The results in mean penetration (in tenths of millimeters) from testing the asphalt cement used in

the mixture at 39.2 °F, using a 200 gram load and 60 second load duration, in accordance with Test Method AASHTO T49 (or ASTM D5).

10. Ring and Ball Softening Point: The mean of the results in °F from the ring and ball softening point test for bitumens (AASHTO T53).

11. Weight Loss: The mean weight loss resulting from the laboratory aging process to the nearest one-tenth of one percent.

PLANT MIXED ASPHALT BOUND LAYERS, ORIGINAL MIXTURE PROPERTIES (SHEET 16)

This data sheet is to be filled out from project records for each asphalt concrete layer identified on Sheet 3 that is thicker than 0.75 inches.

The following data items are to be derived from tests conducted on the mixture during or soon after construction. Calculations for calculated values (i.e., percent air voids) should be made separately for individual samples, using data applicable to those samples.

The test samples can be compacted in the laboratory after sampling in the field, or obtained by coring, cutting, or sawing after the mixture is compacted in place. In the event that both types of samples are tested, separate data sheets should be filled out for those compacted in the laboratory and those compacted in the field. Although tests are to be conducted on core samples from the field for SHRP LTPP (and reported on other data sheets), data from project files should be entered when available.

1. Layer Number: The asphalt concrete layer to be described on the sheet (from Sheet 3).

2. Type of Samples: A code to indicate whether the test samples were sampled in the field and compacted in the laboratory, or removed from the compacted pavement. The codes appear on the data sheet.

3. The Maximum Specific Gravity (no air voids) of a mixture sampled during or soon after construction, as an average from testing of several samples according to AASHTO 209 or ASTM D2041. When possible, several samples should be tested and the average entered. The resulting maximum specific gravity and the design asphalt content for the mixture should be used to calculate the effective specific gravity of aggregate using Equation 2.4 below. Once the effective specific gravity of the aggregate is established, it may be used to calculate other maximum specific gravities for the mixture at other measured asphalt contents using Equation 2.5 below (Ref. 19):

$$G_{se} = \frac{100 - P_b}{100/G_{mm} - P_b/G_b} \tag{2.4}$$

$$G_{mm} = \frac{100}{P_s/G_{se} + P_b/G_b} \tag{2.5}$$

where:

G_{mm} = Maximum specific gravity of paving mixture (no air voids)

P_s = Aggregate, percent by total weight of mixture

P_b = Asphalt, percent by total weight of mixture

G_{se} = Effective specific gravity of aggregate

G_b = Specific gravity of asphalt

These calculated values of maximum specific gravity are not to be entered into the data base, but will be needed to calculate the percent air voids for measured asphalt contents for individual extractions on cores.

4., 5., and 6. Bulk Specific Gravity: The Number of Tests and the Minimum, Maximum, Mean, and Standard Deviation of bulk specific gravities (to the nearest thousandth) of compacted mixtures measured on cores removed from the pavement during or right after construction. While the test method specified in ASTM D1188 is preferable, the results from nuclear density tests (ASTM D2950), appropriately calibrated to measurements on cores, may also be used. See Appendix B for standard deviation equation.

7., 8., and 9. Asphalt Content: The Number of Samples and the Minimum, Maximum, Mean, and Standard Deviation of percents by weight of the total asphalt cement (including that absorbed by the aggregate) in the asphalt concrete mixture to the nearest one-tenth of a percent. Asphalt contents measured by extraction tests (AASHTO T164) on field samples are preferred, but results from nuclear test methods may also be used. If no such test results are available, enter the specified asphalt content as the mean, and leave the other spaces blank. See Appendix B for the standard deviation equation.

10., 11., and 12. Percent Air Voids: The Number of Samples and the Minimum, Maximum, Mean, and Standard Deviation of calculated air voids (to the nearest tenth of a percent) as a percent of the material volume. This data is frequently not available, but can be calculated using other available data from reports on mix design and density measurements on samples from the pavement. Percent air voids is calculated as follows (Ref. 19):

$$P_a = 100 \frac{G_{mm} - G_{mb}}{G_{mm}} \qquad (2.6)$$

where:

P_a = Air voids in compacted mixture, percent of total volume

G_{mm} = Maximum specific gravity of paving mixture (zero air voids) as determined by ASTM Method D2041

G_{mb} = Bulk specific gravity of compacted mixture

See Appendix B for standard deviation equation.

13. Voids in Mineral Aggregate: The mean void space between the aggregate particles of a compacted asphalt concrete mixture, which includes air voids and the effective asphalt content, to the nearest one-

tenth of one percent. Percent of voids in mineral aggregate (VMA) is calculated as follows (Ref. 19):

$$VMA = 100 - \frac{G_{mb} P_s}{G_{sb}} \qquad (2.7)$$

where:

VMA = Voids in mineral aggregate (percent of bulk volume)

G_{sb} = Bulk specific gravity of aggregate

G_{mb} = Bulk specific gravity of compacted mixture (ASTM D2726)

P_s = Aggregate, percent by total weight of mixture
= 100 - (percent of asphalt cement by total weight of mixture)

14. <u>Effective Asphalt Content</u>: The mean effective asphalt content (total asphalt content of the paving mixture minus the mean portion of asphalt that is lost by absorption into the aggregate particles), expressed by weight of total mixture to the nearest one-tenth of one percent. The asphalt absorption may be calculated as a percent of total weight of mixture as follows (Ref. 19):

$$P_{ab} = P_{ba} P_s = \frac{G_{se} - G_{sb}}{G_{sb} G_{se}} G_b P_s \qquad (2.8)$$

where:

P_{ab} = Absorbed asphalt, percent by weight of total mixture

P_{ba} = Absorbed asphalt, percent by weight of <u>aggregate</u>

P_s = Aggregate, percent by total weight of mixture

G_{se} = Effective specific gravity of aggregate

G_{sb} = Bulk specific gravity of aggregate

G_b = Specific gravity of asphalt

15. Marshall Stability: The mean Marshall Stability (Test Method AASHTO T245 or ASTM D1559) in pounds for the mixture during laboratory mix design.

16. Number of Blows: The number of blows of the compaction hammer that were applied to each end of the specimen during laboratory compaction.

17. Marshall Flow: The mean Marshall Flow (average of measured results) as the whole number of hundredths of an inch measured by Test Method AASHTO T245 (or ASTM D1559) for the mixture during the laboratory mix design (i.e., measure 0.15 inch - enter "15.").

18. Hveem Stability: The mean Hveem Stability or "stabilometer value" as measured with the Hveem apparatus using Test Method AASHTO T246 (or ASTM D1561).

19. Hveem Cohesiometer Value: The cohesiometer value, in grams per 25 mm width (or diameter) of specimen, obtained by Test Method AASHTO T246 (or ASTM D1561).

PLANT MIXED ASPHALT BOUND LAYERS, ORIGINAL MIXTURE PROPERTIES (CONTINUED) (SHEET 17)

This data sheet provides for continuation of the data on Sheet 16, and is to be filled out for each asphalt concrete layer identified on Sheet 3. These additional data entries are discussed below.

1. Layer Number: The asphalt concrete layer for which a description is being provided (from Sheet 3).

2. Type Asphalt Plant: The type of plant that produced the asphalt concrete mixture. Codes are provided on the data sheet.

3. Type of Antistripping Agent: The type of antistripping agent used in the mixture. The codes are provided in Table A.21 in Appendix A.

4. and 5. Amount of Antistripping Agent: A code to indicate whether the antistripping agent is liquid or solid. Also, the amount of antistripping agent used in the mixture by weight to the nearest tenth of a percent of weight of asphalt if the agent is liquid and weight of aggregate if it is solid.

6. Moisture Susceptibility Test Type: The type of moisture susceptibility test used during the test program. If a procedure other than those provided was used, space is provided to specify a name or reference for the test.

7., 8., 9., and 10. Moisture Susceptibility Test Results: The mean Hveem Stability Number or Percent Stripped and the Tensile Strength Ratio or Index of Retained Strength. Space is provided to record these results in varying forms, depending on the test procedure used.

PLANT-MIXED ASPHALT BOUND LAYERS, CONSTRUCTION DATA (SHEET 18)

This sheet is to be filled out from project records for each asphalt concrete layer identified on Sheet 3 that is thicker than 0.75 inches.

1. Layer Number: The asphalt concrete layer for which the compaction data is to be described on this sheet (from Sheet 3).

2. Mean Mixing Temperature: The mean temperature of the mixture during mixing at the plant in ^{o}F.

3., 4., and 5. Laydown Temperatures: The Number of Temperature Measurements taken and the Minimum, Maximum, Mean, and Standard Deviation of temperatures measured. See Appendix B for the standard deviation equation.

6. to 31. <u>Compaction Data</u>: Spaces are provided to enter the following for each asphalt concrete lift:

A. Description of the roller used (code from data sheet) and number of coverages for breakdown, intermediate, and final compactions. A "coverage" in this case is defined as one trip of the roller across the pavement.

B. Mean air temperature in ^{o}F while compaction is accomplished.

C. The mean compacted thickness in inches to the nearest tenth.

D. The mean curing period in hours before a new lift is placed or opened to traffic.

Codes appear on the data sheet for steel-wheeled tandem, pneumatic-tired, single-drum vibratory, and double-drum vibratory rollers. For each type of roller, spaces are provided to describe significant characteristics for up to four different rollers. Steel-wheeled tandem rollers are described by their gross weights to the nearest tenth of a ton. Pneumatic-tired rollers are described by their gross weight and mean tire pressure in psi. Vibratory rollers are described by their gross weight in tons to the nearest tenth, frequency in vibrations per minute, amplitude in inches to the nearest thousandth, and roller speed in miles per hour to the nearest tenth of a mile.

If compaction data is unavailable, enter "U" in these spaces. If partial data is available, fill in the available data and enter a "U" where data is not available, but would be applicable. Enter "N" in spaces that are not applicable (i.e., if there was no fourth lift, enter "N" in its spaces). Use only the "roller descriptions and codes" required.

UNBOUND OR STABILIZED BASE OR SUBBASE MATERIAL DESCRIPTION (SHEET 19)

This data sheet is to be filled out from project records for each base or subbase layer identified on Sheet 3. Note that a stabilized subgrade (treated with lime, cement, asphalt, etc.,) is considered to be subbase and entries for this layer should be made on this data sheet and the next.

1. Layer Number: The base or subbase layer to be described on this sheet (from Sheet 3).

2. AASHTO Soil Classification: The AASHTO soil classification for the base or subbase material (before stabilization). The code numbers appear in Appendix A, Table A.10.

3. Atterberg Limits: The plasticity index (PI), liquid limit (LL), and plastic limit (PL) determined by AASHTO T90 and T89 or ASTM D4318.

4. Maximum Lab Dry Density: The maximum laboratory dry density in pounds per cubic foot for the base or subbase material in the layer of interest.

5. Optimum Lab Moisture Content: The optimum moisture content obtained in the laboratory to the nearest one-tenth of a percent for the base or subbase layer.

6. Test Used to Measure Maximum Dry Density: The test method used to establish the maximum dry density and optimum moisture content. Space is provided for identifying another test method used, if different from the listed test methods.

7. Compactive Energy for "Other" Method: The compactive energy in foot-pounds per cubic inch applied if some test method was used other than those listed under Item 6, above. If the test method used was listed under Item 6, above, this space is to be left blank.

8., 9., and 10. In Situ Dry Density (PCF): The Number of Samples tested, and the Minimum, Maximum, Mean, and Standard Deviation of field measurements of dry density in pounds per cubic foot for the base or subbase layer. See Appendix B for standard deviation equation.

11., 12., and 13. In Situ Moisture Content: The Number of Samples tested, and the Minimum, Maximum, Mean, and Standard Deviation of field measurements of base or subbase moisture in percent of dry weight of the material. This moisture content data is to be based on the same tests as for the dry density data in Items 8 - 10, above. See Appendix B for standard deviation equation.

14. and 15. Gradation of Base or Subbase Material (Coarse and Fine Aggregates): The percentage of material passing on various standard sieve sizes to the nearest one percent. It is not expected that values will be available for all seventeen sieve sizes; the object is to provide sufficient sieve sizes to accommodate testing practices for most agencies.

UNBOUND OR STABILIZED BASE OR SUBBASE MATERIAL DESCRIPTION (CONTINUED) (SHEET 20)

This data sheet is for continuation of the data on Sheet 19, and is to be filled out for each base or subbase layer identified on Sheet 3. These additional data entries are discussed below.

1. Layer Number: The base or subbase layer for which a description is being provided (from Sheet 3).

2. and 3. Type and Percent Stabilizing Agent (for Stabilized Layers Only): The types of stabilizing agents and the average percent of each by dry weight of soil mixed into the base or subbase material in the layer of interest. An average of measured percentages should be used whenever available. If percentages have not been measured, the specified percentage should be entered. If neither measured nor specified data are available, but the layer is known to have been stabilized, a percentage should be estimated based on practice at the time the stabilized base or

subbase layer was constructed. If only one stabilizing agent was used, leave the spaces for "Stabilizing Agent 2" blank. If the base or subbase material was not stabilized, enter "N". Codes are provided on the data sheet for stabilizing agents commonly in use and space is provided to identify an agent not listed.

4. Admixture: The type of admixture and the percent added by weight of the base or subbase material, as measured by ASTM D4373.

5., 6., and 7. Compressive Strength: The Number of Tests performed and the Minimum, Maximum, Mean, and Standard Deviation of compressive strength in psi. See Appendix B for standard deviation equation.

8. Type of Compression Test: The type of compressive test used. Codes are provided on the data sheet.

9. Confining Pressure: The confining pressure applied during the compressive strength test. If the test is unconfined, enter "0.0".

10. Calcium Carbonate Content: The percent by weight of the base or subbase material that is composed of calcium carbonate, as determined by ASTM D4373.

11. California Bearing Ratio (CBR): The mean CBR-value as determined by Test Method AASHTO T193 or ASTM D3668.

12. Resistance (R-Value): The mean R-Value as determined by Test Method ASTM D2844.

13. and 14. Modulus of Subgrade Reaction (k-Value): The mean k-Value in pci (pounds per square inch per inch of deflection) measured at the top of the base or subbase after is is compacted in place, and the Type of Test used. Either the repeated load test (AASHTO T221 or ASTM D1195) or the static load test (AASHTO T222) may be used.

SUBGRADE DATA (SHEET 21)

This data sheet is for entering subgrade data from project records, and is to be filled out for each test section. If there are substantial variations in subgrade characteristics throughout the project, additional subgrade data sheets should be provided for each subgrade type. Location information, such as station boundaries, should be provided on these extra data sheets underneath the SHRP Section ID data item. Note that a portion of subgrade that is treated (or stabilized) with lime, cement, asphalt, or such agents, is considered to be a subbase layer and its details should be reported on other data sheets provided for bases and subbases.

As variations in soil type with depth are common (especially where a select fill has been used as an embankment), judgement will be required in selecting subgrade soil samples for testing. Some considerations include: 1) relative thicknesses of soil strata that differ in general characteristics and 2) depth. Subgrade soils near the surface will generally have more of an effect on pavement performance than soils at a greater depth.

1. AASHTO Soil Classification: The AASHTO Soil Classification for the subgrade material. These codes are provided in Appendix A, Table A.10.

2. CBR: The California Bearing Ratio (CBR) for the subgrade soil (Test Method AASHTO T193 or ASTM D3668).

3. Resistance (R-Value): The mean resistance R-value as determined by test method AASHTO T190 or ASTM D2844.

4. and 5. Modulus of Subgrade Reaction (k-Value): The mean modulus of subgrade reaction in pci (pounds per square inch per inch of deflection) for the in situ subgrade, and the Type of Test used. Either the repeated load test (AASHTO T221 or ASTM D1195) or the static load test (AASHTO T222 or ASTM D1196) may be used.

6. Percent Passing No. 40 Sieve: The average of percentages passing the No. 40 sieve from available sieve test results for samples from the first five feet of subgrade. Enter to the nearest tenth of one percent.

7. Percent Passing No. 200 Sieve: The average of percentages passing the No. 200 sieve from available sieve test results for samples from the first five feet of subgrade. Enter to the nearest tenth of one percent.

8. Plasticity Index: The average of plasticity indices measured for samples from the first five feet of the subgrade (Test Methods AASHTO T90 or ASTM D4318).

9. Liquid Limit: The average of the liquid limits measured for samples from the first five feet of subgrade (Test Methods AASHTO T89 or ASTM D4318).

10. Maximum Laboratory Dry Density: The maximum laboratory dry density in pounds per cubic foot for the subgrade material.

11. Optimum Laboratory Moisture Content: The optimum moisture content obtained in the laboratory to the nearest one-tenth of a percent for the subgrade.

12. Test Used to Measure Maximum Dry Density: A code to indicate whether standard AASHTO, modified AASHTO, or some other test method was used to establish the maximum dry density and optimum moisture content.

13. Compactive Energy for "Other" Method: The compactive energy in foot-pounds per cubic inch applied if some test method was used other than standard AASHTO or modified AASHTO. If standard or modified AASHTO was used, leave this space blank.

14., 15., and 16. In Situ Dry Density: The Number of Tests conducted, and the Minimum, Maximum, Mean, and Standard Deviation of field measurements of dry density in place for the subgrade as a percentage of the maximum lab dry density. See Appendix B for standard deviation equation. In situ dry density may be measured successfully by several procedures; including the "rubber-balloon method" (AASHTO T205), the "sand-cone method" (AASHTO T191), or "nuclear methods" (AASHTO T238).

17., 18., and 19. In Situ Moisture Content: The Number of Tests conducted, and the Minimum, Maximum, Mean, and Standard Deviation of field measurements of subgrade moisture content as a percent of the optimum moisture content obtained in the laboratory. This moisture content data is to be based on the same tests as for the dry density data above. Values should be recorded to the nearest tenth of a percent.

20., 21., and 22. In Situ Dry Density: The Number of Tests conducted, and the Minimum, Maximum, Mean, and Standard Deviation of field measurements of dry density in pounds per cubic foot for the subgrade. See Appendix B for standard deviation equation. This data item need not be entered if both the maximum laboratory dry density and the in situ dry density as a percent of maximum have been reported.

23., 24., and 25. In Situ Moisture Content: The Number of Tests conducted, and the Minimum, Maximum, Mean, and Standard Deviation of field measurements of subgrade moisture in percent of dry weight of the material. This moisture content data is to be based on the same tests as for the dry density data above, and need not be entered if the optimum laboratory moisture content and the in situ moisture content as a percent of optimum have been reported. Values should be recorded to the nearest tenth of a percent.

SUBGRADE DATA (CONTINUED) (SHEET 22)

This data sheet is for continuation of the data on Sheet 21 and should be completed for each test section.

1., 2., 3., and 4. Relative Density of Cohesionless Free-Draining Soil: For cohesionless free-draining soils only: 1) minimum and maximum densities in pcf (to the nearest tenth) as determined by Test Method ASTM D2049 (Measured Density), 2) mean relative density in percent (to the nearest tenth) and number of tests conducted, 3) minimum and maximum mean relative densities in percent (to the nearest tenth) and 4) standard deviation of relative density in percent (to the nearest tenth). The calculated relative densities and standard deviation of relative density are related to the "in situ dry densities" in pcf recorded on Sheet 20, and are calculated using those field densities and the minimum and maximum densities from Test Method D2049.

If the subgrade soil has more than 12 percent by weight passing the No. 200 sieve or is otherwise known to not be free-draining, enter "N" in those spaces.

5. Soil Suction: A value for soil suction to the nearest tenth of a ton per square foot (AASHTO T273).

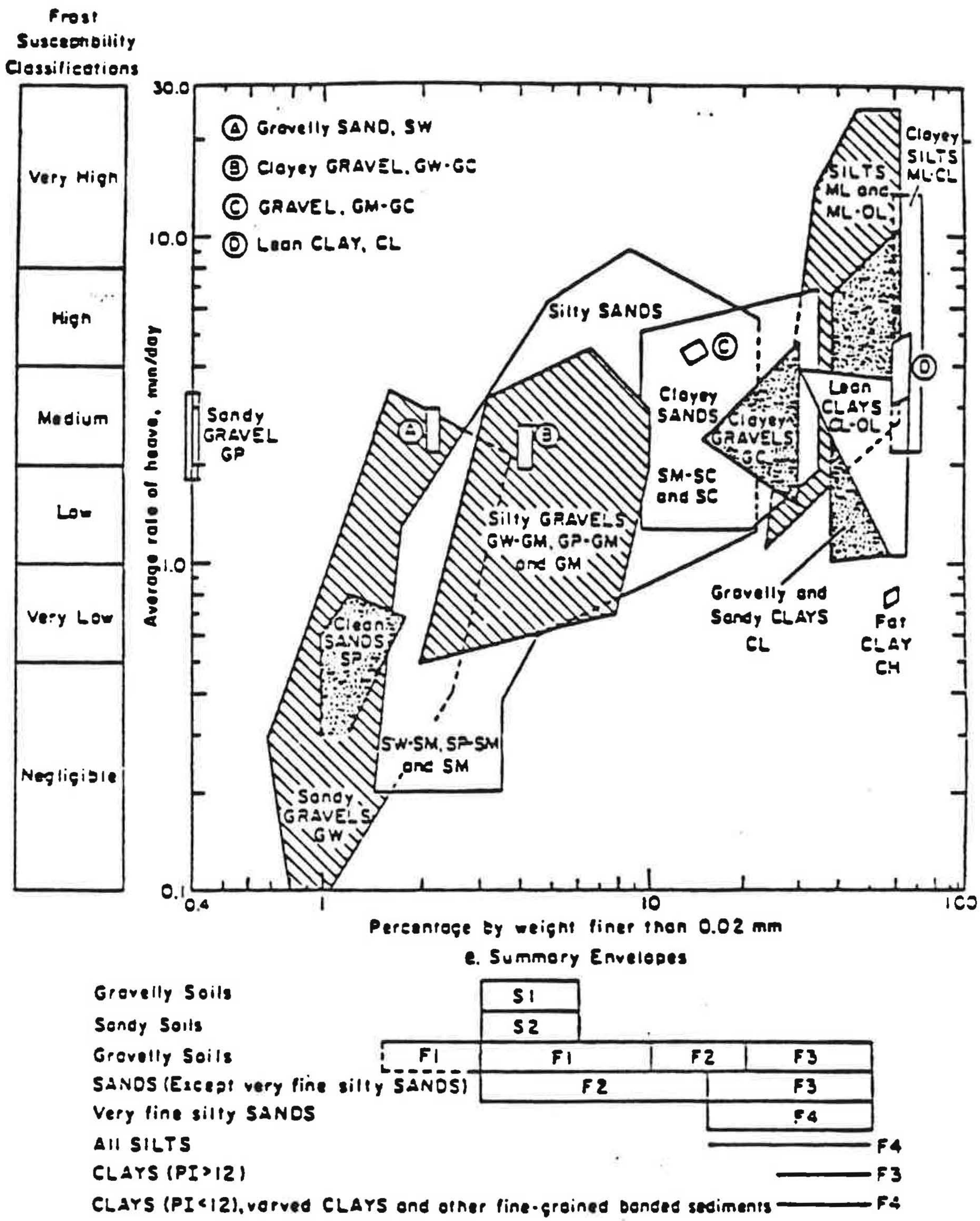
6. Expansion Index: The Expansion Index as determined by a proposed ASTM "Test Method for Expansion Index of Soils". This test method was in final ballot by ASTM Committee D-18 in December 1987, and is expected to be adopted at a high probability level. The "Expansion Index" has been included as a data element as it appears to offer high potential for "explaining" the effects of expansive soils on pavement performance in future predictive models.

7. and 8. Swell Pressure: A value to the nearest pound per square inch for swell pressure, and a code to identify the test used.

9. Percent by Weight Finer Than 0.02mm: The percent by weight (to the nearest tenth) of the subgrade sample having soil "grains" finer in size than 0.02 millimeters. This value is generally obtained by hydrometer analysis (ASTM Test Method D422). This data item is only required in "Freeze Zones" where frost may be expected to penetrate into the subgrade.

10. <u>Average Rate of Heave During Standard Laboratory Freezing Test</u>: The average rate of heave in millimeters per day (to the nearest tenth) of the subgrade soil as measured by a standard laboratory freeze test (reference not available - used by U.S. Army Corps. of Engineers). This data item is only required in "Freeze Zones" where frost may be expected to penetrate into the subgrade.

11. <u>Frost Susceptibility Classification Code</u>: The frost susceptibility classification of the subgrade soil as indicated by Figure 2.1. The codes appear on the data sheet. A value for "Average Rate of Heave" is required for classification, although "Percent by Weight Finer Than 0.02mm" is indicative and significant to the heave rate. This data item is only required in "Freeze Zones" where frost may be expected to penetrate into the subgrade.



U.S. Army Corps of Engineers

Figure 2.1. Frost Susceptibility Classifications as Functions of Rate of Heave and Percent Finer than 0.02mm (Ref. 9).

STATE HIGHWAY AGENCY

INVENTORY DATA SHEETS

* Indicates high priority inventory data items.

*STATE ASSIGNED ID [__ __ __ __]

SHEET 1

INVENTORY DATA

LTPP PROGRAM

*STATE CODE [__ __]

*SHRP SECTION ID [__ __ __ __]

PROJECT AND SECTION IDENTIFICATION

* 1.DATE OF DATA COLLECTION OR UPDATE (MO/YR) [__ __/__ __]

* 2.STATE HIGHWAY AGENCY (SHA) DISTRICT NUMBER [__ __.]

* 3.COUNTY OR PARISH [__ __ __.]

* 4.FUNCTIONAL CLASS (SEE TABLE A.2, APPENDIX A) [__ __.]

* 5.ROUTE SIGNING (NUMERIC CODE) [__.]

Interstate.........1   State..............3
U. S. 2   Other..............4

* 6.ROUTE NUMBER [__ __ __ __ __.]

* 7.LTPP EXPERIMENT CODE (SEE TABLE A.3, APPENDIX A) [__ __.]

* 8.TYPE OF PAVEMENT (SEE CODES, TABLE A.4) [__ __.]

* 9.NUMBER OF THROUGH LANES (ONE DIRECTION) [__.]

*10.DIRECTION OF TRAVEL [__.]

East Bound.........1   North Bound.........3
West Bound.........2   South Bound.........4

SECTION LOCATION STARTING POINT

*11.MILEPOINT .... [__ __ __.__ __]
*12.ELEVATION .... [__ __ __ __ __]
*13.LATITUDE .... [__ __° __ __' __ __.__ __"]
*14.LONGITUDE .... [__ __ __° __ __' __ __.__ __"]

*15.ADDITIONAL LOCATION INFORMATION (SIGNIFICANT LANDMARKS):[__________

____

____]

16.HPMS SAMPLE NUMBER (HPMS ITEM 28)

__ __ __ __ __ __ __ __ __ __ __ __ __

17.HPMS SECTION SUBDIVISION (HPMS ITEM 29) __.

*STATE ASSIGNED ID	[_ _ _ _]
*STATE CODE	[_ _]
*SHRP SECTION ID	[_ _ _ _]

SHEET 2

INVENTORY DATA

LTPP PROGRAM

GEOMETRIC, SHOULDER AND DRAINAGE INFORMATION

* 1. LANE WIDTH (FEET) [_ _.]

* 2. MONITORING SITE LANE NUMBER[1] [_.]
(LANE 1 IS OUTSIDE LANE, NEXT TO SHOULDER
LANE 2 IS NEXT TO LANE 1, ETC)

* 3. SUBSURFACE DRAINAGE LOCATION [_.]
Continuous Along Test Section...1
Intermittent....................2

* 4. SUBSURFACE DRAINAGE TYPE [_.]
No Subsurface Drainage..1
Longitudinal Drains.....2
Transverse Drains.......3
Drainage Blanket........4
Well System.............5
Drainage Blanket with Longitudinal Drains...6
Other (Specify)________________7

SHOULDER DATA	INSIDE SHOULDER	OUTSIDE SHOULDER
* 5. SURFACE TYPE Turf.............. 1 Granular.......... 2 Asphalt Concrete.. 3 Concrete.......... 4 Surface Treatment. 5 Other (Specify)__________ 6	_	[_]
6. TOTAL WIDTH (FEET)	_ _.	_ _.
7. PAVED WIDTH (FEET)	_ _.	_ _.
8. SHOULDER BASE TYPE (CODES-TABLES A.6)	_ _	_ _
9. SURFACE THICKNESS (INCHES)	_ _._	_ _._
10. BASE THICKNESS (INCHES)	_ _._	_ _._
ADDITIONAL DATA FOR PCC SHOULDERS:		
11. AVERAGE JOINT SPACING (FEET)	_ _ _.	_ _ _.
12. SKEWNESS OF JOINTS (FEET)	_._	_._
13. JOINTS MATCH PAVEMENT JOINTS? (YES - 1, NO - 2)	_	_
14. REINFORCED? (YES - 1, NO - 2)	_	_

15. DIAMETER OF LONGITUDINAL DRAINPIPES (INCHES) _._

16. SPACING OF LATERALS (FEET) _ _ _.

NOTES:

1. For the LTPP studies, only the outside lane will be studied, so the number "1" should always be entered.

SHEET 3	*STATE ASSIGNED ID [_ _ _ _]
INVENTORY DATA	*STATE CODE [_ _]
LTPP PROGRAM	*SHRP SECTION ID [_ _ _ _]

LAYER DESCRIPTIONS

LAYER NUMBER[1]	*LAYER DESCRIPTION[2]	*MATERIAL TYPE CLASSIFICATION[3]	<------ LAYER THICKNESS (IN) ------> *MEAN	MIN.	MAX.	STD. DEV.	*LAYER TYPE[4]
1	SUBGRADE(7)	[_ _]					[_]
2	[_ _]	[_ _]	[_ _ _._]	_ _ _._	_ _ _._	_ _ _._	[_]
3	[_ _]	[_ _]	[_ _ _._]	_ _ _._	_ _ _._	_ _ _._	[_]
4	[_ _]	[_ _]	[_ _ _._]	_ _ _._	_ _ _._	_ _ _._	[_]
5	[_ _]	[_ _]	[_ _ _._]	_ _ _._	_ _ _._	_ _ _._	[_]
6	[_ _]	[_ _]	[_ _ _._]	_ _ _._	_ _ _._	_ _ _._	[_]
7	[_ _]	[_ _]	[_ _ _._]	_ _ _._	_ _ _._	_ _ _._	[_]
8	[_ _]	[_ _]	[_ _ _._]	_ _ _._	_ _ _._	_ _ _._	[_]
9	[_ _]	[_ _]	[_ _ _._]	_ _ _._	_ _ _._	_ _ _._	[_]

*DEPTH BELOW SURFACE TO "RIGID" LAYER (FEET) (ROCK, STONE, DENSE SHALE) [_ _._]

NOTES:

1. Layer 1 is subgrade soil, last layer is existing surface.

2. Layer description codes:

Overlay............01	Base Layer.........05	Porous Friction Course.............09
Seal Coat..........02	Subbase Layer......06	Surface Treatment....10
Original Surface...03	Subgrade...........07	Embankment (Fill)....11
HMAC Layer (Below Surface Layer)...04	Interlayer.........08	

3. The material type classification codes for surface, base or subbase, subgrade, and seal coat or interlayer materials appear in Tables A.5, A.6, A.7 and A.8, respectively.

4. Layer Types:
   - A - HMAC Layer (Requires sheets 12-18 to be filled out)
   - P - PCC Layer (Requires sheets 5-11 to be filled out)
   - B - Base/Subbase Layers (Requires sheets 19 and 20 to be filled out)
   - G - Subgrade (Requires sheets 21 and 22 to be filled out)

*STATE ASSIGNED ID [__ __ __ __]

SHEET 4 *STATE CODE [__ __]

INVENTORY DATA *SHRP SECTION ID [__ __ __ __]

LTPP PROGRAM

AGE AND MAJOR PAVEMENT IMPROVEMENTS

* 1.DATE OF LATEST (RE)CONSTRUCTION (MONTH/YEAR) [__ __/__ __]

* 2.DATE SUBSEQUENTLY OPENED TO TRAFFIC (MONTH/YEAR) [__ __/__ __]

3.LATEST (RE)CONSTRUCTION COST PER LANE MILE (IN THOUSANDS OF DOLLARS)[1] __ __ __ __ __.

MAJOR IMPROVEMENTS SINCE LATEST (RE)CONSTRUCTION

* 4. YEAR	* 5. WORK TYPE CODE (TABLE A.17)	* 6. WORK QUANTITY (TABLE A.17 for units)	7. THICKNESS (INCHES)	8. TOTAL COST[1] (THOUSANDS OF DOLLARS PER LANE-MILE)
[__ __]	[__ __]	[__ __ __ __ __.]	__ __.__	__ __ __.
[__ __]	[__ __]	[__ __ __ __ __.]	__ __.__	__ __ __.
[__ __]	[__ __]	[__ __ __ __ __.]	__ __.__	__ __ __.
[__ __]	[__ __]	[__ __ __ __ __.]	__ __.__	__ __ __.
[__ __]	[__ __]	[__ __ __ __ __.]	__ __.__	__ __ __.
[__ __]	[__ __]	[__ __ __ __ __.]	__ __.__	__ __ __.

* 9.YEAR WHEN ROADWAY WIDENED [__ __]

*10.ORIGINAL NUMBER OF LANES (ONE DIRECTION) [__]

*11.FINAL NUMBER OF LANES (ONE DIRECTION) [__]

*12.LANE NUMBER OF LANE ADDED[2] [__]

NOTES 1. Cost is to represent pavement structure cost. Non-pavement costs such as cut and fill work, work on bridges, culverts, lighting, and guard rails are to be excluded.

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

*STATE ASSIGNED ID [_ _ _ _]

SHEET 5 *STATE CODE [_ _]

INVENTORY DATA *SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

PORTLAND CEMENT CONCRETE LAYERS

JOINT DATA

* 1. LAYER NUMBER (FROM SHEET 3) [_]

* 2. AVERAGE CONTRACTION JOINT SPACING (FEET) [_ _ _._]

3. (RANDOM JOINT SPACING, IF ANY: ______________________)

* 4. BUILT-IN EXPANSION JOINT SPACING (FEET) [_ _ _ _.]

* 5. SKEWNESS OF JOINTS (FT/LANE) [_._]

* 6. TRANSVERSE CONTRACTION JOINT LOAD TRANSFER SYSTEM [_]
    Round Dowels.........................1
    Aggregate Interlock..................2
    I-Beams..............................3
    Star Lugs............................4
    Other (Specify)_____________________5

* 7. ROUND DOWEL DIAMETER (INCHES) [_._ _]

* 8. DOWEL OR MECHANICAL LOAD TRANSFER DEVICE SPACING (INCHES) [_ _.]

9. AVERAGE INTERMEDIATE SAWED JOINT SPACING (FEET) _ _._

DIMENSIONS FOR I-BEAM DOWEL BARS
10. HEIGHT, (INCHES) .... _._ _
11. WIDTH, (INCHES) .... _._ _

12. DISTANCE OF NEAREST DOWEL (OR MECHANICAL LOAD TRANSFER DEVICE) FROM OUTSIDE LANE-SHOULDER EDGE (INCHES) _ _._

13. DOWEL LENGTH (INCHES) _ _.

14. DOWEL COATING _
    Paint and/or Grease..................1
    Plastic..............................2
    Monel................................3
    Stainless Steel......................4
    Epoxy................................5
    Other (Specify)_____________________6

15. METHOD USED TO INSTALL MECHANICAL LOAD TRANSFER DEVICES _
    Preplaced on Baskets.................1
    Mechanically Installed...............2
    Other (Specify)_____________________3

*STATE ASSIGNED ID [__ __ __ __]

SHEET 6 *STATE CODE [__ __]

INVENTORY DATA *SHRP SECTION ID [__ __ __ __]

LTPP PROGRAM

PORTLAND CEMENT CONCRETE LAYERS

JOINT DATA (CONTINUED)

* 1. LAYER NUMBER (FROM SHEET 3) [__]

* 2. METHOD USED TO FORM TRANSVERSE JOINTS [__]
- Sawed....................1
- Plastic Insert...........2
- Metal Insert (i.e., Uni-Tube)..........3
- Other (Specify) ______ 4

* 3. TYPE OF LONGITUDINAL JOINT (BETWEEN LANES) [__]
- Butt.....................1
- Keyed....................2
- Sawed Weakened Plane........3
- Insert Weakened Plane.......4
- Other (Specify) ______ 5

* 4. TYPE OF SHOULDER-TRAFFIC LANE JOINT [__]
- Butt.....................1
- Keyed....................2
- Sawed Weakened Plane.....3
- Insert Weakened Plane.......4
- Tied Concrete Curb..........5
- Other (Specify) ______ 6

5. TRANSVERSE JOINT SEALANT TYPE (AS BUILT) __
- Preformed (Open Web).....1
- Asphalt..................2
- Rubberized Asphalt..........3
- Low-Modulus Silicone........4
- Other (Specify) ______ 5

TRANSVERSE JOINT SEALANT RESERVOIR (AS BUILT)

6. WIDTH, (INCHES) .... __.__ __

7. DEPTH, (INCHES) .... __.__ __

LONGITUDINAL JOINT SEALANT RESERVOIR (AS BUILT)

8. WIDTH, (INCHES) .... __.__ __

9. DEPTH, (INCHES) .... __.__ __

10. BETWEEN LANE TIE BAR DIAMETER (INCHES) __.__ __

11. BETWEEN LANE TIE BAR LENGTH (INCHES) __ __.

12. BETWEEN LANE TIE BAR SPACING (INCHES) __ __.__

SHOULDER-TRAFFIC LANE JOINT SEALANT RESERVOIR (AS BUILT)

13. WIDTH, (INCHES) .... __.__ __

14. DEPTH, (INCHES) .... __.__ __

SHOULDER-TRAFFIC LANE JOINT TIE BARS (FOR CONCRETE SHOULDER)

15. DIAMETER (INCHES) __.__ __

16. LENGTH (INCHES) __ __.

17. SPACING (INCHES) __ __.

*STATE ASSIGNED ID [__ __ __ __]

SHEET 7

INVENTORY DATA

LTPP PROGRAM

*STATE CODE [__ __]

*SHRP SECTION ID [__ __ __ __]

PORTLAND CEMENT CONCRETE LAYERS REINFORCING STEEL DATA

* 1. LAYER NUMBER (FROM SHEET 3) [__]

* 2. TYPE OF REINFORCING [__]
    Deformed Bars........................1
    Welded Wire Fabric...................2
    Other (specify)______________________3

* 3. TRANSVERSE BAR DIAMETER (INCHES) [__.__ __]

* 4. TRANSVERSE BAR SPACING (INCHES) [__ __.__]

* 5. LONGITUDINAL BAR DIAMETER (INCHES) [__.__ __]

* 6. DESIGN PERCENTAGE OF LONGITUDINAL STEEL (%) [__.__ __]

7. DEPTH TO REINFORCEMENT FROM SLAB SURFACE (INCHES) [__.__]

8. LONGITUDINAL BAR SPACING (INCHES) __ __.__

9. YIELD STRENGTH OF REINFORCING (KSI) __ __.__

10. METHOD USED TO PLACE REINFORCEMENT __
    Preset on Chairs.....................1
    Mechanically.........................2
    Between Layers of Concrete...........3
    Other (Specify)______________________4

11. LAP LENGTH OF LONGITUDINAL STEEL SPLICES (INCHES) __ __.
    (CRCP ONLY)

*STATE ASSIGNED ID [__ __ __ __]

SHEET 8 *STATE CODE [__ __]

INVENTORY DATA *SHRP SECTION ID [__ __ __ __]

LTPP PROGRAM

PORTLAND CEMENT CONCRETE LAYERS
MIXTURE DATA

* 1.LAYER NUMBER (FROM SHEET 3) [__]

MIX DESIGN (LB./YD^3 - OVEN DRIED WEIGHT)

* 2. Coarse Aggregate .... [__ __ __ __.]
* 3. Fine Aggregate .... [__ __ __ __.]
* 4. Cement .... [__ __ __ __.]
* 5. Water .... [__ __ __ __.]

* 6.TYPE CEMENT USED (See Cement Type Codes, Table A.11) [__ __]
(If Other, Specify__________________________)

* 7.ALKALI CONTENT OF CEMENT, (PERCENT BY WEIGHT
OF CEMENT) [__ __.__]

ENTRAINED AIR CONTENT, (PERCENT) (AASHTO T121, T152, OR T196)

* 8. Mean .... [__.__]
Range:
9. Minimum Value .... __.__
10. Maximum Value .... __.__

	TYPE CODE	AMOUNT
*11.ADMIXTURE #1	[__ __]	[__ __ __.__ __ __]
*12.ADMIXTURE #2	[__ __]	[__ __ __.__ __ __]
*13.ADMIXTURE #3	[__ __]	[__ __ __.__ __ __]

(See Cement Admixture Codes, Table A.12)
(If Other, Specify ______________________________)

SLUMP (Inches) (AASHTO T119 OR ASTM C143)

14. Mean.. __.__
Range:
15. Minimum Value.................................. __.__
16. Maximum Value.................................. __.__
17. Standard Deviation............................. __.__
18. Number of Tests................................ __ __ __.

*STATE ASSIGNED ID [_ _ _ _]

SHEET 9 *STATE CODE [_ _]

INVENTORY DATA *SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

PORTLAND CEMENT CONCRETE LAYERS MIXTURE DATA (CONTINUED)

* 1. LAYER NUMBER (FROM SHEET 3) [_]

COMPOSITION OF COARSE AGGREGATE — TYPE — PERCENT

* 2. Crushed Stone..1 Manufactured [_] [_ _ _.]
* 3. Gravel.........2 Lightweight......5 [_] [_ _ _.]
* 4. Crushed Gravel.3 Recycled Concrete..6 [_] [_ _ _.]
Crushed Slag...4
Other (Specify)_______________7

* 5. GEOLOGIC CLASSIFICATION OF COARSE AGGREGATE [_ _.]
(SEE GEOLOGIC CLASSIFICATION CODES, TABLE A.9)

COMPOSITION OF FINE AGGREGATE — TYPE — PERCENT

* 6. Natural Sand..............................1 [_] [_ _ _.]
* 7. Crushed or Manufactured Sand (From [_] [_ _ _.]
* 8. Crushed Gravel or Stone)...................2 [_] [_ _ _.]
Recycled Concrete..........................3
Other (Specify)_______________4

9. INSOLUBLE RESIDUE, PERCENT (ASTM D3042) _ _ _.

10. GRADATION OF COARSE AGGREGATE

11. GRADATION OF FINE AGGREGATE

Sieve Size	% Passing	Sieve Size	% Passing
2".........	_ _ _	No. 4......	_ _ _
1 1/2".....	_ _ _	No. 8......	_ _ _
1".........	_ _ _	No. 10.....	_ _ _
7/8".......	_ _ _	No. 16.....	_ _
3/4".......	_ _ _	No. 30.....	_ _
5/8".......	_ _ _	No. 40.....	_ _
1/2".......	_ _	No. 50.....	_ _
3/8".......	_ _	No. 80.....	_ _
		No. 100....	_ _
		No. 200....	_ _

BULK SPECIFIC GRAVITIES:

12. Coarse Aggregate (AASHTO T85 or ASTM C127) _._ _ _
13. Fine Aggregate (AASHTO T84 or ASTM C128) _._ _ _

	*STATE ASSIGNED ID [_ _ _ _]
SHEET 10	*STATE CODE [_ _]
INVENTORY DATA	*SHRP SECTION ID [_ _ _ _]
LTPP PROGRAM	

PORTLAND CEMENT CONTRETE LAYERS MIXTURE DATA (CONTINUED)

* 1. LAYER NUMBER (FROM SHEET 3) [_]

* 2. TYPE OF PAVER USED [_]
Slip-Form Paver............1 Side-Form...................2
Other (Specify)_______________________________3

AGGREGATE DURABILITY TEST RESULTS
(SEE DURABILITY TEST TYPE CODES, TABLE A.13)

	TYPE OF AGGREGATE	TYPE OF TEST	RESULTS
3.	Coarse	_ _	_ _ _._
4.	Coarse	_ _	_ _ _._
5.	Coarse	_ _	_ _ _._
6.	Coarse and Fine	_ _	_ _ _._

7. METHOD USED TO CURE CONCRETE _

Membrane Curing Compound....1 Burlap-Polyethylene Blanket.5
Burlap Curing Blankets......2 Cotton Mat Curing...........6
Waterproof Paper Blankets...3 Hay.........................7
White Polyethylene Sheeting.4
Other (Specify)_______________________________8

8. METHOD USED TO TEXTURE CONCRETE _
Tine........................1 Grooved Float...............4
Broom.......................2 Astro Turf..................5
Burlap Drag.................3
Other (Specify)_______________________________6

ELASTIC MODULUS (KSI)

9.	MEAN	_ _ _ _ _.
10.	MINIMUM	_ _ _ _ _.
11.	MAXIMUM	_ _ _ _ _.
12.	NUMBER OF TESTS	_ _.
13.	STD. DEV.	_ _ _ _ _.

14. METHOD FOR DETERMINATION OF ELASTIC MODULUS _
Compression Test on Cores (ASTM C469)....................1
Compression Test on Cylinders Molded
During Construction (ASTM C469)........................2
Calculated Using ACI Relation Between
Elastic Modulus and Compressive Strength
(ACI 318, Section 8.5) 3
Other (Specify)_______________________________4

*STATE ASSIGNED ID [_ _ _ _]

SHEET 11 *STATE CODE [_ _]

INVENTORY DATA *SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

PORTLAND CEMENT CONCRETE LAYERS STRENGTH DATA

* 1. LAYER NUMBER (FROM SHEET 3) .... [_]

FLEXURAL STRENGTH[1] (MODULUS OF RUPTURE) (PSI)

* 2. TYPE OF TEST............ [_]
THIRD-POINT LOADING (AASHTO T97 OR ASTM C78) 1
CENTER-POINT LOADING (AASHTO T177 OR ASTM C293) .. 2
* 3. AGE (DAYS)............ [_ _ _.]
* 4. MEAN............ [_ _ _ _ _.]
5. MINIMUM............ _ _ _ _ _.
6. MAXIMUM............ _ _ _ _ _.
7. NUMBER OF TESTS............ _ _.
8. STD. DEV............ _ _ _ _ _.

COMPRESSIVE STRENGTH OF CONCRETE (PSI)
(TEST METHOD AASHTO T22 OR ASTM C39)

* 9. AGE (DAYS)............ [_ _ _.]
*10. MEAN............ [_ _ _ _ _.]
11. MINIMUM............ _ _ _ _ _.
12. MAXIMUM............ _ _ _ _ _.
13. NUMBER OF TESTS............ _ _.
14. STD. DEV............ _ _ _ _ _.

SPLITTING TENSILE STRENGTH OF CONCRETE (PSI)
(TEST METHOD AASHTO T198 OR ASTM C496)

15. AGE (DAYS)............ [_ _ _.]
16. MEAN............ [_ _ _ _ _.]
17. MINIMUM............ _ _ _ _.
18. MAXIMUM............ _ _ _ _.
19. NUMBER OF TESTS............ _ _.
20. STD. DEV............ _ _ _ _.

NOTE 1: For new construction of test sections for SHRP LTPP, use third point loading.

SHEET 12	*STATE ASSIGNED ID	[__ __ __ __]
INVENTORY DATA	*STATE CODE	[__ __]
LTPP PROGRAM	*SHRP SECTION ID	[__ __ __ __]

PLANT MIXED ASPHALT BOUND LAYERS AGGREGATE PROPERTIES

* 1. LAYER NUMBER (FROM SHEET 3) [__]

COMPOSITION OF COARSE AGGREGATE

			TYPE	PERCENT
* 2.	Crushed Stone......1	Crushed Slag.........4	[__]	[__ __ __.]
* 3.	Gravel.............2	Manufactured	[__]	[__ __ __.]
* 4.	Crushed Gravel.....3	Lightweight........5	[__]	[__ __ __.]
	Other (Specify)________________6			

* 5. GEOLOGIC CLASSIFICATION OF COARSE AGGREGATE (SEE GEOLOGIC CLASSIFICATION CODES, TABLE A.9) [__ __.]

COMPOSITION OF FINE AGGREGATE

		TYPE	PERCENT
* 6.	Natural Sand..................................1	[__]	[__ __ __.]
* 7.	Crushed or Manufactured Sand (From	[__]	[__ __ __.]
* 8.	Crushed Gravel or Stone)..................2	[__]	[__ __ __.]
	Recycled Concrete...........................3		
	Other (Specify)________________4		

* 9. TYPE OF MINERAL FILLER [__]

Stone Dust.........1 Portland Cement....3
Hydrated Lime......2 Fly Ash............4
Other (Specify)________________5

AGGREGATE DURABILITY TEST RESULTS
(SEE DURABILITY TEST TYPE CODES, TABLE A.13)

	TYPE OF AGGREGATE	TYPE OF TEST	RESULTS
10.	Coarse	__ __	__ __ __.__ __ __
11.	Coarse	__ __	__ __ __.__ __ __
12.	Coarse	__ __	__ __ __.__ __ __
13.	Coarse	__ __	__ __ __.__ __ __

14. POLISH VALUE OF COARSE AGGREGATES SURFACE LAYER ONLY (AASHTO T279, ASTM D3319) __ __.

*STATE ASSIGNED ID [_ _ _ _]

SHEET 13 *STATE CODE [_ _]

INVENTORY DATA *SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

PLANT MIXED ASPHALT BOUND LAYERS

AGGREGATE PROPERTIES (CONTINUED)

* 1. LAYER NUMBER (FROM SHEET 3) [_]

* 2. GRADATION OF COMBINED AGGREGATES

Sieve Size or No.	% Passing	Sieve Size or No.	% Passing
2"...........	[_ _ _]	No. 4.........	[_ _]
1 1/2".......	[_ _ _]	No. 8.........	[_ _]
1"...........	[_ _ _]	No. 10.......	[_ _]
7/8".........	[_ _ _]	No. 16.......	[_ _]
3/4 "........	[_ _ _]	No. 30.......	[_ _]
5/8".........	[_ _ _]	No. 40.......	[_ _]
1/2".........	[_ _ _]	No. 50.......	[_ _]
3/8".........	[_ _]	No. 80.......	[_ _]
		No. 100......	[_ _]
		No. 200......	[_ _]

BULK SPECIFIC GRAVITIES:

* 3. Coarse Aggregate (AASHTO T85 or ASTM C127) [_._ _ _]

* 4. Fine Aggregate (AASHTO T84 or ASTM C128) [_._ _ _]

* 5. Mineral Filler (AASHTO T100 or ASTM D854) [_._ _ _]

* 6. Aggregate Combination (Calculated) [_._ _ _]

7. EFFECTIVE SPECIFIC GRAVITY OF AGGREGATE COMBINATION (Calculated) _._ _ _

*STATE ASSIGNED ID [_ _ _ _]

SHEET 14 *STATE CODE [_ _]

INVENTORY DATA *SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

PLANT MIXED ASPHALT BOUND LAYERS
ASPHALT CEMENT PROPERTIES

* 1.LAYER NUMBER (FROM SHEET 3) [_]

* 2.ASPHALT GRADE (SEE ASPHALT CODE SHEET, TABLE A.16) [_ _]
(IF OTHER, SPECIFY ____________________)

* 3.SOURCE (SEE SUPPLY CODE SHEET, TABLE A.14) [_ _]
(IF OTHER, SPECIFY ____________________)

* 4.SPECIFIC GRAVITY OF ASPHALT CEMENT
(AASHTO T228) [_._ _ _]

ORIGINAL ASPHALT CEMENT PROPERTIES

* 5.VISCOSITY OF ASPHALT AT 140°F (POISES)
(AASHTO T202) [_ _ _ _ _ _.]

* 6.VISCOSITY OF ASPHALT AT 275°F (CENTISTOKES)
(AASHTO T201) [_ _ _ _._ _]

* 7.PENETRATION AT 77°F (AASHTO T49) (TENTHS OF A MM)
(100 g., 5 sec.) [_ _ _.]

ASPHALT MODIFIERS (SEE TYPE CODE, TABLE A.15)

	TYPE	QUANTITY(%)
* 8. MODIFIER #1	[_ _].	[_ _].
* 9. MODIFIER #2	[_ _].	[_ _].

(IF OTHER, SPECIFY TYPE ____________________)

10.DUCTILITY AT 77°F (CM)
(AASHTO T51) _ _ _.

11.DUCTILITY AT 39.2°(CM)
(AASHTO T51) _ _ _.

12.TEST RATE FOR DUCTILITY MEASUREMENT
AT 39.2°F (CM/MIN) _ _ _.

13.PENETRATION AT 39.2°F (AASHTO T49) (TENTHS OF A MM)
(200 g., 60 sec.) _ _ _.

14.RING AND BALL SOFTENING POINT (AASHTO T53) (°F) _ _ _.

NOTE: If emulsified or cutback asphalt was used, enter "N" in the spaces for "Original Asphalt Cement Properties".

Revised June 13, 1988

*STATE ASSIGNED ID [_ _ _ _]

SHEET 15 *STATE CODE [_ _]

INVENTORY DATA *SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

PLANT MIXED ASPHALT BOUND LAYERS

ASPHALT CEMENT PROPERTIES (CONTINUED)

* 1.LAYER NUMBER (FROM SHEET 3) [_]

LABORATORY AGED ASPHALT CEMENT PROPERTIES

2.TEST PROCEDURE USED TO MEASURE AGING EFFECTS _

ASTM D1754 - THIN FILM OVEN TEST...........1
ASTM D2872 - ROLLING THIN FILM OVEN TEST...2
OTHER (SPECIFY)____________________________3

3.VISCOSITY OF ASPHALT AT 140°F (POISE) (AASHTO T202) _ _ _ _ _ _.

4.VISCOSITY OF ASPHALT AT 275°F (CENTISTOKES) (AASHTO T201) _ _ _ _._ _

5.DUCTILITY AT 77°F (CM) (AASHTO T51) _ _ _.

6.DUCTILITY AT 39.2°F (CM) (AASHTO T51) _ _ _.

7.TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (CM/MIN) _ _._

8.PENETRATION AT 77°F, 100 g., 5 Sec. (TENTHS OF A MM) (AASHTO T49) _ _ _.

9.PENETRATION AT 39.2°F, 200 g., 60 Sec. (TENTHS OF A MM) (AASHTO T49) _ _.

10.RING AND BALL SOFTENING POINT ($^{\circ}$F) (AASHTO T53) _ _ _.

11.WEIGHT LOSS (PERCENT) _._

NOTE: If emulsified or cutback asphalt was used, enter "N" in the spaces for "Laboratory Aged Asphalt Cement Properties".

SHEET 16
INVENTORY DATA
LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

PLANT MIXED ASPHALT BOUND LAYERS

ORIGINAL MIXTURE PROPERTIES

* 1.LAYER NUMBER (FROM SHEET 3) [_]

* 2.TYPE OF SAMPLES [_]
SAMPLES COMPACTED IN LABORATORY............1
SAMPLES TAKEN FROM TEST SECTION............2

* 3.MAXIMUM SPECIFIC GRAVITY (NO AIR VOIDS)
(AASHTO T209 OR ASTM D2041) [_._ _ _]

BULK SPECIFIC GRAVITY (ASTM D1188)

* 4. MEAN ....[_._ _ _] NUMBER OF TESTS ...... _ _.
5. MINIMUM ...... _._ _ _ MAXIMUM .... _._ _ _
6. STD. DEV........ _._ _ _

ASPHALT CONTENT (PERCENT WEIGHT OF TOTAL MIX)
(AASHTO T164 OR ASTM D2172)

* 7. MEAN ....[_ _._] NUMBER OF SAMPLES .... _ _.
8. MINIMUM .... _ _._ MAXIMUM .... _ _._
9. STD. DEV. .... _ _._

PERCENT AIR VOIDS

*10. MEAN ....[_ _._] NUMBER OF SAMPLES .... _ _.
11. MINIMUM .... _ _._ MAXIMUM .... _ _._
12. STD. DEV. .... _ _._

13.VOIDS IN MINERAL AGGREGATE (PERCENT) _ _._

14.EFFECTIVE ASPHALT CONTENT (PERCENT) _ _._

15.MARSHALL STABILITY (LBS) (AASHTO T245 OR ASTM D1559) _ _ _ _.

16.NUMBER OF BLOWS _ _

17.MARSHALL FLOW (HUNDREDTHS OF AN INCH)
(AASHTO T245 OR ASTM D1559) _ _ _ _.

18.HVEEM STABILITY (AASHTO T246 OR ASTM D1561) _ _ _.

19.HVEEM COHESIOMETER VALUE (GRAMS/25 MM OF WIDTH)
(AASHTO T246 OR ASTM D1561) _ _ _ _.

*STATE ASSIGNED ID [__ __ __ __]

SHEET 17 *STATE CODE [__ __]

INVENTORY DATA *SHRP SECTION ID [__ __ __ __]

LTPP PROGRAM

PLANT MIXED ASPHALT BOUND LAYERS

ORIGINAL MIXTURE PROPERTIES

CONTINUED

* 1.LAYER NUMBER (FROM SHEET 3) [__]

* 2.TYPE ASPHALT PLANT [__]

BATCH PLANT............1 DRUM MIX PLANT.........2

OTHER (SPECIFY)____3

* 3.TYPE OF ANTISTRIPPING AGENT USED
(SEE TYPE CODES, TABLE A.21) [__ __]
(Other, Specify____)

* 4.AMOUNT OF ANTISTRIPPING AGENT USED LIQUID OR SOLID CODE [__]

* 5. (If liquid, enter code 1, and amount
as percent of asphalt cement weight.
If solid, enter code 2 and amount as
percent of aggregate weight.) [__ __.__]

6.MOISTURE SUSCEPTIBILITY TEST TYPE __

1 - AASHTO T165 (ASTM D1075)
2 - TEXAS FREEZE-THAW PEDESTAL TEST (REF. 21)
3 - TEXAS BOILING TEST (REF. 22)
4 - REVISED LOTTMAN PROCEDURE (AASHTO T283)
5 - OTHER (SPECIFY) ________________________________

MOISTURE SUSCEPTIBILITY TEST RESULTS:

7. HVEEM STABILITY NO. __ __

8. PERCENT STRIPPED __ __

9. TENSILE STRENGTH RATIO (AASHTO T283) __.__ __

10. INDEX OF RETAINED STRENGTH (AASHTO T165) __ __ __.

*STATE ASSIGNED ID [_ _ _ _]

SHEET 18 *STATE CODE [_ _]

INVENTORY DATA *SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

PLANT-MIXED ASPHALT BOUND LAYERS CONSTRUCTION DATA

* 1. LAYER NUMBER (SEE SHEET 3) [_]

2. MEAN MIXING TEMPERATURE (^{o}F) _ _ _.

LAYDOWN TEMPERATURES (^{o}F)

3. MEAN .... _ _ _ NUMBER OF TESTS .... _ _
4. MINIMUM .... _ _ _ MAXIMUM .... _ _ _
5. STD. DEV. .... _ _ _

	ROLLER CODE #	ROLLER DESCRIPTION	GROSS WGT (TONS)	TIRE PRES. (PSI)	FREQ. (VIBR/MIN)	AMPLITUDE (IN)	SPEED (MPH)
6.	A	STEEL-WHL TANDEM	_ _._				
7.	B	STEEL-WHL TANDEM	_ _._				
8.	C	STEEL-WHL TANDEM	_ _._				
9.	D	STEEL-WHL TANDEM	_ _._				
10.	E	PNEUMATIC-TIRED	_ _._	_ _ _.			
11.	F	PNEUMATIC-TIRED	_ _._	_ _ _.			
12.	G	PNEUMATIC-TIRED	_ _._	_ _ _.			
13.	H	PNEUMATIC-TIRED	_ _._	_ _ _.			
14.	I	SINGLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
15.	J	SINGLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
16.	K	SINGLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
17.	L	SINGLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
18.	M	DOUBLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
19.	N	DOUBLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
20.	O	DOUBLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
21.	P	DOUBLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
22.	Q	OTHER ________					

COMPACTION DATA

	First Lift	Second Lift	Third Lift	Fourth Lift
Breakdown				
23. Roller Code # (A-Q)	_	_	_	_
24. Coverages	_ _.	_ _.	_ _.	_ _.
Intermediate				
25. Roller Code # (A-Q)	_	_	_	_
26. Coverages	_ _.	_ _.	_ _.	_ _.
Final				
27. Roller Code # (A-Q)	_	_	_	_
28. Coverages	_ _.	_ _.	_ _.	_ _.
29. Mean Air Temp (^{o}F)	_ _ _.	_ _ _.	_ _ _.	_ _ _.
30. Compacted Thick. (in)	_._	_._	_._	_._
31. Curing Period (days)	_ _.	_ _.	_ _.	_ _.

SHEET 19

INVENTORY DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

UNBOUND OR STABILIZED BASE OR SUBBASE MATERIAL DESCRIPTION

* 1.LAYER NUMBER (FROM SHEET 3) [_]

* 2.AASHTO SOIL CLASSIFICATION (SEE CODES, TABLE A.10) [_ _]

* 3.ATTERBERG LIMITS (ASTM D4318)
PI ...... [_ _.] LL ...... [_ _.] PL ...... [_ _.]

4.MAXIMUM LAB DRY DENSITY (PCF) _ _ _.

5.OPTIMUM LAB MOISTURE CONTENT (PERCENT) _ _._

6.TEST USED TO MEASURE MAXIMUM DRY DENSITY _

Standard AASHTO T99........1 ASTM D558................4
Modified AASHTO T180.......2 ASTM D4223...............5
AASHTO T134 (SOIL-CEMENT)..3
Other (SPECIFY)____________________6

7.COMPACTIVE ENERGY FOR 'OTHER' METHOD (FT.-LBS./CU.IN.) _ _._

IN SITU DRY DENSITY (PCF)

8. MEAN .... _ _ _ NUMBER OF SAMPLES .... _ _
9. MINIMUM .... _ _ _ MAXIMUM .... _ _ _
10. STD. DEV. .... _ _ _

IN SITU MOISTURE CONTENT (PERCENT OF DRY WEIGHT)

11. MEAN .... _ _ _ NUMBER OF SAMPLES .... _ _
12. MINIMUM .... _ _ _ MAXIMUM .... _ _ _
13. STD. DEV. .... _ _ _

14.COARSE GRADATION OF BASE/SUBBASE MATL.

Sieve Size or No.	% Passing
1 1/2"...........	_ _ _
1"...............	_ _ _
7/8".............	_ _ _
3/4 "............	_ _ _
5/8".............	_ _ _
1/2".............	_ _ _
3/8".............	_ _

15. FINE GRADATION OF BASE/SUBBASE MAT

Sieve Size or No.	% Passing
No. 4..............	_ _
No. 8..............	_ _
No. 10.............	_ _
No. 16.............	_ _
No. 30.............	_ _
No. 40.............	_ _
No. 50.............	_ _
No. 80.............	_ _
No. 100............	_ _
No. 200............	_ _

*STATE ASSIGNED ID [__ __ __ __]

SHEET 20

INVENTORY DATA

LTPP PROGRAM

*STATE CODE [__ __]

*SHRP SECTION ID [__ __ __ __]

UNBOUND OR STABILIZED BASE OR SUBBASE MATERIAL DESCRIPTION (CONTINUED)

* 1. LAYER NUMBER (FROM SHEET 3) [__]

TYPE AND PERCENT STABILIZING AGENT (FOR STABILIZED LAYERS ONLY)

* 2. STABILIZING AGENT 1 TYPE CODE [__] PERCENT [__ __.__]
* 3. STABILIZING AGENT 2 TYPE CODE [__] PERCENT [__ __.__]

STABILIZING AGENT TYPE CODES

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

* 4. ADMIXTURES: TYPE [__] PERCENT [__ __.]

Calcium Chloride...... 1 Magnesium Chloride.... 3
Sodium Chloride....... 2
Other (Specify) ______ 4

COMPRESSIVE STRENGTH (PSI)

* 5. MEAN ....[__ __ __] NUMBER OF TESTS ...... __ __
6. MINIMUM .... __ __ __ MAXIMUM .... __ __ __
7. STD. DEV. .... __ __ __

* 8. TYPE OF COMPRESSION TEST [__]

AASHTO T167 (ASTM D1074)....1 AASHTO T220..............2
AASHTO T24 (ASTM D1633).....2 AASHTO T234 (ASTM D2850).4
Other (Specify) ______ 5

* 9. CONFINING PRESSURE (PSI)[1] [__ __.__]

10. CALCIUM CARBONATE CONTENT (PERCENT) (ASTM D4373) __ __ __.

11. CALIFORNIA BEARING RATIO (CBR) (AASHTO T193 OR ASTM D3668) __ __ __.

12. RESISTANCE (R-VALUE) (ASTM D2844) __ __ __.

13. MODULUS OF SUBGRADE REACTION (K-VALUE) (PSI/SQ.IN.) __ __ __.

14. TYPE OF TEST __

AASHTO T221 OR ASTM D1195... 1 AASHTO T222..... 2

NOTE 1: If the test is unconfined, enter "0.0".

*STATE ASSIGNED ID [__ __ __ __]

SHEET 21 *STATE CODE [__ __]

INVENTORY DATA *SHRP SECTION ID [__ __ __ __]

LTPP PROGRAM

SUBGRADE DATA

* 1.AASHTO SOIL CLASSIFICATION (SEE CODES, TABLE A.10) [__ __]

2.CALIFORNIA BEARING RATIO (CBR) (AASHTO T193 OR ASTM D3668) __ __ __.

3.RESISTANCE (R-VALUE) (AASHTO T190 OR ASTM D2844) __ __ __.

4.MODULUS OF SUBGRADE REACTION (K-VALUE) (PSI/IN.) __ __ __.

5. TYPE OF TEST __
AASHTO T221 OR ASTM D1195... 1 AASHTO T222........ 2

6.PERCENT PASSING NO. 40 SIEVE __ __.__

7.PERCENT PASSING NO. 200 SIEVE __ __.__

8.PLASTICITY INDEX (AASHTO T90 OR ASTM D4318) __ __.

9.LIQUID LIMIT (AASHTO T89 OR ASTM D4318) __ __.

10.MAXIMUM LAB DRY DENSITY (PCF) __ __ __.

11.OPTIMUM LAB MOISTURE CONTENT (PERCENT) __ __.__

12.TEST USED TO MEASURE MAXIMUM DRY DENSITY __
STANDARD AASHTO (T-99)...... 1 MODIFIED AASHTO (T-180).. 2
Other (Specify)______________________________ 3

13.COMPACTIVE ENERGY FOR "OTHER" METHOD (FT.-LBS./CU.IN.) __ __.__

IN SITU DRY DENSITY (PERCENT OF OPTIMUM)
14. MEAN .... __ __ __ NUMBER OF TESTS ...... __ __
15. MINIMUM .... __ __ __ MAXIMUM .... __ __ __
16. STD. DEV. .... __ __ __

IN SITU MOISTURE CONTENT (PERCENT OF OPTIMUM)
17. MEAN .... __ __ __.__ NUMBER OF TESTS ...... __ __
18. MINIMUM ...... __ __ __.__ MAXIMUM .... __ __ __.__
19. STD. DEV. ...... __ __ __.__

IN SITU DRY DENSITY (PCF)
20. MEAN .... __ __ __ NUMBER OF TESTS ...... __ __
21. MINIMUM .... __ __ __ MAXIMUM .... __ __ __
22. STD. DEV. .... __ __ __

IN SITU MOISTURE CONTENT (PERCENT OF DRY WEIGHT)
23. MEAN .... __ __ __ NUMBER OF TESTS ...... __ __
24. MINIMUM .... __ __ __ MAXIMUM .... __ __ __
25. STD. DEV. .... __ __ __

*STATE ASSIGNED ID [__ __ __ __]

SHEET 22 *STATE CODE [__ __]

INVENTORY DATA *SHRP SECTION ID [__ __ __ __]

LTPP PROGRAM

SUBGRADE DATA (CONTINUED)

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

MEASURED DENSITIES FROM LABORATORY TESTS (PCF):

1. MINIMUM ...... __ __ __.__ MAXIMUM .... __ __ __.__

RELATIVE DENSITIES (PERCENT):

2. MEAN .... __ __.__ NUMBER OF TESTS ...... __ __
3. MINIMUM .... __ __.__ MAXIMUM .... __ __.__
4. STD. DEV. .... __ __.__

5. SOIL SUCTION (TSF) (AASHTO T273) __ __ __.__

6. EXPANSION INDEX (NEW TEST UNDER COMMITTEE BALLOT BY ASTM IN DEC. 1987) __ __ __.

SWELL PRESSURE (PSI)

7. TEST VALUE __ __ __.
8. TEST CODE __
   AASHTO T190 OR ASTM D2844.1 AASHTO T258, Method 1..2
   Other ______________________________3

9. PERCENT BY WEIGHT FINER THAN 0.02MM[1] __ __.__

10. AVERAGE RATE OF HEAVE DURING STANDARD LABORATORY FREEZING TEST (MILLIMETERS/DAY)[1] __ __.__

11. FROST SUSCEPTIBILITY CLASSIFICATION CODE[1] __

Negligible.............1	Medium.................4
Very Low...............2	High...................5
Low....................3	Very High..............6

NOTE 1: This data is only required in "Freeze Zones" where frost may be expected to penetrate into the subgrade.

3.2 SKID MEASUREMENT

The monitoring data of the Long-Term Pavement Performance (LTPP) study consists of the following data measurements: profile, skid, distress survey, and deflection. This section contains information necessary for the collection of skid data measurements which will be performed by the participating State and Provincial Highway Agencies.

Recommended Procedures

Skid measurements should be taken once every two years, or more frequently if desired by the participating agency. It is also desireable to take skid measurements prior to and after placement of a rehabilitation or maintenance treatment.

Based on a survey of States and Provinces conducted by the Strategic Highway Research Program (SHRP) in June 1988, most agencies use the locked-wheel skid tester to collect skid measurements. As such, the locked-wheel skid tester is recommended for use on the SHRP LTPP test sections.

The skid measurements should be collected with the calibrated locked-wheel skid tester at 40 miles per hour. However, if the legal maximum speed is less than 40 miles per hour, the tests may be conducted at a lower speed.

The General Pavement Study (GPS) test sections are 500 feet long and marked at each 100-foot station. Measurements will be collected at two locations for the GPS test sections. The first measurement will be collected between Stations 0 and 2. The second measurement will be collected between Stations 3 and 5. All measurements are collected in the center of the inner wheel path.

Measurement procedures (other than those outlined above) should follow AASHTO T242 (or ASTM E274) supplemented with Appendix B of FHWA Technical Advisory T 5040.17.

The time of year for collecting the skid data is not specified. It is recognized that many agencies have studied seasonal variation and have selected the most appropriate time of year for skid data collection in their area. Rather than specifying when to collect this data for SHRP, it is encouraged that each agency exercise their judgement in selecting the most appropriate time for their area, and collect this data at the same time of year for each round of skid data collection.

If the measurement system of the locked-wheel skid tester uses a torque transducer which is adaptable to mounting a torque arm, the procedures outlined in Appendix B of FHWA Technical Advisory T 5040.17 recommend periodic verification. For the SHRP test sections, it is desireable to conduct this field force verification prior to collection of skid data on each SHRP test section.

The skid data sheet and corresponding instructions are presented next. Every effort should be made to complete each of the data items on the skid data sheet. Completed data sheets should be forwarded to the SHRP Regional Coordination Offices within one month of skid testing.

Instructions For Completing Skid Data Sheet 1

The upper right-hand corner of the data sheet provides space to enter the State assigned ID, State code, and SHRP section ID. The State assigned ID is the identification number assigned previously by the State Highway Agency. The two-digit State code is the number used to identify the state or province in which the test section is located. The SHRP Section ID is the four-digit identification number assigned by SHRP. The SHRP Section ID along with the State code provides a unique six-digit ID used to facilitate computer filing and is used to identify the test section in the field.

The name of the person or persons operating the skid tester should also be recorded in the upper right-hand corner. Although the names will not be entered into the permanent data base, it will be very helpful to have a record of the equipment operator(s) if any questions arise concerning the skid data.

Following are instructions for completing the remainder of the skid data sheet.

1. Measurement Date for Skid Number (SN): Identify the month, day, and year when the skid measurements were made. The number to identify the month is in numerical sequence of the months as they occur during the year (e.g., 03 for March). The two digits identifying the year are the last two digits of the year (e.g., 89 for 1989).

2. Time of SN Measurement: Provide the hour of day at which the skid measurements were taken, in military time (e.g., 1:00 p.m. is 1300 hours).

3. Skid Number (Between Stations 0 and 2): Identify the skid number (or friction number) between the vehicle wheel tire and the pavement surface expressed in percent at the beginning of the 500-foot test section, between Stations 0 and 2. The skid number is the ratio of the frictional force to the wheel load multiplied by 100 (as described in AASHTO T242 or ASTM E274).

4. Skid Number (Between Stations 3 and 5): Identify the skid number between Stations 3 and 5, as described under Item 3. above.

5. Speed at Which SN Obtained: Enter the speed in miles per hour at which the skid numbers were obtained.

6. Test Method: Identify the type of test method used. The codes appear on the data sheet.

7. Equipment Brand: Indicate the equipment manufacturer. Please note if manufactured in-house.

8. Equipment Model: Identify the manufacturer's specific version of the equipment used.

9. State Equipment Number: Identify the specific piece of equipment used within an agency (where more than one of this type might exist).

10. Date of Last Calibration: Identify the month, day, and year of the most recent calibration of the equipment. Calibration should be performed at least once every two years. The date is identified in the same manner as the date in Item 1. above.

11. Surface Type: Identify the general type of pavement surface. The codes appear on the data sheet.

12. Air Temperature: Provide the air temperature in degrees Fahrenheit at the test site at the time of skid test.

13. Comments: Identify any information pertinent to the skid testing conditions (include if known the number of days that have passed since the section was last rained upon).

Revised November 6, 1989

SKID

DATA SHEET

* Indicates high priority skid data items.

SHEET 1

SKID DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

EQUIPMENT OPERATOR(S)__________

____

*1. MEASUREMENT DATE FOR SKID NUMBER (SN) (MONTH/DAY/YEAR) [_ _/_ _/_ _]

*2. TIME OF SN MEASUREMENT (HOURS) [_ _ _ _.]

*3. SKID NUMBER (BETWEEN STATIONS 0 AND 2) [_ _.]

*4. SKID NUMBER (BETWEEN STATIONS 3 AND 5) [_ _.]

*5. SPEED AT WHICH SN OBTAINED (MPH) [_ _.]

*6. TEST METHOD [_]
- Locked-Wheel Skid Test (AASHTO T242 OR ASTM E274) ... 1
- Mu Meter (AASHTO T268) 2
- Other (Specify) ______________________________ 3

7. EQUIPMENT BRAND______________________________

8. EQUIPMENT MODEL _ _ _ _ _ _ _

9. STATE EQUIPMENT NUMBER _ _ _ _ _ _ _

10. DATE OF LAST CALIBRATION (MONTH/DAY/YEAR) _ _/_ _/_ _

11. SURFACE TYPE _
- Asphalt 1
- Concrete 2
- Surface Treatment 3
- Other (Specify) ______________________________ 4

12. AIR TEMPERATURE (°F) _ _ _.

13. COMMENTS______________________________

____

3.3 DISTRESS SURVEY

This section provides data sheets and instructions for their use in collecting pavement surface distress data. Distress data will be collected primarily with the automated PASCO vehicle. However, a manual distress survey has been developed as a backup method. The manual method will be used at times when it is not possible to schedule the PASCO vehicle, such as prior to maintenance or rehabilitation work. The manual distress survey will also be performed in remote areas not accessible to PASCO (e.g. Hawaii, Puerto Rico).

The information presented on the data sheets is intended to be common to both the automated and manual method although much of this information will be obtained through automated data retrieval and entry, and therefore will not require the use of the data forms.

When a manual, or visual distress survey is to be performed, the guidelines presented in the "Manual for Field Distress Surveys," dated May 1989 should be followed along with the "Distress Identification Manual for the LTPP Studies," also dated May 1989. It is anticipated that similar documents will be developed for use in interpretation of the data collected by the PASCO vehicle.

Following are instructions for completing data sheets for (1) Asphaltic Concrete (AC) Pavements, (2) Jointed Concrete Pavements (JCP), and (3) Continuously Reinforced Concrete Pavements (CRCP). In the common data section appearing in the upper right-hand corner of all data sheets, the four-digit State ID is entered, along with the six-digit SHRP ID (two-digit State code plus four-digit SHRP Section ID).

Instructions For Completing AC Data Sheets

The results of distress surveys on AC surfaces are recorded on Sheets 1-3. Except where indicated otherwise, entries are made for all distress data elements. If a particular type of distress does not exist on the pavement at the location of interest, a zero should be entered in the appropriate space.

Description of Data Sheet 1. This data sheet provides space for recording measured values for the distress types identified in the left column. The units of measurement for each of the distress types are also identified in the left column. The extent of the measured distress for each particular level of severity is entered in the severity level columns identified as low, moderate, or high. Zeros are to be entered for any distress types and/or severity levels not found. The distress types and severity levels should be identified by using the "Distress Identification Manual for the LTPP Studies". The date of the distress survey is also recorded on Sheet 1.

Description of Data Sheet 2. This sheet is a continuation of the distress survey data recorded on Sheet 1 and is completed as described under Data Sheet 1. However, for the distresses shoving and polished aggregate, only extent is recorded. In addition, space is provided to list "Other" distress types observed on the test section but not listed on Data Sheet 1 or 2.

Description of Data Sheet 3. This data sheet provides space to record rutting and lane-to-shoulder dropoff.

Rutting is measured as the maximum vertical depression (to the nearest 1/10 of an inch) of the pavement surface in a wheelpath. It is measured from the center of a four-foot straight edge. Measurements are taken at the beginning of the test section and at 50-foot intervals. There should be a total of eleven measurements in each wheelpath, for a total of 22 measurements on each test section.

Lane-to-shoulder dropoff is measured as the difference in elevation (to the nearest 1/10 of an inch) between the pavement surface and the adjacent shoulder surface. Measurements are taken at the beginning of the test section and at 100-foot intervals (a total of six measurements) at the lane/shoulder interface or joint. Lane-to-shoulder dropoff typically occurs when the outside shoulder settles. However, heave of the shoulder may occur due to frost action or swelling soil. If heave of the shoulder is present, it should be recorded as a negative (-) value. At each point where there is no lane-to-shoulder dropoff, enter zero.

Instructions For Completing JCP Data Sheets

The results of distress surveys on JCP surfaces are recorded on Sheets 4-6. Except where indicated otherwise, entries are made for all distress data elements. If a particular type of distress does not exist on the pavement at the location of interest, a zero should be entered in the appropriate space.

Description of Data Sheet 4. This data sheet provides space for recording measured values for the distress types identified in the left column. The units of measurement for each of the distress types are also identified in the left column. The extent of the measured distress for each particular level of severity is entered in the severity level columns identified as low, moderate, or high. Zeros are to be entered for any distress types and/or severity levels not found. The distress types and severity levels should be identified by using the "Distress Identification Manual for the LTPP Studies". The date of the distress survey is also recorded on Sheet 4.

Description of Data Sheet 5. This sheet is a continuation of the distress survey data recorded on Sheet 4 and is completed as described under Data Sheet 4. However, for the distresses polished aggregate, popouts, and blowups, only extent is recorded. In addition, space is provided to list "Other" distress types observed on the test section but not listed on Data Sheet 4 or 5.

Description of Data Sheet 6. This data sheet provides space to record faulting of transverse joints and cracks, lane-to-shoulder dropoff, and lane-to-shoulder separation.

Faulting of transverse joints and cracks is measured as the difference in elevation (to the nearest 1/10 of an inch) between the pavement surfaces on either side of a transverse joint or crack. It is measured one foot from the outside slab edge. Measurements are taken at every joint and crack that has faulting. If more than 10 joints or cracks have faulting, record the measurements on additional copies of Sheet 6. The distance from the start of the test section to the point where the measurement is taken is also recorded. The space to the left of the entry of measured faulting is to be filled with a positive or negative sign. If the "approach" slab is higher than the "departure" slab, a positive sign is to be entered. If the approach slab is lower, a negative sign is entered.

Lane-to-shoulder dropoff is measured as the difference in elevation (to the nearest 1/10 of an inch) between the pavement surface and the adjacent shoulder surface. Measurements are taken at the beginning of the test section and at 100-foot intervals (a total of six measurements) at the lane/shoulder interface or joint. Lane-to-shoulder dropoff typically occurs when the outside shoulder settles. However, heave of the shoulder may occur due to frost action or swelling soil. If heave of the shoulder is present, it should be recorded as a negative (-) value. At each point where there is no lane-to-shoulder dropoff, enter zero.

Lane-to-shoulder separation is measured as the width of the joint (to the nearest 1/10 of an inch) between the outside lane and the adjacent shoulder surface. Measurements are taken at the beginning of the test section and at 100-foot intervals (a total of six measurements). At each point where there is no lane-to-shoulder separation, enter zero.

Instructions For Completing CRCP Data Sheets

The results of distress surveys on CRCP surfaces are recorded on Sheets 7-9. Except where indicated otherwise, entries are made for all distress data elements. If a particular type of distress does not exist on the pavement at the location of interest, a zero should be entered in the appropriate space.

Description of Data Sheet 7. This data sheet provides space for recording measured values for the distress types identified in the left column. The units of measurement for each of the distress types are also identified in the left column. The extent of the measured distress for each particular level of severity is entered in the severity level columns identified as low, moderate, or high, except as indicated on the form. Zeros are to be entered for any distress types and/or severity levels not found. The distress types and severity levels should be identified by using the "Distress Identification Manual for the LTPP Studies". The date of the distress survey is also recorded on Sheet 7.

Description of Data Sheet 8. This sheet is a continuation of the distress survey data recorded on Sheet 7 and is completed as described under Data Sheet 7. In addition, space is provided to list "Other" distress types observed on the test section but not listed on Data Sheet 7 or 8.

Description of Data Sheet 9. This data sheet provides space to record lane-to-shoulder dropoff and lane-to-shoulder separation. Measurements are taken at the beginning of the test section and at 100-foot intervals (a total of six measurements for each distress) at the lane/shoulder interface or joint.

Lane-to-shoulder dropoff is measured as the difference in elevation (to the nearest 1/10 of an inch) between the pavement surface and the adjacent shoulder surface. Lane-to-shoulder dropoff typically occurs when the outside shoulder settles. However, heave of the shoulder may occur due to frost action or swelling soil. If heave of the shoulder is present, it should be recorded as a negative (-) value.

Lane-to-shoulder separation is measured as the width of the joint (to the nearest 1/10 of an inch) between the outside lane and the adjacent shoulder surface.

At each point where there is no lane-to-shoulder dropoff or lane-to-shoulder separation, enter zero.

DISTRESS

DATA SHEETS

Revised May 8, 1989

SHEET 1

DISTRESS SURVEY

LTPP PROGRAM

STATE ASSIGNED ID _ _ _ _

STATE CODE _ _

SHRP SECTION ID _ _ _ _

DISTRESS SURVEY FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES

DATE OF DISTRESS SURVEY (MONTH/DAY/YEAR) _ _/_ _/_ _

DISTRESS TYPE	SEVERITY LEVEL LOW	MODERATE	HIGH
CRACKING			
1. ALLIGATOR (FATIGUE) CRACKING (Square Feet)	_ _ _ _.	_ _ _ _.	_ _ _ _.
2. BLOCK CRACKING (Square Feet)	_ _ _ _.	_ _ _ _.	_ _ _ _.
3. EDGE CRACKING (Linear Feet)	_ _ _.	_ _ _.	_ _ _.
4. LONGITUDINAL CRACKING (Linear Feet)	_ _ _ _.	_ _ _ _.	_ _ _ _.
5. REFLECTION CRACKING AT JOINTS (Number of Cracks)	_ _ _.	_ _ _.	_ _ _.
6. TRANSVERSE CRACKING (Number of Cracks)	_ _ _.	_ _ _.	_ _ _.
PATCHING AND POTHOLES			
7. PATCH/PATCH DETERIORATION (Square Feet)	_ _ _ _.	_ _ _ _.	_ _ _ _.
(Number)	_ _.	_ _.	_ _.
8. POTHOLES (Number)	_ _ _.	_ _ _.	_ _ _.

STATE ASSIGNED ID _ _ _ _

SHEET 2

DISTRESS SURVEY

LTPP PROGRAM

STATE CODE _ _

SHRP SECTION ID _ _ _ _

DISTRESS SURVEY FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES (CONTINUED)

DISTRESS TYPE	SEVERITY LEVEL: LOW	MODERATE	HIGH
SURFACE DEFORMATION			
9. RUTTING - REFER TO SHEET 3			
10. SHOVING (Square Feet)			_ _ _ _.
SURFACE DEFECTS			
11. BLEEDING (Square Feet)	_ _ _ _.	_ _ _ _.	_ _ _ _.
12. POLISHED AGGREGATE (Square Feet)			_ _ _ _.
13. RAVELING AND WEATHERING (Square Feet)	_ _ _ _.	_ _ _ _.	_ _ _ _.
MISCELLANEOUS DISTRESSES			
14. LANE-TO-SHOULDER DROPOFF - REFER TO SHEET 3			
15. WATER BLEEDING AND PUMPING (Number of Affected Cracks)	_ _ _.	_ _ _.	_ _ _.

16. OTHER (Describe)____________________

Revised May 8, 1989

SHEET 3

DISTRESS SURVEY

LTPP PROGRAM

STATE ASSIGNED ID _ _ _ _

STATE CODE _ _

SHRP SECTION ID _ _ _ _

DISTRESS SURVEY FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES (CONTINUED)

9. RUTTING

INNER WHEEL PATH			OUTER WHEEL PATH		
Point No.	Point Distance[1] (Feet)	Rut Depth (Inches)	Point No.	Point Distance[1] (Feet)	Rut Depth (Inches)
1	0.	_._	1	0.	_._
2	50.	_._	2	50.	_._
3	100.	_._	3	100.	_._
4	150.	_._	4	150.	_._
5	200.	_._	5	200.	_._
6	250.	_._	6	250.	_._
7	300.	_._	7	300.	_._
8	350.	_._	8	350.	_._
9	400.	_._	9	400.	_._
10	450.	_._	10	450.	_._
11	500.	_._	11	500.	_._

14. LANE-TO-SHOULDER DROPOFF

Point No.	Point Distance[1] (Feet)	Lane-to-Shoulder Dropoff (Inches)
1	0.	_._
2	100.	_._
3	200.	_._
4	300.	_._
5	400.	_._
6	500.	_._

Note 1. "Point Distance" is the distance in feet from the start of the test section to the point where the measurement was made.

Revised May 8, 1989

SHEET 4

DISTRESS SURVEY

LTPP PROGRAM

STATE ASSIGNED ID _ _ _ _

STATE CODE _ _

SHRP SECTION ID _ _ _ _

DISTRESS SURVEY FOR PAVEMENTS WITH JOINTED PORTLAND CEMENT CONCRETE SURFACES

DATE OF DISTRESS SURVEY (MONTH/DAY/YEAR) _ _/_ _/_ _

DISTRESS TYPE	SEVERITY LEVEL LOW	MODERATE	HIGH
CRACKING			
1. CORNER BREAKS (Number)	_ _ _.	_ _ _.	_ _ _.
2. DURABILITY "D" CRACKING (Number of Affected Joints and Cracks)	_ _ _ _.	_ _ _ _.	_ _ _ _.
3. LONGITUDINAL CRACKING (Linear Feet)	_ _ _ _.	_ _ _ _.	_ _ _ _.
4. TRANSVERSE CRACKING (Number of Cracks)	_ _ _.	_ _ _.	_ _ _.
JOINT DEFICIENCIES			
5. JOINT SEAL DAMAGE OF TRANSVERSE JOINTS (Number)	_ _.	_ _.	_ _.
6. SPALLING OF LONGITUDINAL JOINT (Linear Feet)	_ _ _ _.	_ _ _ _.	_ _ _ _.
7. SPALLING OF TRANSVERSE JOINTS (Number of Joints)	_ _.	_ _.	_ _.

Revised May 8, 1989

SHEET 5

DISTRESS SURVEY

LTPP PROGRAM

STATE ASSIGNED ID _ _ _ _

STATE CODE _ _

SHRP SECTION ID _ _ _ _

DISTRESS SURVEY FOR PAVEMENTS WITH JOINTED PORTLAND CEMENT CONCRETE SURFACES (CONTINUED)

DISTRESS TYPE	SEVERITY LEVEL: LOW	MODERATE	HIGH
SURFACE DEFECTS			
8. MAP CRACKING AND SCALING (Square Feet)	_ _ _ _.	_ _ _ _.	_ _ _ _.
9. POLISHED AGGREGATE (Square Feet)			_ _ _ _.
10. POPOUTS (Number/Square Foot)			_ _.
Total Affected Area (Square Feet)			_ _ _ _.
MISCELLANEOUS DISTRESSES			
11. BLOWUPS (Number)			_ _.
12. FAULTING OF TRANSVERSE JOINTS AND CRACKS - REFER TO SHEET 6			
13. LANE-TO-SHOULDER DROPOFF - REFER TO SHEET 6			
14. LANE-TO-SHOULDER SEPARATION - REFER TO SHEET 6			
15. PATCH/PATCH DETERIORATION (Square Feet)	_ _ _ _.	_ _ _ _.	_ _ _ _.
(Number)	_ _.	_ _.	_ _.
16. WATER BLEEDING AND PUMPING (Number of Affected Joints and Cracks)	_ _ _.	_ _ _.	_ _ _.
17. OTHER (Describe) ________________			

Revised May 8, 1989

STATE ASSIGNED ID _ _ _ _

SHEET 6

DISTRESS SURVEY

LTPP PROGRAM

STATE CODE _ _

SHRP SECTION ID _ _ _ _

DISTRESS SURVEY FOR PAVEMENTS WITH JOINTED PORTLAND CEMENT CONCRETE SURFACES (CONTINUED)

12. FAULTING OF TRANSVERSE JOINTS AND CRACKS

Joint No.[1]	Point Distance[2] (Feet)	Joint[3] Faulting (Inches)	Crack No.[1]	Point Distance[2] (Feet)	Crack[3] Faulting (Inches)
1	_ _ _.	_._	1	_ _ _.	_._
2	_ _ _.	_._	2	_ _ _.	_._
3	_ _ _.	_._	3	_ _ _.	_._
4	_ _ _.	_._	4	_ _ _.	_._
5	_ _ _.	_._	5	_ _ _.	_._
6	_ _ _.	_._	6	_ _ _.	_._
7	_ _ _.	_._	7	_ _ _.	_._
8	_ _ _.	_._	8	_ _ _.	_._
9	_ _ _.	_._	9	_ _ _.	_._
10	_ _ _.	_._	10	_ _ _.	_._

13. LANE-TO-SHOULDER DROPOFF

14. LANE-TO-SHOULDER SEPARATION

Point No.	Point Distance[2] (Feet)	Lane-to-Shoulder Dropoff (In.)	Lane-to-Shoulder Separation (In.)
1	0.	_._	_._
2	100.	_._	_._
3	200.	_._	_._
4	300.	_._	_._
5	400.	_._	_._
6	500.	_._	_._

Note 1. Numbers represent only transverse joints or cracks measured.

Note 2. "Point Distance" is the distance in feet from the start of the test section to the point where the measurement was made.

Note 3. Enter either a positive or negative sign in the left space, depending on whether the "approach slab" is higher or lower than the "departure slab", respectively.

Revised May 8, 1989

SHEET 7

DISTRESS SURVEY

LTPP PROGRAM

STATE ASSIGNED ID _ _ _ _

STATE CODE _ _

SHRP SECTION ID _ _ _ _

DISTRESS SURVEY FOR PAVEMENTS WITH CONTINUOUSLY REINFORCED PORTLAND CEMENT CONCRETE SURFACES

DATE OF DISTRESS SURVEY (MONTH/DAY/YEAR) _ _/_ _/_ _

DISTRESS TYPE	SEVERITY LEVEL: LOW	MODERATE	HIGH
CRACKING			
1. DURABILITY "D" CRACKING (Number of Affected Joints and Cracks)	_ _ _ _.	_ _ _ _.	_ _ _ _.
2. LONGITUDINAL CRACKING (Linear Feet)	_ _ _ _.	_ _ _ _.	_ _ _ _.
3. TRANSVERSE CRACKING (Number of Cracks)	_ _ _.	_ _ _.	_ _ _.
SURFACE DEFECTS			
4. MAP CRACKING AND SCALING (Square Feet)	_ _ _ _.	_ _ _ _.	_ _ _ _.
5. POLISHED AGGREGATE (Square Feet)			_ _ _ _.
6. POPOUTS (Number/Square Foot)			_ _.
Total Affected Area (Square Feet)			_ _ _ _.

Revised May 8, 1989

SHEET 8

DISTRESS SURVEY

LTPP PROGRAM

STATE ASSIGNED ID _ _ _ _

STATE CODE _ _

SHRP SECTION ID _ _ _ _

DISTRESS SURVEY FOR PAVEMENTS WITH
CONTINUOUSLY REINFORCED PORTLAND CEMENT CONCRETE SURFACES
(CONTINUED)

DISTRESS TYPE	SEVERITY LEVEL LOW	MODERATE	HIGH
MISCELLANEOUS DISTRESSES			
7. BLOWUPS (Number)			_ _.
8. CONSTRUCTION JOINT DETERIORATION (Number)	_ _.	_ _.	_ _.
9. LANE-TO-SHOULDER DROPOFF - REFER TO SHEET 9			
10. LANE-TO-SHOULDER SEPARATION - REFER TO SHEET 9			
11. PATCH/PATCH DETERIORATION (Square Feet)	_ _ _ _.	_ _ _ _.	_ _ _ _.
(Number)	_ _.	_ _.	_ _.
12. PUNCHOUTS (Number)	_ _.	_ _.	_ _.
13. SPALLING OF LONGITUDINAL JOINT (Linear Feet)	_ _ _ _.	_ _ _ _.	_ _ _ _.
14. WATER BLEEDING AND PUMPING (Number of Affected Joints and Cracks)	_ _ _.	_ _ _.	_ _ _.
15. OTHER (Describe) ______________________			

STATE ASSIGNED ID _ _ _ _

SHEET 9

DISTRESS SURVEY

LTPP PROGRAM

STATE CODE _ _

SHRP SECTION ID _ _ _ _

DISTRESS SURVEY FOR PAVEMENTS WITH CONTINUOUSLY REINFORCED PORTLAND CEMENT CONCRETE SURFACES (CONTINUED)

9. LANE-TO-SHOULDER DROPOFF

10. LANE-TO-SHOULDER SEPARATION

Point No.	Point Distance[1] (Feet)	Lane-to-Shoulder Dropoff (In.)	Lane-to-Shoulder Separation (In.)
1	0.	_._	_._
2	100.	_._	_._
3	200.	_._	_._
4	300.	_._	_._
5	400.	_._	_._
6	500.	_._	_._

Note 1. "Point Distance" is the distance in feet from the start of the test section to the point where the measurement was made.

CHAPTER 6
MAINTENANCE DATA COLLECTION

This chapter provides data sheets and instructions for their use in collecting information concerning maintenance applications and treatments on SHRP monitored test sections. The proposed maintenance data collection plan addresses two separate time periods referred to as (1) historical data and (2) SHRP accumulated data. Historical data consists of information collected on or near the monitoring site up to the time that site specific maintenance data collection using SHRP guidelines begins. Maintenance Data Sheet No. 1 is used for this period. SHRP accumulated data consists of information collected from the time SHRP monitoring of the site began by using the expanded system described in the remainder of this chapter. Maintenance Data Sheets Nos. 2 through 17 are used for this period. In brief, it is the intent that these sheets be used to record those data items during maintenance activities that reasonably identify existing pavement conditions prior to treatment, properties and quantities of materials used, and construction techniques applied during treatment. The maintenance data collection sheets are provided in the following order.

DESCRIPTION	SHEET #
Historical Maintenance Information	1
Maintenance Location Summary	2
Seal Coat AC Pavement	3-4
Crack Sealing AC Pavement	5
Patching AC Pavement	6
Partial Depth Patching PCC Pavement	7-9
Joint Resealing PCC Pavement	10-11
Grinding, Milling and Grooving	12
Full Depth Repair of PCC Pavement	13-16
Cost Data	17

For each specific type of treatment (or work type) the appropriate data sheets should be completed (see Table 1.0). The maintenance data sheets provided

Table 1.0. Maintenance Data Sheets to be completed.

WORK ITEM	WORK TYPE CODE*	MAINTENANCE DATA SHEETS
Crack Sealing (linear ft.)	01	5
Transverse Joint Sealing (linear ft.)	02	10-11
Lane-Shoulder, Longitudinal Joint Sealing (linear ft.)	03	10-11
Full Depth Joint Repair Patching of PCC (sq. yards)	04	13-16
Full Depth Patching of PCC Pavement Other than at Joint (sq. yards)	05	13-16
Partial Depth Patching of PCC Pavement Other than at Joint (sq. yards)	06	7-9
PCC Slab Replacement (sq. yards)	07	13-16
Grinding/Milling Surface (sq. yards)	12	12
Grooving Surface (sq. yards)	13	12
Mechanical Premix Patch (using motor grader and roller) (sq. yards)	21	6
Manual Premix Spot Patch (hand spreading and compacting with roller) (sq. yards)	22	6
Machine Premix Patch (placing premix with paver, compacting with roller) (sq. yards)	23	6
Full Depth Patch of AC Pavement (removing damaged material, repairing supporting material, and repairing) (sq. yards)	24	6
Patch Pot Holes - Hand Spread, Compacted with Truck (no. of holes)	25	6
Skin Patching (hand tools/hot pot to apply liquid asphalt and aggregate) (sq. yards)	26	6
Strip Patching (using spreader and distributor to apply hot liquid asphalt and aggregate) (sq. yards)	27	6
Surface Treatment, single layer (sq. yards)	28	3-4
Surface Treatment, double layer (sq. yards)	29	3-4
Surface Treatment, three or more layers (sq. yards)	30	3-4
Aggregate Seal Coat (sq. yards)	31	3-4
Sand Seal Coat (sq. yards)	32	3-4
Slurry Seal Coat (sq. yards)	33	3-4
Fog Seal Coat (sq. yards)	34	3-4
Prime Coat (sq. yards)	35	3-4
Tack Coat (sq. yards)	36	3-4
Dust Layering (sq. yards)	37	3-4
Partial Depth Patching of PCC Pavement at Joints (sq. yards)	54	7-9

*Work Type Codes are taken from Table A.17 in Appendix A.

do not include descriptions of pavements to be repaired, however, the "State Code" and the "SHRP Section ID" connect this information to other more descriptive data (i.e. inventory, distress, materials sampling, etc.) for the test section. On many of the data sheets, "Other" codes are provided for use where a product or technique is used which is not identified. As maintenance practices change and new materials become available, it will be necessary to record their use and performance. Therefore, where it is necessary to use an "Other" code, sufficient information should be provided to identify what material or technique was used. A manufacturer or reference is also highly desirable.

Data Sheets are to be filled out as completely as possible. It is recognized that some items requested may not be available. With this in mind, priority items have been indicated in bold face print with an asterisk (*). Every effort should be taken to obtain these data items. All remaining items should be acquired using a reasonable amount of effort. If any of these are unknown or unavailable, a "U" should be entered on the data sheet.

GUIDELINES FOR MAINTENANCE OF GPS TEST SECTIONS

The maintenance guidelines stated here allow for applications and treatments which are necessary to keep the pavements in safe and serviceable condition, to be performed on monitoring sites. These guidelines have been previously established under SHRP Operational Memorandum No. SHRP-LTPP-OM-001. The guidelines were developed to allow the application of most of the routine maintenance that a pavement section would have received if it had not been selected as a monitoring site. Limitations on treatments, however, have been applied. These limitations are intended to eliminate those activities that would seriously alter the information that is to be obtained from a monitoring site. Maintenance of non-pavement related items such as guard rails, lighting and signs is not affected by these guidelines.

A maintenance control zone, as shown in Figure 1, was established around each SHRP monitoring site. The zone was created as a buffer to reduce the influence of maintenance treatments on the performance of the monitoring site.

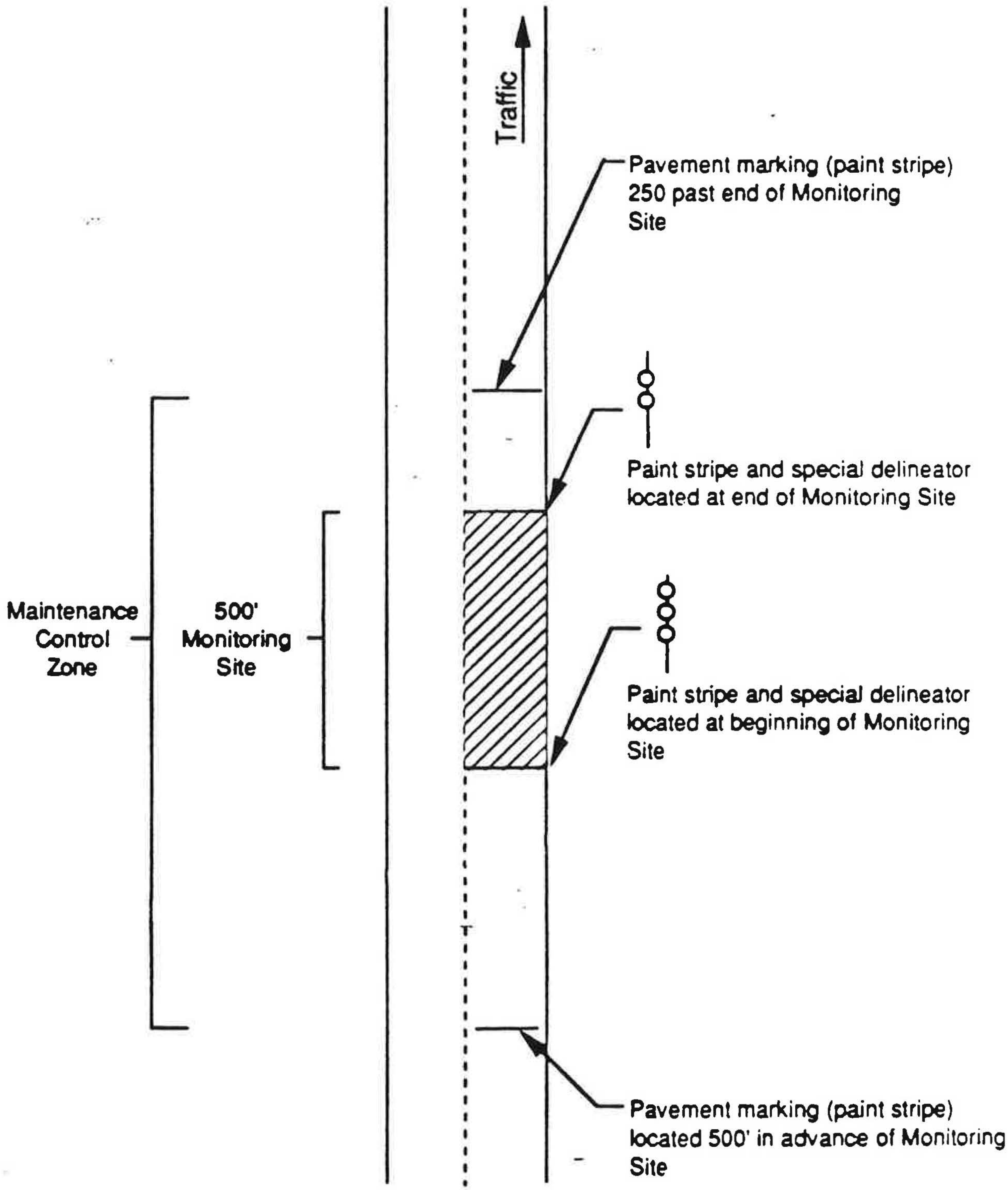


Figure 1. Illustration of GPS monitoring site maintenance control zone

These guidelines pertain only to the activities performed within the maintenance control zone. It is desired that the control zones only receive attention in response to a direct pavement need in accordance with guidelines. It is also desired that all maintenance treatments should be performed using the corresponding highway agencies standard procedures and materials.

Safety related maintenance may be performed according to the governing highway authority standards at any time. Safety related maintenance used in this context refers to spot patching of potholes, punchouts, blowups, or any other similar type of surface defect, and restoration of skid resistance. For slowly deteriorating safety conditions, it would be desirable to notify the SHRP Regional Coordination Office (RCO) in advance of any corrective action so that observation of the pavement condition prior to application of the treatment could be made. In order to obtain the greatest amount of structural performance information from a monitoring site, use of hot mixed asphaltic concrete (HMAC) overlays to restore skid resistance in the maintenance control zone is discouraged.

Routine or corrective maintenance activities that may be performed on the monitoring sites include the following:

- Crack Sealing
- Joint Cleaning/Sealing
- Isolated Spot Pavement Repairs, such as Patching

These activities may be performed without prior communication with the SHRP Regional Coordination Office (RCO). There are other maintenance activities that are permitted, however, notification to the RCO before their application is requested. These include:

- Seal Coats
  - Sand Seal
  - Cape Seal
  - Aggregate/Chip Seal

Slurry Seal

Fog Seal

- Milling or Grinding for Safety

Since the application of these types of treatments alter the pavement surface, their placement should be coordinated with the RCO prior to conducting the work. The purpose of this contact is to coordinate appropriate surveys that are required to adequately measure the pavements condition before and after treatment. Ideally, these before and after measurements will be taken by RCO's as close to and as soon after application as possible. The following types of measurements are required:

- Deflection
- Distress Survey
- Profile
- Skid

Guidelines on the timing of these measurements are contained in a separate SHRP Operational Memorandum.

In concluding the guidelines for maintenance activities, it is restated that those activities that will significantly alter the pavement performance should not be applied to the SHRP test sections in their first (non-rehabilitated) or study (rehabilitated and continued monitoring) performance period. These include the following:

- Extensive milling, grinding, grooving, or use of heater planer
- Undersealing
- Overlays, (HMAC, PCC)
- Slab jacking
- Retro-fitted underdrains or edge drains
- Other specialized types of maintenance activities that affect the structural response of the monitoring site.

If these measures are applied to the pavement outside of the maintenance control zone, transitions from these treatments to the control zone should be of sufficient lengths (recommended 200 ft. ± from beginning or end of control zone) to ensure the monitoring site is not influenced. If any of these types of treatments are planned for an area adjacent to a control zone, or for adjoining lanes or shoulders, the RCO must be notified as soon as possible.

Although application of these treatments is strongly discouraged during the SHRP monitoring performance period, at some point the condition of the test section will drop to a level which requires some type of extensive rehabilitative measures. In this event, the RCO should be notified to coordinate the last round of evaluation measurements. Since large amounts of information have been collected on these monitoring sites, it is desired that these sections be included as part of a rehabilitated pavement study. If this pavement is continued as one of the SHRP rehabilitation experiments, then data on the types of treatments should be collected following the guidelines established in the Rehabilitation Chapter (Chapter 7) of the Data Collection Guide.

DATA SOURCE IDENTIFICATION

It is anticipated that SHRP/LTPP maintenance data will be collected from several possible sources of information. To ensure a relative level of confidence in the reported maintenance information, the source of this data is considered to be of great importance.

Of all the possible sources of information, the most desirable is data collection sheets filled out in the field by a maintenance engineer or inspector. This would be done at the actual time of treatment application. If this is not possible or practical, then field notes or project diaries for each specific maintenance project should be used. These sources of data would most accurately reflect the actual materials and treatments placed on each monitoring site. It is strongly recommended that these "actual" sources be drawn from wherever possible.

If project diaries or field notes are not available, then maintenance construction or as built plans should be used. If these exist, they will give a relative idea of what has been done, but usually only show typical cross sections or plan quantities. Due to potential differences between what is actually in the field and what has been planned, this source is less desirable. Some of the parameters requested in the maintenance data collection guide may not be available from plans and may not have been recorded in a project diary either. An example of this is air content. This value is usually a specification value given by a SHA, AASHTO or industry standard. If no specific records of this type are available for a project, the most likely source for this data would be an applicable specification. It can be assumed that if the work performed was to specifications, then these values will nominally be representative of that found in the field. Because this information is the less specific for the individual monitoring sites, it is also less desirable.

If all other sources of data are exhausted, the only remaining way to obtain this information would be from engineering judgement of usual maintenance practices. This is highly subjective and would depend greatly on the knowledge and experience of each individual maintenance engineer or data collector. The use of the engineering judgement source is strongly discouraged and would be considered the least desirable condition as it may not reflect actual treatments or materials applied in the field.

In an attempt to define the overall quality of data collected, identifying these sources is necessary. Space is provided for the applicable items on the data collection sheets to indicate each source. This information will help establish a level of confidence to promote proper use of the data.

To facilitate the reporting of the source of information, three categories have been provided. These appear on the data collection sheets as "actual," "plans/specs," and "judgement" and are as described above.

As maintenance data is collected and subsequent completed data sheets are sent to the Regional Coordinating Offices, it will be imperative that the RCO's review these initial submissions. If sheets submitted from each State Highway Agency (SHA) appear to be completed as described in this chapter, then only spot checking of additional data by RCO's will be required. If problems are apparent in the data, then additional communication and coordination will be required between the SHA's and RCO's to resolve the questions.

DATA SECTION COMMON FOR ALL DATA SHEETS

A common set of project identification data appears in the upper right hand corner of every data sheet. These data items are described below.

State Assigned ID

The State assigned ID is an identification number assigned by the State Highway Agency (SHA) used solely to facilitate filing of the projects for the SHA's convenience, and may be cross-referenced with the construction project number. A State Highway Agency can use any system for assigning these identification numbers.

State Code

The State code is a number used to identify the state or Canadian province in which the pavement section is located (see Table A.1, Appendix A for codes).

SHRP Section ID

The SHRP section ID is a four-digit identification number assigned by SHRP. This number is used to facilitate the computer filing of the projects and will identify the section in the field. It will be cross-referenced with the State assigned ID.

HISTORICAL MAINTENANCE INFORMATION (SHEET 1)

Space is provided for identifying a maximum of six maintenance activities by year in which they were accomplished. If more than six maintenance activities were performed since pavement construction, this sheet must be repeated. Historical maintenance information consists of data collected on or near the monitoring site up to the time that site specific data collection using SHRP guidelines begins. This data will frequently be very difficult to obtain from existing records for pre-SHRP monitoring work, but it is extremely important that every effort be made to retrieve it.

1. Year: The year in which the maintenance activity occurred. Enter the last two digits of the year (83 for 1983, etc.).

2. Maintenance Case Number: The State Highway Agency assigned case number for the specific maintenance being reported. If no number was assigned, leave this space blank.

3. Work Type Code: A code entered to identify the type of maintenance work accomplished. The work type codes appear in Table A.17 in Appendix A.

4. Maintenance Location Code: A code entered to identify where on the roadway the maintenance was conducted. These codes appear in Table A.18 in Appendix A.

5. Maintenance Material Code: A code entered for identifying the maintenance materials used (such as "preformed joint fillers," "hot liquid asphalt," etc.). These codes appear in Table A.19 in Appendix A.

6. Work Quantity: The quantity of work performed for the complete project in the appropriate units as listed in Table A.17 (See item 1.3).

7. Thickness: The thickness entered to the nearest tenth of an inch for those maintenance activities that increase the thickness of the pavement structure (such as "surface treatment, single layer," or "surface treatment, double layer," etc.). Localized treatments (such as patching) should be marked as to average depth of material placed. Leave this space blank for treatments that do not increase the pavement thickness (such as fog seal).

8. Total Cost: The total costs for the maintenance work, reported in thousands of dollars per lane-mile. This should be calculated using the number of lanes and estimated total length over which the maintenance treatment was applied. All non-pavement items (guardrails, lighting, etc.) should be excluded. To be consistent with other cost data, this information should include only cost of materials. Labor, traffic control, or other incidental costs should be excluded.

MAINTENANCE LOCATION SUMMARY (SHEET 2)

This data sheet provides space for recording in the field all maintenance activities performed on the SHRP monitoring site. State Highway Agencies can use this sheet to sketch the approximate location and extent of all treatment applications. This sheet provides data collectors the ability to summarize all activities in which more extensive data is recorded on Sheets 3 to 17. The purpose of this sheet is to facilitate collection of all maintenance information.

SEAL COAT APPLICATION DATA FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES (SHEET 3)

Data Sheets 3 and 4 are for recording data on seal coat and surface treatment applications. If more than one seal coat or surface treatment is applied then one set (Sheets 3 and 4) should be completed for each coat or layer. That is, repeat Sheets 3 and 4 for each coat or layer.

1. Dates: The month, day and year the maintenance operation began and the month, day and year it was completed.

2. Primary Reason for Seal Coat: The codes appear on the data sheet, and space has been provided for entering a reason other than those for which codes were provided.

3. Percent of Test Section Sealed: The percent of the test section surface area over which the seal coat was placed. For SHRP LTPP test sections, the percent of the monitored outside lane is to be entered.

4. Type of Seal Coat: The type of seal coat (slurry, aggregate, fog, etc.) applied to the pavement surface. Codes are provided on the data sheet. Space has been provided to specify a different type of seal coat, where applicable. If more space is needed, attach a separate piece of paper to this form. If multiple coats are applied, repeat Sheets 3 and 4 for each.

5. Type/Grade of Bituminous Material in Seal Coat: Table A.16 in Appendix A provides a comprehensive list of possible types and grades, as taken from information published by the Asphalt Institute. Space is provided to write in a description of a cement used in the seal coat if it is other than the conventional asphalt cements and asphalt emulsions commonly used (such as sulphlex, latex modified asphalt, etc.).

6. Application Rate for Bituminous or Other Cementing Material: The amount of bituminous material to the nearest one-tenth of a gallon, placed per square yard of pavement (water added to emulsified asphalt is included).

7. Application Rate for Aggregate: The amount by weight of aggregate to the nearest one-tenth of a pound, including mineral filler, placed per square yard of pavement.

8. Approximate Finished Surface Treatment Thickness: The approximate thickness of the applied seal coat, to the nearest one-tenth of an inch.

9. Ambient Conditions at Time Seal Coat Applied: Air temperature in degrees Fahrenheit and a code entered to indicate whether the surface was dry or wet at the time the seal coat was applied.

10. Average Crack Severity Level: The average severity level of the cracks in the test section. The codes are provided on the data forms. Reference to the Distress Identification Manual should be used to establish severity level.

11. Primary Type of Cracks: A code entered to describe the primary type of crack evaluated in item 10 (above). Codes are provided in Table A.22 of Appendix A. For a complete description of each crack type, see the Distress Identification Manual.

SEAL COAT APPLICATION DATA FOR A PAVEMENT WITH ASPHALT CONCRETE SURFACES, CONTINUED (SHEET 4)

This data sheet is a continuation of seal coat data recorded on Sheet 3.

1. Gradation of Aggregate: The percent of the aggregate (including mineral filler) passing various standard sieve sizes, to the nearest one percent. Values will likely not be available for all thirteen sieve sizes listed. The objective of this list is to provide sufficient sieve sizes to accommodate testing and specification practice for most state and province agencies.

2. Aggregate Precoated: A code entered to indicate whether the seal coat aggregate was precoated or not. The codes appear on the data sheet.

3. Roller Used for Seating Aggregate: A code entered for indicating what type of roller was used for seating the aggregate into the asphalt. Codes appear on the data sheet.

4. Estimated Time Allowed for Seal Coat to Cure Prior to Traffic Application: A code used to identify the approximate length of time between application of the seal coat and opening the section to traffic (usually from completion of rolling or seating the aggregate. If no aggregate is placed then from the time the liquid was applied). Codes are provided on the data form.

5. Condition of Surface Before Sealing: A code entered to indicate whether the surface of the existing pavement was clean, moderately clean, or dirty when the seal coat was placed.

6. Initial Existing Pavement Surface Preparation: A code entered to indicate the method of initial surface preparation for the existing pavement. The codes appear on the data sheet, and space is provided to describe a method

not coded, where applicable. Attach a separate piece of paper if more space is needed.

7. Final Preparation of Existing Pavement Surface: A code entered to record the final surface preparation used on the existing asphalt concrete surface prior to seal coat application. The codes appear on the data sheet, and space is provided to describe a surface preparation method not coded, where applicable.

CRACK SEALING DATA FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES (SHEET 5)

This data sheet is for reporting the details of sealing individual cracks to prevent moisture intrusion into the underlying layers. If a seal coat is used over a broad area for crack sealing, it should be reported on Maintenance Data Sheets 3 and 4.

1. Dates: The month, day, and year the maintenance activity began and the month, day and year it was completed.

2. Average Crack Severity Level: The average severity of the cracks in the test section. Codes are provided on the data forms. Reference to the Distress Identification Manual should be used to establish severity level.

3. Primary Type of Cracks: A code entered to describe the primary type of crack prevalent over the monitored test section. Codes are provided in Table A.22 of Appendix A. A complete description of each type of crack is available in the Distress Identification Manual.

4. Type of Material Used to Seal Cracks: A code entered to record the type of material used to seal the cracks in the pavement surface. Codes are provided on the data sheet. If a proprietary crack/joint sealant or some other type not coded is used, spaces are provided to record information to identify the material.

5. Ambient Conditions at Time of Crack Sealing: The low and high air temperatures observed during crack sealing activities in degrees Fahrenheit, and a code entered to indicate whether the surface was dry or wet at the time the cracks were sealed.

6. Approximate Total Length of Cracks Sealed: The approximate total linear feet of individual cracks sealed within the test section to the nearest foot. For SHRP LTPP studies, only the total linear feet of cracks sealed in the outer lane are to be recorded.

7. Method Used to Clean Crack Prior to Sealing: A code entered to record the procedure used to clean the debris from cracks prior to sealing. Codes are provided on the data sheet, and a space is provided for entering a method for which no code is provided.

PATCHING DATA FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES (SHEET 6)

This data sheet is for reporting on patches within a test section with an asphalt concrete surface, which includes only the outside lane for SHRP LTPP.

1. Dates: The month, day, and year that the maintenance work began and the month, day, and year that it was completed.

2. Primary Reason for Patches: A code entered for indicating the primary reason for patching. Where patching was required for more than one reason, enter the cause resulting in the greatest area of patching. Codes appear in Table A.22 of Appendix A, and space is provided for writing in a reason for which no code was provided. For a complete description of each distress type, see the Distress Identification Manual.

3. Secondary Reason for Patches: A code entered for indicating a second reason for patching using codes as discussed above.

4. Patches: The number and square feet of patches, differentiated by vertical extent of patch; whether only the surface was replaced, the surface and a pavement layer that had been overlaid, all AC and PCC layers and part of the base, or all AC and PCC layers and all of the base (full-depth). Full depth patching refers to total replacement of the pavement materials at a particular location. It is not intended to imply a registered term certifying replacement of all materials with asphalt bound material.

5. If Patched Pavement is AC Overlay of PCC, Was Patch: A code entered to indicate whether the pavement patched was an Asphalt Concrete (AC) overlay of a Portland Cement Concrete (PCC) Pavement, and whether the patch material was all AC or AC over PCC to match existing materials. If not AC overlay of PCC, leave both spaces blank. Codes appear on the data sheet.

6. Surface Material(s) Used to Patch Pavement: A code to identify the type of surface material(s) used for patching. Codes are provided on the data form for up to two material types. Where a material other than those listed is used, space is provided for specification. If more than two types of surface material are used, specify the two used in the greatest area of patches.

7. Method of Compaction: A code entered to specify the method used for compacting the new patch material. Codes are provided on the data sheet.

8. Method Used to Determine Location and Sizes of Patches Required: A code entered to specify the means of locating areas requiring patching and identifying the limits of the areas to be patched. Codes are provided on the data form. Where some method other than those listed was used, space is provided to specify.

9. Method Used to Cut Boundaries: A code entered to indicate the method used for cutting the existing pavement at the patch boundary. Codes are provided on the data form, and space is provided for entering a method for which no code was provided.

PARTIAL DEPTH PATCHING DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACE (SHEET 7)

This data sheet is for reporting on patches within a test section with a PCC surface, which includes only the outside lane for SHRP LTPP. Partial depth patching includes replacing only a portion of the total pavement and base structure. It does not include replacing all pavement and base courses down to the subgrade.

1. Dates: The month, day, and year performance of the maintenance activity began and the month, day, and year that it was completed.

2. Primary Reason for Patches: A code entered to indicate the reason for patching. Where patching was required for more than one reason, enter the cause resulting in the greatest area of patching. Codes appear on Table A.22 of Appendix A, and space is provided for writing in a reason for which no code was provided. For a complete description of each distress type, see the Distress Identification Manual.

3. Secondary Reason for Patches: A code entered to indicate a second reason for patches using codes as discussed above.

4. Patches: The approximate area patched in square feet. The number of patches, and the average depth of the patches to the nearest tenth of an inch.

5. Method Used for Patch Boundary Determination: A code entered to identify the method of patch boundary determination. Codes are provided on the data form. Where some other method than those listed is used, space is provided on the data form to specify.

6. Method Used to Cut Boundaries: A code entered to indicate the method used for cutting the existing pavement at the patch boundary. Codes are provided on the data form, and space is provided for entering a method for which no code was provided.

7. Method Used to Break Up and/or Remove Deteriorated Concrete: A code entered to identify the method used to break up and/or remove the existing PCC materials. Codes are provided on the data sheet. Where a method other than that specified is used, space is provided to describe it.

8. Method for Final Cleaning of Patch Area: A code entered to specify the means of final surface preparation used to prepare the area to be patched. Codes are provided on the data form.

PARTIAL DEPTH PATCHING DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES, CONTINUED (SHEET 8)

This data sheet is a continuation of partial depth patching data recorded on Sheet 7.

1. Patch Material Used: A code entered to record the type of surface material used to patch the pavement. Codes are provided on the data form. Where a material other than those specified is used, it should be described in the space provided.

2. Bonding Agent: A code entered to identify the material used to bond the patch material to the existing portland cement. Codes are on the data form. Where a material other than those specified is used, it should be described in the space provided.

3. Mixture Design for Patch Material: The pounds per cubic yard of coarse aggregate, fine aggregate, cement, and water (report gallons per cubic yard) in the patch mixture. Coarse aggregate is aggregate retained on a No. 4 sieve. Appropriate entries are to be made depending on the type of patch material (A.C., P.C.C., etc.) used. For asphalt concrete patch material, leave the space for "water" blank.

4. Type Cement Used: A code entered to record the type of cement used in the patch mix. Types of cement and associated codes are shown in Tables A.11 and A.16 (Appendix A) for portland and asphalt cements, respectively. For epoxy cement enter "61." For polymer cement, enter "62." If a cement not otherwise identified was used, enter "63."

5. Air Content: The mean air content in percent by volume and range of air contents in the portland cement concrete mix to the nearest one-tenth of a percent. Where asphalt concrete is used as the patch material, these spaces are to be left blank.

6. Admixtures: Admixtures added to the concrete mix for whatever reason necessary. Spaces are provided to list up to two types of admixtures. Codes are provided in Table A.12, Appendix A. Where asphalt concrete is used as the patch material or where admixtures were not used, these spaces are to be left blank.

7. Slump: The mean and range of the slump for portland cement concrete patch material to the nearest inch. Where asphalt concrete is used as the patch material, these spaces are to be left blank.

8. Compressive Strength of Patch Material: The compressive strength of a standard cylinder of PCC patch material in psi after a certain curing time period in days. If compression tests were not performed and some other strength test (such as the indirect tensile test) was performed, space

is provided to identify the type of strength testing performed on the patch material, type of loading, age at testing, and measured strength. Refer to the test designation by AASHTO, ASTM, or other agency.

9. Maximum Size of Coarse Aggregate: The maximum size of coarse aggregate used in the patch material to the nearest one-tenth of an inch.

PARTIAL DEPTH PATCHING DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES, CONTINUED (SHEET 9)

This data sheet is for continuation of partial patching data recorded on Sheet 8.

1. Curing Method: The methods used for curing the patch material, if any. Space is provided to identify up to two methods used. Codes are provided on the data form. Space is also provided to specify some other method where that used is not shown on the data form. Where asphalt concrete is used as the patch material, these spaces are to be left blank. Where only one method is used, enter code for "Method 1" and leave "Method 2" blank.

2. Approximate Time Between Patching and Opening to Traffic: The approximate time in hours from placement of materials until traffic was allowed on the patch surface.

3. Ambient Conditions at Time of Patching: The low and high air temperatures observed during patching activities in degrees Fahrenheit, and a code entered to indicate whether the surface was dry or wet at the time of patching.

4. Method of Consolidating Material: A code entered for identification of the means of consolidating the patch materials. Codes are provided on the data form. Leave blank for asphalt concrete.

5. Finishing Method: A code entered to record the method used to finish the patch surface. Codes are provided on the data form. Where asphalt concrete is used as the patch material, this space is to be left blank.

6. Joint Forming Method: The method used for forming contraction joints into the patched concrete pavement surface for longitudinal, transverse, and shoulder joints where they may be present. Codes are provided on the data form. Where asphalt concrete is used as the patch material, these spaces are to be left blank.

JOINT RESEALING DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES (SHEET 10)

This data sheet is for recording details of replacement of joint seals in PCC pavements.

1. Dates: The month, day, and year the maintenance activity began and the month, day, and year it was completed.

2. Method of Removing Old Sealant: A code entered to identify the method used for removing the old or existing joint sealant. Codes are provided on the data form.

3. New Sealant Reservoir Dimensions: The width and depth of the sealant reservoir to the nearest one-tenth of an inch.

4. Bond Breaker Under Sealant: A code entered to identify the material used to prevent an adhesive bond between the sealant and the bottom of the reservoir. Codes are provided on the data form. Space is also provided to specify another material or method, where applicable.

5. Were Jointed Sidewalls Refaced: A code entered to specify whether none, one, or both sidewalls were refaced during the joint resealing process. Codes are provided on the data forms.

6. Cleaning of Sidewalls: A code entered to specify the means of cleaning the sidewalls prior to resealing. Codes are provided on the data form.

JOINT RESEALING DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES, CONTINUED (SHEET 11)

This data sheet is a continuation of the data recorded on Sheet 10. If more than one material or method is used for different joints, repeat Sheets 10 and 11 for each type.

1. Type of Contraction Joint Sealant: A code entered to specify the AASHTO/ASTM designation of the type of joint sealant material used. Codes are provided on the data form. Space is also provided to include information regarding the manufacturer and the product's specific name, where a joint sealant is used for which no code was provided.

2. Depth of Top of Sealant Placement: The depth to the nearest one-tenth of an inch from the top of the slab to the top of the joint sealant material.

3. Are Expansion Joints Sealed Differently than Contraction Joints: A code entered to indicate differences in sealing materials used for contraction and expansion joints. Codes are provided on the sheet. Space has been provided to describe material types if different methods are used.

4. Total Linear Feet of Joints Sealed: The total linear feet to the nearest tenth of a foot of joints sealed on the monitoring site. These are to be recorded as quantity of transverse and longitudinal joints.

DIAMOND GRINDING, MILLING OR GROOVING DATA FOR PAVEMENT SURFACES (SHEET 12)

1. Dates: The month, day, and year the maintenance activity began and the month, day, and year it was completed.

2. Pavement Surface Type: A code entered to report whether the surface material was asphalt concrete or portland cement concrete. Codes are provided on the data form.

3. Method Used: A code entered to report whether the surface material was removed by diamond grinding or milling equipment. Codes appear on the data sheet.

4. Reason for Grinding, Milling, or Grooving: The primary reason for grinding or milling the pavement section. Codes are provided on the data form. Space is provided to indicate another reason, where a code has not been provided.

5. Extent of Grinding, Milling, or Grooving: A code entered to indicate whether the grinding or milling was partial over individual joints, over patches only, or complete over the section. Codes are provided on the data form, and space is provided to describe a different extent of grinding or milling where necessary.

6. Average Depth of Cut: The average depth of the cut in the surface material to the nearest one-tenth of an inch.

7. Cutting Head Width: The approximate width to the nearest one-tenth of an inch of the machine cutting head.

8. Average Groove Width: The average groove width to the nearest one-tenth of an inch. Leave these spaces blank if diamond grinding or grooving was not the method used.

9. Average Spacing Between Blades: The average spacing between the grinding blades to the nearest one-tenth of an inch. Leave these spaces blank if diamond grinding or grooving was not the method used.

FULL DEPTH REPAIR FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES (SHEET 13)

This data sheet is for reporting details of full depth repair, including either full depth patches or complete slab replacement, for pavements with PCC surfaces.

1. Dates: The month, day, and year the maintenance activity began and the month, day, and year it was completed.

2. Primary Reason for Patches or Slab Replacement: A code entered for indicating the primary reason for patching or slab replacement. Where patching or slab replacement was required for more than one reason, enter

the cause resulting in the greatest repair area. Codes appear in Table A.22 of Appendix A, and space is provided for writing in a reason for which no code was provided. For a complete description of each distress type, see the Distress Identification Manual.

3. Secondary Reason for Patches or Slab Replacement: A code entered for indicating a second reason for patching or slab replacement, using codes as discussed above.

4. Patches: The number and square feet of patches differentiated by depth of material replaced whether only the slab was replaced, or both the slab and the base.

5. Patch Material Used: A code entered to record the type of surface material used to patch the pavement. Codes are provided on the data form. Where a material other than those specified is used, it should be described in the space provided.

6. Slabs Replaced: The number and square feet of slabs replaced, differentiated by whether only the slab was replaced or both the slab and part of the base.

7. Base Replaced By: The materials used to replace the base for patches and slab replacement, respectively. Codes appear on the data form, and space is provided for writing in another material for which no code was provided. Leave this space blank if the base was not replaced.

8. Method for Patch Boundary Determination: A code entered to indicate the means of determining the extent of the area to be patched, or whether slabs should be replaced. Codes are provided on the data form, and space is included to describe another method for which a code was not provided.

9. Cutting Instrument: A code entered to specify the instrument used to cut the boundaries of the area to be patched. Codes are provided on the data form.

FULL DEPTH REPAIR DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES, CONTINUED (SHEET 14)

This data sheet is a continuation of full depth repair data for PCC pavements recorded on Sheet 13.

1. Type of Joint Load Transfer System Used for Repaired Areas: The type of joint load transfer systems used for the transverse and longitudinal joints in the newly repaired area, respectively. Codes are provided on the data form, and space is included for entering a type for which a code was not provided.

2. Securing Load Transfer Devices: A code entered to indicate the material used to grout or epoxy load transfer devices into drilled or preformed holes. Codes are provided on the data form. Space is provided for

3. Reinforcing Steel Placed in Patch: A code entered to indicate whether the patched area contains reinforcing steel or not. Codes are provided on the data form.

4. Bar Diameters: The rebar numbers of the longitudinal and transverse bars or wire mesh (tied or untied to old concrete) in the full-depth repair. If either longitudinal or transverse bars were not used, the appropriate spaces may be left blank for these and the next three items.

5. Bar Lengths: The lengths of longitudinal and transverse bars or wire mesh, to the nearest one-tenth of an inch.

6. Bar Spacings: The approximate center-to-center spacings of adjacent longitudinal and transverse bars or wire mesh, to the nearest one-tenth of an inch.

7. Dowel Coatings: Codes entered to record the coatings used on longitudinal and transverse dowel bars. Codes are provided on the data sheet. If dowel bars were not used, leave this space blank.

8. Number of Saw Cuts: The number of saw cuts required per patch, if any.

9. Depth of Typical Boundary Saw Cut: The depth, to the nearest one-tenth of an inch, of the average boundary saw cut.

10. Concrete Breakup: A code entered to specify the means of breaking up the existing concrete to be removed. Codes are provided on the data form.

11. Removal of Concrete: A code entered to indicate the method of material removal from the area patched.

FULL DEPTH REPAIR DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES, CONTINUED (SHEET 15)

This data sheet is a continuation of full depth repair data recorded on Sheets 13 and 14.

1. Method of Reinforcing Steel Placement: A code entered to indicate the means of placing the reinforcing steel. Codes are provided on the data form. If reinforcing steel is not included, this space should be left blank.

2. Mixture Design for PCC Patch Material: The pounds per cubic yard of coarse aggregate, fine aggregate, cement, and water (report gallons per cubic yard) in patch mixture. Coarse aggregate is aggregate retained on a No. 4 sieve. For asphalt concrete patch material, leave the space for "water" blank.

3. Type Cement Used: A code entered to indicate the type of cement used in the patch mix. Types of cement and associated codes are provided in Table A.11 and A.16 (Appendix A) for portland and asphalt cements, respectively.

For epoxy cement, enter "61." For polymer cement, enter "62." If a cement not otherwise identified was used, enter "63."

4. Air Content: The mean air content and the range of the measured values (in percent by volume) in the portland cement mix, to the nearest one-tenth of a percent. Where asphalt concrete is used as the patch material, these spaces are to be left blank.

5. Admixtures: Admixtures added to the PCC mix for whatever purpose necessary. Space is provided to list up to two types of admixtures. A list of admixtures is provided in Table A.12, Appendix A. Where asphalt concrete is used as the patch material, leave these spaces blank.

6. Slump: The mean slump and the range (minimum and maximum measured value) for portland cement concrete patch material, to the nearest one-tenth of an inch. Where asphalt concrete is used as the patch material, these spaces are to be left blank.

7. Flexural Strength (Modulus of Rupture): The mean flexural strength of the portland cement concrete mix used in the patch in pounds per square inch, based on third point loading (ASTM C78), and the number of days the beam was cured before testing. If third-point beam tests were not performed and some other strength test (such as compressive or indirect tensile tests) were performed, space is provided to identify the type of strength testing performed on the concrete mixture, the type of loading, age at testing, and measured strength. Refer to a test designation by AASHTO, ASTM, or other agency. Where asphalt concrete is used as the patch material, leave these spaces blank.

8. Ambient Conditions at Time of Patching: The low and high air temperatures observed during patching activities in degrees Fahrenheit, and a code entered to indicate whether the surface was dry or wet at the time of patching.

9. Maximum Size of Coarse Aggregate: The maximum size of the coarse aggregate in the patch material to the nearest one-tenth of an inch.

FULL DEPTH REPAIR DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES, CONTINUED (SHEET 16)

This data sheet is a continuation of full depth repair data recorded on Sheets 13, 14, and 15. Where asphalt concrete was used as the patch material, the only data to be entered on this sheet is for "Consolidation of Materials" and "Approximate Time."

1. Joint Forming Method: Codes entered to specify the method of forming contraction joints in the shoulder, transverse direction, and longitudinal direction. Codes are provided on the data form. Where some method other than those listed was used, space is provided to specify.

2. Was Bond Breaker Used Between Adjacent Lanes: A code entered to indicate whether a bond breaker was used to discourage bonding between the new patch and an adjacent lane. Codes are provided on the data form.

3. Curing Method: Codes entered to indicate one or two methods of curing the patch materials. Codes are provided on the data sheet. Where some method other than one of those listed was used, space is provided to specify. If only one method was used, enter for "Method 1" only.

4. Approximate Time Between Patching and Opening to Traffic: The approximate time in hours which the patch materials were allowed to cure prior to allowing traffic on the surface.

5. Consolidation of Materials: A code entered to indicate the means of consolidating the patch materials into the area patched. Codes are provided on the data form.

6. Finishing: A code entered to indicate the means of finishing the surface of the patched area or new slab. Codes are provided on the data form. Where a method other than one of those specified was used, it should be indicated in the space provided.

7. Type of Transverse Joints in Patches or Slabs: Codes entered to indicate the type of joints adjacent to or in patches or new slabs, respectively, include expansion joints, contraction joints, or a mixture of the two. Codes are provided on the data form. Leave code for patches blank if no patches were adjacent to or include joints. Leave code for slabs blank if no full slabs were replaced.

8. Were Old Joints Matched: A code entered to indicate whether joints in the patch were matched with the old existing joints in the pavement. Codes are provided on the data form.

COST DATA (SHEET 17)

This data sheet provides spaces for recording measured or estimated quantities used on the test section in units specified, average costs per unit in dollars and total costs in thousands of dollars for each maintenance type for which data sheets have been provided. Spaces are also provided for entering the test section length treated, which will be used to convert the total cost of the maintenance on the test section to cost per lane-mile for compatibility with other cost data collected. All non-pavement items (guardrails, lighting, etc.) should be excluded. To be consistent with other cost data, this information should include only cost of materials. Labor, traffic control, or other incidental costs should be excluded.

MAINTENANCE

DATA SHEETS

* Indicates high priority maintenance data items.

Revised August 30, 1989

SHEET 1

MAINTENANCE DATA

LTPP PROGRAM

*STATE ASSIGNED ID __ __ __ __

*STATE CODE __ __

*SHRP SECTION ID __ __ __ __

HISTORICAL MAINTENANCE INFORMATION[1]

1 *YEAR	2 *MAINT. CASE NO. (CASE)	3 *WORK TYPE CODE (TABLE A.17)	4 *MAINTENANCE LOCATION CODE (TABLE A.18)	5 *MAINT. MATERIAL CODE (TABLE A.19)	6 *WORK QUANTITY	7 *THICKNESS (INCHES)	8 *TOTAL COST[2] (THOUSANDS OF DOLLAR PER LANE-MILE)
__ __	__ __ __	__ __	__ __	__ __	__ __ __ __ __.	__ __.__	__ __ __.
__ __	__ __ __	__ __	__ __	__ __	__ __ __ __ __.	__ __.__	__ __ __.
__ __	__ __ __	__ __	__ __	__ __	__ __ __ __ __.	__ __.__	__ __ __.
__ __	__ __ __	__ __	__ __	__ __	__ __ __ __ __.	__ __.__	__ __ __.
__ __	__ __ __	__ __	__ __	__ __	__ __ __ __ __.	__ __.__	__ __ __.
__ __	__ __ __	__ __	__ __	__ __	__ __ __ __ __.	__ __.__	__ __ __.

Note 1. This data will frequently be very difficult to convert from existing records for pre-SHRP monitoring work, but it is sufficiently important that every effort should be made to obtain it.

Note 2. Maintenance costs should be converted to thousands of dollars per lane-mile for uniformity with other cost data.

Sheet 2

Maintenance Data

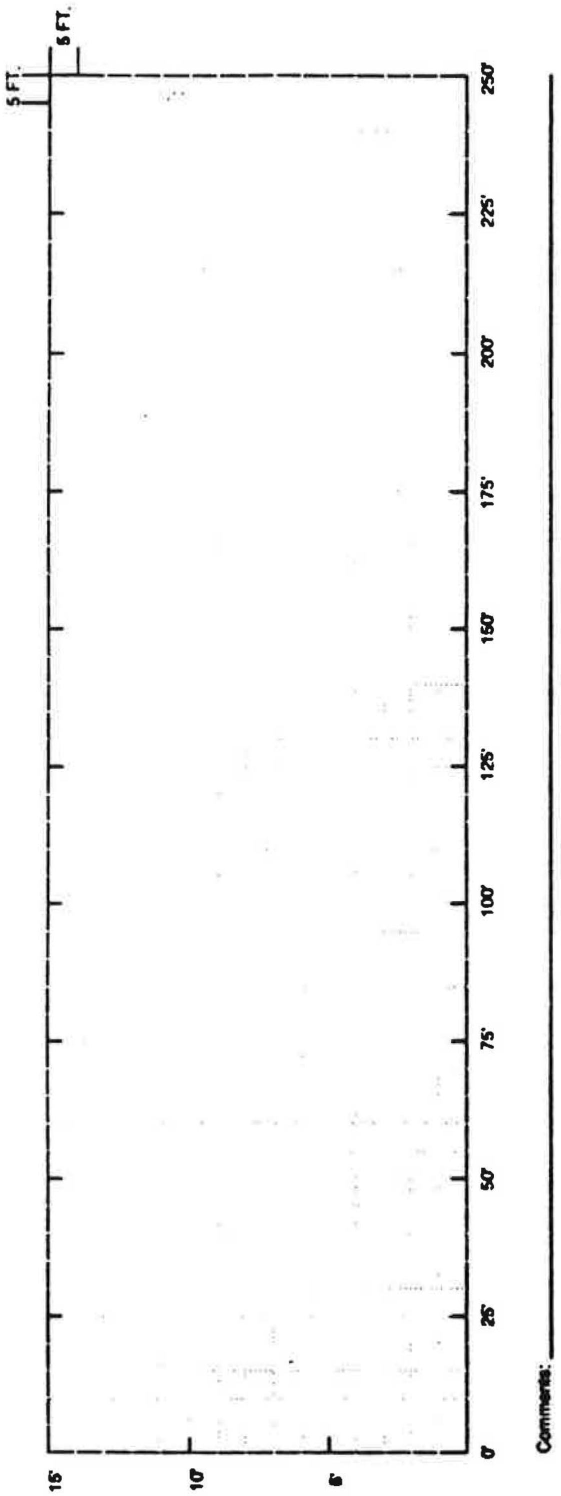
LTPP Program

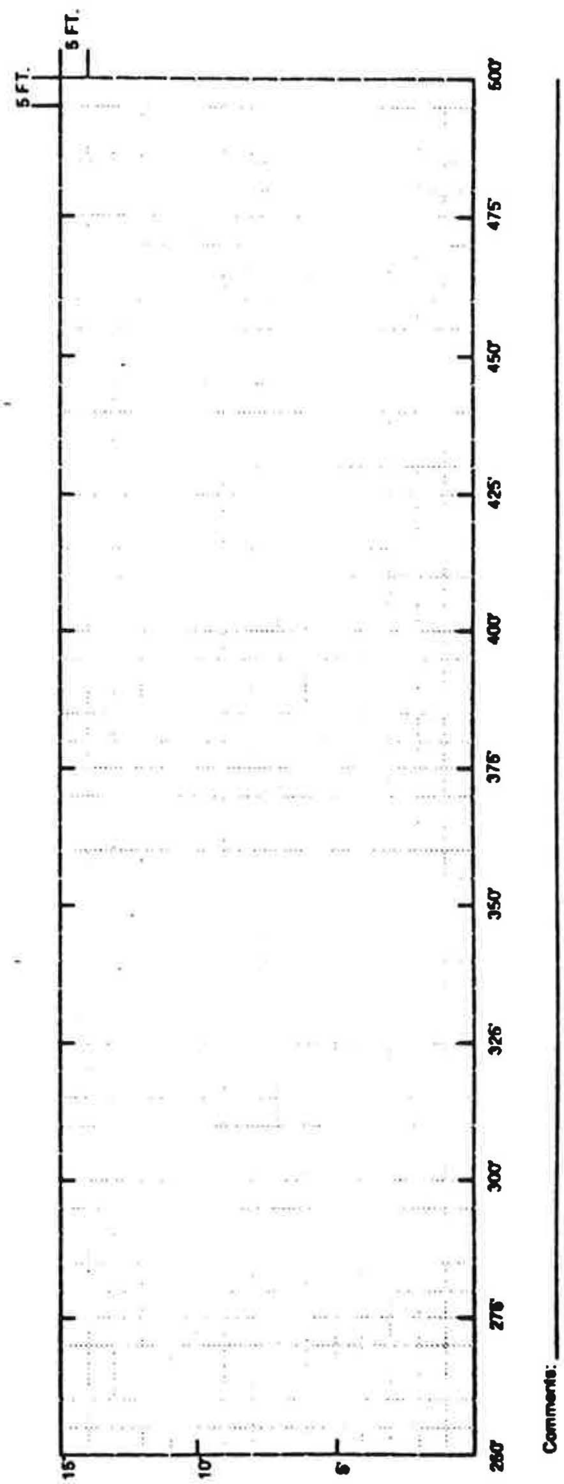
MAINTENANCE LOCATION SUMMARY

State Assigned ID [_ _ _ _]

State Code [_ _]

SHRP Section ID [_ _ _ _]





Instructions: Sketch the approximate location and extent of all maintenance activities.

Date ____________

***STATE ASSIGNED ID** [__ __ __ __]

SHEET 3 ***STATE CODE** [__ __]

MAINTENANCE DATA ***SHRP SECTION ID** [__ __ __ __]

LTPP PROGRAM

SEAL COAT APPLICATION DATA FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES

1. ***DATE WORK BEGAN** (MONTH/DAY/YEAR) [__ __ / __ __ / __ __]
   ***DATE WORK WAS COMPLETED** (MONTH/DAY/YEAR) [__ __ / __ __ / __ __]

2. ***PRIMARY REASON FOR SEAL COAT** [__]
   SEAL CRACKS.............1 RAVELING.............4
   IMPROVE SKID RESISTANCE.2 UNKNOWN..............5
   BLEEDING................3
   OTHER (SPECIFY)________________________________6

3. ***PERCENT OF TEST SECTION SEALED** [__ __ __]

4. ***TYPE OF SEAL COAT** [__]
   FOG SEAL................1 SAND SEAL............4
   SLURRY SEAL.............2 CAPE SEAL............5
   AGGREGATE SEAL..........3
   OTHER (SPECIFY)________________________________6
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

5. ***TYPE/GRADE OF BITUMINOUS MATERIAL IN SEAL COAT**
   (SEE TABLE A.16 FOR TYPE CODE) [__ __]
   DESCRIPTION OF "OTHER CEMENT" [________________________]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]
   MANUFACTURER NAME [________________________]
   MANUFACTURER MATERIAL NAMES [________________________]

6. ***APPLICATION RATE FOR BITUMINOUS OR OTHER CEMENTING MATERIAL**
   (GALLONS/SQ. YARD) [__.__]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

7. ***APPLICATION RATE FOR AGGREGATE** (INCLUDING MINERAL FILLER WHERE APPLICABLE) (POUNDS/SQ. YARD) [__ __.__]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

8. ***APPROXIMATE FINISHED SURFACE TREATMENT THICKNESS** (INCHES) [__.__]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

9. ***AMBIENT CONDITIONS AT TIME SEAL COAT APPLIED**
   AIR TEMPERATURE (°F) __ __ __
   ***SURFACE MOISTURE** - DRY = 1, WET = 2 [__]
   DATE SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

10. AVERAGE CRACK SEVERITY LEVEL (SEE DISTRESS IDENTIFICATION MANUAL) (LOW = 1, MODERATE = 2, HIGH = 3) __

11. PRIMARY TYPE OF CRACKS (SEE TABLE A.22 FOR TYPE CODES) __ __
    (SEE DISTRESS IDENTIFICATION MANUAL FOR DESCRIPTION)

*STATE ASSIGNED ID [__ __ __ __]

SHEET 4 *STATE CODE [__ __]

MAINTENANCE DATA SHRP SECTION ID [__ __ __ __]

LTPP PROGRAM

SEAL COAT APPLICATION DATA FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES (CONTINUED)

1. ***GRADATION OF AGGREGATE**
(INCLUDING MINERAL FILLER WHERE APPLICABLE)

U.S. STANDARD SIEVE SIZE (NO.)	TOTAL PERCENT PASSING	U.S. STANDARD SIEVE SIZE (NO.)	TOTAL PERCENT PASSING
1 In.	__ __ __	No. 10	__ __
3/4 In.	__ __ __	No. 16	__ __
5/8 In.	__ __ __	No. 30	__ __
1/2 In.	__ __ __	No. 50	__ __
3/8 In.	__ __ __	No. 100	__ __
No. 4	__ __	No. 200	__ __
No. 8	__ __		

DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

2. ***AGGREGATE PRECOATED?** YES - 1 NO - 2 [__]
DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

3. ***ROLLER USED FOR SEATING AGGREGATE** [__]
NONE....................1 STEEL WHEEL...........3
PNEUMATIC...............2 UNKNOWN...............4
OTHER (SPECIFY) ______________________________5
DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

4. ***ESTIMATED TIME ALLOWED FOR SEAL COAT TO CURE PRIOR TO TRAFFIC APPLICATION:** [__]
NONE....................1 1 TO 3 DAYS...........5
4 HOURS OR LESS.........2 3 TO 7 DAYS...........6
4 TO 8 HOURS............3 > 7 DAYS..............7
8 TO 24 HOURS...........4
DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

5. CONDITION OF SURFACE BEFORE SEALING __
CLEAN ...1 MODERATELY CLEAN ...2 DIRTY ...3

6. INITIAL EXISTING PAVEMENT SURFACE PREPARATION __
NONE....................1 COLD MILL.............3
SWEEP CLEAN ONLY........2 SHOT BLAST............4
OTHER (SPECIFY) ______________________________5

7. FINAL PREPARATION OF EXISTING PAVEMENT SURFACE __
NONE (OTHER THAN IDENTIFIED ABOVE)..................1
PRIMARILY AIR BLAST.................................2
PRIMARILY WATER BLAST...............................3
PRIMARILY SAND BLAST................................4
SAND BLAST AND AIR BLAST............................5
OTHER (SPECIFY) ______________________________6

***STATE ASSIGNED ID** [__ __ __ __]

SHEET 5

MAINTENANCE DATA

LTPP PROGRAM

***STATE CODE** [__ __]

***SHRP SECTION ID** [__ __ __ __]

CRACK SEALING DATA FOR PAVEMENT WITH ASPHALT CONCRETE SURFACES

1. ***DATE WORK BEGAN** (MONTH/DAY/YEAR) [__ __ /__ __ /__ __]
   ***DATE WORK WAS COMPLETED** (MONTH/DAY/YEAR) [__ __ /__ __ /__ __]

2. ***AVERAGE CRACK SEVERITY LEVEL** (SEE DISTRESS IDENTIFICATION MANUAL)
   (LOW = 1, MODERATE = 2, HIGH = 3) [__]

3. ***PRIMARY TYPE OF CRACKS** (SEE TABLE A.22 FOR TYPE CODES) [__ __]
   (SEE DISTRESS IDENTIFICATION MANUAL FOR DESCRIPTION)

4. ***TYPE OF MATERIAL USED TO SEAL CRACKS** [__]
   ASPHALT CEMENT.............1
   EMULSIFIED ASPHALT CEMENT..2
   CUTBACK ASPHALT CEMENT.....3
   EMULSIFIED ASPHALT CEMENT SLURRY SEAL.............4
   EMULSIFIED ASPHALT CEMENT WITH SAND..............5
   PROPRIETARY CRACK/JOINT SEALANT................6
   MODIFIED ASPHALT..........7
   OTHER (SPECIFY)________________________________8
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]
   IF 6 OR 7 ABOVE, COMPLETE FOLLOWING:
   MANUFACTURER NAME [________________________________]
   MANUFACTURER SEALANT NAME [________________________________]

5. ***AMBIENT CONDITIONS AT TIME OF CRACK SEALING**
   AIR TEMPERATURES (^{0}F) LOW __ __ __.
   HIGH __ __ __.
   ***SURFACE MOISTURE** - DRY = 1, WET = 2 [__]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

6. APPROXIMATE TOTAL LENGTH OF CRACKS SEALED, FEET __ __ __ __.

7. METHOD USED TO CLEAN CRACK PRIOR TO SEALING __
   NONE.......................1
   COMPRESSED AIR.............2
   ROUTING....................3
   STEEL WIRE BRUSH.........4
   BROOMING.................5
   HOT AIR LANCE............6
   OTHER (SPECIFY)________________________________7
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

*STATE ASSIGNED ID [__ __ __ __]

SHEET 6 | *STATE CODE [__ __]

MAINTENANCE DATA | *SHRP SECTION ID [__ __ __ __]

LTPP PROGRAM

PATCHING DATA FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES

1. ***DATE WORK BEGAN** (MONTH/DAY/YEAR) [__ __/__ __/__ __]
   ***DATE WORK WAS COMPLETED** (MONTH/DAY/YEAR) [__ __/__ __/__ __]

2. ***PRIMARY REASON FOR PATCHES** (SEE TABLE A.22 FOR TYPE CODES) [__ __]
   OTHER (SPECIFY) ______________________

3. SECONDARY REASON FOR PATCHES (SEE TABLE A.22 FOR TYPE CODES) __ __
   OTHER (SPECIFY) ______________________

4. ***PATCHES**

	NUMBER	SQ. FEET
SURFACE ONLY	[__ __]	[__ __ __ __]
SURFACE AND OVERLAID PAVEMENT	[__ __]	[__ __ __ __]
AC AND PC LAYERS AND PARTIAL BASE REPLACEMENT	[__ __]	[__ __ __ __]
FULL DEPTH	[__ __]	[__ __ __ __]

5. ***IF PATCHED PAVEMENT IS AC OVERLAY OF PCC, WAS PATCH** [__]
   ALL AC - 1 AC AND PCC TO MATCH - 2

6. ***SURFACE MATERIAL(S) USED TO PATCH PAVEMENT** [__] [__]
   HOT MIX ASPHALT CONCRETE....................................1
   PLANT MIX WITH CUTBACK ASPHALT, COLD LAID..............2
   PLANT MIX WITH EMULSIFIED ASPHALT, COLD LAID..........3
   ROAD MIX WITH CUTBACK ASPHALT.............................4
   ROAD MIX WITH EMULSIFIED ASPHALT..........................5
   PORTLAND CEMENT CONCRETE....................................6
   OTHER (SPECIFY) ______________________7
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

7. METHOD OF COMPACTION __
   NONE.........................1 VIBRATORY ROLLER........4
   PNEUMATIC ROLLER...........2 STEEL WHEEL ROLLER......5
   VIBRATORY PLATE COMPACTOR.3 TRUCK TIRE..............6
   OTHER (SPECIFY) ______________________7
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

8. METHOD USED TO DETERMINE LOCATION AND SIZES OF PATCHES REQUIRED __
   DEFLECTION TESTING........1 VISUAL...................3
   CORING.....................2
   OTHER (SPECIFY) ______________________4
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

9. METHOD USED TO CUT BOUNDARIES __
   NONE.............1 AIR HAMMER................3
   SAW CUT..........2 COLD MILLING..............4
   OTHER (SPECIFY) ______________________5
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

***STATE ASSIGNED ID** [__ __ __ __]

SHEET 7 ***STATE CODE** [__ __]

MAINTENANCE DATA ***SHRP SECTION ID** [__ __ __ __]

LTPP PROGRAM

PARTIAL DEPTH PATCHING DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES

1. ***DATE WORK BEGAN** (MONTH/DAY/YEAR) [__ __ /__ __ /__ __]
   ***DATE WORK WAS COMPLETED** (MONTH/DAY/YEAR) [__ __ /__ __ /__ __]

2. ***PRIMARY REASON FOR PATCHES** (SEE TABLE A.22 FOR TYPE CODES) [__ __]
   OTHER (SPECIFY)________________________________

3. SECONDARY REASON FOR PATCHES (SEE TABLE A.22 FOR TYPE CODES) [__ __]
   OTHER (SPECIFY)________________________________

4. ***PATCHES**
   TOTAL SQUARE FEET [__ __ __ __.]
   NUMBER [__ __.]
   AVERAGE DEPTH, INCHES [__ __.__]

5. METHOD USED FOR PATCH BOUNDARY DETERMINATION __
   VISUAL 1
   BALL PEEN HAMMER, STEEL ROD, CHAIN
   OR EQUIVALENT.........................2
   DELAM-TECH..............................3
   OTHER______________________________4
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

6. METHOD USED TO CUT BOUNDARIES __
   DIAMOND BLADE SAW.......1 AIR HAMMER...............4
   CARBIDE BLADE SAW.......2 COLD MILLING............5
   NONE...................3
   OTHER (SPECIFY)______________________________6
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

7. METHOD USED TO BREAK UP AND/OR REMOVE
   DETERIORATED CONCRETE __
   JACKHAMMER..............1 COLD MILLING............2
   OTHER (SPECIFY)______________________________3
   DATA SOURCE = ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

8. METHOD FOR FINAL CLEANING OF PATCH AREA __
   NONE....................1 WATERBLASTING...........3
   SANDBLASTING............2
   OTHER (SPECIFY)______________________________4
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

***STATE ASSIGNED ID** [__ __ __ __]

SHEET 7 ***STATE CODE** [__ __]

MAINTENANCE DATA ***SHRP SECTION ID** [__ __ __ __]

LTPP PROGRAM

PARTIAL DEPTH PATCHING DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES

1. ***DATE WORK BEGAN** (MONTH/DAY/YEAR) [__ __ /__ __ /__ __]
   ***DATE WORK WAS COMPLETED** (MONTH/DAY/YEAR) [__ __ /__ __ /__ __]

2. ***PRIMARY REASON FOR PATCHES** (SEE TABLE A.22 FOR TYPE CODES) [__ __]
   OTHER (SPECIFY)________________

3. SECONDARY REASON FOR PATCHES (SEE TABLE A.22 FOR TYPE CODES) [__ __]
   OTHER (SPECIFY)________________

4. ***PATCHES**
   TOTAL SQUARE FEET [__ __ __ __.]
   NUMBER [__ __.]
   AVERAGE DEPTH, INCHES [__ __.__]

5. METHOD USED FOR PATCH BOUNDARY DETERMINATION __
   VISUAL 1
   BALL PEEN HAMMER, STEEL ROD, CHAIN
   OR EQUIVALENT..........................2
   DELAM-TECH..............................3
   OTHER ________________4
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

6. METHOD USED TO CUT BOUNDARIES __
   DIAMOND BLADE SAW.......1 AIR HAMMER...............4
   CARBIDE BLADE SAW.......2 COLD MILLING............5
   NONE....................3
   OTHER (SPECIFY)________________6
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

7. METHOD USED TO BREAK UP AND/OR REMOVE
   DETERIORATED CONCRETE __
   JACKHAMMER...............1 COLD MILLING............2
   OTHER (SPECIFY)________________3
   DATA SOURCE = ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

8. METHOD FOR FINAL CLEANING OF PATCH AREA __
   NONE.....................1 WATERBLASTING...........3
   SANDBLASTING............2
   OTHER (SPECIFY)________________4
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

***STATE ASSIGNED ID** [__ __ __ __]

SHEET 8 ***STATE CODE** [__ __]

MAINTENANCE DATA ***SHRP SECTION ID** [__ __ __ __]

LTPP PROGRAM

PARTIAL DEPTH PATCHING DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES (CONTINUED)

1. ***PATCH MATERIAL USED** [__]
   PORTLAND CEMENT CONCRETE.1 EPOXY MORTOR............3
   POLYMER CONCRETE.........2 ASPHALT CONCRETE........4
   OTHER (SPECIFY) ________________ 5
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

2. ***BONDING AGENT** [__]
   NONE.....................1 EPOXY RESIN.............3
   CEMENT GROUT.............2 CUTBACK ASPHALT.........4
   OTHER ________________ 5
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

3. ***MIXTURE DESIGN FOR PATCH MATERIAL,** LB./CUBIC YD.
   COARSE AGGREGATE [__ __ __ __.]
   FINE AGGREGATE [__ __ __ __.]
   CEMENT [__ __ __ __.]
   WATER (GALLONS/CUBIC YD.) (LEAVE BLANK FOR A.C.) [__ __ __ __.]

   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

4. ***TYPE CEMENT USED** (SEE CEMENT TYPE CODES, TABLES A.11 AND A.16) [__ __]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

5. ***AIR CONTENT**, PERCENT BY VOLUME (LEAVE BLANK FOR A.C.)
   MEAN [__ __.__]
   RANGE [__ __.__ TO __ __.__]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

6. ***ADMIXTURES** (LEAVE BLANK FOR A.C.) [__ __]
   (SEE CEMENT ADDITIVE CODES, TABLE A.12) [__ __]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

7. ***SLUMP**, INCHES (LEAVE BLANK FOR A.C.)
   MEAN [__ __.]
   RANGE [__ __. TO __ __.]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

8. ***COMPRESSIVE STRENGTH OF PATCH MATERIAL**, PSI [__ __ __ __.]
   CURING TIME, DAYS (LEAVE BLANK FOR A.C.) [__ __.]
   IF UNAVAILABLE, AND OTHER STRENGTH TEST CONDUCTED,
   ENTER ALTERNATE TEST [________________]
   TYPE OF LOADING [________________]
   AGE, DAYS [__ __]; STRENGTH, PSI [__ __ __ __]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

9. MAXIMUM SIZE OF COARSE AGGREGATE, INCHES __.__
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

***STATE ASSIGNED ID** [__ __ __ __]

SHEET 9 ***STATE CODE** [__ __]

MAINTENANCE DATA ***SHPR SECTION ID** [__ __ __ __]

LTPP PROGRAM

PARTIAL DEPTH PATCHING DATA FOR PAVEMENTS
WITH PORTLAND CEMENT CONCRETE SURFACES
(CONTINUED)

1. ***CURING METHOD** (LEAVE BLANK FOR A.C.) METHOD 1 [__ __]
METHOD 2 [__ __]

NONE........................1 BURLAP-POLYETHYLENE BLANKETS.6
MEMBRANE CURING COMPOUND....2 INSULATING LAYERS............7
BURLAP CURING BLANKETS......3 COTTON MAT CURING............8
WATERPROOF PAPER BLANKETS...4 HAY..........................9
WHITE POLYETHYLENE SHEETING.5
OTHER (SPECIFY)____10
DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

2. ***APPROXIMATE TIME BETWEEN PATCHING AND OPENING TO TRAFFIC,** HOURS [__ __.]
DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

3. ***AMBIENT CONDITIONS AT TIME OF PATCHING** LOW [__ __ __.]
AIR TEMPERATURE (°F) HIGH [__ __ __.]

SURFACE MOISTURE - DRY = 1, WET = 2 [__]
DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

4. METHOD OF CONSOLIDATING MATERIALS (LEAVE BLANK FOR A.C.) __
VIBRATORS...............1 RODDING/TAMPING.........4
VIBRATING SCREEDS.......2 ROLLING.................5
TROWELING...............3
OTHER (SPECIFY)______________________________________6
DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

5. FINISHING METHOD (LEAVE BLANK FOR A.C.) __
SCREEDING...............1 MACHINE-TROWELING.......3
HAND-TROWELING..........2
OTHER (SPECIFY)______________________________________4
DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

6. JOINT FORMING METHOD (LEAVE BLANK FOR A.C.)
SHOULDER __
TRANSVERSE __
LONGITUDINAL __

NONE......................1 FIBERBOARD INSERT.......4
POLYETHYLENE STRIP INSERT.2 SAWING..................5
STYROFOAM INSERT..........3 FORMS...................6
OTHER (SPECIFY)______________________________________7
DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

***STATE ASSIGNED ID** [__ __ __ __]

SHEET 10 ***STATE CODE** [__ __]

MAINTENANCE DATA ***SHRP SECTION ID** [__ __ __ __]

LTPP PROGRAM

JOINT RESEALING DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES

1. ***DATE WORK BEGAN** (MONTH/DAY/YEAR) [__ __ /__ __ /__ __]
   ***DATE WORK WAS COMPLETED** (MONTH/DAY/YEAR) [__ __ /__ __ /__ __]

2. ***METHOD OF REMOVING OLD SEALANT** [__]
   NOT REMOVED....................................1
   JOINT PLOW -- V-SHAPED.........................2
   -- RECTANGULAR.................................3
   HIGH PRESSURE WATER BLASTING...................4
   DIAMOND BLADE SAW..............................5
   CARBIDE BLADE SAW..............................6
   PULL-OUT OF OLD COMPRESSION SEALANT............7
   NOT PREVIOUSLY SEALED..........................8
   OTHER (SPECIFY)________________________9
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

3. ***NEW SEALANT RESERVOIR DIMENTIONS,** INCHES
   WIDTH [__.__]
   DEPTH (FROM TOP OF SLAB TO TOP OF BACKER ROD OR TAPE [__ __.__]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

4. ***BOND BREAKER UNDER SEALANT** [__]
   NONE...1
   NONREACTIVE ADHESIVE BACKED TAPE...............2
   BACKER ROD.....................................3
   OTHER (SPECIFY)________________________4

5. WERE JOINT SIDEWALLS REFACED? __
   NO...1
   YES -- ONE-BLADE...............................2
   -- TWO-BLADE...................................3
   OTHER (SPECIFY)________________________4

6. CLEANING OF SIDEWALLS __
   NONE...1
   SANDBLASTING...................................2
   WATERBLASTING..................................3
   OTHER (SPECIFY)________________________4
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

***STATE ASSIGNED ID** [_ _ _ _]

SHEET 11 ***STATE CODE** [_ _]

MAINTENANCE DATA ***SHRP SECTION ID** [_ _ _ _]

LTPP PROGRAM

JOINT RESEALING DATA FOR PAVEMENTS
WITH PORTLAND CEMENT CONCRETE SURFACES
(CONTINUED)

1. ***TYPE OF CONTRACTION JOINT SEALANT** (AASHTO or ASTM SPECIFICATIONS) [_]

D1850 (ASTM)CONCRETE JOINT SEALER, COLD-APPLICATION TYPE....1
D1190 (ASTM) - M173 (AASHTO) CONCRETE JOINT SEALER, HOT-POURED ELASTIC TYPE.................................2
D3406 (ASTM) - M282 (AASHTO) JOINT SEALANTS, HOT-POURED, ELASTOMERIC-TYPE, FOR PCC PAVEMENTS...................3
D3405 (ASTM) - M301 (AASHTO) JOINT SEALANTS, HOT-POURED FOR CONCRETE AND ASPHALT PAVEMENTS....................4
D3542 (ASTM) PREFORMED POLYCHLOROPRENE ELASTOMERIC JOINT SEALS FOR BRIDGES....................................5
D2628 (ASTM) PREFORMED POLYCHOROPRENE ELASTOMERIC JOINT SEALS FOR CONCRETE PAVEMENTS.........................6
OTHER (DESCRIBE - IF SILICONE MATERIAL IS USED FEDERAL SPEC. TT-S-001543A, GEORGIA D.O.T. SPEC 833.06, OR EQUAL APPLIES)...................................7

____

____

MANUFACTURER INFORMATION ON TYPE OF PRESSURE RELIEF JOINT SEALANT

MANUFACTURER NAME [______________________________]

MANUFACTURER SEALANT NAME [______________________________]

DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [_]

2. ***DEPTH OF TOP OF SEALANT PLACEMENT BELOW PAVEMENT SURFACE**, INCHES [_._]

DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [_]

3. ***ARE EXPANSION JOINTS SEALED DIFFERENTLY THAN CONTRACTION JOINTS?** [_]

YES = 1 NO = 2

IF YES, DESCRIBE MATERIAL USED IN EXPANSION JOINTS [____________________

____

____]

4. ***TOTAL LINEAR FEET OF JOINTS SEALED**

TRANSVERSE JOINTS [_ _ _ _._]

LONGITUDINAL JOINTS [_ _ _ _._]

NOTE: IF DIFFERENT MATERIALS OR METHODS ARE USED REPEAT SHEETS 10 AND 11 FOR EACH RECORDING THEIR LENGTHS IN ITEM NO. 4.

***STATE ASSIGNED ID** [__ __ __ __]

SHEET 12 ***STATE CODE** [__ __]

MAINTENANCE DATA ***SHRP SECTION ID** [__ __ __ __]

LTPP PROGRAM

DIAMOND GRINDING, MILLING OR GROOVING DATA FOR PAVEMENT SURFACES

1. ***DATE WORK BEGAN** (MONTH/DAY/YEAR) [__ __ /__ __ /__ __]
   ***DATE WORK WAS COMPLETED** (MONTH/DAY/YEAR) [__ __ /__ __ /__ __]

2. ***PAVEMENT SURFACE TYPE** [__]
   ASPHALT CONCRETE (AC)..............................1
   PORTLAND CEMENT CONCRETE (PCC)........................2

3. ***METHOD USED** [__]
   DIAMOND GRINDING....................................1
   MILLING...2
   GROOVING..3

4. ***REASON FOR MILLING, GRINDING OR GROOVING** [__]
   ELIMINATION OF FAULTING.............................1
   ELIMINATION OF SLAB WARPING.........................2
   IMPROVE SKID RESISTANCE.............................3
   RESTORATION OF TRANSVERSE
   DRAINAGE SLOPE......................................4
   OTHER (SPECIFY) ____5

5. ***EXTENT OF MILLING, GRINDING, OR GROOVING** [__]
   ENTIRE TEST SECTION LENGTH..........................1
   INDIVIDUAL JOINTS OR CRACKS.........................2
   PATCHES ONLY..3
   OTHER (SPECIFY) ____4

6. ***AVERAGE DEPTH OF CUT,** INCHES [__.__ __]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

7. CUTTING HEAD WIDTH, INCHES __ __ __.__
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

8. AVERAGE GROOVE WIDTH (DIAMOND GRINDING AND GROOVING
   ONLY), INCHES __.__
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

9. AVERAGE SPACING BETWEEN BLADES (DIAMOND GRINDING AND GROOVING
   ONLY), INCHES .__
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

***STATE ASSIGNED ID** [__ __ __ __]

SHEET 13 **STATE CODE** [__ __]

MAINTENANCE DATA **SHRP SECTION ID** [__ __ __ __]

LTPP PROGRAM

FULL DEPTH REPAIR DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES

1. ***DATE WORK BEGAN** (MONTH/DAY/YEAR) [__ __ /__ __ /__ __]
   ***DATE WORK WAS COMPLETED** (MONTH/DAY/YEAR) [__ __ /__ __ /__ __]

2. ***PRIMARY REASON FOR PATCHES OR SLAB REPLACEMENT** [__]
   (SEE TABLE A.22 FOR TYPE CODES)
   OTHER (SPECIFY) ______________________

3. SECONDARY REASON FOR PATCHES OR SLAB REPLACEMENT __
   (SEE TABLE A.22 FOR TYPE CODES)
   OTHER (SPECIFY) ______________________

4. ***PATCHES**

	NUMBER	SQ. FEET
SLAB ONLY	[__ __]	[__ __ __ __]
SLAB AND BASE	[__ __]	[__ __ __ __]

5. ***PATCH MATERIAL USED** [__]
   PORTLAND CEMENT CONCRETE.1 ASPHALT CONCRETE........3
   POLYMER CONCRETE.........2 EPOXY MORTAR............4
   OTHER (SPECIFY)______________________5
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

6. ***SLABS REPLACED**

	NUMBER	SQ. FEET
SLAB ONLY	[__ __]	[__ __ __ __]
SLAB AND BASE	[__ __]	[__ __ __ __]

7. ***BASE REPLACED BY** (BLANK IF NO BASE IS REPLACED)
   SIMILAR MATERIAL..........1 PATCHES [__]
   ASPHALT CONCRETE.........2 FULL SLABS [__]
   PORTLAND CEMENT CONCRETE.3
   OTHER (SPECIFY)______________________4
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

8. METHOD FOR PATCH BOUNDARY DETERMINATION __
   VISUAL...................1 STATE STANDARD OR
   CORING...................2 SPECIFICATION..4
   DEFLECTION...............3
   OTHER (SPECIFY)______________________5
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

9. CUTTING INSTRUMENT __
   DIAMOND BLADE SAW.......1 WHEEL SAW................3
   CARBIDE BLADE SAW.......2 AIR HAMMER...............4
   OTHER (SPECIFY)______________________5
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

***STATE ASSIGNED ID** [__ __ __ __]

SHEET 14 ***STATE CODE** [__ __]

MAINTENANCE DATA ***SHRP SECTION ID** [__ __ __ __]

LTPP PROGRAM

FULL DEPTH REPAIR DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES (CONTINUED)

1. ***TYPE OF JOINT LOAD TRANSFER SYSTEM USED FOR REPAIRED AREAS** — TRANSVERSE [__] LONGITUDINAL [__]
   NONE....................1 UNDERCUTTING..............4
   DOWEL BARS..............2 AGGREGATE INTERLOCK.......5
   TIE BARS................3
   OTHER (SPECIFY)________________________________6
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

2. ***SECURING LOAD TRANSFER DEVICES** [__]
   NONE....................1 EPOXY FILLER..............3
   GROUT FILLER............2
   OTHER (SPECIFY)________________________________4
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

3. ***REINFORCING STEEL PLACED IN PATCH** [__]
   NO......................1
   YES.....................2

		TRANSVERSE	LONGITUDINAL
4.	***BAR DIAMETERS,** REBAR NUMBER	[__ __]	[__ __]
5.	***BAR LENGTHS,** INCHES	[__.__]	[__.__]
6.	***BAR SPACING,** INCHES	[__.__]	[__.__]

   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

7. ***DOWEL COATINGS** — [__] [__]
   NONE.....................1 MONEL...................4
   PAINT AND/OR GREASE.....2 STAINLESS STEEL.........5
   PLASTIC.................3 EPOXY...................6
   OTHER (SPECIFY)________________________________7
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

8. NUMBER OF SAW CUTS PER PATCH (IF SAWED) __ __

9. DEPTH OF TYPICAL BOUNDARY SAW CUT, INCHES __ __.__
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

10. CONCRETE BREAKUP __
    NONE....................1 GRAVITY DROP HAMMER.....3
    PNEUMATIC AIR HAMMER....2 SAWING..................4
    OTHER (SPECIFY)________________________________5
    DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

11. REMOVAL OF CONCRETE __
    CONCRETE BREAKUP AND CLEANOUT.......................1
    LIFT OUT INTACT SLAB SECTION........................2
    OTHER (SPECIFY)________________________________3
    DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

***STATE ASSIGNED ID** [__ __ __ __]

SHEET 15

MAINTENANCE DATA

LTPP PROGRAM

***STATE CODE** [__ __]

***SHRP SECTION ID** [__ __ __ __]

FULL DEPTH REPAIR DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES (CONTINUED)

1. ***METHOD OF REINFORCING STEEL PLACEMENT** [__]
   CHAIRS...1
   BETWEEN LAYERS OF CONCRETE.........................2
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

2. ***MIXTURE DESIGN FOR PATCH MATERIAL,** LB./CUBIC YARD
   COARSE AGGREGATE [__ __ __ __.]
   FINE AGGREGATE [__ __ __ __.]
   CEMENT [__ __ __ __.]
   WATER (GALLONS/CUBIC YD.) (LEAVE BLANK FOR AC) [__ __ __ __.]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

3. ***TYPE CEMENT USED** (SEE TYPE CODES, TABLES A.11 AND A.16) [__ __]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

4. ***AIR CONTENT,** PERCENT BY VOLUME (LEAVE BLANK FOR A.C.)
   MEAN [__ __.__]
   RANGE [__ __.__ TO __ __.__]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

5. ***ADMIXTURES** (LEAVE BLANK FOR A.C.)
   (SEE CEMENT ADDITIVE CODES, TABLE A.12) [__ __]
   [__ __]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

6. ***SLUMP,** INCHES (LEAVE BLANK FOR A.C.)
   MEAN [__ __.]
   RANGE [__ __. TO __ __.]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

7. ***FLEXURAL STRENGTH (MODULUS OF RUPTURE),** PSI [__ __ __ __.]
   (BASED ON 3RD POINT LOADING) CURING TIME, DAYS [__ __.]
   IF UNAVAILABLE, AND OTHER STRENGTH TEST CONDUCTED,
   ENTER ALTERNATE TEST [______________________________]
   TYPE OF LOADING [______________________________]
   AGE, DAYS [__ __]; STRENGTH, PSI [__ __ __ __.]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

8. ***AMBIENT CONDITIONS AT TIME OF PATCHING**
   AIR TEMPERATURE (°F) LOW [__ __ __.]
   HIGH [__ __ __.]

   SURFACE MOISTURE - DRY = 1, WET = 2 [__]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

9. MAXIMUM SIZE OF COARSE AGGREGATE, INCHES __.__
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

*STATE ASSIGNED ID [__ __ __ __]

SHEET 16 — *STATE CODE [__ __]

MAINTENANCE DATA — * SHRP SECTION ID [__ __ __ __]

LTPP PROGRAM

FULL DEPTH REPAIR DATA FOR PAVEMENTS
WITH PORTLAND CEMENT CONCRETE SURFACES (CONTINUED)

1. ***JOINT FORMING METHOD** SHOULDER [__] TRANSVERSE [__] LONGITUDINAL [__]
   NONE........................1 FIBERBOARD INSERT.......4
   POLYETHYLENE STRIP INSERT.2 SAWING..................5
   STYROFOAM INSERT..........3 FORMS...................6
   OTHER (SPECIFY)_______________________________7
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

2. ***WAS BOND BREAKER USED BETWEEN ADJACENT LANES?** [__]
   YES - 1, NO - 2

3. ***CURING METHOD** METHOD 1 [__ __] METHOD 2 [__ __]
   NONE..........................1 BURLAP-POLYETHYLENE
   MEMBRAGE CURING COMPOUND....2 BLANKETS.............6
   BURLAP CURING BLANKETS......3 INSULATING LAYERS.......7
   WATERPROOF PAPER BLANKETS...4 COTTON MAT CURING.......8
   WHITE POLYETHYLENE SHEETING.5 HAY.....................9
   OTHER (SPECIFY)_______________________________10
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

4. ***APPROXIMATE TYPICAL TIME BETWEEN PATCHING AND OPENING TO TRAFFIC[1],**
   HOURS [__ __.]
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 [__]

5. CONSOLIDATION OF MATERIALS[1] __
   INTERNAL VIBRATORS......1 ROLLING.................4
   VIBRATING SCREEDS.......2 TAMPING.................5
   TROWELING...............3
   OTHER (SPECIFY)_______________________________6

6. FINISHING __
   SCREEDING...............1 MACHINE TROWELING.......3
   HAND-TROWELING..........2
   OTHER (SPECIFY)_______________________________4
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

7. TYPE OF TRANSVERSE JOINTS IN PATCHES __ OR SLABS __
   NONE........................1 MIXTURE OF EXPANSION AND
   ALL EXPANSION JOINTS......2 CONTRACTION JOINTS...4
   ALL CONTRACTION JOINTS....3
   DATA SOURCE - ACTUAL = 1 PLANS/SPECS = 2 JUDGEMENT = 3 __

8. WERE OLD JOINTS MATCHED? __
   YES - 1, NO - 2

[1]Note: Items 4. and 5. are the only entries to be made if asphalt concrete was used as the patch material.

Revised August 30, 1989

*STATE ASSIGNED ID _ _ _ _

*STATE CODE _ _

*SHRP SECTION ID _ _ _ _

SHEET 17

MAINTENANCE DATA

LTPP PROGRAM

COST DATA

1.
*TEST SECTION LENGTH TREATED (FEET) .... _ _ _ _ _.

MAINTENANCE TYPE	UNITS	2. *QUANTITY	3. *AVERAGE COST PER UNIT (DOLLARS)	4. *TOTAL COST (THOUSANDS) OF DOLLARS)
SEAL COAT	SQ. YDS.	_ _ _ _.	_ _ _._ _	_ _ _ _.
CRACK SEALING	LIN. FT.	_ _ _ _.	_ _ _._ _	_ _ _ _.
PATCHES - A.C. PAVEMENTS:				
SURFACE ONLY	SQ. YDS.	_ _ _ _.	_ _ _._ _	_ _ _ _.
SURFACE AND PARTIAL BASE REPLACEMENT	SQ. YDS.	_ _ _ _.	_ _ _._ _	_ _ _ _.
FULL DEPTH	SQ. YDS.	_ _ _ _.	_ _ _._ _	_ _ _ _.
PATCHES - PCC PAVEMENTS:				
PARTIAL DEPTH	SQ. YDS.	_ _ _ _.	_ _ _._ _	_ _ _ _.
SLAB ONLY	SQ. YDS.	_ _ _ _.	_ _ _._ _	_ _ _ _.
SLAB AND BASE	SQ. YDS.	_ _ _ _.	_ _ _._ _	_ _ _ _.
PCC SLAB REPLACEMENT				
SLAB ONLY	SQ. YDS.	_ _ _ _.	_ _ _._ _	_ _ _ _.
SLAB AND BASE	SQ. YDS.	_ _ _ _.	_ _ _._ _	_ _ _ _.
JOINT RESEALING: (PCC PAVEMENTS)	LIN. FT.	_ _ _ _.	_ _ _._ _	_ _ _ _.
DIAMOND GRINDING OR MILLING: (PCC PAVEMENT)	SQ. YDS.	_ _ _ _.	_ _ _._ _	_ _ _ _.

CHAPTER 7. REHABILITATION DATA COLLECTION

This chapter provides data sheets and instructions for their use in collecting rehabilitation data. These data sheets should be filled out as rehabilitation work is completed. The rehabilitation data sheets appear in numerical sequence at the end of this chapter.

The rehabilitation data collection includes two separate time periods: (1) historical data and (2) SHRP accumulated data. Historical data consists of information collected on the monitoring site up to the time that site specific rehabilitation data collection using SHRP guidelines begins. The historical data are recorded on Sheet 4 of the inventory data sheets contained in Chapter 2 of this manual. SHRP accumulated data are recorded on the rehabilitation data sheets provided in this chapter. The rehabilitation sheets are presented in the following order.

Description	Sheet(s)
Improvement Listing	1
Revised Layer Descriptions	2
Asphalt Concrete (AC) Overlay	3-10
Hot Mix Recycled Asphalt Pavement	11-22
Cold Mix Recycled Asphalt Pavement	23-34
Heater Scarification Surface Recycled Asphalt Pavement	35
Portland Cement Concrete (PCC) Overlay	36-43
Recycled PCC	44-52
Pressure Relief Joints in PCC Pavements	53-54
Subsealing PCC Pavement	55-56
Subdrainage (Retrofit) Data	57
Load Transfer Restoration Data	58-59
Crack and Seat PCC Pavement	60
Restoration of AC Shoulders	61
Restoration of PCC Shoulders	62-63
Milling and Grinding Data for Pavement Surfaces	64

For each specific work type, the appropriate set of sheets should be completed (as indexed in Table 7.1). It is recognized that parts of both Chapter 6 (Maintenance Data Collection) and Chapter 7 (Rehabilitation Data Collection) may be required to adequately record a given set of improvements for a test section (i.e., for a job with patching, joint and crack sealing, and overlay, sheets from both Chapters 6 and 7 will be required).

Table 7.1. Rehabilitation data sheets to be completed.

Work Item	Work Type Code*	Rehabilitation Data Sheets
PCC Shoulder Restoration	08	62-63
PCC Shoulder Replacement	09	62-63
AC Shoulder Restoration	10	61
AC Shoulder Replacement	11	61
Pressure Grout Subsealing	14	55-56
Slab Jacking Depressions	15	55-56
Asphalt Subsealing	16	55-56
Asphalt Concrete Overlay	19	3-10
Portland Cement Concrete Overlay	20	36-43
Longitudinal Subdrains	38	57
Transverse Subdrainage	39	57
Drainage Blankets	40	57
Well System	41	57
Drainage Blankets with Longitudinal Drains	42	57
Hot-Mix Recycled Asphalt Concrete	43	11-22
Cold-Mix Recycled Asphalt Concrete	44	23-34
Heater Scarification, Surface Recycled Asphalt Concrete	45	35
Crack and Seat PCC Pavement as Base for New AC Surface	46	60
Crack and Seat PCC Pavements as Base for New PCC Surface	47	60
Recycled Portland Cement Concrete	48	44-52
Pressure Relief Joints in PCC Pavements	49	53-54
Joint Load Transfer Restoration in PCC Pavements	50	58-59
Mill Off Existing Pavement and Overlay with AC	51	64**
Mill Off Existing Pavement and Overlay with PCC	52	64**

* Work Type Code from Table A.17, Appendix A.
** Plus appropriate overlay data sheets.

NOTE: Rehabilitation Sheets 1 and 2 should be completed for every rehabilitated test section.

The data sheets provide for a broad array of data elements. It is recognized that much of the data will not be available. However, available data should be entered and every effort should be made to obtain data indicated by an asterisk (*). When the data element is not applicable to or represents something that does not exist on the test section, enter an "N" to indicate that the data element is not applicable. If the data element is applicable, but the value is unknown (i.e., not available in project records), enter a "U" to indicate that the value is unknown. Many data items will require codes to be entered. Unless otherwise noted in the following instructions, the codes are listed or referenced on the data sheets.

The data sheets also provide for collection of detailed information on variability of materials and layer thicknesses, as such variability is known to contribute heavily to pavement deterioration. It is recognized that replicate test data are often unavailable, so single test results in these cases should be entered as the mean and other values left blank. However, whenever possible, data on variability should be obtained.

GUIDELINES FOR REHABILITATION OF GPS TEST SECTIONS

A maintenance control zone of 1250 feet (500 feet prior to the monitoring site, the 500-foot monitoring site, and 250 feet past the monitoring site) will be established at each SHRP test section. The maintenance control zone and allowable maintenance activities are described in detail in Chapter 6 (Maintenance Data Collection) and SHRP Operational Memorandum No. SHRP-LTPP-OM-001 (Guidelines for Maintenance of GPS test sections).

Rehabilitation work, or any activities that will significantly alter the pavement performance, should not be applied to the SHRP GPS test sections in their first (non-rehabilitated) or study (rehabilitated and continued monitoring) performance period. These include the following:

- Extensive milling, grinding, grooving, or use of heater planer.
- Undersealing.
- Overlays (HMAC/PCC).

- Slab jacking.
- Retro-fitting underdrains or edge drains.
- Other specific types of activities that affect the structural response of the monitoring site.

However, these measures may be applied to the pavement outside of the maintenance control zone. If an activity is planned for outside of the maintenance control zone, a transition from the treatment to the control zone should be of sufficient length (recommended 200 feet in front of the beginning and at the end of the control zone) to ensure the monitoring site is not influenced. If any of these types of treatments are planned for an area and adjacent to a control zone, or for adjoining lanes or shoulders, the Regional Coordination Office (RCO) should be notified as soon as possible.

One type of rehabilitation work that is required is placement of an asphalt concrete overlay for test sections in the GPS-6B (Planned AC Overlay of AC) and GPS-7B (Planned AC Overlay of PCC) studies. Rehabilitation Sheets 3-9 should be completed for these test sections. Test sections in GPS-6A (Existing AC Overlay of AC) and GPS-7A (Existing AC Overlay of PCC) have an existing AC overlay. Data pertaining to the overlay of these test sections would be collected on the appropriate inventory data sheets.

If a PCC overlay is placed on a GPS-9 (PCC Overlay of PCC) test section, Rehabilitation Sheets 36-42 should be completed if the PCC overlay data were not recorded on inventory data sheets.

Rehabilitation of approved GPS test sections is not permitted during the SHRP monitoring performance period, except when the condition of the test section drops to a level that requires a rehabilitative measure. In this event, the RCO should be notified to coordinate the last round of evaluation measurements. Since large amounts of information have been collected on these monitoring sites, it is desired that these sections be included as part of a rehabilitated pavement study. However, decisions as to which rehabilitated test sections will continue to be monitored will be made on an individual basis. These decisions will depend on the history of the monitored test section and the planned rehabilitation treatments. If this pavement is continued as one of the SHRP rehabilitation experiments, then data on the types of treatments should be collected following the guidelines established in this chapter.

DATA SECTION COMMON FOR ALL DATA SHEETS

A common set of project identification data appears in the upper right hand corner of every data sheet. These data items are described below.

State Assigned ID

The State assigned ID is an identification number assigned by the State Highway Agency (SHA) used solely to facilitate filing of the projects for the SHA's convenience, and may be cross-referenced with the construction project number. A State Highway Agency can use any system for assigning these identification numbers.

State Code

The State code is a number used to identify the state or Canadian province in which the pavement section is located (see Table A.1, Appendix A for codes).

SHRP Section ID

The SHRP section ID is a four-digit identification number assigned by SHRP. This number is used to facilitate the computer filing of the projects and will identify the section in the field. It will be cross-referenced with the State assigned ID.

The rehabilitation data sheets do not include detailed descriptions of the pavements prior to rehabilitation, but the "State Assigned ID", "State Code", and the "SHRP Section ID" described above connect the rehabilitation data to the other data for the test section. For SHRP studies, the full range of data described in previous sections should be available. As a minimum for other studies of effects of rehabilitation on pavement performance, Inventory Data

Sheets 1, 2, 3, and 4 should be filled out and appropriate traffic, environmental, and monitoring data collected.

DATA COMMON FOR ALL REHABILITATION TYPES

On many of the rehabilitation data sheets, "Other" codes are provided for use where a product or technique is used which is not specified. This reflects the realization that rehabilitation practices change and that new materials become available, and that it will be necessary to record their use and performance. Therefore, where it is necessary to use an "Other" code, sufficient information should be provided to identify what material or technique was used, and possibly the manufacturer or reference, if future study is required. As rehabilitation techniques are so varied, the data to be collected will also be varied. In many cases, existing layers will be removed and recycled or partially removed (say by cold-milling). Rehabilitation by overlaying may not disturb the existing layers, but new layers must be described. Some techniques (such as adding pressure relief joints, subsealing, and load transfer restoration) modify the existing pavement without affecting the layer description data directly.

INSTRUCTIONS FOR COMPLETING REHABILITATION DATA SHEETS

The following sections present instructions for completing each of the rehabilitation data sheets.

IMPROVEMENT LISTING (SHEET 1)

This data sheet is to be filled out each time improvements are made on a project. This does not include work such as bridges, culverts, lighting, etc.

1. Date Completed: The month, day, and year that the pavement improvements were finished and the project was subsequently opened to traffic (not the date when the project was accepted). The first set of two digits represent the numerical sequence of the month as it occurs during the year; the second set of two digits represent the day within the month; and the third set of two digits are the last two digits in the year.

2. Work Type Code: A code to identify the type of maintenance work accomplished (Appendix A, Table A.17).

3. Work Quantity: The quantity of work applied to the section in appropriate units (refer to Table A.17 for units).

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

5. Cost: The cost the improvement is reported in thousands of dollars per lane-mile. The cost includes only pavement structure cost. Non-pavement costs such as cut and fill work, work on bridges, culverts, lighting, and guardrails should be excluded.

REVISED LAYER DESCRIPTIONS (SHEET 2)

This data sheet is to be filled out each time improvements are made on a project to reflect the improved pavement structure. Include all layers of the structure, revised or otherwise. As all subsequent data sheets refer back to this one, special care should be taken in completing Sheet 2.

1. Layer Number: Space is provided for nine or fewer layer numbers, with Number 1 as the subgrade and the last number identifying the surface layer.

2. Layer Description: A layer description code is to be entered for each of the layers in the system. For hot mix asphalt concrete (HMAC) layers, separate lifts having the same mixture are not to be identified as separate layers. Where HMAC is used as a base for PCC pavements, it should be described by Code 5.

3. Material Type Classification: A code identifying the type of materials in each layer of the pavement structure, including the subgrade, should be entered for material type classification. Codes for surfacing materials, base and subbase materials, subgrade soils, thin seals and interlayers are identified in Tables A.5, A.6, A.7, and A.8, respectively.

4. Layer Thickness: Four numbers can be provided to indicate the minimum, maximum, mean, and standard deviation of thickness for each specific layer in inches (enter to the nearest tenth of an inch). If only a single specified design value for thickness is available for the project records, enter it as the "mean value". For SHRP/LTPP, a number of boreholes will be made for sampling materials, so careful thickness measurements are to be made and the mean thickness will be verified or revised and variability information added as the result of these field measurements and measurements of cores in the laboratory.

ASPHALT CONCRETE OVERLAY, AGGREGATE PROPERTIES (SHEET 3)

This sheet (and the following Sheets 4-10) are to be filled out from project records for each asphalt concrete overlay layer identified on Sheet 2 that is thicker than 0.75 inches. Detailed data for thinner layers (i.e., thin seal coats, porous friction treatments, etc.) should be entered on the sheets specified for those operations.

Although various SHA's discriminate between fine and coarse aggregates on the basis of different sieve sizes, the following definition (Ref 20) is to be applied for SHRP studies: All aggregate retained on the No. 8 sieve is coarse aggregate. All aggregate passing the No. 8 sieve is fine aggregate. "Mineral Filler" is defined (ASTM D242) as that portion passing the No. 30 sieve (at least 95 percent must pass the No. 50 sieve and at least 70 percent must also pass the No. 200 sieve).

1. Layer Number: The asphalt concrete layer for which a description is being provided (from Sheet 2).

2., 3., and 4. Composition of Coarse Aggregate: When more than one coarse aggregate is used, the type and percentage by total weight of coarse aggregate should be indicated for each coarse aggregate. If only one type of coarse aggregate is used, enter its type code and 100 percent in the top set of the data spaces, leaving the others blank.

5. Geologic Classification of Coarse Aggregate: The geologic classification of the natural stone used as coarse aggregate in the concrete. These codes appear in Table A.9 and provide identification as to which of the three major classes of rock the coarse aggregate belongs to and the type of rock within those classes. If a "blend" was used, enter the code for the geologic classification for the material representing the majority of the coarse aggregate. If a "crushed slag", "manufactured lightweight", or "recycled concrete" was used, enter "N".

6., 7., and 8. Composition of Fine Aggregate: When more than one fine aggregate is used, the type and percentage by total weight of fine aggregate should be indicated for each fine aggregate. Fine aggregate is defined as that passing the No. 8 sieve and retained on the No. 200 sieve. If only one type of fine aggregate is used, enter its type code and 100 percent in the top set of the data spaces, leaving the others blank.

9. Type of Mineral Filler: The type of mineral filler used. The codes appear on the data sheet, including space for entering some other type for which a code has not been provided.

10. to 13. Aggregate Durability Test Results: The type of durability tests used and the results in thousandths recorded in units specified for the test. Three of these sets are for coarse (Items 10, 11, and 12) and one (Item 13) for the combination of coarse and fine aggregates. The durability test type codes appear in Table A.13. Items 10, 11, and 12 are to correlate with Items 2, 3, and 4 above, respectively.

14. Polish Value of Coarse Aggregates: The accelerated polish value of the coarse aggregates used in the surface layer, as determined by AASHTO T279 (ASTM D3319).

ASPHALT CONCRETE OVERLAY, AGGREGATE PROPERTIES (CONTINUED) (SHEET 4)

1. Layer Number: The asphalt concrete layer for which a description is being provided (from Sheet 2).

2. Gradation of Combined Aggregates: The percent passing (of coarse and fine aggregates) on various standard sieve sizes to the nearest one percent. It is not expected that values will be available for all eighteen sieve sizes;

the objective is to provide sufficient sieve sizes to accommodate testing and specification practice for most highway agencies.

3. to 6. Bulk Specific Gravities: The bulk specific gravities (to the nearest thousandth) for coarse aggregate, fine aggregate, mineral filler, and the aggregate combination. The bulk specific gravities for the aggregate fractions are measured using the laboratory procedures indicated on the data sheet. The bulk specific gravity for the aggregate combination (usually called "bulk specific gravity of aggregate") is calculated as follows (Ref 19):

$$G_{sb} = \frac{P_1 + P_2 + P_3}{P_1/G_1 + P_2/G_2 + P_3/G_3} \qquad (7.1)$$

where:

G_{sb} = Bulk specific gravity for the total aggregate

P_1, P_2, P_3 = Percentages by weight of coarse aggregate, fine aggregate, and mineral filler

G_1, G_2, G_3 = Specific gravities of coarse aggregate, fine aggregate, and mineral filler

7. Effective Specific Gravity of Aggregate Combination: The calculated effective specific gravity to the nearest thousandth. This calculation requires the maximum specific gravity (no air voids) of the paving mixture, which is obtained by Test Method AASHTO T209 or ASTM D2041. The effective specific gravity of the aggregate is calculated as follows (Ref 19):

$$G_{se} = \frac{100 - P_b}{100/G_{mm} - P_b/G_b} \qquad (7.2)$$

where:

G_{se} = Effective specific gravity of aggregate

P_b = Asphalt cement, percent by total weight of mixture

G_{mm} = Maximum specific gravity of paving mixtures (no air voids)

G_b = Specific gravity of asphalt

ASPHALT CONCRETE OVERLAY, ASPHALT CEMENT PROPERTIES (SHEET 5)

The following data items should be provided when available for the original asphalt cement, tested prior to its use in the construction.

1. Layer Number: The asphalt concrete layer to be described on this sheet (from Sheet 2).

2. Asphalt Grade: The grade of asphalt cement used (see Table A.16). Space is provided on the data sheet for identifying another grade of asphalt cement not appearing in Table A.16.

3. Source: The source for the asphalt cement. A list of asphalt refiners and processors is provided in Table A.14, Appendix A. Space is provided to specify other sources which may not be included in the table provided.

4. Specific Gravity of Asphalt Cement: The specific gravity of the asphalt cement (to the nearest thousandth) when it is available. If unavailable, a typical specific gravity for asphalt cements produced at the source refinery may be entered. If source is unknown, enter 1.010 as a reasonable estimate. This specific gravity is measured as specified by AASHTO T228 (or ASTM D70).

5. Viscosity of Asphalt at 140°F: The results in poises from kinematic viscosity testing using Test Method AASHTO T202 (or ASTM D2171) on samples of the original asphalt cement prior to its use in construction of the pavement section.

6. Viscosity of Asphalt at 275°F: The results in centistokes (to the nearest hundredth) from absolute viscosity testing using Test Method AASHTO T201 (or ASTM D2170) on samples of the original asphalt cement.

7. Penetration at 77°F: The penetration (in tenths of a millimeter) from testing the original asphalt cement in the mixture at 77°F, using a 100 gram load and a five-second load duration with Test Method AASHTO T49 (or ASTM D5) on samples of the original asphalt cement material.

8. and 9. Asphalt Modifiers: Space is provided to list the type and quantity of up to two modifiers added to the asphalt cement for whatever purpose. A list of possible asphalt cement modifiers and codes for data entry are provided on Table A.15, Appendix A. If a material other than those listed in Table A.15 is used, space is provided to record the pertinent information. The quantities of modifier should be provided in percent of asphalt cement weight. Some modifiers (such as lime) may be specified in terms of "percent of aggregate weight", but they must be converted to percent of asphalt cement weight for uniformity.

10. Ductility at 77°F: The ductility in centimeters as measured by Test Method AASHTO T51 at 77°F (or ASTM D113).

11. Ductility at 39.2°F: The ductility in centimeters at 39.2°F, using the procedures of Test Method AASHTO T51 (or ASTM D113).

12. Test Rate for Ductility Measurement at 39.2°F: The test speed in centimeters per minute for the ductility measurement taken at 39.2°F.

13. Penetration at 39.2°F: The penetration value using a 200 gram weight and 60 second loading duration, tested in accordance with Test Method AASHTO T49 (or ASTM D5) on samples of the original asphalt cement, prior to its use as a construction material.

14. Ring and Ball Softening Point: The softening point of the asphalt cement in °F as measured with the ring-and-ball apparatus used in Test Method AASHTO T53, on samples of the original asphalt cement prior to its use as a construction material.

ASPHALT CONCRETE OVERLAY, LABORATORY AGED ASPHALT CEMENT PROPERTIES (SHEET 6)

The following data items should be provided for laboratory aged asphalt cement samples, using virgin asphalt cement samples aged in accordance with the provisions of Test Method AASHTO T179 (or ASTM D1754) or Test Method AASHTO T240 (or ASTM D2872).

1. Layer Number: The asphalt concrete layer for which a description is being provided (from Sheet 2).

2. Test Procedure Used to Measure Aging Effects: The test procedure used to "age" the asphalt cement in the laboratory and to measure the effects of the aging. Codes are provided on the data sheet.

3. Viscosity of Asphalt at 140°F: The results in poises from viscosity testing on laboratory aged asphalt cement samples using Test Method AASHTO T202 (or ASTM D2171).

4. Viscosity of Asphalt at 275°F: The results in centistokes (to the nearest hundredth) from viscosity testing using Test Method AASHTO T201 (or ASTM D2170) on laboratory aged asphalt cement samples.

5. Ductility at 77°F: The ductility in centimeters as measured by Test Method AASHTO T51 (or ASTM D113) on laboratory aged samples of the asphalt cement.

6. Ductility at 39.2°F: The ductility in centimeters of laboratory aged asphalt specimens at 39.2°F, using the procedures of Test Method AASHTO T51 (or ASTM D113).

7. Test Rate for Ductility Measurement at 39.2°F: The test rate to the nearest tenth of a centimeter per minute for ductility determination at 39.2°F.

8. Penetration at 77°F: The penetration (in tenths of millimeters) from testing the asphalt cement used in the mixture at 77°F, using a 100 gram load and a 5 second load duration, in accordance with Test Method AASHTO T49 (or ASTM D5).

9. Penetration at 39.2°F: The penetration (in tenths of millimeters) from testing the asphalt cement used in the mixture at 39.2°F, using a 200 gram load and 60 second load duration, in accordance with Test Method AASHTO T49 (or ASTM D5).

10. Ring and Ball Softening Point: The results in °F from the ring and ball softening point test for bitumens (AASHTO T53).

11. Weight Loss: The weight loss resulting from the laboratory aging process to the nearest one-tenth of one percent.

ASPHALT CONCRETE OVERLAY, LABORATORY MIXTURE DESIGN (SHEET 7)

The following data items are to be derived from tests conducted on the mixture during mix design.

1. Layer Number: The asphalt concrete layer to be described on this sheet (from Sheet 2).

2. Maximum Specific Gravity The maximum specific gravity (to the nearest thousandth) of the mixture, calculated using Equations 7.2 and 7.3.

3. Bulk Specific Gravity: The bulk specific gravity (to the nearest thousandth) of the mixture, compacted in the laboratory at the optimum asphalt content selected and by appropriate procedures for Marshall or Hveem stability. Test Method ASTM D1188 is to be used for establishing the bulk specific gravity.

4. Optimum Asphalt Content: The optimum amount of asphalt cement added to the asphalt concrete mixture to the nearest one-tenth of a percent. This optimum asphalt content is obtained from the Marshall or Hveem Stability Testing.

5. Percent Air Voids: The calculated air voids (to the nearest tenth of a percent) in the mixture, compacted in the laboratory to the optimum asphalt content and by appropriate procedures for Marshall or Hveem stability. Equation 7.4 may be used for calculating the percent air voids.

6. Marshall Stability: The Marshall Stability (Test Method AASHTO T245 or ASTM D1559) of the mixture at optimum asphalt content in pounds.

7. Number of Blows: The number of blows of the compaction hammer that were applied to each end of the specimen to compact it for Marshall Stability and flow testing.

8. Marshall Flow: The Marshall Flow (Test Method AASHTO T245 or ASTM D1559) of the mixture at optimum asphalt content. This item is to be entered as the whole number of the measured hundredth of an inch (i.e. if 0.15 is measured, enter "15.").

9. Hveem Stability: The Hveem Stability or "stabilometer value" of the mixture at optimum asphalt content as measured with the Hveem apparatus using Test Method AASHTO T246 (or ASTM D1561).

10. Hveem Cohesiometer Value: The cohesiometer value of the mixture at optimum asphalt content, in grams per 25 mm width (or diameter) of specimen, obtained by Test Method AASHTO T246 (or ASTM D1561).

ASPHALT CONCRETE OVERLAY, MIXTURE PROPERTIES AS PLACED (SHEET 8)

This data sheet is to be filled out from project records for each asphalt concrete overlay layer identified on Sheet 2 that is thicker than 0.75 inches. The data items are results from tests conducted on the mixture during or soon after construction. Calculations for calculated values (i.e., percent air voids) should be made separately for individual samples, using data applicable to those samples. The test samples can be compacted in the laboratory after sampling in the field, or obtained by coring, cutting or sawing after the mixture is compacted in place. In the event that both types of samples are tested, separate data sheets should be filled out for those compacted in the laboratory and those compacted in the field. Although tests are to be conducted on core samples from the field for SHRP LTPP (and reported on other data sheets), data from project files should be entered when available.

1. Layer Number: The asphalt concrete layer to be described on the sheet (from Sheet 2).

2. Type of Samples: Whether the test samples were sampled in the field and compacted in the laboratory, or removed from the compacted pavement. The codes appear on the data sheet.

3. The Maximum Specific Gravity (no air voids) of a mixture sampled during or soon after construction, as an average from testing of several samples according to AASHTO T209 or ASTM D2041. Where possible, several samples should be tested and the average entered. Use the resulting maximum specific gravity and the design asphalt content for the mixture to calculate the effective specific gravity of aggregate using Equation 7.2. Once the effective specific gravity of the aggregate is established, it may be used to calculate other maximum specific gravities for the mixture at other measured asphalt contents using Equation 7.3 below (Ref. 19):

$$G_{mm} = \frac{100}{P_s/G_{se} + P_b/G_b} \tag{7.3}$$

where:

G_{mm} = Maximum specific gravity of paving mixture (no air voids)

P_s = Aggregate, percent by total weight of mixture

G_{se} = Effective specific gravity of aggregate

P_b = Asphalt, percent by total weight of mixture

G_b = Specific gravity of asphalt

4. Bulk Specific Gravity: The Number of Tests and the Minimum, Maximum, Mean, and Standard Deviation of bulk specific gravities (to the nearest thousandth) of compacted mixtures measured on cores removed from the pavement

during or right after construction. While the test method specified in ASTM D1188 is preferable, the results from nuclear density tests (ASTM D2950), appropriately calibrated to measurements on cores, may also be used. See Appendix B for standard deviation equation.

5. Asphalt Content: The Number of Tests and the Minimum, Maximum, Mean, and Standard Deviation of percents by weight of the total asphalt cement (including that absorbed by the aggregate) in the asphalt concrete mixture to the nearest one-tenth of a percent. Asphalt contents measured by extraction tests (AASHTO T164) on field samples are preferred, but results from nuclear test methods may also be used. If no such test results are available, enter the specified asphalt content as the mean, and leave the other spaces blank. See Appendix B for the standard deviation equation.

6. Percent Air Voids: The Number of Tests and the Minimum, Maximum, Mean, and Standard Deviation of calculated air voids (to the nearest tenth of a percent) as a percent of the material volume. These data are frequently not available, but can be calculated using other available data from reports on mix design and density measurements on samples from the pavement. Percent air voids is calculated as follows (Ref. 19):

$$P_a = 100 \frac{G_{mm} - G_{mb}}{G_{mm}} \tag{7.4}$$

where:

P_a = Air voids in compacted mixture, percent of total volume

G_{mm} = Maximum specific gravity of paving mixture (zero air voids) as determined by ASTM D2041

G_{mb} = Bulk specific gravity of compacted mixture

See Appendix B for standard deviation equation.

7. Voids in Mineral Aggregate: The Number of Tests and the Minimum, Maximum, Mean, and Standard Deviation of mean void space between the aggregate particles of a compacted asphalt concrete mixture, which includes air voids and the effective asphalt content, to the nearest one-tenth of one percent. Percent of voids in mineral aggregate (VMA) is calculated as follows (Ref. 19):

$$VMA = 100 - \frac{G_{mb}\ P_s}{G_{sb}} \tag{7.5}$$

where:

VMA = Voids in mineral aggregate (percent of bulk volume)

G_{mb} = Bulk specific gravity of compacted mixture (ASTM D2726)

P_s = Aggregate, percent by total weight of mixture

= 100 - (percent of asphalt cement by total weight of mixture)

G_{sb} = Bulk specific gravity of aggregate

8. Effective Asphalt Content: The Number of Tests and the Minimum, Maximum, Mean, and Standard Deviation of effective asphalt content (total asphalt content of the paving mixture minus the portion of asphalt that is lost by absorption into the aggregate particles), expressed by weight of total mixture to the nearest one-tenth of one percent. The asphalt absorption may be calculated as a percent of total weight of mixture as follows (Ref 19):

$$P_{ab} = P_{ba} P_s = \frac{G_{se} - G_{sb}}{G_{sb} G_{se}} G_b P_s \qquad (7.6)$$

where:

P_{ab} = Absorbed asphalt, percent by weight of total mixture

P_{ba} = Absorbed asphalt, percent by weight of aggregate

P_s = Aggregate, percent by total weight of mixture

G_{se} = Effective specific gravity of aggregate

G_{sb} = Bulk specific gravity of aggregate

G_b = Specific gravity of asphalt

ASPHALT CONCRETE OVERLAY, MIXTURE PROPERTIES AS PLACED (CONTINUED) (SHEET 9)

1. Layer Number: The asphalt concrete layer for which a description is being provided (from Sheet 2).

2. Type Asphalt Plant: The type of plant that produced the asphalt concrete mixture. Codes are provided on the data sheet.

3. Type of Antistripping Agent: The type of antistripping agent used in the mixture. The codes are provided in Table A.21 in Appendix A.

4. Antistripping Agent Liquid or Solid Code: A code to indicate whether the antistripping agent used is a liquid or solid. Codes are provided on the data sheet.

5. Amount of Antistripping Agent: The amount of antistripping agent used in the mixture by weight to the nearest tenth of a percent of weight of asphalt if the agent is liquid and weight of aggregate if it is solid.

6. Moisture Susceptibility Test Type: The type of moisture susceptibility test used during the test program. If a procedure other than those provided is used, space is provided to specify a name or reference for the test.

7. Moisture Susceptibility Test Results: The Hveem Stability Number or Percent Stripped and the Tensile Strength Ratio or Index of Retained Strength. Space is provided to record these results in varying forms, depending on the test procedure used.

ASPHALT CONCRETE OVERLAY, CONSTRUCTION DATA (SHEET 10)

1. Layer Number: The asphalt concrete overlay layer for which the compaction data are to be described on this sheet (from Sheet 2).

2. Mixing Temperature: The temperature of the mixture at the plant (i.e., the mix as discharged) in °F.

3., 4., and 5. Laydown Temperatures: The Number of Tests taken and the Mean, Minimum, Maximum, and Standard Deviation of temperatures measured. The temperature should be measured just behind the screed. Three to five measurements should be made. See Appendix B for the standard deviation equation.

6. to 22. Roller Data: Codes appear on the data sheet for steel-wheeled tandem, pneumatic-tired, single-drum vibratory, and double-drum vibratory rollers. For each type of roller, spaces are provided to describe significant characteristics for up to four different rollers. Steel-wheeled tandem rollers are described by their gross weights to the nearest tenth of a ton. Pneumatic-tired rollers are described by their gross weight and tire pressure in psi. Vibratory rollers are described by their gross weight in tons to the nearest tenth, frequency in vibrations per minute, amplitude in inches to the nearest thousandth, and roller speed in miles per hour to the nearest tenth.

Compaction Data: Spaces are provided for Items 23. to 31. to enter the following data regarding the compaction of the asphalt concrete.

23. to 28. Description of the Roller used (code from data sheet) and Number of Coverages for breakdown, intermediate, and final compactions for each of up to four asphalt concrete lifts. A "coverage" in this case is defined as one trip of the roller across the pavement.

29. The Air Temperature in °F while compaction is accomplished. Space is provided to record data for each of up to four asphalt concrete lifts.

30. The Compacted Thickness in inches to the nearest tenth. If coring is not performed, the planned thickness should be recorded. Space is provided to record data for each of up to four asphalt concrete lifts.

31. The <u>Curing Period</u> in days before a new lift is placed or opened to traffic. Space is provided to record data for each of up to four asphalt concrete lifts.

HOT MIX RECYCLED ASPHALT PAVEMENT, GENERAL INFORMATION AND RECLAIMED AGGREGATE PROPERTIES (SHEET 11)

The properties of the original asphalt concrete mixture (to be reclaimed) and its components will already be available as inventory data. However, some of the key properties, such as aggregate gradation, will be duplicated here to assist in the evaluation of the recycled mix design. Also included for the hot mix recycled asphalt will be procedures on the removal and processing of the existing structure, as well as properties for the new asphalt cement, recycling agents, and/or any aggregate used in the recycled mixture.

1. <u>Layer Number</u>: The recycled layer for which a description is being provided (from Sheet 2).

2. <u>Procedure Used to Break Up and/or Remove the Asphalt Pavement</u>: A code to indicate the procedure used for removal of the asphalt pavement to be recycled. Codes are provided on the data sheet.

3. <u>Pavement Processing</u>: A code to indicate how the pavement material was processed after removal. Codes are provided on the data sheet.

4. <u>Gradation of Reclaimed Aggregates</u>: The percent passing (after crushing) on various standard sieve sizes to the nearest one percent. It is not expected that values will be available for all eighteen sieve sizes; the objective is to provide sufficient sieve sizes to accommodate testing and specification practices for most agencies.

5. to 8. <u>Bulk Specific Gravities</u>: The bulk specific gravities (to the nearest thousandth) for coarse aggregate, fine aggregate, mineral filler, and the aggregate combination. The bulk specific gravities for the aggregate fractions are measured using the laboratory procedures indicated on the data sheet. The bulk specific gravity for the aggregate combination (usually called "bulk specific gravity of aggregate") is calculated as shown in Equation 7.1.

9. <u>Effective Specific Gravity of Aggregate Combination</u>: The calculated effective specific gravity to the nearest thousandth. This calculation requires the maximum specific gravity (no air voids) of the paving mixture, which is obtained by Test Method AASHTO T209 or ASTM D2041. The effective specific gravity of the aggregate is calculated as shown in Equation 7.2.

HOT MIX RECYCLED ASPHALT PAVEMENT, UNTREATED AGGREGATE PROPERTIES (SHEET 12)

This data sheet is to be filled out when untreated aggregate (new or reclaimed from base layer) is added to a recycled AC mixture. If no untreated aggregate was added, this sheet will not be applicable and should be so noted.

1. <u>Layer Number</u>: The asphalt concrete layer for which a description is being provided (from Sheet 2).

2., 3., and 4. Composition of Coarse Aggregate: When more than one coarse aggregate is used, the type and percentage by total weight of coarse aggregate should be indicated for each coarse aggregate. If only one type of coarse aggregate is used, enter its type code and 100 percent in the top set of the data spaces, leaving the others blank.

5. Geologic Classification of Coarse Aggregate: The geologic classification of the untreated aggregate. The codes appear in Table A.9 and provide identification as to which of the three major classes of rock the coarse aggregate belongs to and the type of rock within those classes. If a "blend" was used, enter the code for the geologic classification for the material representing the majority of the untreated coarse aggregate. If a "crushed slag", "manufactured light-weight", or "recycled concrete" was used as coarse aggregate, enter "N".

6., 7., and 8. Composition of Fine Aggregate: When more than one fine aggregate is used, the type and percentage by total weight of fine aggregate should be indicated for each fine aggregate. Fine aggregate is defined as that passing the No. 8 sieve and retained on the No. 200 sieve. If only one type of fine aggregate is used, enter its type code and 100 percent in the top set of the data spaces, leaving the others blank.

9. and 10. Source: Two one-digit codes to reflect whether the coarse and fine aggregates, respectively, were reclaimed from existing base material on the roadway or obtained for original use from a conventional source (pit). Codes are provided on the data sheet.

11. Type of Mineral Filler: The type of mineral filler used. The codes appear on the data sheet, including space for entering some other type for which a codes has not been provided.

12. to 15. Aggregate Durability Test Results: The type of aggregate durability test used in the results in thousandths recorded in units specified for the test. Three of these sets are for coarse (Items 12, 13, and 14) and one (Item 15) for the combination of coarse and fine aggregate. Items 12, 13, and 14 are to correlate with Items 2, 3, and 4 above, respectively. The durability test type codes appear in Table A.13.

16. Polish Value of Coarse Aggregates: The accelerated polish value of the coarse aggregates used in the surface layer, as determined by AASHTO T279 (ASTM D3319).

HOT MIX RECYCLED ASPHALT PAVEMENT, UNTREATED AGGREGATE PROPERTIES (CONTINUED) (SHEET 13)

1. Layer Number: The hot mix asphalt recycled concrete layer for which a description is being provided (from Sheet 2).

2. Gradation of Untreated Aggregates: The percent passing of untreated coarse and fine aggregates on various standard sieve sizes to the nearest one percent. It is not expected that values will be available for all eighteen sieve sizes; the objective is to provide sufficient sieve sizes to accommodate testing and specification practice for most agencies.

3. to 6. Bulk Specific Gravities: The bulk specific gravities (to the nearest thousandth) for coarse aggregate, fine aggregate, mineral filler, and the aggregate combination. The bulk specific gravities for the aggregate fractions are measured using the laboratory procedures indicated on the data sheet. The bulk specific gravity for the aggregate combination (usually called "bulk specific gravity of aggregate") is calculated as shown in Equation 7.1.

7. Effective Specific Gravity of Aggregate Combination: The calculated effective specific gravity to the nearest thousandth. This calculation requires the maximum specific gravity (no air voids) of the paving mixture, which is obtained by Test Method AASHTO T209 or ASTM D2041. The effective specific gravity of the aggregate is calculated as shown in Equation 7.2.

HOT MIX RECYCLED ASPHALT PAVEMENT, COMBINED AGGREGATE PROPERTIES (SHEET 14)

This data sheet is provided to note the combined (the reclaimed and the untreated) aggregate properties.

1. Layer Number: The hot mix asphalt recycled layer for which a description is being provided (from Sheet 2).

2. Amount of New Untreated Aggregate Added: The amount of untreated aggregate added, to the nearest tenth of a percent of the combined weight of the aggregates in the recycled mixture.

3. Gradation of Combined Aggregates: The percent passing on various standard sieve sizes to the nearest one percent. It is not expected that values will be available for all eighteen sieve sizes; the objective is to provide sufficient sieve sizes to accommodate testing and specification practices for most agencies.

4. to 7. Bulk Specific Gravities: The bulk specific gravities (to the nearest thousandth) for coarse aggregate, fine aggregate, mineral filler, and the aggregate combination. The bulk specific gravities for the aggregate fractions are measured using the laboratory procedures indicated on the data sheet. The bulk specific gravity for the aggregate combination (usually called "bulk specific gravity of aggregate") is calculated as shown in Equation 7.1.

8. Effective Specific Gravity of Aggregate Combination: The calculated effective specific gravity to the nearest thousandth. This calculation requires the maximum specific gravity (no air voids) of the paving mixture, which is obtained by Test Method AASHTO T209 or ASTM D2041. The effective specific gravity of the aggregate is calculated as shown in Equation 7.2.

HOT MIX RECYCLED ASPHALT PAVEMENT, RECLAIMED ASPHALT CEMENT PROPERTIES (SHEET 15)

The following data items should reflect the results of laboratory testing of asphalt cement extracted from representative samples of the existing asphalt concrete mixture to be reclaimed and used in the recycled mixture.

1. Layer Number: The hot mix recycled asphalt concrete layer to be described on this sheet (from Sheet 2).

2. Specific Gravity of Asphalt Cement: The specific gravity of the asphalt cement (to the nearest thousandth) when it is available. If unavailable, a typical specific gravity for asphalt cements produced at the source refinery may be entered. If source is unknown, enter 1.010 as a reasonable estimate. This specific gravity is measured as specified by AASHTO T228 (or ASTM D70).

3. Viscosity of Asphalt at 140°F: The results in poises from kinematic viscosity testing using Test Method AASHTO T202 (or ASTM D2171) on samples of the extracted asphalt cement.

4. Viscosity of Asphalt at 275°F: The results in centistokes (to the nearest hundredth) from absolute viscosity testing using Test Method AASHTO T201 (or ASTM D2170) on samples of the extracted asphalt cement.

5. Penetration at 77°F: The penetration (in tenths of a millimeter) from testing the original asphalt cement in the mixture at 77°F, using a 100 gram load and a five-second load duration with Test Method AASHTO T49 (or ASTM D5) on samples of the extracted asphalt cement material.

6. Ductility at 77°F: The ductility in centimeters as measured by Test Method AASHTO T51 at 77°F (or ASTM D113).

7. Ductility at 39.2°F: The ductility in centimeters at 39.2°F, using the procedures of Test Method AASHTO T51 (or ASTM D113).

8. Test Rate for Ductility Measurement at 39.2°F: The test speed in centimeters per minute for the ductility measurement taken at 39.2°F.

9. Penetration at 39.2°F: The penetration value using a 200 gram weight and 60 second loading duration, tested in accordance with Test Method AASHTO T49 (or ASTM D5) on samples of the extracted asphalt cement.

10. Ring and Ball Softening Point: The softening point of the asphalt cement in °F as measured with the ring-and-ball apparatus used in Test Method AASHTO T53, on samples of the extracted asphalt cement.

HOT MIX RECYCLED ASPHALT PAVEMENT, NEW ASPHALT CEMENT PROPERTIES (SHEET 16)

This sheet is provided to incorporate data on any new asphalt cement which is added to the recycled mix.

1. Layer Number: The asphalt concrete layer to be described on this sheet (from Sheet 2).

2. Asphalt Grade: The grade of the asphalt cement used (see Table A.16). Space is provided on the data sheet for identifying another grade of asphalt cement not appearing in Table A.16.

3. Source: The source for the new asphalt cement. A list of asphalt refiners and processors is provided in Table A.14, Appendix A. Space is provided to specify other sources which may not be included on the table provided.

4. Specific Gravity of Asphalt Cement: The specific gravity of the asphalt cement (to the nearest thousandth) when it is available. If unavailable, a typical specific gravity for asphalt cements produced at the source refinery may be entered. If source is unknown, enter 1.010 as a reasonable estimate. This specific gravity is measured as specified by AASHTO T228 (ASTM D70).

5. Viscosity of Asphalt at 140°F: The results in poises from kinematic viscosity testing using test method AASHTO T202 (ASTM D2171) on samples of the new asphalt cement prior to its addition to the recycled mix.

6. Viscosity of Asphalt at 275°F: The results in centistokes (to the nearest hundredth) from absolute viscosity testing using test method AASHTO T201 (ASTM D2170) on samples of the new asphalt cement.

7. Penetration at 77°F: The penetration (in tenths of a millimeter) from testing the original asphalt cement in the mixture at 77°F, using a 100 gram load and a five-second load duration with test method AASHTO T49 (ASTM D5) on samples of the new asphalt cement material.

8. Ductility at 77°F: The ductility in centimeters as measured by test method AASHTO T51 (ASTM D113) at 77°F.

9. Ductility at 39.2°F: The ductility in centimeters at 39.2°F, using the procedures of test method AASHTO T51 (ASTM D113).

10. Test Rate for Ductility Measurement at 39.2°F: The test speed in centimeters per minute for the ductility measurement taken at 39.2°F.

11. Penetration at 39.2°F: The penetration value using a 200 gram weight and 60 second loading duration, tested in accordance with test method AASHTO T49 (ASTM D5) on samples of the new asphalt cement, prior to its addition to the recycled mix.

12. Ring and Ball Softening Point: The softening point of the asphalt cement in °F as measured with the ring and ball apparatus used in test method AASHTO T53, on samples of the new asphalt cement prior to its addition to the recycled mix.

HOT MIX RECYCLED ASPHALT PAVEMENT, COMBINED ASPHALT CEMENT PROPERTIES (SHEET 17)

The following data should be provided, when available, for the combined asphalt cement, tested prior to its use in the construction.

1. Layer Number: The hot mix recycled asphalt concrete layer to be described on this sheet (from Sheet 2).

2. Recycling Agent: Codes to identify the Type and Quantity of recycling agent used. The codes for type appear in Table A.20. The amount of recycling agent should be provided by weight added to the reclaimed (aged) asphalt, to the nearest one-tenth of a percent of the reclaimed asphalt cement weight. As an example, if the weight of the recycling agent to be added to the aged asphalt cement was 41.5 percent of the weight of the aged asphalt in the reclaimed mixture, "41.5" would be entered on the data sheet.

3. Amount of New Asphalt Cement Added: The quantity of new asphalt cement to the nearest tenth of a percent of total recycled mixture weight (includes reclaimed asphalt concrete and untreated aggregate and asphalt cement/recycling agent added).

4. Specific Gravity of Asphalt Cement: The specific gravity of the asphalt cement (to the nearest thousandth) when it is available. If unavailable, a typical specific gravity for asphalt cements produced at the source refinery may be entered. If source is unknown, enter 1.010 as a reasonable estimate. This specific gravity is measured as specified by AASHTO T228 (or ASTM D70).

5. Viscosity of Asphalt at 140°F: The results in poises from kinematic viscosity testing using test method AASHTO T202 (ASTM D2171) on samples of the combined asphalt cement prior to its use in construction of the recycled pavement section.

6. Viscosity of Asphalt at 275°F: The results in centistokes (to the nearest hundredth) from absolute viscosity testing using test method AASHTO T201 (ASTM D2170) on samples of the combined asphalt cement.

7. Penetration at 77°F: The penetration (in tenths of a millimeter) from testing the combined asphalt cement in the mixture at 77°F, using a 100 gram load in the five-second load duration with test method AASHTO T49 (ASTM D5) on samples of the combined asphalt cement material.

8. and 9. Asphalt Modifiers: Space is provided to list the type and quantity of up to two modifiers added to the asphalt cement for whatever purpose (other than the recycling agent which is recorded under Item 2. above). A list of possible asphalt cement modifiers and codes for data entry are provided on Table A.15, Appendix A. If a material other than those listed in Table A.15 is used, space is provided to record the pertinent information. The quantities of modifier should be provided in percent of asphalt cement weight. Some modifiers (such as lime) may be specified in terms of "percent of aggregate weight", but they must be converted to percent of asphalt cement weight for uniformity. Space is provided for up to two types of modifiers.

10. Ductility at 77°F: The ductility in centimeters measured by test method AASHTO T51 (ASTM D113) at 77°F.

11. Ductility at 39.2°F: The ductility in centimeters at 39.2°F, using the procedures of test method AASHTO T51 (ASTM D113).

12. Test Rate for Ductility Measurement at 39.2°F: The test speed in centimeters per minute for the ductility measurement taken at 39.2°F.

13. Penetration at 39.2°F: The penetration value using a 200 gram weight and 60-second loading duration, tested in accordance with test method AASHTO T49 (ASTM D5) on samples of the combined asphalt cement, prior to its use as a construction material.

14. Ring and Ball Softening Point: The softening point of the asphalt cement in °F as measured with the ring and ball apparatus used in test method AASHTO T53, on samples with the combined asphalt cement prior to its use as a construction material.

HOT MIX RECYCLED ASPHALT PAVEMENT, LABORATORY AGED COMBINED ASPHALT CEMENT PROPERTIES (SHEET 18)

The data items on this sheet should be provided for laboratory aged asphalt cement samples using samples of the combined asphalt cement aged in accordance with the provisions of test method AASHTO T179 (ASTM D1754) or test method AASHTO T240 (ASTM D2872).

1. Layer Number: The hot mix asphalt recycled concrete layer for which a description is being provided (from Sheet 2).

2. Test Procedure Used to Measure Aging Effects: The test procedure used to "age" the asphalt cement in the laboratory, and to measure the effects of the aging. Space is provided on the data sheet to indicate the aging process used if other than those stated above.

3. Viscosity of Asphalt at 140°F: The results in poises from viscosity testing on laboratory aged asphalt cement samples using Test Method AASHTO T202 (or ASTM D2171).

4. Viscosity of Asphalt at 275°F: The results in centistokes (to the nearest hundredth) from viscosity testing using Test Method AASHTO T201 (or ASTM D2170) on laboratory aged asphalt cement samples.

5. Ductility at 77°F: The ductility in centimeters as measured by Test Method AASHTO T51 (or ASTM D113) on laboratory aged samples of the asphalt cement.

6. Ductility at 39.2°F: The ductility in centimeters at 39.2°F, using the procedures of Test Method AASHTO T51 (or ASTM D113).

7. Test Rate for Ductility Measurement at 39.2°F: The test rate to the nearest tenth of a centimeter per minute for ductility determination at 39.2°F.

8. Penetration at 77°F: The penetration (in tenths of millimeters) from testing the asphalt cement used in the mixture at 77°F, using a 100 gram load and a 5 second load duration, in accordance with Test Method AASHTO T49 (or ASTM D5).

9. Penetration at 39.2°F: The penetration (in tenths of millimeters) from testing the asphalt cement used in the mixture at 39.2°F, using a 200 gram load and 60 second load duration, in accordance with Test Method AASHTO T49 (or ASTM D5).

10. Ring and Ball Softening Point: The results in °F from the ring and ball softening point test for bitumens (AASHTO T53).

11. Weight Loss: The weight loss resulting from the laboratory aging process to the nearest one-tenth of one percent.

HOT MIX RECYCLED ASPHALT PAVEMENT, LABORATORY MIXTURE DESIGN (SHEET 19)

The following data items are to be derived from tests conducted on the mixture during mix design.

1. Layer Number: The recycled asphalt concrete layer to be described on this sheet (from Sheet 2).

2. Maximum Specific Gravity: The maximum specific gravity (to the nearest thousandth) of the recycled mixture, calculated using Equations 7.2 and 7.3.

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

4. Optimum Asphalt Content: The optimum amount of asphalt cement added to the recycled asphalt concrete mixture to the nearest one-tenth of a percent. This optimum asphalt content is obtained from the Marshall or Hveem Stability Testing.

5. Percent Air Voids: The calculated air voids (to the nearest tenth of a percent) in the recycled mixture, compacted in the laboratory to the optimum asphalt content and by appropriate procedures for Marshall or Hveem stability. Equation 7.4 may be used for calculating the percent air voids.

6. Marshall Stability: The Marshall Stability (Test Method AASHTO T245 or ASTM D1559) of the mixture at optimum asphalt content in pounds.

7. Number of Blows: The number of blows of the compaction hammer that were applied to each end of the specimen to compact it for Marshall Stability and flow testing.

8. Marshall Flow: The Marshall Flow (Test Method AASHTO T245 or ASTM D1559) of the mixture at optimum asphalt content. This item is to be entered as the whole number of the measured hundredth of an inch (i.e. if 0.15 is measured, enter "15.").

9. Hveem Stability: The Hveem Stability or "stabilometer value" of the mixture at optimum asphalt content as measured with the Hveem apparatus using Test Method AASHTO T246 (or ASTM D1561).

10. Hveem Cohesiometer Value: The cohesiometer value of the mixture at optimum asphalt content, in grams per 25 mm width (or diameter) of specimen, obtained by Test Method AASHTO T246 (or ASTM D1561).

HOT MIX RECYCLED ASPHALT PAVEMENT, MIXTURE PROPERTIES AS PLACED (SHEET 20)

The following data items are to be derived from in situ testing of the mixtures.

1. Layer Number: The recycled asphalt concrete layer to be described on this sheet (from Sheet 2).

2. Type of Samples: A code to indicate whether the test samples were compacted in the laboratory or removed from the compacted pavement. The codes appear on the data sheet.

3. Maximum Specific Gravity (no air voids) of a mixture sampled during or soon after construction, as an average from testing of several samples according to AASHTO 209 or ASTM D2041. Where possible, several samples should be tested and the average entered. Use the resulting maximum specific gravity and the design asphalt content for the mixture to calculate the effective specific gravity of aggregate using Equation 7.2. Once the effective specific gravity of the aggregate is established, it may be used to calculate other maximum specific gravities for the mixture at other measured asphalt contents using Equation 7.3.

4. Bulk Specific Gravity: The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of bulk specific gravities (to the nearest thousandth) of compacted mixtures measured on cores removed from the pavement during or right after construction. While the test method specified in ASTM D1188 is preferable, the results from nuclear density tests (ASTM D2950), appropriately calibrated to measurements on cores, may also be used. See Appendix B for standard deviation equation.

5. Asphalt Content: The Number of Tests and the Minimum, Maximum, Mean, and Standard Deviation of percents by weight of the total asphalt cement (including that absorbed by the aggregate) in the asphalt concrete mixture to the nearest one-tenth of a percent. Asphalt contents measured by extraction tests (AASHTO T164) on field samples are preferred, but results from nuclear test methods may also be used. If no such test results are available, enter the specified asphalt content as the mean, and leave the other spaces blank. See Appendix B for the standard deviation equation.

6. Percent Air Voids: The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of calculated air voids (to the nearest tenth of a percent) as a percent of the material volume. These data are frequently not available, but can be calculated using other available data from reports on mix design and density measurements on samples from the pavement. Percent air voids is calculated as shown in Equation 7.4.

7. Voids in Mineral Aggregate: The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of void space between the aggregate particles of a compacted asphalt concrete mixture, which includes air voids and the effective asphalt content, to the nearest one-tenth of one percent. Percent of voids in mineral aggregate (VMA) is calculated as shown in Equation 7.5.

8. Effective Asphalt Content: The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of effective asphalt content (total asphalt content of the paving mixture minus the portion of asphalt that is lost by absorption into the aggregate particles), expressed by weight of total mixture to the nearest one-tenth of one percent. The asphalt absorption may be calculated as a percent of total weight of mixture as shown in Equation 7.6.

HOT MIX RECYCLED ASPHALT PAVEMENT, MIXTURE PROPERTIES AS PLACED (CONTINUED) (SHEET 21)

1. Layer Number: The recycled asphalt concrete layer for which a description is being provided (from Sheet 2).

2. Type Asphalt Plant: Type of plant that produced the asphalt concrete mixture. Codes are provided on the data sheet.

3. Type of Antistripping Agent: The type of antistripping agent used in the mixture. The codes are provided in Table A.21 in Appendix A.

4. Antistripping Agent Liquid or Solid Code: A code to indicate whether the antistripping agent used is a liquid or solid. Codes are provided on the data sheet.

5. Amount of Antistripping Agent: The amount of antistripping agent used in the mixture by weight to the nearest tenth of a percent of weight of asphalt if the agent is liquid and weight of aggregate if it is solid.

6. Moisture Susceptibility Test Type: The type of moisture susceptibility test used during the test program. If a procedure other than those provided is used, space is provided to specify a name or reference for the test.

7. Moisture Susceptibility Test Results: The Hveem Stability Number or Percent Stripped and the Tensile Strength Ratio or Index of Retained Strength. Space is provided to record these results in varying forms, depending on the test procedure used.

HOT MIX RECYCLED ASPHALT PAVEMENT, CONSTRUCTION DATA (SHEET 22)

1. Layer Number: The recycled asphalt concrete layer for which the compaction data are to be described on this sheet (from Sheet 2).

2. Mixing Temperature: The temperature of the mixture at the plant (i.e., the mix as discharged) in °F.

3., 4., and 5. Laydown Temperatures: The Number of Temperature Measurements taken and the Minimum, Maximum, Mean, and Standard Deviation of temperatures measured. The temperatures should be measured just behind the screed. Three to five measurements should be made. See Appendix B for the standard deviation equation.

6. to 22. Roller Data: Codes appear on the data sheet for steel-wheeled tandem, pneumatic-tired, single-drum vibratory, and double-drum vibratory rollers. For each type of roller, spaces are provided to describe significant characteristics for up to four different rollers. Steel-wheeled tandem rollers are described by their gross weights to the nearest tenth of a ton. Pneumatic-tired rollers are described by their gross weight and mean tire pressure in psi. Vibratory rollers are described by their gross weight in tons to the nearest tenth, frequency in vibrations per minute, amplitude in inches to the nearest thousandth, and roller speed in miles per hour to the nearest tenth.

Compaction Data: Spaces are provided for Items 23. to 31. to enter the following data regarding the compaction of the recycled mix.

23. to 28. Description of the Roller used (code from data sheet) and Number of Coverages for breakdown, intermediate, and final compactions for each of up to four asphalt concrete lifts. A "coverage" in this case is defined as one trip of the roller across the pavement.

29. The Air Temperature in °F while compaction is accomplished. Space is provided to record data for each of up to four asphalt concrete lifts.

30. The Compacted Thickness in inches to the nearest tenth. If coring is not performed, the planned thickness should be recorded. Space is provided to record data for each of up to four asphalt concrete lifts.

31. The Curing Period in days before a new lift is placed or opened to traffic. Space is provided to record data for each of up to four asphalt concrete lifts.

COLD MIX RECYCLED ASPHALT PAVEMENT, GENERAL INFORMATION AND RECLAIMED AGGREGATE PROPERTIES (SHEET 23)

The properties of the original asphalt concrete mixture (to be reclaimed) and its components will already be available as inventory data. However, some of the key properties, such as aggregate gradation, will be duplicated here to assist in the evaluation of the recycled mix design. Also included for the cold mix recycled asphalt will be procedures on the removal and processing of the existing structure, as well as properties for the new asphalt cement, recycling agents, and/or any new aggregate used in the recycled mixture.

1. Layer Number: The recycled layer for which a description is being provided (from Sheet 2).

2. Procedure Used to Break Up and/or Remove the Asphalt Pavement: A code to indicate the procedure used for removal of the asphalt pavement to be recycled. Codes are provided on the data sheet.

3. Pavement Processing: A code to indicate how the pavement material was processed after removal. Codes are provided on the data sheet.

4. Gradation of Reclaimed Aggregates: The percent passing (after crushing) on various standard sieve sizes to the nearest one percent. It is not expected that values will be available for all eighteen sieve sizes; the objective is to provide sufficient sieve sizes to accommodate testing and specification practices for most agencies.

5. to 8. Bulk Specific Gravities: The bulk specific gravities (to the nearest thousandth) for coarse aggregate, fine aggregate, mineral filler, and the aggregate combination. The bulk specific gravities for the aggregate fractions are measured using the laboratory procedures indicated on the data sheet. The bulk specific gravity for the aggregate combination (usually called "bulk specific gravity of aggregate") is calculated as shown in Equation 7.1.

9. Effective Specific Gravity of Aggregate Combination: The calculated effective specific gravity to the nearest thousandth. This calculation requires the maximum specific gravity (no air voids) of the paving mixture, which is obtained by Test Method AASHTO T209 or ASTM D2041. The effective specific gravity of the aggregate is calculated as shown in Equation 7.2.

COLD MIX RECYCLED ASPHALT PAVEMENT, UNTREATED AGGREGATE PROPERTIES (SHEET 24)

This data sheet is to be filled out when untreated aggregate (new or reclaimed from base layer) is added to a recycled AC mixture. If no untreated aggregate was added, this sheet will not be applicable and should be so noted.

1. Layer Number: The asphalt concrete layer for which a description is being provided (from Sheet 2).

2., 3., and 4. Composition of Coarse Aggregate: When more than one coarse aggregate is used, the type and percentage by total weight of coarse aggregate should be indicated for each coarse aggregate. If only one type of coarse aggregate is used, enter its type code and 100 percent in the top set of the data spaces, leaving the others blank.

5. Geologic Classification of Coarse Aggregate: The geologic classification of the untreated aggregate (when applicable). These codes appear in Table A.9 and provide identification as to which of the three major classes of rock the coarse aggregate belongs to and the type of rock within those classes. If a "blend" was used, enter the code for the geologic classification for the material representing the majority of the untreated coarse aggregate. If a "crushed slag", "manufactured light-weight", or "recycled concrete" was used as coarse aggregate, enter "N".

6., 7., and 8. Composition of Fine Aggregate: When more than one fine aggregate is used, the type and percentage by total weight of fine aggregate should be indicated for each fine aggregate. Fine aggregate is defined as that passing the No. 8 sieve and retained on the No. 200 sieve. If only one type of fine aggregate is used, enter its type code and 100 percent in the top set of the data spaces, leaving the others blank.

9. and 10. Source: Two one-digit codes to reflect whether the coarse and fine aggregates, respectively, were reclaimed from existing base material on the roadway or obtained for original use from a conventional source (pit). Codes are provided on the data sheet.

11. Type of Mineral Filler: The type of mineral filler used. The codes appear on the data sheet, including space for entering some other type for which a code has not been provided.

12. to 15. Aggregate Durability Test Results: The type of aggregate durability test used and the results in thousandths recorded in units specified for the test. Three of these sets are for coarse (Items 12, 13, and 14) and one (Item 15) for the combination of coarse and fine aggregate. Items 12, 13, and 14 are to correlate with Items 2, 3, and 4 above, respectively. The durability test type codes appear in Table A.13.

16. Polish Value of Coarse Aggregates: The accelerated polish value of the coarse aggregates used in surface layer, as determined by AASHTO T279 (ASTM D3319).

COLD MIX RECYCLED ASPHALT PAVEMENT, UNTREATED AGGREGATE PROPERTIES (CONTINUED) (SHEET 25)

1. Layer Number: The cold mix asphalt recycled concrete layer for which a description is being provided (from Sheet 2).

2. Gradation of Untreated Aggregates: The percent passing (of untreated coarse and fine aggregates) on various standard sieve sizes to the nearest one percent. It is not expected that values will be available for all eighteen sieve sizes; the objective is to provide sufficient sieve sizes to accommodate testing and specification practice for most agencies.

3. to 6. Bulk Specific Gravities: The bulk specific gravities (to the nearest thousandth) for coarse aggregate, fine aggregate, mineral filler, and the aggregate combination. The bulk specific gravities for the aggregate fractions are measured using the laboratory procedures indicated on the data sheet. The bulk specific gravity for the aggregate combination (usually called "bulk specific gravity of aggregate") is calculated as shown in Equation 7.1.

7. Effective Specific Gravity of Aggregate Combination: The calculated effective specific gravity to the nearest thousandth. This calculation requires the maximum specific gravity (no air voids) of the paving mixture, which is obtained by Test Method AASHTO T209 or ASTM D2041. The effective specific gravity of the aggregate is calculated as shown in Equation 7.2.

COLD MIX RECYCLED ASPHALT PAVEMENT, COMBINED AGGREGATE PROPERTIES (SHEET 26)

This data sheet is provided to note the combined (the reclaimed and the untreated) aggregate properties.

1. Layer Number: The cold mix asphalt recycled layer for which a description is being provided (from Sheet 2).

2. Amount of New Untreated Aggregate Added: The amount of untreated aggregate added, to the nearest tenth of a percent of the combined weight of the aggregates in the recycled mixture.

3. Gradation of Combined Aggregates: The percent passing on various standard sieve sizes to the nearest one percent. It is not expected that values will be available for all eighteen sieve sizes; the objective is to provide sufficient sieve sizes to accommodate testing and specification practices for most agencies.

4. to 7. Bulk Specific Gravities: The bulk specific gravities (to the nearest thousandth) for coarse aggregate, fine aggregate, mineral filler, and the aggregate combination. The bulk specific gravities for the aggregate fractions are measured using the laboratory procedures indicated on the data sheet. The bulk specific gravity for the aggregate combination (usually called "bulk specific gravity of aggregate") is calculated as shown in Equation 7.1.

8. Effective Specific Gravity of Aggregate Combination: The calculated effective specific gravity to the nearest thousandth. This calculation requires the maximum specific gravity (no air voids) of the paving mixture, which is obtained by Test Method AASHTO T209 or ASTM D2041. The effective specific gravity of the aggregate is calculated as shown in Equation 7.2.

COLD MIX RECYCLED ASPHALT PAVEMENT, RECLAIMED ASPHALT CEMENT PROPERTIES (SHEET 27)

The following data items should reflect the results of laboratory testing of asphalt cement extracted from representative samples of the existing asphalt concrete mixture to be reclaimed and used in the recycled mixture.

1. Layer Number: The cold mix recycled asphalt concrete layer to be described on this sheet (from Sheet 2).

2. Specific Gravity of Asphalt Cement: The specific gravity of the asphalt cement (to the nearest thousandth) when it is available. If unavailable, a typical specific gravity for asphalt cements produced at the source refinery may be entered. If source is unknown, enter 1.010 as a reasonable estimate. This specific gravity is measured as specified by AASHTO T228 (or ASTM D70).

3. Viscosity of Asphalt at 140°F: The results in poises from kinematic viscosity testing using Test Method AASHTO T202 (or ASTM D2171) on samples of the extracted asphalt cement.

4. Viscosity of Asphalt at 275°F: The results in centistokes (to the nearest hundredth) from absolute viscosity testing using Test Method AASHTO T201 (or ASTM D2170) on samples of the extracted asphalt cement.

5. Penetration at 77°F: The penetration (in tenths of a millimeter) from testing the original asphalt cement in the mixture at 77°F, using a 100 gram load and a five-second load duration with Test Method AASHTO T49 (or ASTM D5) on samples of the extracted asphalt cement material.

6. Ductility at 77°F: The ductility in centimeters as measured by Test Method AASHTO T51 at 77°F (or ASTM D113).

7. Ductility at 39.2°F: The ductility in centimeters at 39.2°F, using the procedures of Test Method AASHTO T51 (or ASTM D113).

8. Test Rate for Ductility Measurement at 39.2°F: The test speed in centimeters per minute for the ductility measurement taken at 39.2°F.

9. Penetration at 39.2°F: The penetration value using a 200 gram weight and 60 second loading duration, tested in accordance with Test Method AASHTO T49 (or ASTM D5) on samples of the extracted asphalt cement.

10. Ring and Ball Softening Point: The softening point of the asphalt cement in °F as measured with the ring-and-ball apparatus used in Test Method AASHTO T53, on samples of the extracted asphalt cement.

COLD MIX RECYCLED ASPHALT PAVEMENT, NEW ASPHALT CEMENT PROPERTIES (SHEET 28)

This sheet is provided to incorporate data on any new asphalt cement which is added to the recycled mix.

1. Layer Number: The asphalt concrete layer to be described on this sheet (from Sheet 2).

2. Asphalt Grade: The grade of the asphalt cement used (see Table A.16). Space is provided on the data sheet for identifying another grade of asphalt cement not appearing in Table A.16.

3. Source: The source for the new asphalt cement. A list of asphalt refiners and processors is provided in Table A.14, Appendix A. Space is provided to specify other sources which may not be included on the table provided.

4. Specific Gravity of Asphalt Cement: The specific gravity of the asphalt cement (to the nearest thousandth) when it is available. If unavailable, a typical specific gravity for asphalt cements produced at the source refinery may be entered. If source is unknown, enter 1.010 as a reasonable estimate. This specific gravity is measured as specified by AASHTO T228 (ASTM D70).

5. Viscosity of Asphalt at 140°F: The results in poises from kinematic viscosity testing using test method AASHTO T202 (ASTM D2171) on samples of the new asphalt cement prior to its addition to the recycled mix.

6. Viscosity of Asphalt at 275°F: The results in centistokes (to the nearest hundredth) from absolute viscosity testing using Test Method AASHTO T201 (or ASTM D2170) on samples of the original asphalt cement.

7. Penetration at 77°F: The penetration (in tenths of a millimeter) from testing the original asphalt cement in the mixture at 77°F, using a 100 gram load and a five-second load duration with test method AASHTO T49 (ASTM D5) on samples of the new asphalt cement material.

8. Saybolt Furol Viscosity of Emulsified Asphalt at 77°F: The Saybolt Furol viscosity at 77°F (to the nearest tenth of a second) as measured by test method AASHTO T72 or ASTM D88. If the asphalt cement added was not an emulsified asphalt, enter "N".

9. Residue by Distillation: The residue to the nearest whole percent of the original emulsified asphalt sample remaining after distillation according to test methods AASHTO T59 or ASTM D244. If the asphalt cement added was not an emulsified asphalt, enter "N".

10. Coating Ability and Water Test: The coating on a reference aggregate in initially dry and wet states, and its ability to remain on the aggregates after spraying with water. Rating of good, fair, and poor are assigned after evaluation according to the procedures in test methods AASHTO T59 or ASTM D244. If the asphalt cement added is not an emulsified asphalt, enter "N".

11. Ductility at 77°F: The ductility in centimeters as measured by test method AASHTO T51 (ASTM D113) at 77°F.

12. B Ductility at 39.2°F: The ductility in centimeters at 39.2°F, using the procedures of test method AASHTO T51 (ASTM D113).

13. Test Rate for Ductility Measurement at 39.2°F: The test speed in centimeters per minute for the ductility measurement taken at 39.2°F.

14. Penetration at 39.2°F: The penetration value using a 200 gram weight and 60 second loading duration, tested in accordance with test method AASHTO T49 (ASTM D5) on samples of the new asphalt cement, prior to its addition to the recycled mix.

15. Ring and Ball Softening Point: The softening point of the asphalt cement in °F as measured with the ring and ball apparatus used in test method AASHTO T53, on samples of the new asphalt cement prior to its addition to the recycled mix.

COLD MIX RECYCLED ASPHALT PAVEMENT, COMBINED ASPHALT CEMENT PROPERTIES (SHEET 29)

The following data should be provided, when available, for the combined asphalt cement, tested prior to its use in the construction.

1. Layer Number: The cold mix recycled asphalt concrete layer to be described on this sheet (from Sheet 2).

2. Recycling Agent: Codes to identify the Type and Quantity of recycling agent used. The codes for type appear in Table A.20. The amount of recycling agent should be provided by weight added to the reclaimed (aged) asphalt, to the nearest one-tenth of a percent of the reclaimed asphalt cement weight. As an example, if the weight of the recycling agent to be added to the aged asphalt cement was 41.5 percent of the weight of the aged asphalt in the reclaimed mixture, "41.5" would be entered on the data sheet.

3. Amount of New Asphalt Cement Added: The quantity of new asphalt cement to the nearest tenth of a percent of total recycled mixture weight (includes reclaimed asphalt concrete and untreated aggregate and asphalt cement/recycling agent added).

4. Specific Gravity of Asphalt Cement: The specific gravity of the asphalt cement (to the nearest thousandth) when it is available. If unavailable, a typical specific gravity for asphalt cements produced at the source refinery may be entered. If source is unknown, enter 1.010 as a reasonable estimate. This specific gravity is measured as specified by AASHTO T228 (or ASTM D70).

5. Viscosity of Asphalt at 140°F: The results in poises from kinematic viscosity testing using test method AASHTO T202 (ASTM D2171) on samples of the combined asphalt cement prior to its use in construction of the recycled pavement section.

6. Viscosity of Asphalt at 275°F: The results in centistokes (to the nearest hundredth) from absolute viscosity testing using test method AASHTO T201 (ASTM D2170) on samples of the combined asphalt cement.

7. Penetration at 77°F: The penetration (in tenths of a millimeter) from testing the combined asphalt cement in the mixture at 77°F, using a 100 gram load in the five-second load duration with test method AASHTO T49 (ASTM D5) on samples of the combined asphalt cement material.

8. and 9. Asphalt Modifiers: Space is provided to list the type and quantity of up to two modifiers added to the asphalt cement for whatever purpose (other than the recycling agent which is recorded under Item 2. above). A list of possible asphalt cement modifiers and codes for data entry are provided on Table A.15, Appendix A. If a material other than those listed in Table A.15 is used, space is provided to record the pertinent information. The quantities of modifier should be provided in percent of asphalt cement weight. Some modifiers (such as lime) may be specified in terms of "percent of aggregate weight", but they must be converted to percent of asphalt cement weight for uniformity. Space is provided for up to two type of modifiers.

10. Ductility at 77°F: The ductility in centimeters measured by test method AASHTO T51 (ASTM D113) at 77°F.

11. Ductility at 39.2°F: The ductility in centimeters at 39.2°F, using the procedures of test method AASHTO T51 (ASTM D113).

12. Test Rate for Ductility Measurement at 39.2°F: The test speed in centimeters per minute for the ductility measurement taken at 39.2°F.

13. Penetration at 39.2°F: The penetration value using a 200 gram weight and 60-second loading duration, tested in accordance with test method AASHTO T49 (ASTM D5) on samples of the combined asphalt cement, prior to its use as a construction material.

14. Ring and Ball Softening Point: The softening point of the asphalt cement in °F as measured with the ring and ball apparatus used in test method AASHTO T53, on samples with the combined asphalt cement prior to its use as a construction material.

COLD MIX RECYCLED ASPHALT PAVEMENT, LABORATORY AGED COMBINED ASPHALT CEMENT PROPERTIES (SHEET 30)

The data items on this sheet should be provided for laboratory aged asphalt cement samples using samples of the combined asphalt cement aged in accordance with the provisions of test method AASHTO T179 (ASTM D1754) or test method AASHTO T240 (ASTM D2872).

1. Layer Number: The cold mix asphalt recycled concrete layer for which a description is being provided (from Sheet 2).

2. Test Procedure Used to Measure Aging Effects: The test procedure used to "age" the asphalt cement in the laboratory, and to measure the effects of the aging. Space is provided on the data sheet to indicate the aging process used if other than those stated above.

3. Viscosity of Asphalt at 140°F: The results in poises from viscosity testing on laboratory aged asphalt cement samples using Test Method AASHTO T202 (or ASTM D2171).

4. Viscosity of Asphalt at 275°F: The results in centistokes (to the nearest hundredth) from viscosity testing using Test Method AASHTO T201 (or ASTM D2170) on laboratory aged asphalt cement samples.

5. Ductility at 77°F: The ductility in centimeters as measured by Test Method AASHTO T51 (or ASTM D113) on laboratory aged samples of the asphalt cement.

6. Ductility at 39.2°F: The ductility in centimeters of laboratory aged asphalt specimens at 39.2°F, using the procedures of Test Method AASHTO T51 (or ASTM D113).

7. Test Rate for Ductility Measurement at 39.2°F: The test rate to the nearest tenth of a centimeter per minute for ductility determination at 39.2°F.

8. Penetration at 77°F: The penetration (in tenths of millimeters) from testing the asphalt cement used in the mixture at 77°F, using a 100 gram load and a 5 second load duration, in accordance with Test Method AASHTO T49 (or ASTM D5).

9. Penetration at 39.2°F: The penetration (in tenths of millimeters) from testing the asphalt cement used in the mixture at 39.2°F, using a 200 gram load and 60 second load duration, in accordance with Test Method AASHTO T49 (or ASTM D5).

10. Ring and Ball Softening Point: The results in °F from the ring and ball softening point test for bitumens (AASHTO T53).

11. Weight Loss: The weight loss resulting from the laboratory aging process to the nearest one-tenth of one percent.

COLD MIX RECYCLED ASPHALT PAVEMENT, LABORATORY MIXTURE DESIGN (SHEET 31)

The following data items are to be derived from tests conducted on the mixture during mix design.

1. Layer Number: The recycled asphalt concrete layer to be described on this sheet (from Sheet 2).

2. The Maximum Specific Gravity: The maximum specific gravity (to the nearest thousandth) of the recycled mixture, calculated using Equations 7.2 and 7.3.

3. Bulk Specific Gravity: The bulk specific gravity (to the nearest thousandth) of the recycled mixture, compacted in the laboratory at the optimum asphalt content selected and by appropriate procedures for Marshall or Hveem stability. Test Method ASTM D1188 is to used for establishing the bulk specific gravity.

4. Optimum Asphalt Content: The optimum amount of asphalt cement added to the recycled asphalt concrete mixture to the nearest one-tenth of a percent. This optimum asphalt content is obtained from the Marshall or Hveem Stability Testing.

5. Percent Air Voids: The calculated air voids (to the nearest tenth of a percent) in the recycled mixture, compacted in the laboratory to the optimum asphalt content and by appropriate procedures for Marshall or Hveem stability. Equation 7.4 may be used for calculating the percent air voids.

6. Marshall Stability: The Marshall Stability (Test Method AASHTO T245 or ASTM D1559) of the mixture at optimum asphalt content in pounds.

7. Number of Blows: The number of blows of the compaction hammer that were applied to each end of the specimen to compact it for Marshall Stability and flow testing.

8. Marshall Flow: The Marshall Flow (Test Method AASHTO T245 or ASTM D1559) of the mixture at optimum asphalt content. This item is to be entered as the whole number of the measured hundredth of an inch (i.e. if 0.15 is measured, enter "15.").

9. Hveem Stability: The Hveem Stability or "stabilimeter value" of the mixture at optimum asphalt content as measured with the Hveem apparatus using Test Method AASHTO T246 (or ASTM D1561).

10. Hveem Cohesiometer Value: The cohesiometer value of the mixture at optimum asphalt content, in grams per 25 mm width (or diameter) of specimen, obtained by Test Method AASHTO T246 (or ASTM D1561).

COLD MIX RECYCLED ASPHALT PAVEMENT, MIXTURE PROPERTIES AS PLACED (SHEET 32)

The following data items are to be derived from in situ testing of the mixture.

1. Layer Number: The recycled asphalt concrete layer to be described on this sheet (from Sheet 2).

2. Type of Samples: A code to indicate whether the test samples were compacted in the laboratory or removed from the compacted pavement. The codes appear on the data sheet.

3. Maximum Specific Gravity (no air voids) of a mixture sampled during or soon after construction, as an average from testing of several samples according to AASHTO 209 or ASTM D2041. Where possible, several samples should be tested and the average entered. Use the resulting maximum specific gravity and the design asphalt content for the mixture to calculate the effective specific gravity of aggregate using Equation 7.2. Once the effective specific gravity of the aggregate is established, it may be used to calculate other maximum specific gravities for the mixture at other measured asphalt contents using Equation 7.3.

4. Bulk Specific Gravity: The Number of Tests and the Minimum, Maximum, Mean, and Standard Deviation of bulk specific gravities (to the nearest thousandth) of compacted mixtures measured on cores removed from the pavement during or right after construction. While the test method specified in ASTM D1188 is preferable, the results from nuclear density tests (ASTM D2950), appropriately calibrated to measurements on cores, may also be used. See Appendix B for standard deviation equation.

5. Asphalt Content: The Number of Tests and the Minimum, Maximum, Mean, and Standard Deviation of percents by weight of the total asphalt cement (including that absorbed by the aggregate) in the asphalt concrete mixture to the nearest one-tenth of a percent. Asphalt contents measured by extraction tests (AASHTO T164) on field samples are preferred, but results from nuclear test methods may also be used. If no such test results are available, enter the specified asphalt content as the mean, and leave the other spaces blank. See Appendix B for the standard deviation equation.

6. Percent Air Voids: The Number of Tests and the Minimum, Maximum, Mean, and Standard Deviation of calculated air voids (to the nearest tenth of a percent) as a percent of the material volume. These data are frequently not available, but can be calculated using other available data from reports on mix design and density measurements on samples from the pavement. Percent air voids is calculated as shown in Equation 7.4.

7. Voids in Mineral Aggregate: The Number of Tests and the Minimum, Maximum, Mean, and Standard Deviation of void space between the aggregate particles of a compacted asphalt concrete mixture, which includes air voids and the effective asphalt content, to the nearest one-tenth of one percent. Percent of voids in mineral aggregate (VMA) is calculated as shown in Equation 7.5.

8. Effective Asphalt Content: The Number of Tests and the Minimum, Maximum, Mean, and Standard Deviation of effective asphalt content (total asphalt content of the paving mixture minus the portion of asphalt that is lost by absorption into the aggregate particles), expressed by weight of total mixture to the nearest one-tenth of one percent. The asphalt absorption may be calculated as a percent of total weight of mixture as shown in Equation 7.6.

COLD MIX RECYCLED ASPHALT PAVEMENT, MIXTURE PROPERTIES AS PLACED (CONTINUED) AND CONSTRUCTION DATA (SHEET 33)

1. Layer Number: The recycled asphalt concrete layer for which a description is being provided (from Sheet 2).

2. Type of Antistripping Agent: The type of antistripping agent used in the mixture. The codes are provided in Table A.21 in Appendix A.

3. Antistripping Agent Liquid or Solid Code: A code to indicate whether the antistripping agent used is a liquid or solid. Codes are provided on the data sheet.

4. Amount of Antistripping Agent: The amount of antistripping agent used in the mixture by weight to the nearest tenth of a percent of weight of asphalt if the agent is liquid and weight of aggregate if it is solid.

5. Moisture Susceptibility Test Type: The type of moisture susceptibility test used during the test program. If a procedure other than those provided is used, space is provided to specify a name or reference for the test.

6. Moisture Susceptibility Test Results: The Hveem Stability Number or Percent Stripped and the Tensile Strength Ratio or Index of Retained Strength. Space is provided to record these results in varying forms, depending on the test procedure used.

Construction Data: The following data (Items 10. to 14.) should be provided to describe the construction operations involved in the cold mix recycling process.

7. Type of Recycling: A code to indicate whether the recycling was done in place or mixed in a central plant.

8. Procedures for Mixing In Place: A code to indicate the procedure used for mixing the materials during recycling. The codes appear on the data sheet, along with space for entering a procedure other than those listed.

9. Type Asphalt Plant: Type of plant that produced the asphalt concrete mixture, if centrally mixed. Codes are provided on the data sheet.

10. Was Mixture Aerated?: A code to indicate whether the mixture was aerated before spreading. The codes appear on the data sheet.

11. Period Between Mixing and Spreading: The period between mixing and spreading (to the nearest hour).

COLD MIX RECYCLED ASPHALT PAVEMENT, CONSTRUCTION DATA (CONTINUED) (SHEET 34)

1. Layer Number: The recycled asphalt concrete layer for which the compaction data are to be described on this sheet (from Sheet 2).

2. Method of Spreading Mixture: Codes are provided on the data sheet to describe the method used to spread the AC mixture.

3. to 19. Roller Data: Codes appear on the data sheet for steel-wheeled tandem, pneumatic-tired, single-drum vibratory, and double-drum vibratory rollers. For each type of roller, spaces are provided to describe significant characteristics for up to four different rollers. Steel-wheeled tandem rollers are described by their gross weights to the nearest tenth of a ton. Pneumatic-tired rollers are described by their gross weight and tire pressure in psi. Vibratory rollers are described by their gross weight in tons to the nearest tenth, frequency in vibrations per minute, amplitude in inches to the nearest thousandth, and roller speed in miles per hour to the nearest tenth.

Compaction Data: Spaces are provided for Items 20. to 28. to enter the following data regarding the compaction of the recycled mix:

20. to 25. Description of the Roller used (code from data sheet) and Number of Coverages for breakdown, intermediate, and final compactions. A "coverage" in this case is defined as one trip of the roller across the pavement.

26. The <u>Air Temperature</u> in °F while compaction is accomplished.

27. The <u>Compacted Thickness</u> in inches to the nearest tenth. If coring is not performed, the planned thickness should be recorded.

28. The <u>Curing Period</u> in days before a new lift is placed or opened to traffic.

HEATER SCARIFICATION SURFACE RECYCLED ASPHALT PAVEMENT (SHEET 35)

1. <u>Layer Number</u>: The layer number of the surface prior to heater scarification (from Sheet 2).

2. <u>Type of Heater Scarification</u>: A code to indicate what type of heater scarification was employed. Codes appear on the data sheet.

3. <u>Depth of Scarification</u>: The average depth of cut to the nearest one-tenth of an inch during scarification. This is the reduction in thickness of the existing surface prior to replacement of recycled material.

4. <u>Type of Surface Treatment</u>: A code to indicate the type of surface treatment or overlay applied after heater scarification of the surface. Codes are provided on the data sheet.

5. <u>Type of Rejuvenating Agent</u>: A code to identify the type of rejuvenating agent added to the broken asphalt concrete to restore cohesion and flexibility. Codes for various agents used are provided on Table A.20.

6. <u>Amount of Rejuvenating Agent</u>: A three-digit number to record to the nearest one-tenth of a gallon per square yard the application rate of the rejuvenating agent.

7. <u>Roller Data</u>: Codes appear on the data sheet for steel-wheeled tandem, pneumatic-tired, single-drum vibratory, and double-drum vibratory rollers. For each type of roller, spaces are provided to describe significant characteristics. Steel-wheeled tandem rollers are described by their gross weights to the nearest tenth of a ton. Pneumatic-tired rollers are described by their gross weight and tire pressure in psi. Vibratory rollers are described by their gross weight in tons to the nearest tenth, frequency in vibrations per minute, amplitude in inches to the nearest thousandth, and roller speed in miles per hour to the nearest tenth of a mile.

8. <u>Compaction Data</u>: Spaces are provided to enter the type of roller and number of coverages used for the breakdown, intermediate, and final phases of surface compaction after heater scarification.

9. <u>Length of Time Between Heater Scarification and Addition of Surface Treatment</u>: The number of days between scarification/recompaction and addition of surface treatment.

10. <u>Length of Time Between Surfacing and Opening Road to Traffic</u>: The number of days between surface treatment and opening the surface to traffic.

PORTLAND CEMENT CONCRETE OVERLAY, JOINT DATA (SHEET 36)

1. Layer Number: The portland cement concrete overlay for which a description is being provided (from Sheet 2).

2. and 3. Average Contraction Joint Spacing: The average spacing in feet (to the nearest tenth of a foot) between consecutive contraction joints (length of the concrete slab) of the pavement under survey. A space is provided to write in a description of any Random Joint Spacing.

4. Built-in Expansion Joint Spacing: The average spacing in feet between consecutive expansion joints of the pavement under survey. If there are no expansion joints in the original construction, enter "N".

5. Skewness of Joints: The average deviation of the contraction joint across the slab from a right angle with the edge measured in feet per lane. If not skewed, enter "N".

6. Transverse Contraction Joint Load Transfer System: The mechanism by which a portion of the moving load is transferred across the transverse contraction joint to the adjacent slab. A space is provided to write in a description of another load transfer system if different from those for which codes are provided. Where dowels or other mechanical load transfer devices are not provided at joints, enter "N" in the spaces for describing these devices.

7. Round Dowel Diameter: The outer diameter of the round dowel bars used as the load transfer device across a contraction joint of the pavement under survey. This number is entered to the nearest one-tenth of an inch.

8. Dowel or Mechanical Load Transfer Device Spacing: The average center-to-center distance in inches between mechanical load transfer devices (round or I-beam dowels, star lugs, etc.) across the contraction joint of the PCC layer being described.

9. Average Intermediate Sawed Joint Spacing: The average distance between joints that have been sawed at intervals between contraction joints (called "warping joints" by some agencies). If no intermediate sawed joints have been provided, enter "N".

10. and 11. Dimensions for I-Beams or Keyways: The Height and Width of I-beams or keyways (if used) to the nearest hundredth of an inch.

12. Distance of Nearest Dowel (or Mechanical Load Transfer Device) From Outside Lane-Shoulder Edge: The distance from the outside lane-shoulder edge to the center of the nearest dowel or mechanical load transfer device, measured to the nearest tenth of an inch.

13. Dowel Length: The length in inches of the round or I-beam dowel bars across contraction joints in the PCC layer being described.

14. Dowel Coating: The material covering the dowel bar surfaces when installed in the concrete slab. A space is provided to write in a description if some dowel coating was used other than those for which codes are provided.

15. Method Used to Install Mechanical Load Transfer Devices: Whether the devices were installed by placing them on baskets, installed mechanically, or by other means. Space is provided for describing some method of installing dowels if the method used differs from those for which codes are provided.

PORTLAND CEMENT CONCRETE OVERLAY, JOINT DATA (CONTINUED) (SHEET 37)

1. Layer Number: The portland cement concrete overlay for which a description is being provided (from Sheet 2).

2. Method Used to Form Transverse Joints: Whether the contraction joints were constructed by sawing the hardened slab at the proper time, or by placing an insert in the slab surface while the concrete is plastic, or by any other construction method used to form the joint. Space is provided for describing another method if none of those for which codes were provided was used.

3. Type of Longitudinal Joint: How the longitudinal joint between the lanes was formed. Space is provided for describing another way of forming the joints if none of those for which codes are provided was used.

4. Type of Shoulder-Traffic Lane Joint: How the joint between the shoulder and the traffic lane was formed. "Tied concrete curb" indicates that a curb was provided in lieu of a shoulder. Space is provided for describing another way of forming the joints if none of those for which codes are provided was used.

5. Transverse Joint Sealant Type: Type of joint sealant used in the transverse joints. Space is provided for describing another type of sealant if none of those for which codes were provided was used.

6. Transverse Joint Sealant Reservoir Width: The as-constructed width of the transverse joint sealant reservoir to the nearest hundredth of an inch.

7. Transverse Joint Sealant Reservoir Depth: The as-constructed depth of the transverse joint sealant reservoir to the nearest hundredth of an inch.

8. Longitudinal Joint Sealant Reservoir Width: The width of the as-built longitudinal joint sealant reservoir to the nearest hundredth of an inch. If butt or keyed joints were used without a sealant reservoir, enter "0.00."

9. Longitudinal Joint Sealant Reservoir Depth: The depth of the as-built longitudinal joint sealant reservoir to the nearest hundredth of an inch. If butt or keyed joints were used without a sealant reservoir, enter "0.00."

10. Joint Sealant Backer Material Type: A code to indicate the type of blocking material used (placed prior to the joint sealant). Codes are provided on the data sheet.

11. Joint Sealant Backer Dimension: If the joint sealant backer material type is a rod or rope, enter the diameter, in inches to the nearest tenth of an inch. If the joint sealant backer material type is tape, enter the width, in inches to the nearest hundredth of an inch.

12. Between Lane Tie Bar Diameter: The diameter of the tie bars used across longitudinal joints between lanes entered to the nearest one hundredth of an inch.

13. Between Lane Tie Bar Length: The length in inches of the tie bars used across the longitudinal joint between the lanes.

14. Between Lane Tie Bar Spacing: The center-to-center spacing between consecutive tie bars across the longitudinal joint between the lanes to the nearest tenth of an inch.

15. and 16. Shoulder-Traffic Lane Joint Sealant Reservoir: The Width and Depth of the as-built joint sealant reservoir between the shoulder and traffic lane. If butt or keyed joints were used without a sealant reservoir, enter "0.00" in both of the spaces provided.

17., 18., and 19. Shoulder-Traffic Lane Joint Tie Bars: The outer Diameter of the tie bars across the joint between the shoulder and the traffic lane to the nearest one hundredth of an inch, the Length of the tie bars to the nearest inch, and the center-to-center distance (Spacing) in inches between consecutive tie bars across the concrete shoulder-traffic lane joint. If no concrete shoulder exists, enter "N" for these data entry spaces.

PORTLAND CEMENT CONCRETE OVERLAY, REINFORCING STEEL DATA (SHEET 38)

1. Layer Number: The portland cement concrete overlay for which a description is being provided (from Sheet 2).

2. Type of Reinforcing: The type of reinforcing used in the PCC layer being described. A space is provided for entering a written description of a reinforcing type other than deformed bars or welded wire fabric.

3. Transverse Bar Diameter: The diameter of the transverse bars or wire to the nearest one hundredth of an inch.

4. Transverse Bar Spacing: The mean center-to-center spacing between transverse bars or wires to the nearest tenth of an inch.

5. Longitudinal Bar Diameter: The diameter of the longitudinal bars or wire to the nearest hundredth of an inch.

6. Design Percentage of Longitudinal Steel: The percentage of reinforcing steel of the PCC cross-section required in the design to the nearest hundredth of one percent.

7. Depth to Reinforcement From Slab Surface: The depth (to the nearest tenth of an inch) of the concrete cover over the reinforcing steel.

8. Longitudinal Bar Spacing: The center-to-center spacing between longitudinal bars or wires to the nearest tenth of an inch.

9. Yield Strength of Reinforcing Steel: The yield strength of the reinforcing steel in the bars to the nearest tenth of a kip per square inch.

If tests were not conducted for the steel used, enter the minimum yield strength allowed for the grade of steel used.

10. Method Used to Place Reinforcement: The method used to install reinforcing steel bars or wire fabric during pavement construction. These methods include presetting the reinforcement on chairs, placing it mechanically by means of special equipment used for that purpose, or by placing them between layers of concrete. A space is also provided to describe another method of placement if a code was not provided for the method used.

11. Lap Length of Longitudinal Steel Splices: The length to the nearest inch of the longitudinal reinforcing steel overlap at a CRCP construction joint. If the rigid pavement is not CRCP, enter "N".

PORTLAND CEMENT CONCRETE OVERLAY, MIXTURE DATA (SHEET 39)

1. Layer Number: The portland cement concrete overlay for which a description is being provided (from Sheet 2).

2. to 5. Mix Design: The oven dry weights in pounds of Coarse Aggregate, Fine Aggregate, Cement, and weight of Water provided by the mix design for a cubic yard of concrete.

6. Cement Type Used: Type of cement used in the slab concrete. These cement type codes appear in Table A.11 in Appendix A.

7. Alkali Content of Cement: The alkali content of the cement to the nearest tenth of one percent, expressed as sodium oxide equivalent.

8., 9., and 10. Entrained Air Content: The Mean, Minimum, and Maximum values of entrained air (percent of mixture volume) as measured (by Test Methods AASHTO T121, AASHTO T152, AASHTO T196, ASTM C138, ASTM C173, or ASTM C231) during construction to the nearest tenth of one percent.

11., 12., and 13. Admixtures: The types and amounts (in percent by weight of cement to the nearest thousandth) of admixtures used in the concrete. The codes for concrete admixtures appear in Table A.12 in Appendix A, and space has been provided for identifying an admixture type for which a code was not provided.

14. to 18. Slump: The Mean of the slump measurements made, the Minimum and Maximum values, the Standard Deviation from the mean to the nearest tenth of an inch and the Number of Tests from which the values are obtained. The slump test is described in AASHTO T119 or ASTM C143. The maximum and minimum values and standard deviation of slump should be left blank if only one test result is available. The equation for standard deviation is given in Appendix B.

PORTLAND CEMENT CONCRETE OVERLAY, AGGREGATE DATA (SHEET 40)

1. Layer Number: The portland cement concrete overlay for which a description is being provided (from Sheet 2).

2., 3., and 4. Composition of Coarse Aggregate: When more than one coarse aggregate is used, the type and percentage by total weight of coarse aggregate should be indicated for each coarse aggregate. Coarse aggregate is defined as that portion of the aggregate retained on the No. 4 sieve. If only one type of coarse aggregate is used, enter its type code and 100 percent in the top set of the data spaces, leaving the others blank.

5. Geologic Classification of Coarse Aggregate: The geologic classification of the natural stone used as coarse aggregate in the concrete. These codes appear in Table A.9 and provide identification as to which of the three major classes of rock the coarse aggregate belongs to and the type of rock within those classes. If a "blend" was used, enter the code for the geologic classification for the material representing the majority of the coarse aggregate. If a "crushed slag", "manufactured lightweight", or "recycled concrete" was used, enter "N."

6., 7., and 8. Composition of Fine Aggregate: When more than one fine aggregate is used, the type and percentage by total weight of fine aggregate should be indicated for each fine aggregate. Fine aggregate is defined as that passing the No. 4 sieve and retained on the No. 200 sieve. If only one type of fine aggregate is used, enter its type code and 100 percent in the top set of the data spaces, leaving the others blank.

9. Insoluble Residue: The percentage of insoluble residue (noncarbonate material) as determined using ASTM D3042.

10. and 11. Gradation of Aggregates: The percent passing various standard sieve sizes to the nearest one percent of the coarse and fine aggregates. It is not expected that values will be available for all sieve sizes shown; the objective is to provide sufficient sieve sizes to accommodate testing and specification practice for most agencies.

12. and 13. Bulk Specific Gravities: The mean bulk specific gravities (to the nearest thousandth) for coarse aggregate and fine aggregate. The bulk specific gravities for the aggregate fractions are measured using these laboratory procedures: a) Coarse Aggregate - AASHTO T85 or ASTM C127, and b) Fine Aggregate - AASHTO T84 or ASTM C128.

PORTLAND CEMENT CONCRETE OVERLAY, AGGREGATE DATA (CONTINUED) AND CONSTRUCTION DATA (SHEET 41)

1. Layer Number: The portland cement concrete overlay for which a description is being provided (from Sheet 2).

2. to 5. Aggregate Durability Test Results: The type of durability tests used and the results in tenths recorded in units specified for the test. Three of these sets are for coarse and one for the combination of coarse and fine aggregates. The durability test type codes and the units for reporting appear in Table A.13.

6. Type of Paver Used: Record whether a slip-form or side-form paver was used to place the concrete. The codes appear on the data sheet. Enter "N" if a paver was not used (i.e., roller compacted concrete).

7., 8., and 9. Air Temperatures During Placement: The Mean air temperature at the time the overlay concrete was placed (in °F) and the range of air temperatures (Minimum and Maximum) occurring during placement.

10. Curing Period Before Opening to Any Traffic: The number of days the concrete was allowed to cure before opening the pavement to traffic (including construction traffic).

11. Time Before Sawing Joints: The number of hours between the time the concrete was placed and the joints were sawed.

12. Method Used to Cure Concrete: The method used to cure the concrete pavement. Space is provided for identifying another curing method if none of those with codes was used.

13. Method Used to Texture Concrete: How the concrete surface was textured. Space is provided for identifying another texturing method if none of those with codes was used.

PORTLAND CEMENT CONCRETE OVERLAY, CONSTRUCTION DATA (CONTINUED) (SHEET 42)

1. Layer Number: The PCC overlay layer to be described on this sheet (from Sheet 2).

2. Bonding Condition of Overlay: A code to identify what degree of bonding is present between the overlay and the original pavement surface. Codes are provided on the data sheet.

3. Surface Preparation: A code to record the method of surface preparation prior to placement of the overlay. Codes are provided on the data sheet.

4. Type of Grout Used for Bonded Overlays: A code used to identify the type of grout used for a bonded or partially bonded overlay. Enter "N" for an unbonded overlay. Codes are provided on the data form.

5. Material Used to Prevent Bonding for Unbonded Overlays: A code to identify the type of material used to prevent bonding of the overlay to the existing surface. Codes are provided on the data sheet. Space has also been provided to specify another means of bond prevention, other than those listed on the data sheet. Enter "N" if the overlay is bonded to the surface overlaid.

6. Mean Direct Shear Strength of Core at Overlay/Slab Interface: The results of direct shear testing (average of measured results) to the nearest one-tenth of a pound per square inch to determine the degree of bonding between the overlay and the existing surface.

7. Age of Overlay at Time of Direct Shear Testing: The number of days for which the overlay is allowed to cure prior to testing cores for shear strength as recorded for Item 6.

8. Overlay Joints Matched with Existing Pavement Slab Joints?: A code to identify whether or not the joints of the overlay were matched with joints

of the existing pavement. Enter "N" if the PCC overlay or original surface is continuously reinforced.

PORTLAND CEMENT CONCRETE OVERLAY, STRENGTH DATA (SHEET 43)

This data sheet is used to provide strength data on cylinders or beams molded from plastic concrete during construction.

1. Layer Number: The portland cement concrete overlay for which a description is being provided (from Sheet 2).

2. to 8. Flexural Strength: The Type of Test (third-point or center-point loading), the Age of the sample at testing, the Number of Tests performed, and the Mean, Minimum, Maximum, and Standard Deviation of flexural strength tests, in psi. The preferred type of test for SHRP LTPP test sections is the third-point loading (AASHTO T97 or ASTM C78). The standard deviation of the flexural strength is to be calculated as shown in Appendix B.

9. to 14. Compressive Strength: The Age of sample at testing, the Number of Tests performed, and the Mean, Minimum, Maximum, and Standard Deviation of compressive strength in psi, measured according to AASHTO T22 or ASTM C39. See Appendix B for standard deviation equation.

15. to 20. Splitting Tensile Strength: The Age of the sample at testing, the Number of Tests, and the Mean, Minimum, Maximum, and Standard Deviation of splitting tensile strength in psi, measured according to AASHTO T198 or ASTM C496. See Appendix B for standard deviation equation.

21. to 26. Elastic Modulus: The Mean, Minimum, Maximum, and Standard Deviation of elastic moduli of the concrete in kips per square inch and the Number of Tests performed. The elastic moduli can be obtained either through compression testing of cylindrical samples collected and tested during construction, or through relationships published by the ACI and others relating elastic modulus to compressive strength. In the event that only one test result is available, enter it as the "mean value". The standard deviation should be left blank unless at least four test results are available. See Appendix B for standard deviation equation. The ACI formula in general use (ACI 318-83, Section 8.5) is:

$$E_c = 57,000 \, (f_c)^{1/2} \tag{7.7}$$

where:

E_c = Modulus of Elasticity, psi

f_c = 28-Day Compressive Strength, psi

Space is also provided to record the Method for Determination of Elastic Modulus, the test method used for measuring the elastic modulus of the mix; whether the test was conducted upon a sample of the concrete prepared during construction, by some other test procedures, or calculated using the equation above.

RECYCLED PORTLAND CEMENT CONCRETE, JOINT DATA (SHEET 44)

1. Layer Number: The recycled portland cement concrete layer for which a description is being provided (from Sheet 2).

2. and 3. Average Contraction Joint Spacing: The average spacing in feet (to the nearest tenth of a foot) between consecutive contraction joints (length of the concrete slab) of the pavement under survey. A space is provided to write in a description of any Random Joint Spacing.

4. Built-in Expansion Joint Spacing: The average spacing in feet between consecutive expansion joints of the pavement under survey. If there are no expansion joints in the original construction, enter "N".

5. Skewness of Joints: The average deviation of the contraction joint across the slab from a right angle with the edge measured in feet per lane. If not skewed, enter "N".

6. Transverse Contraction Joint Load Transfer System: The mechanism by which a portion of the moving load is transferred across the transverse contraction joint to the adjacent slab. A space is provided to write in a description of another load transfer system if different from those for which codes are provided. Where dowels or other mechanical load transfer devices are not provided at joints, enter "N" in the spaces for describing these devices.

7. Round Dowel Diameter: The outer diameter of the round dowel bars used as the load transfer device across a contraction joint of the pavement under survey. This number is entered to the nearest one-tenth of an inch.

8. Dowel or Mechanical Load Transfer Device Spacing: The average center-to-center distance in inches between mechanical load transfer devices (round or I-beam dowels, star lugs, etc.) across the contraction joint of the PCC layer being described.

9. Average Intermediate Sawed Joint Spacing: The average distance between joints that have been sawed at intervals between contraction joints (called "warping joints" by some agencies). If no intermediate sawed joints have been provided, enter "N".

10. and 11. Dimensions for I-Beams or Keyways: The Height and Width of I-beams or keyways (if used) to the nearest hundredth of an inch.

12. Distance of Nearest Dowel (or Mechanical Load Transfer Device) From Outside Lane-Shoulder Edge: The distance from the outside lane-shoulder edge to the center of the nearest dowel or mechanical load transfer device, measured to the nearest tenth of an inch.

13. Dowel Length: The length in inches of the round or I-beam dowel bars across contraction joints in the PCC layer being described.

14. Dowel Coating: The material covering the dowel bar surfaces when installed in the concrete slab. A space is provided to write in a description if some dowel coating was used other than those for which codes are provided.

15. Method Used to Install Mechanical Load Transfer Devices: Whether the devices were installed by placing them on baskets, installed mechanically, or by other means. Space is provided for describing some method of installing dowels if the method used differs from those for which codes are provided.

RECYCLED PORTLAND CEMENT CONCRETE, JOINT DATA (CONTINUED) (SHEET 45)

1. Layer Number: The recycled portland cement concrete layer for which a description is being provided (from Sheet 2).

2. Method Used to Form Transverse Joints: Whether the contraction joints were constructed by sawing the hardened slab at the proper time, or by placing an insert in the slab surface while the concrete is plastic, or by any other construction method used to form the joint. Space is provided for describing another method if none of those for which codes were provided was used.

3. Type of Longitudinal Joint: How the longitudinal joint between the lanes was formed. Space is provided for describing another way of forming the joints if none of those for which codes are provided was used.

4. Type of Shoulder-Traffic Lane Joint: How the joint between the concrete shoulder and the traffic lane was formed. "Tied concrete curb" indicates that a curb was provided in lieu of a shoulder. Space is provided for describing another way of forming the joints if none of those for which codes are provided was used.

5. Transverse Joint Sealant Type: Type of joint sealant used in the transverse joints. Space is provided for describing another type of sealant if none of those for which codes were provided was used.

6. Transverse Joint Sealant Reservoir Width: The as-constructed width of the transverse joint sealant reservoir to the nearest hundredth of an inch.

7. Transverse Joint Sealant Reservoir Depth: The as-constructed depth of the transverse joint sealant reservoir to the nearest hundredth of an inch.

8. Longitudinal Joint Sealant Reservoir Width: The width of the as-built longitudinal joint sealant reservoir to the nearest hundredth of an inch. If butt or keyed joints were used without a sealant reservoir, enter "0.00."

9. Longitudinal Joint Sealant Reservoir Depth: The depth of the as-built longitudinal joint sealant reservoir to the nearest hundredth of an inch. If butt or keyed joints were used without a sealant reservoir, enter "0.00."

10. Joint Sealant Backer Material Type: A code to indicate the type of blocking material used (placed prior to the joint sealant). Codes are provided on the data sheet.

11. Joint Sealant Backer Dimension: If the joint sealant backer material type is a road or rope, enter the diameter, in inches to the nearest tenth of

an inch. If the joint sealant backer material type is tape, enter the width, in inches to the nearest hundredth of an inch.

12. Between Lane Tie Bar Diameter: The diameter of the tie bars used across longitudinal joints between lanes entered to the nearest one hundredth of an inch.

13. Between Lane Tie Bar Length: The length in inches of the tie bars used across the longitudinal joint between the lanes.

14. Between Lane Tie Bar Spacing: The center-to-center spacing between consecutive tie bars across the longitudinal joint between the lanes to the nearest tenth of an inch.

15. and 16. Shoulder-Traffic Lane Joint Sealant Reservoir: The Width and Depth of the as-built joint sealant reservoir between the shoulder and traffic lane. If butt or keyed joints were used without a sealant reservoir, enter "0.00" in both of the spaces provided.

17., 18., and 19. Shoulder-Traffic Lane Joint Tie Bars: The outer Diameter of the tie bars across the joint between the shoulder and the traffic lane to the nearest one hundredth of an inch, the Length of the tie bars to the nearest inch, and the center-to-center distance (Spacing) in inches between consecutive tie bars across the concrete shoulder-traffic lane joint. If no concrete shoulder exists, enter "N" for these data entry spaces.

RECYCLED PORTLAND CEMENT CONCRETE, REINFORCING STEEL DATA (SHEET 46)

1. Layer Number: The recycled portland cement concrete layer for which a description is being provided (from Sheet 2).

2. Type of Reinforcing: The type of reinforcing used in the PCC layer being described. A space is provided for entering a written description of a reinforcing type other than deformed bars or welded wire fabric.

3. Transverse Bar Diameter: The diameter of the transverse bars or wire to the nearest one hundredth of an inch.

4. Transverse Bar Spacing: The mean center-to-center spacing between transverse bars or wires to the nearest tenth of an inch.

5. Longitudinal Bar Diameter: The diameter of the longitudinal bars or wire to the nearest hundredth of an inch.

6. Design Percentage of Longitudinal Steel: The percentage of reinforcing steel of the PCC cross-section required in the design to the nearest hundredth of one percent.

7. Depth to Reinforcement From Slab Surface: The depth (to the nearest tenth of an inch) of the concrete cover over the reinforcing steel.

8. Longitudinal Bar Spacing: The center-to-center spacing between longitudinal bars or wires to the nearest tenth of an inch.

9. Yield Strength of Reinforcing Steel: The yield strength of the reinforcing steel in the bars to the nearest tenth of a kip per square inch. If tests were not conducted for the steel used, enter the minimum yield strength allowed for the grade of steel used.

10. Method Used to Place Reinforcement: The method used to install reinforcing steel bars or wire fabric during pavement construction. These methods include presetting the reinforcement on chairs, placing it mechanically by means of special equipment used for that purpose, or by placing them between layers of concrete. A space is also provided to describe another method of placement if a code was not provided for the method used.

11. Lap Length of Longitudinal Steel Splices: The length to the nearest inch of the longitudinal reinforcing steel overlap at a CRCP construction joint. If the rigid pavement is not CRCP, enter "N".

RECYCLED PORTLAND CEMENT CONCRETE, MIXTURE DATA (SHEET 47)

1. Layer Number: The recycled portland cement concrete layer for which a description is being provided (from Sheet 2).

2. to 5. Mix Design: The oven dry weights in pounds of Coarse Aggregate, Fine Aggregate, Cement, and weight of Water provided by the mix design for a cubic yard of concrete.

6. Type Cement Used: Type of cement used in the concrete. The cement type codes appear in Table A.11 in Appendix A.

7. Alkali Content of Cement: The alkali content of the cement to the nearest tenth of one percent.

8., 9., and 10. Entrained Air Content: The Mean, Minimum, and Maximum values of entrained air (percent of mixture volume) as measured (by Test Methods AASHTO T121, AASHTO T152, AASHTO T196, ASTM C138, ASTM C173, or ASTM C231) during construction to the nearest tenth of one percent.

11., 12., and 13. PCC Admixtures: The types and amounts (in percent by weight of cement to the nearest thousandth) of admixtures used in the concrete. The codes for concrete admixtures appear in Table A.12 in Appendix A, and space has been provided for identifying an admixture type for which a code was not provided.

14. to 18. Slump: The Mean of the slump measurements made, the Minimum and Maximum values, the Standard Deviation from the mean to the nearest tenth of an inch and the Number of Tests from which the values are obtained. The slump test is described in AASHTO T119 or ASTM C143. The maximum and minimum values and standard deviation of slump should be left blank if only one test result is available. The equation for standard deviation is given in Appendix B.

RECYCLED PORTLAND CEMENT CONCRETE, NEW AGGREGATE DATA (SHEET 48)

1. Layer Number: The recycled portland cement concrete layer for which a description is being provided (from Sheet 2).

2., 3., and 4. Composition of Coarse Aggregate: The types and percentages by weight of up to three separate materials in the coarse aggregate (that portion of an aggregate retained on the No. 4 sieve) used in the concrete mix. Space is provided for description of another type if none of the types for which codes are provided were used. Where only one type of material was used, enter its type code and 100 in the top set of data spaces, enter "N."

5. Geologic Classification of Coarse Aggregate: The geologic classification of the natural stone used as coarse aggregate in the concrete. These codes appear in Table A.9 and provide identification as to which of the three major classes of rock the coarse aggregate belongs to and the type of rock within those classes. If a "blend" was used, enter the code for the geologic classification for the material representing the majority of the coarse aggregate. If a "crushed slag", "manufactured lightweight", or "recycled concrete" was used, enter "N."

6., 7., and 8. Composition of Fine Aggregate: The types and percentages by weight of materials in the fine aggregate (passing the No. 4 (4.75 mm) sieve and retained on the No. 200 (75 micron) sieve). Space is provided for identifying another type if none of those for which codes are provided was used. Where only one type of material was used, enter its type code and 100 in the top set of data spaces, leaving the others blank.

9. Insoluble Residue: The percentage of insoluble residue (noncarbonate material) as determined using ASTM D3042.

10. and 11. Gradation of New Aggregates: The percent passing various standard sieve sizes to the nearest one percent for the new coarse and new fine aggregates. It is not expected that values will be available for all sieve sizes shown; the objective is to provide sufficient sieve sizes to accommodate testing and specification practice for most agencies.

12. and 13. Bulk Specific Gravities of New Aggregates: The mean bulk specific gravities (to the nearest thousandth) for coarse aggregate and fine aggregate. The bulk specific gravities for the aggregate fractions are measured using these laboratory procedures: a) Coarse Aggregate - AASHTO T85 or ASTM C127, and b) Fine Aggregate - AASHTO T84 or ASTM C128.

RECYCLED PORTLAND CEMENT CONCRETE, NEW AGGREGATE DATA (CONTINUED) AND COMBINED AGGREGATE DATA (SHEET 49)

1. Layer Number: The recycled portland cement concrete layer for which a description is being provided (from Sheet 2).

2. to 5. Durability of New Aggregates: The type of durability tests used and the results in tenths recorded in units specified for the test. Three of these sets are for coarse and one for the combination of coarse and fine aggregates. The durability test type codes and the units for reporting appear in Table A.13.

6. Amount of New Coarse Aggregate Added: The percent of new coarse aggregate added to the recycled concrete mixture (by weight of the combined coarse aggregate).

7. Amount of New Fine Aggregate Added: The percent of new fine aggregate added to the recycled concrete mixture (by weight of the combined fine aggregate).

8. and 9. Gradation of Combined Aggregates: The percent passing various standard sieve sizes to the nearest one percent for the combined coarse and combined fine aggregates. It is not expected that values will be available for all sieve sizes shown; the objective is to provide sufficient sieve sizes to accommodate testing and specification practice for most agencies.

10. and 11. Bulk Specific Gravities of Combined Aggregates: The bulk specific gravities (to the nearest thousandth) for coarse aggregate and fine aggregate. The bulk specific gravities for the aggregate fractions are measured using these laboratory procedures: a) Coarse Aggregate - AASHTO T85 or ASTM C127, and b) Fine Aggregate - AASHTO T84 or ASTM C128.

12. to 15. Durability of Combined Aggregates: The type of durability tests used and the results in tenths recorded in units specified for the test. Three of these sets are for coarse and one for the combination of coarse and fine aggregates. The durability test type codes and the units for reporting appear in Table A.13.

RECYCLED PORTLAND CEMENT CONCRETE, CONSTRUCTION DATA (SHEET 50)

1. Layer Number: The recycled portland cement concrete layer for which a description is being provided (from Sheet 2).

2. Equipment Used to Break Up PCC Pavement: A code to indicate the equipment used to break up the PCC pavement for recycling. Codes are provided on the data sheet.

3. Average Size of PCC Pieces After Breaking: The approximate Width and Length of the individual pieces of PCC after breaking. This may be arrived at by measuring typical pieces and use of judgement to select approximate averages.

4. How Were Concrete Pieces and Reinforcing Steel (if present) Separated Initially On Site?: Code to indicate the procedure used to separate the pieces of PCC, and reinforcing steel (if present) after breaking. The codes appear on the data sheet, along with space to describe a procedure used other than those listed.

RECYCLED PORTLAND CEMENT CONCRETE, CONSTRUCTION DATA (CONTINUED) (SHEET 51)

1. Layer Number: The recycled portland cement concrete layer for which a description is being provided (from Sheet 2).

2. Type of Paver Used: Record whether a slip-form or side-form paver was used to place the concrete. The codes appear on the data sheet. Enter "N" if a paver was not used (i.e., roller compacted concrete).

3. Air Temperature During Placement: The Mean air temperature at the time the overlay concrete was placed (in °F) and the range of air temperatures (Minimum and Maximum) occurring during placement.

4. Curing Period Before Opening to Any Traffic: The number of days the concrete was allowed to cure before opening the pavement to traffic (including construction traffic).

5. Time Before Sawing Joints: The number of hours between the time the concrete was placed and the joints were sawed.

6. Method Used to Cure Concrete: The method used to cure the concrete pavement. Space is provided for identifying another curing method if none of those with codes was used.

7. Method Used to Texture Concrete: How the concrete surface was textured. Space is provided for identifying another texturing method if none of those with codes was used.

RECYCLED PORTLAND CEMENT CONCRETE, STRENGTH DATA (SHEET 52)

This data sheet is used to provide strength data on cylinders or beams molded from plastic concrete during construction.

1. Layer Number: The recycled portland cement concrete layer for which a description is being provided (from Sheet 2).

2. to 8. Flexural Strength: The Type of Test (third-point or center-point loading), the Age of the sample at testing, the Number of Tests performed, and the Mean, Minimum, Maximum, and Standard Deviation of flexural strength tests, in psi. Testing for SHRP LTPP test sections which are to be built after 1988 should be done using third-point loading (AASHTO T97 or ASTM C78). The standard deviation of the flexural strength is to be calculated as shown in Appendix B.

9. to 14. Compressive Strength: The Age of sample at testing, the Number of Tests performed, and the Mean, Minimum, Maximum, and Standard Deviation of compressive strength in psi, measured according to AASHTO T22 or ASTM C39. See Appendix B for standard deviation equation.

15. to 20. Splitting Tensile Strength: The Age of the sample at testing, the Number of Tests, and the Mean, Minimum, Maximum, and Standard Deviation of splitting tensile strength in psi, measured according to AASHTO T198 or ASTM C496. See Appendix B for standard deviation equation.

21. to 26. Elastic Modulus: The Minimum, Maximum, Mean, and Standard Deviation of elastic moduli of the concrete in kips per square inch and the Number of Tests performed. The elastic moduli can be obtained either through compression testing of cylindrical samples collected and tested during construction, or through relationships published by the ACI and others relating elastic modulus to compressive strength. In the event that only one test result is available, enter it as the "mean value". The standard deviation should be left blank unless at least four test results are available. See Appendix B for standard deviation equation. The ACI formula in general use (ACI 318-83, Section 8.5) is as shown in Equation 7.8. Space is also provided to indicate the Method for Determination of Elastic Modulus, the test method used for measuring the elastic modulus of the mix; whether the test was conducted upon a sample of the

concrete prepared during construction, by some other test procedures, or calculated using Equation 7.7.

PRESSURE RELIEF JOINTS IN PCC PAVEMENTS (SHEET 53)

1. Layer Number: The portland cement concrete layer in which pressure relief joints are being installed (from Sheet 2).

2. Reason for Pressure Relief Joint Installation: A code to record the primary reason for the pressure relief joint installation. Codes are provided on the data sheet.

3. Average Pressure Relief Joint Interval: The average spacing between consecutive pressure relief joints to the nearest one-tenth of a foot.

4. Average Distance Between Pressure Relief Joint and Nearest Working Joint: The average spacing between pressure relief joints installed and the nearest adjacent existing pavement joints, to the nearest one-tenth of a foot.

5. Relief Joint Initial Dimensions: The average Depth and Width of the pressure relief joints at the time of installation, to the nearest one-hundredth of an inch .

6. Method of Cutting and Removal of Concrete: A code to record the procedure used to install the pressure relief joints. Codes are provided on the data sheet, along with space for describing installation methods other than those listed.

7. Is Original Aggregate Expansive in Concrete?: A code to record if the original aggregate in the concrete is expansive or not. Codes are provided on the data sheet.

PRESSURE RELIEF JOINTS IN PCC PAVEMENTS (CONTINUED) (SHEET 54)

1. Layer Number: The portland cement concrete layer in which pressure relief joints are being installed (from Sheet 2).

2., 3., and 4. Type of Pressure Relief Joint Sealant: A code to record the type of material used to seal the newly constructed pressure relief joints. Codes are provided on the data sheet. Space is also provided to include information regarding the manufacturer and product name.

5., 6., and 7. Type of Pressure Relief Joint Filler: A code to identify the type of material used to fill the newly constructed pressure relief joint. Codes are provided on the data sheet. Space is also provided to include information regarding the manufacturer and product name.

SUBSEALING PCC PAVEMENT (SHEET 55)

1. Layer Number of PCC Pavement: The portland cement concrete layer under which subsealing is being performed (from Sheet 2).

2. Type of Mixture Used in Subsealing: A code to identify the type of material used to subseal the project. Codes are provided on the data sheet.

3., 4., and 5. Asphalt Cement Data: Spaces are provided to record grade, penetration at 77°F, and ring and ball softening point for asphalt cement used for subsealing.

6. to 10. Mix Design of Portland Cement Grout: Spaces are provided to record mix design information for a portland cement grout used to subseal the pavement. This includes type of cement, the ratio of cement to sand by weight, the water/cement ratio by weight, additive type (enter "N" if none is used), and amount of additive in percent by weight of cement.

11. Fluidity of Portland Cement Grout: The fluidity of the grout, to the nearest 0.2 seconds, as measured by Test Method ASTM C939-81.

12. Cube Compressive Strength of Portland Cement Grout: The compressive strength measured by Test Methods AASHTO T106 or ASTM C109 in psi.

13. Curing Period for Portland Cement Grout: Number of days the grout cube was cured before compressive strength testing by Test Methods AASHTO T106 or ASTM C109.

14. Determination of Area to be Undersealed: A code to record the means for determining the required areal extent of the subsealing efforts. Codes are provided on the data sheet.

SUBSEALING PCC PAVEMENT (CONTINUED) (SHEET 56)

This data sheet is for continuation of the data on Sheet 54.

1. Layer Number of PCC Pavement: The portland cement concrete layer under which subsealing is being performed (from Sheet 2).

2. Depth of Subsealing Hole from Top of Slab: The thickness of the slab at the subsealing hole to the nearest one-hundredth of an inch.

3. Maximum Allowable Pumping Pressure: The maximum pumping pressure allowable during subsealing to the nearest pound per square inch.

4. Maximum Surge Pressure: The maximum surge pressure allowed to initiate subsealing to the nearest pound per square inch.

5. Slabs in Test Section: For jointed concrete pavements record the number of slabs in the test section (to the nearest whole number) and the number of slabs subsealed. For SHRP LTPP, the numbers are to represent only the outside lane.

6. Average Number of Holes per Slab Subsealed: The average number of holes per slab in the jointed concrete test sections that were subsealed. For SHRP LTPP, the numbers are to represent only the outside lane.

7. Typical Number of Subsealing Holes Near Joint or Crack: The average number of subsealing holes per slab within two feet of a joint or crack (for jointed concrete only; enter "N" for continuously reinforced concrete).

8. Average Number of Holes per Lineal Foot of Pavement: For continuously reinforced concrete pavement record the average number of holes per lineal foot of pavement to the nearest hundredth. If the pavement surface is not continuously reinforced concrete pavement, enter "N". For SHRP LTPP, the numbers are to represent only the outside lane.

9. Average Volume of Material Pumped per Hole: The average volume per hole of material pumped to the nearest tenth of a cubic foot.

10. Monitoring of Lift: Code to identify the method used for monitoring the subsealing work and amount of lift. Codes are provided on the data sheet along with space for describing a method other than those listed.

11. Typical Time Between Subsealing and Reopening to Traffic: The approximate time in hours between the time of subsealing and allowing traffic over the project.

12. Were Deflection Measurements Taken Before and After Subsealing?: A code to identify whether or not deflection measurements were taken before subsealing. Codes are provided on the data sheet.

13. Time of Day that Deflection Measurements were Conducted: Provide the hour of the day at which the deflection measurements started and ended, for measurements before and after subsealing, in military time (i.e., 1:00 p.m. is 1300 hours). If measurements were taken for more than one day, enter earliest starting time and latest ending time.

SUBDRAINAGE RETROFIT DATA (SHEET 57)

This data sheet is for describing a subdrainage system installed in an existing pavement. If both longitudinal and transverse subdrains are installed, this data sheet should be completed twice (once for data pertaining only to the longitudinal subdrains and once for data pertaining only to the transverse subdrains).

1. Type of Subdrains: A code to identify whether the subdrains are transverse or longitudinal with respect to the pavement centerline. Codes are provided on the data sheet.

2. Extent of Subdrains: A code to indicate whether the drains are evenly spaced, or localized. Codes are provided on the data sheet.

3. Type of Drainage Pipe: A code to record the type of pipe used as subdrains. Codes are provided on the data sheet, along with space for entering a type other than those listed. Where the drainage system does not employ pipes, enter "N".

4. Diameter of Pipe: The diameter or width of the subdrain pipe to the nearest one-tenth of an inch. Where the drainage system does not employ pipes, enter "N".

5. Depth of Pipe Below Top of Pavement Surface: The average depth from the top of the pavement surface to the top of the subdrain pipe, to the nearest tenth of an inch. Where the drainage system does not employ pipes, enter "N".

6. Horizontal Placement of Pipe From Outer Edge of Pavement: The approximate horizontal distance between the edge of the full depth pavement surface and the centerline of the subdrain pipe, to the nearest tenth of an inch. Where the drainage system does not employ pipes, enter "N".

7. Type of Primary Filter Used: A code to identify the type of primary filter material used to prevent clogging of the drain.

8. Maximum Particle Size of Primary Filter Material: Where the primary filter material is granular in composition, the maximum aggregate dimension allowed, to the nearest tenth of an inch.

9. Gradation of the Primary Filter Material: Where the primary filter material is granular in composition, the gradation of the filter material should be recorded in terms of percent by weight passing each of four standard sieve sizes listed.

10. Permeability of Primary Filter Material: The average permeability of the primary filter material to the nearest one-hundredth of a foot per day.

11. Type and Location of Secondary Filter Material: A code to record the use of a secondary filter material, if applicable. Codes are provided on the data sheet.

12. Average Outlet Interval: The approximate average distance in feet between adjacent subdrainage outlets.

13. Primary Purpose of Subdrainage Installation: A code to identify the primary reason for which subdrains were installed. Codes are provided on the data sheet.

LOAD TRANSFER RESTORATION DATA (SHEET 58)

This data sheet is for describing work to restore load transfer across joints in an existing jointed concrete pavement.

1. Layer Number: The portland cement concrete layer in which load transfer was restored (from Sheet 2).

2. Type of Load Transfer Restoration: A code to identify the means used to restore load transfer across an affected joint. Codes are provided on the data sheet.

3. Frequency of Installation: A code to identify, on average, how many of the joints or cracks had restoration of load transfer. Codes are provided on the data sheet.

4. Number of Devices Per Joint: The number of load restoration devices installed per joint.

5. Location of Dowels or Shear Devices: The average distances (to the nearest inch) from the outer lane edge to the center of the load transfer device, for up to twelve devices.

6. Diameter of Retrofit Dowel Bars: The average dowel bar diameter to the nearest hundredth of an inch, where dowel bars are installed. If dowel bars are not used, enter "N".

7. Length of Retrofit Dowel Bars: The average length of the retrofit dowel bars, to the nearest tenth of an inch. If dowel bars are not used, enter "N".

LOAD TRANSFER RESTORATION DATA (CONTINUED) (SHEET 59)

1. Layer Number: The portland cement concrete layer in which load transfer was restored (from Sheet 2).

2. Material Used to Backfill Slot/Core Hole: A code used to record the type of material used to backfill around the load transfer restoration device. Codes are provided on the data sheet.

3. Bonding Agent Used Between Existing PCC and Backfill Material: A code to identify the material used to bond the backfill material to the existing PCC pavement. Codes are provided on the data sheet.

4. Load Transfer Efficiency Before and After Restoration: The load transfer efficiencies are recorded for each of the first three load transfer devices from the edge of the slab (number 1 is the one nearest the edge, etc.) for up to 4 joints including: (1) the point distances from the beginning of the test section to the location of the joint tested, and (2) the load transfer efficiencies in percent before and after restoration. Entries for point distance will be the same for each of the three separate tests on specific load transfer devices at a particular joint. For SHRP LTPP, tests are to be conducted before and after restoration on the same joints.

There is no established ASTM or AASHTO procedure for measuring load transfer efficiency for retrofit dowels or shear devices, but the following procedure utilizing a falling weight deflectometer (FWD) may be expected to provide the data desired:

Step 1. The FWD load plate is positioned as shown in Figure 7.1(a) for retrofit dowel bars, or as shown in Figure 7.1(b) for retrofit shear devices. Figure 7.1

Step 2. A load of approximately 9,000 lbf (plus or minus 500 lbf) is applied and the deflections at Sensors 1 and 2 (see Figure 7.1) are recorded.

Step. 3. The FWD is moved to the center of the slab (or a position near the center where there is no crack) and the same approximate load applied and measurements made.

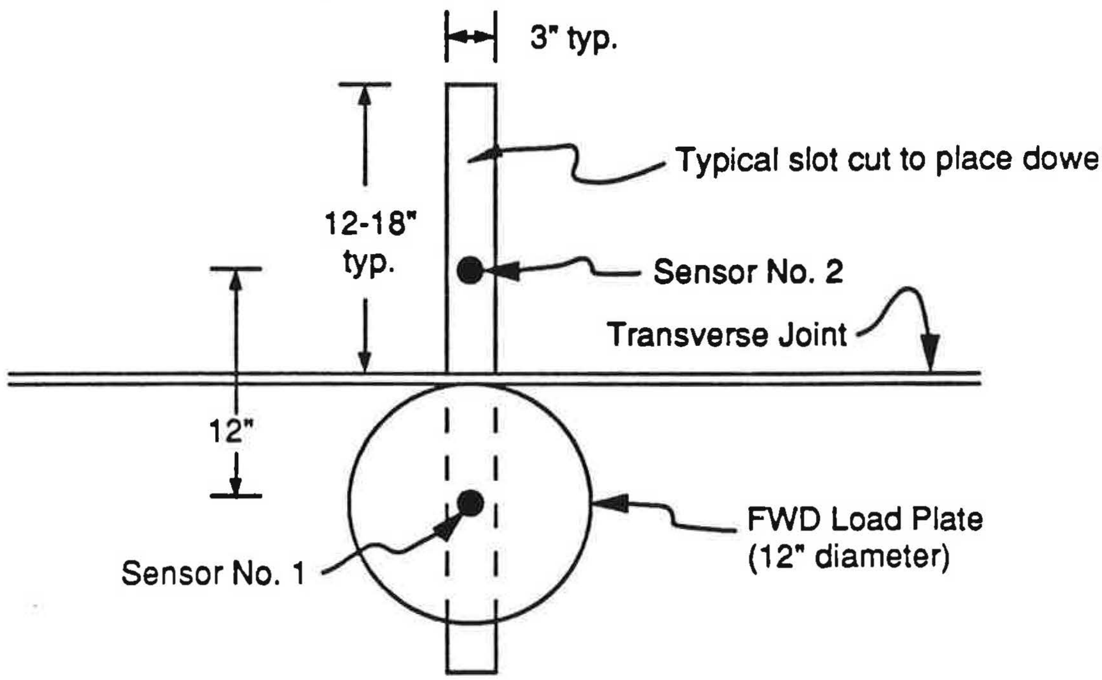


Figure 7.1(a). Retrofit Dowel Bar

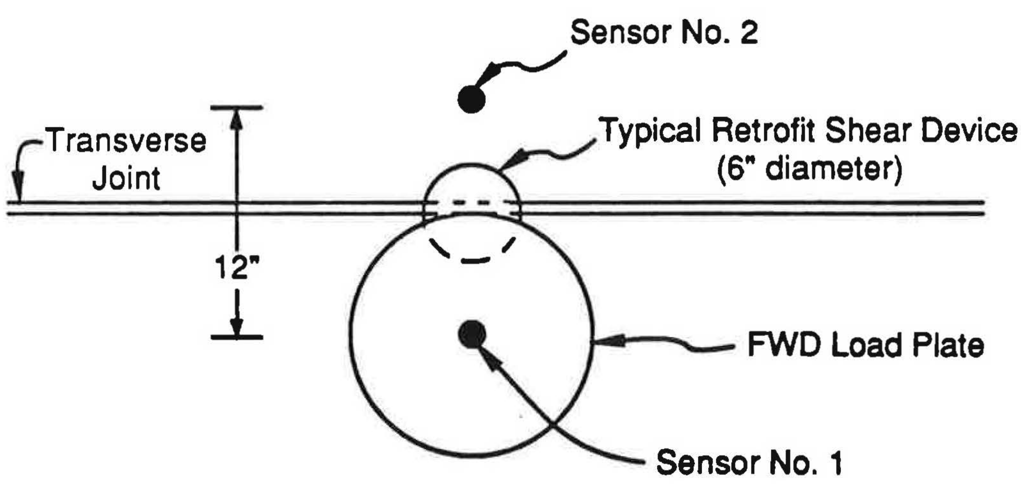


Figure 7.1(b). Retrofit Shear Device

Figure 7.1. Measurement of load transfer efficiency for retrofit devices.

Step 4. The Load Transfer Efficiency (LTE) is calculated as follows:

$$LTE = \frac{d_{j2} \times 100}{d_{j1}} \times \frac{d_{c1}}{d_{c2}} \qquad (7.8)$$

d_{j1}, d_{j2} = Measured deflections at Sensors 1 and 2, respectively, near the joint

d_{c1}, d_{c2} = Measured deflections of Sensors 1 and 2, respectively, near the center of the slab

(Note: The purpose for including the center of slab deflections is to adjust the measurements at the joint for natural slab bending. This is believed to provide a more realistic value for load transfer efficiency.)

The FWD measurements are not to be obtained when the temperature is greater than 80°F as the joints and cracks are likely to be closed tightly and high load transfer will typically be measured.

Load transfer measurements have also been made by removing sensors from the "sensor bar" and setting them right next to the joint on either side. While this is theoretically more accurate, it is not practical, and the ratio from six inches on either side has been found to closely approximate that from sensors adjacent to the joint.

It is preferable to make FWD measurements within six months after load transfer restoration is completed.

5. Date of Load Transfer Efficiency Tests: Provide day, month, and year (last two digits) when tests were conducted, before and after the load restoration.

CRACK AND SEAT PORTLAND CEMENT CONCRETE PAVEMENT (SHEET 60)

1. Layer Number: The portland cement concrete layer for which crack and seat data are being provided (from Sheet 2).

2. Average PCC Breakage Size: The estimated average length and width of the broken PCC pieces to the nearest inch.

3. Pavement Breaker Passes/Lane: The number of pavement breaker passes per lane.

4. Pavement Breaker Type: A code to identify the type of pavement breaker used on this particular project. Codes are provided on the data sheet.

5. Proof Roller Type: The type of the proof roller used after breaking the pavement.

6. Proof Roller Weight: The weight of the proof roller (to the nearest ton) used after breaking the pavement.

7. Broken Pavement Exposure to Traffic: The approximate length of time for which the pavement was exposed to traffic after cracking, in days.

8. Deflection Measurements Taken: Codes to record if and when deflection measurements were taken at various times during performance of the work. Codes are provided on the data sheet.

9. Deflection Measurement Device Used: A code to identify the type of deflection device used to measure deflections. Codes are provided on the data sheet.

10. Magnitude of Load Used for Deflection Test: The magnitude of the load produced by the deflection testing device in pounds.

11. Loading Frequency: The frequency that the load is applied in hertz (for cyclic loading devices only). These spaces will not apply for SHRP LTPP as falling weight deflectometers are to be used.

12. Broken Pavement Surface Preparation: Codes to identify the means of surface preparation used prior to surface overlay or other treatment. Codes are provided on the data sheet.

RESTORATION OF AC SHOULDERS (SHEET 61)

This data sheet is for describing work to restore existing shoulders. All data items pertain to the characteristics of the restored AC shoulder.

1. Shoulder Restored: A code to indicate whether the outside, inside, or both shoulders were restored. Codes are provided on the data sheet. Note that Data Items 2. to 7. pertain to restored inside and/or outside shoulders. Data Items 8. to 14. pertain to restored outside shoulders only.

2. Surface Type: The type of restored shoulder surface (See Table A.5, Appendix A for codes).

3. Total Width: The total (paved and unpaved) width of the restored shoulder to the nearest whole number of feet.

4. Paved Width: The total paved width of the restored shoulder to the nearest whole number of feet.

5. Shoulder Base Type: The type of base material used in the restored shoulder (See Table A.6, Appendix A for codes).

6. Surface Thickness: The average thickness of the restored shoulder surface at the outside lane-shoulder edge to the nearest tenth of an inch.

7. Base Thickness: The average thickness of the restored shoulder base at the outside lane-shoulder edge to the nearest tenth of an inch.

8. Type of Shoulder Restoration: A code to identify the procedure used to restore the shoulder. Codes are provided on the data sheet.

9. Type of AC Materials: The type of asphalt concrete materials used in the shoulder restoration. Codes are provided on the data sheet.

10. Thickness of AC Material Removed by Cold Milling: If cold milling was used, the thickness of the AC removal, to the nearest tenth of an inch.

11. AC Overlay Thickness: If an AC overlay was placed on the shoulder, the thickness of the overlay to the nearest tenth of an inch.

12. Lane/Shoulder Joint Sealant: The method used to seal the joint separating the shoulder and traffic lane. Codes are provided on the data sheet.

13. Lane/Shoulder Joint Sealant Reservoir: The average Width and Depth of the as-built joint sealant reservoir between the restored shoulder and traffic lane. If butt or keyed joints were used without a sealant reservoir, enter "0.0" in both of the spaces provided.

14. Type of Joint Sealant: A code to indicate whether the sealant was poured (molded in place) or preformed (compression-type). Codes are provided on the data sheet.

RESTORATION OF PCC SHOULDERS (SHEET 62)

This data sheet is for describing work to restore existing shoulders. All data items pertain to the characteristics of the restored PCC shoulder.

1. Shoulder Restored: A code to indicate whether the outside, inside, or both shoulders were restored. Codes are provided on the data sheet. Note that Data Items 2. to 7. pertain to restored inside and/or outside shoulders. The remaining data items pertain to restored outside shoulders only.

2. Surface Type: The type of restored shoulder surface (See Table A.5, Appendix A for codes).

3. Total Width: The total (paved and unpaved) width of the restored shoulder to the nearest whole number of feet.

4. Paved Width: The total paved width of the restored shoulder to the nearest whole number of feet.

5. Shoulder Base Type: The type of base material used in the restored shoulder (See Table A.6, Appendix A for codes).

6. Surface Thickness: The average thickness of the restored shoulder surface at the outside lane-shoulder edge to the nearest tenth of an inch.

7. Base Thickness: The average thickness of the restored shoulder base at the outside lane-shoulder edge to the nearest tenth of an inch.

8. Type of Shoulder System: A code to indicate whether the restored shoulder is jointed plain concrete pavement (JPCP), jointed reinforced concrete pavement (JRCP), or continuously reinforced concrete pavement (CRCP). Note that Data Items 9., 10., and 11. pertain only to JPCP and JRCP shoulders.

9. Average Joint Spacing: Average joint spacing for JPCP or JRCP shoulders to the nearest whole foot.

10. Skewness of Joints: The average deviation of the contraction joint across the restored shoulder from a right angle with the edge. This is measured in feet to the nearest tenth. If joints are not skewed, enter "N".

11. Joints Match Pavement Joints?: Codes to indicate whether the joints in the restored shoulder were constructed to match the joints in the adjacent pavement slab.

12. Type of Lane/Shoulder Joint: A code to identify the type of lane/shoulder joint present. Codes are provided on the data sheet.

13. to 16. Lane/Shoulder Joint Tie System: Specify the Type of system employed utilizing the codes provided on the data sheet, the outer Bar Diameter of the tie bars across the joint between the shoulder and the traffic lane to the nearest hundredth of an inch, the mean Bar Length of the tie bars to the nearest inch, and the average center-to-center distance (Bar Spacing) in inches between consecutive tie bars across the concrete shoulder-traffic lane joint.

RESTORATION OF PCC SHOULDERS (CONTINUED) (SHEET 63)

1. Lane/Shoulder Joint Sealant: The method used to seal the joint separating the shoulder and traffic lane. Codes are provided on the data sheet.

2. Lane/Shoulder Joint Sealant Reservoir: The average Width and Depth of the as-built joint sealant reservoir between the restored shoulder and traffic lane. If butt or keyed joints were used without a sealant reservoir, enter "0.0" in both of the spaces provided.

3. Type of Joint Sealant: A code to indicate whether the sealant was poured (molded in place) or preformed (compression-type). Codes are provided on the data sheet.

4. Joint Sealant Backer Material Type: A code to indicate the type of blocking material used (placed prior to the joint sealant). Codes are provided on the data sheet.

5. Joint Sealant Backer Dimension: If the joint sealant backer material type is a rod or rope, enter the diameter, in inches to the nearest tenth of an inch. if the joint sealant backer material type is tape, enter the width, in inches to the nearest tenth of an inch.

MILLING AND GRINDING DATA FOR PAVEMENT SURFACES (SHEET 64)

This data sheet is to be completed when milling or grinding is performed prior to rehabilitation work (e.g. overlay placement). If rehabilitation work is not planned after milling or grinding, refer to Chapter 6 (Maintenance Data Collection) for the appropriate data sheet.

1. Layer Number(s): The pavement layer that is to be ground or milled (from Sheet 2). Space has been provided for an additional layer number if more than just the surface layer was milled or ground. If more than two layers are affected, identify the top layer (surface) and the last (deepest) layer.

2. Method Used: A code to indicate whether milling, grinding, or another method was used. Codes appear on the data sheet.

3. Extent of Existing Surface Preparation: A code to indicate what portion of the test section was ground or milled. Codes appear on the data sheet.

4. Average Depth of Cut: The average depth of cut in the surface to the nearest one-tenth of an inch.

REHABILITATION

DATA SHEETS

* Indicates high priority rehabilitation data items.

***STATE ASSIGNED ID** [_ _ _ _]

SHEET 1

REHABILITATION DATA

LTPP PROGRAM

***STATE CODE** [_ _]

***SHRP SECTION ID** [_ _ _ _]

IMPROVEMENT LISTING

* 1. DATE COMPLETED (MO/DAY/YR)	* 2. WORK[1] TYPE CODE (TABLE A.17)	* 3. WORK QUANTITY (UNITS FROM (TABLE A.17)	4. THICKNESS (INCHES)	5. COST[2] (THOUSANDS OF DOLLARS PER LANE-MILE)
[_ _/_ _/_ _]	[_ _]	[_ _ _ _ _ _.]	_ _._	_ _ _.
[_ _/_ _/_ _]	[_ _]	[_ _ _ _ _ _.]	_ _._	_ _ _.
[_ _/_ _/_ _]	[_ _]	[_ _ _ _ _ _.]	_ _._	_ _ _.
[_ _/_ _/_ _]	[_ _]	[_ _ _ _ _ _.]	_ _._	_ _ _.
[_ _/_ _/_ _]	[_ _]	[_ _ _ _ _ _.]	_ _._	_ _ _.
[_ _/_ _/_ _]	[_ _]	[_ _ _ _ _ _.]	_ _._	_ _ _.

NOTES:

1. For each specific work type, the appropriate set of sheets should be completed (as indexed in Table 7.1). It is recognized that parts of both Chapter 6 (Maintenance Data Collection) and Chapter 7 (Rehabilitation Data Collection) may be required to adequately record a given set of improvements for a test section.

2. Cost includes only pavement structure cost. Non-pavement costs such as cut and fill work, work on bridges, culverts, lighting, and guard rails are to be excluded.

Revised December 15, 1989

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

SHEET 2

REHABILITATION DATA

LTPP PROGRAM

REVISED LAYER DESCRIPTIONS

1. LAYER[1] NUMBER	*2. LAYER[2] DESCRIPTION	*3. MATERIAL[3,4] TYPE CLASSIFICATION	*4. LAYER THICKNESS (IN) MEAN	MIN.	MAX.	STD. DEV.
1	SUBGRADE(7)	[_ _]				
2	[_ _]	[_ _]	[_ _ _._]	_ _ _._	_ _ _._	_ _ _._
3	[_ _]	[_ _]	[_ _ _._]	_ _ _._	_ _ _._	_ _ _._
4	[_ _]	[_ _]	[_ _ _._]	_ _ _._	_ _ _._	_ _ _._
5	[_ _]	[_ _]	[_ _ _._]	_ _ _._	_ _ _._	_ _ _._
6	[_ _]	[_ _]	[_ _ _._]	_ _ _._	_ _ _._	_ _ _._
7	[_ _]	[_ _]	[_ _ _._]	_ _ _._	_ _ _._	_ _ _._
8	[_ _]	[_ _]	[_ _ _._]	_ _ _._	_ _ _._	_ _ _._
9	[_ _]	[_ _]	[_ _ _._]	_ _ _._	_ _ _._	_ _ _._

NOTES:

1. Layer 1 is subgrade soil, last layer is existing surface.

2. Layer description codes:

Overlay............01	Base Layer.........05	Porous Friction Course...........09
Seal/Tack Coat.....02	Subbase Layer......06	Surface Treatment....10
Original Surface...03	Subgrade...........07	Embankment (Fill)....11
HMAC Layer (Below Surface Layer)...04	Interlayer.........08	Recycled Layer.......12

3. The material type classification codes for surface, base or subbase, subgrade, and seal coat or interlayer materials appear in Tables A.5, A.6, A.7 and A.8, respectively.

4. If the materials or thicknesses of a layer has not changed during the rehabilitation, enter "99" as the material type classification and leave the layer thicknesses for that layer blank. If a layer has changed, enter the appropriate codes and thicknesses.

***STATE ASSIGNED ID** [_ _ _ _]

SHEET 3

***STATE CODE** [_ _]

REHABILITATION DATA

***SHRP SECTION ID** [_ _ _ _]

LTPP PROGRAM

ASPHALT CONCRETE OVERLAY AGGREGATE PROPERTIES

* 1. **LAYER NUMBER (FROM SHEET 2)** [_]

COMPOSITION OF COARSE AGGREGATE (Items 2., 3., and 4.)

			TYPE	PERCENT
Crushed Stone... 1	Crushed Slag..... 4	* 2.	[_]	[_ _ _.]
Gravel.......... 2	Manufactured	* 3.	[_]	[_ _ _.]
Crushed Gravel.. 3	Lightweight.... 5	* 4.	[_]	[_ _ _.]
Other (Specify)________ 6				

* 5. **GEOLOGIC CLASSIFICATION OF COARSE AGGREGATE (SEE GEOLOGIC CLASSIFICATION CODES, TABLE A.9)** [_ _]

COMPOSITION OF FINE AGGREGATE (Items 6., 7., and 8.)

		TYPE	PERCENT
Natural Sand..................... 1	* 6.	[_]	[_ _ _.]
Manufactured Sand (From	* 7.	[_]	[_ _ _.]
Crushed Gravel or Stone)......... 2	* 8.	[_]	[_ _ _.]
Recycled Concrete................ 3			
Other (Specify)________ 4			

* 9. **TYPE OF MINERAL FILLER** [_]

Stone Dust........ 1 Portland Cement... 3
Hydrated Lime..... 2 Fly Ash........... 4
Other (Specify)________ 5

AGGREGATE DURABILITY TEST RESULTS (Items 10. to 13.)
(SEE DURABILITY TEST TYPE CODES, TABLE A.13)

	TYPE OF AGGREGATE	TYPE OF TEST	RESULTS
10.	COARSE	_ _	_ _ _._ _ _
11.	COARSE	_ _	_ _ _._ _ _
12.	COARSE	_ _	_ _ _._ _ _
13.	COMBINED COARSE AND FINE	_ _	_ _ _._ _ _

14. **POLISH VALUE OF COARSE AGGREGATES (SURFACE LAYER ONLY) (AASHTO T279, ASTM D3319)** _ _.

*STATE ASSIGNED ID [_ _ _ _]

SHEET 4

REHABILITATION DATA

LTPP PROGRAM

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

ASPHALT CONCRETE OVERLAY
AGGREGATE PROPERTIES (CONTINUED)

* 1.LAYER NUMBER (FROM SHEET 2) [_]

* 2.GRADATION OF COMBINED AGGREGATES

Sieve Size or No.	% Passing	Sieve Size or No.	% Passing
2"...........	[_ _ _]	No. 4........	[_ _]
1 1/2".......	[_ _ _]	No. 8........	[_ _]
1"...........	[_ _ _]	No. 10.......	[_ _]
7/8".........	[_ _ _]	No. 16.......	[_ _]
3/4 "........	[_ _ _]	No. 30.......	[_ _]
5/8".........	[_ _ _]	No. 40.......	[_ _]
1/2".........	[_ _ _]	No. 50.......	[_ _]
3/8".........	[_ _]	No. 80.......	[_ _]
		No. 100......	[_ _]
		No. 200......	[_ _]

BULK SPECIFIC GRAVITIES (Items 3. to 6.)

* 3. COARSE AGGREGATE (AASHTO T85 OR ASTM C127) [_._ _ _]

* 4. FINE AGGREGATE (AASHTO T84 OR ASTM C128) [_._ _ _]

* 5. MINERAL FILLER (AASHTO T100 OR ASTM D854) [_._ _ _]

* 6. AGGREGATE COMBINATION (CALCULATED - EQ. 7.1) [_._ _ _]

7.EFFECTIVE SPECIFIC GRAVITY OF AGGREGATE
COMBINATION (CALCULATED - EQ. 7.2) _._ _ _

*STATE ASSIGNED ID [_ _ _ _]

SHEET 5

*STATE CODE [_ _]

REHABILITATION DATA

*SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

ASPHALT CONCRETE OVERLAY
ASPHALT CEMENT PROPERTIES

* 1.LAYER NUMBER (FROM SHEET 2) [_]

* 2.ASPHALT GRADE (SEE ASPHALT CODE SHEET, TABLE A.16) [_ _]
(IF OTHER, SPECIFY ______________________________)

* 3.SOURCE (SEE SUPPLY CODE SHEET, TABLE A.14) [_ _]
(IF OTHER, SPECIFY ______________________________)

* 4.SPECIFIC GRAVITY OF ASPHALT CEMENT
(AASHTO T228 OR ASTM D70) [_._ _ _]

* 5.VISCOSITY OF ASPHALT AT 140°F (POISES)
(AASHTO T202 OR ASTM D2171) [_ _ _ _ _ _.]

* 6.VISCOSITY OF ASPHALT AT 275°F (CENTISTOKES)
(AASHTO T201 OR ASTM D2170) [_ _ _ _._ _]

* 7.PENETRATION AT 77°F (AASHTO T49 OR ASTM D5)
(TENTHS OF A MM) (100 G., 5 SEC.) [_ _ _.]

ASPHALT MODIFIERS (SEE TYPE CODE, TABLE A.15) (Items 8. and 9.)

	TYPE	QUANTITY(%)
* 8. MODIFIER #1	[_ _.]	[_ _.]
* 9. MODIFIER #2	[_ _.]	[_ _.]

(IF OTHER, SPECIFY TYPE ______________________________)

10.DUCTILITY AT 77°F (CM)
(AASHTO T51 OR ASTM D113) _ _ _.

11.DUCTILITY AT 39.2°(CM)
(AASHTO T51 OR ASTM D113) _ _ _.

12.TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (CM/MIN) _ _ _.

13.PENETRATION AT 39.2°F (AASHTO T49 OR ASTM D5)
(TENTHS OF A MM) (200 G., 60 SEC.) _ _ _.

14.RING AND BALL SOFTENING POINT (AASHTO T53) (°F) _ _ _.

***STATE ASSIGNED ID** [_ _ _ _]

SHEET 6

REHABILITATION DATA

LTPP PROGRAM

***STATE CODE** [_ _]

***SHRP SECTION ID** [_ _ _ _]

ASPHALT CONCRETE OVERLAY
LABORATORY AGED ASPHALT CEMENT PROPERTIES

* **1. LAYER NUMBER (FROM SHEET 2)** [_]

2. TEST PROCEDURE USED TO MEASURE AGING EFFECTS _
   - ASTM D1754 - Thin Film Oven Test.................. 1
   - ASTM D2872 - Rolling Thin Film Oven Test.......... 2
   - Other (Specify)________________ 3

3. VISCOSITY OF ASPHALT AT 140°F (POISES) (AASHTO T202 OR ASTM D2171) _ _ _ _ _ _.

4. VISCOSITY OF ASPHALT AT 275°F (CENTISTOKES) (AASHTO T201 OR ASTM D2170) _ _ _ _._ _

5. DUCTILITY AT 77°F (CM) (AASHTO T51 OR ASTM D113) _ _ _.

6. DUCTILITY AT 39.2°F (CM) (AASHTO T51 OR ASTM D113) _ _ _.

7. TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (CM/MIN) _ _._

8. PENETRATION AT 77°F, 100 G., 5 SEC. (TENTHS OF A MM) (AASHTO T49 OR ASTM D5) _ _ _.

9. PENETRATION AT 39.2°F, 200 G, 60 SEC. (TENTHS OF A MM) (AASHTO T49 OR ASTM D5) _ _.

10. RING AND BALL SOFTENING POINT (°F) (AASHTO T53) _ _ _.

11. WEIGHT LOSS (PERCENT) _._

SHEET 7	***STATE ASSIGNED ID** [_ _ _ _]
REHABILITATION DATA	***STATE CODE** [_ _]
LTPP PROGRAM	***SHRP SECTION ID** [_ _ _ _]

ASPHALT CONCRETE OVERLAY LABORATORY MIXTURE DESIGN

*** 1. LAYER NUMBER (FROM SHEET 2)**	[_]
2. MAXIMUM SPECIFIC GRAVITY (NO AIR VOIDS) (EQ. 7.3)	_._ _ _
3. BULK SPECIFIC GRAVITY (ASTM D1188)	_._ _ _
4. OPTIMUM ASPHALT CONTENT (PERCENT WEIGHT OF TOTAL MIX) (AASHTO T164 OR ASTM D2172)	_ _._
5. PERCENT AIR VOIDS (EQ. 7.4)	_ _._
6. MARSHALL STABILITY (LBS) (AASHTO T245 OR ASTM D1559)	_ _ _ _.
7. NUMBER OF BLOWS	_ _.
8. MARSHALL FLOW (HUNDREDTHS OF AN INCH) (AASHTO T245 OR ASTM D1559)	_ _ _ _.
9. HVEEM STABILITY (AASHTO T246 OR ASTM D1561)	_ _ _.
10. HVEEM COHESIOMETER VALUE (GRAMS/25 MM OF WIDTH) (AASHTO T246 OR ASTM D1561)	_ _ _ _.

SHEET 8

REHABILITATION DATA

LTPP PROGRAM

***STATE ASSIGNED ID [_ _ _ _]**

***STATE CODE [_ _]**

***SHRP SECTION ID [_ _ _ _]**

ASPHALT CONCRETE OVERLAY MIXTURE PROPERTIES AS PLACED

* 1. **LAYER NUMBER (FROM SHEET 2)** [_]

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

* 3. **MAXIMUM SPECIFIC GRAVITY (NO AIR VOIDS) (EQ. 7.3)** [_._ _ _]

* 4. **BULK SPECIFIC GRAVITY (ASTM D1188)**
   MEAN ....[_._ _ _]   **NUMBER OF TESTS** ...... _ _.
   MINIMUM ...... _._ _ _   **MAXIMUM** .... _._ _ _
   STD. DEV. .... _._ _ _

* 5. **ASPHALT CONTENT (PERCENT WEIGHT OF TOTAL MIX)**
   (AASHTO T164 OR ASTM D2172)
   MEAN ....[_ _._]   **NUMBER OF TESTS** ...... _ _.
   MINIMUM .... _ _._   **MAXIMUM** .... _ _._
   STD. DEV. .... _ _._

* 6. **PERCENT AIR VOIDS (EQ. 7.4)**
   MEAN ....[_ _._]   **NUMBER TESTS** .... _ _.
   MINIMUM .... _ _._   **MAXIMUM** .... _ _._
   STD. DEV. .... _ _._

7. VOIDS IN MINERAL AGGREGATE (PERCENT) (EQ. 7.5)
   MEAN .... _ _._   **NUMBER OF TESTS** .... _ _.
   MINIMUM .... _ _._   **MAXIMUM** .... _ _._
   STD. DEV. ...... _ _._

8. **EFFECTIVE ASPHALT CONTENT (PERCENT) (EQ. 7.6)**
   MEAN .... _ _._   **NUMBER OF TESTS** .... _ _.
   MINIMUM ...... _ _._   **MAXIMUM** .... _ _._
   STD. DEV. .... _ _._

SHEET 9

REHABILITATION DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

ASPHALT CONCRETE OVERLAY
MIXTURE PROPERTIES AS PLACED (CONTINUED)

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. TYPE ASPHALT PLANT [_]
Batch Plant .... 1 Drum Mix Plant 2
Other (Specify)________________ 3

* 3. TYPE OF ANTISTRIPPING AGENT
(SEE TYPE CODES, TABLE A.21) [_ _]
(OTHER, SPECIFY________________)

* 4. ANTISTRIPPING AGENT LIQUID OR SOLID CODE [_]
Liquid .... 1 Solid 2

* 5. AMOUNT OF ANTISTRIPPING AGENT [_ _._]
(IF LIQUID, ENTER AMOUNT AS PERCENT OF ASPHALT CEMENT WEIGHT.
IF SOLID, ENTER AMOUNT AS PERCENT OF AGGREGATE WEIGHT.)

6. MOISTURE SUSCEPTIBILITY TEST TYPE _
AASHTO T165 (ASTM D1075)........................... 1
Texas Freeze-Thaw Pedestal Test (Ref 21)........... 2
Texas Boiling Test (Ref 22)........................ 3
Revised Lottman Procedure (AASHTO T283)............ 4
Other (Specify) ________________ 5

7. MOISTURE SUSCEPTIBILITY TEST RESULTS
HVEEM STABILITY NO. _ _.
PERCENT STRIPPED _ _.
TENSILE STRENGTH RATIO (AASHTO T283) _._ _
INDEX OF RETAINED STRENGTH (AASHTO T165) _ _ _.

SHEET 10

REHABILITATION DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

ASPHALT CONCRETE OVERLAY CONSTRUCTION DATA

* 1.LAYER NUMBER (SEE SHEET 2) [_]

2.MIXING TEMPERATURE (°F) _ _ _.

LAYDOWN TEMPERATURES (°F) (Items 3., 4., and 5.)

3. MEAN .... _ _ _. NUMBER OF TESTS ...... _ _.
4. MINIMUM .... _ _ _. MAXIMUM .... _ _ _.
5. STD. DEV. .... _ _ _.

ROLLER DATA (Items 6. to 22.)

	ROLLER CODE #	ROLLER DESCRIPTION	GROSS WGT (TONS)	TIRE PRES. (PSI)	FREQ. (VIBR/MIN)	AMPLITUDE (IN)	SPEED (MPH)
6.	A	STEEL-WHL TANDEM	_ _._				
7.	B	STEEL-WHL TANDEM	_ _._				
8.	C	STEEL-WHL TANDEM	_ _._				
9.	D	STEEL-WHL TANDEM	_ _._				
10.	E	PNEUMATIC-TIRED	_ _._	_ _ _.			
11.	F	PNEUMATIC-TIRED	_ _._	_ _ _.			
12.	G	PNEUMATIC-TIRED	_ _._	_ _ _.			
13.	H	PNEUMATIC-TIRED	_ _._	_ _ _.			
14.	I	SINGLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
15.	J	SINGLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
16.	K	SINGLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
17.	L	SINGLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
18.	M	DOUBLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
19.	N	DOUBLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
20.	O	DOUBLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
21.	P	DOUBLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
22.	Q	OTHER ______________					

COMPACTION DATA (Items 23. to 31.)

	FIRST LIFT	SECOND LIFT	THIRD LIFT	FOURTH LIFT
BREAKDOWN:				
23. ROLLER CODE # (A-Q)	_	_	_	_
24. COVERAGES	_ _.	_ _.	_ _.	_ _.
INTERMEDIATE:				
25. ROLLER CODE # (A-Q)	_	_	_	_
26. COVERAGES	_ _.	_ _.	_ _.	_ _.
FINAL:				
27. ROLLER CODE # (A-Q)	_	_	_	_
28. COVERAGES	_ _.	_ _.	_ _.	_ _.
29.AIR TEMPERATURE (°F)	_ _ _.	_ _ _.	_ _ _.	_ _ _.
30.COMPACTED THICKNESS (IN)	_._	_._	_._	_._
31.CURING PERIOD (DAYS)	_ _.	_ _.	_ _.	_ _.

SHEET 11	*STATE ASSIGNED ID [_ _ _ _]
REHABILITATION DATA	*STATE CODE [_ _]
LTPP PROGRAM	*SHRP SECTION ID [_ _ _ _]

HOT MIX RECYCLED ASPHALT PAVEMENT
GENERAL INFORMATION AND RECLAIMED AGGREGATE PROPERTIES

* 1. LAYER NUMBER (FROM SHEET 2) [_]

GENERAL INFORMATION

* 2. PROCEDURE USED TO BREAK UP AND/OR REMOVE THE ASPHALT PAVEMENT [_]

Scarifying............. 1 Ripping................ 3
Grid Rolling........... 2 Cold Milling........... 4
Other (Specify)________________________ 5

* 3. PAVEMENT PROCESSING [_]

None.. 1
Crushed and Screened.......................... 2
Pulverized by Hammermill...................... 3
Pulverized by Grid or V-Cleated Roller........ 4
Other (Specify)________________________ 5

RECLAIMED AGGREGATE PROPERTIES

* 4. GRADATION OF RECLAIMED AGGREGATES

Sieve Size or No.	% Passing	Sieve Size or No.	% Passing
2"...........	[_ _ _]	No. 4........	[_ _]
1 1/2".......	[_ _ _]	No. 8........	[_ _]
1"...........	[_ _ _]	No. 10.......	[_ _]
7/8".........	[_ _ _]	No. 16.......	[_ _]
3/4 "........	[_ _ _]	No. 30.......	[_ _]
5/8".........	[_ _ _]	No. 40.......	[_ _]
1/2".........	[_ _ _]	No. 50.......	[_ _]
3/8".........	[_ _]	No. 80.......	[_ _]
		No. 100......	[_ _]
		No. 200......	[_ _]

BULK SPECIFIC GRAVITIES (Items 5. to 8.)

* 5. COARSE AGGREGATE (AASHTO T85 OR ASTM C127) [_._ _ _]
* 6. FINE AGGREGATE (AASHTO T84 OR ASTM C128) [_._ _ _]
* 7. MINERAL FILLER (AASHTO T100 OR ASTM D854) [_._ _ _]
* 8. AGGREGATE COMBINATION (CALCULATED - EQ. 7.1) [_._ _ _]

9. EFFECTIVE SPECIFIC GRAVITY OF AGGREGATE COMBINATION (CALCULATED - EQ. 7.2) _._ _ _

*STATE ASSIGNED ID [_ _ _ _]

SHEET 12

REHABILITATION DATA

LTPP PROGRAM

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

HOT MIX RECYCLED ASPHALT PAVEMENT
UNTREATED AGGREGATE PROPERTIES

* 1. LAYER NUMBER (FROM SHEET 2) [_]

COMPOSITION OF COARSE AGGREGATE (Items 2., 3., and 4.)

			TYPE	PERCENT
Crushed Stone.....1	Crushed Slag.......4	* 2.	[_]	[_ _ _.]
Gravel............2	Manufactured	* 3.	[_]	[_ _ _.]
Crushed Gravel....3	Lightweight......5	* 4.	[_]	[_ _ _.]
Other (Specify)________ 6				

* 5. GEOLOGIC CLASSIFICATION OF COARSE AGGREGATE (SEE GEOLOGIC CLASSIFICATION CODES, TABLE A.9) [_ _]

COMPOSITION OF FINE AGGREGATE (Items 6., 7., and 8.)

		TYPE	PERCENT
Natural Sand...................... 1	* 6.	[_]	[_ _ _.]
Manufactured Sand (From	* 7.	[_]	[_ _ _.]
Crushed Gravel or Stone)......... 2	* 8.	[_]	[_ _ _.]
Recycled Concrete................. 3			
Other (Specify)________ 4			

SOURCE (Items 9. and 10.)

Reclaimed Base Material............ 1	* 9.	COARSE	[_]
Pit (Original Use)................. 2	*10.	FINE	[_]

*11. TYPE OF MINERAL FILLER [_]

Stone Dust........ 1	Portland Cement... 3
Hydrated Lime..... 2	Fly Ash........... 4
Other (Specify)________ 5	

AGGREGATE DURABILITY TEST RESULTS (Items 12. to 15.)
(SEE DURABILITY TEST TYPE CODES, TABLE A.13)

	TYPE OF AGGREGATE	TYPE OF TEST	RESULTS
12.	COARSE	_ _	_ _ _._ _ _
13.	COARSE	_ _	_ _ _._ _ _
14.	COARSE	_ _	_ _ _._ _ _
15.	COMBINED COARSE AND FINE	_ _	_ _ _._ _ _

16. POLISH VALUE OF COARSE AGGREGATES (SURFACE LAYER ONLY) (AASHTO T279, ASTM D3319) _ _.

SHEET 13	*STATE ASSIGNED ID [_ _ _ _]
REHABILITATION DATA	*STATE CODE [_ _]
LTPP PROGRAM	*SHRP SECTION ID [_ _ _ _]

HOT MIX RECYCLED ASPHALT PAVEMENT
UNTREATED AGGREGATE PROPERTIES (CONTINUED)

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. GRADATION OF UNTREATED AGGREGATES

Sieve Size or No.	% Passing	Sieve Size or No.	% Passing
2"...........	[_ _ _]	No. 4........	[_ _]
1 1/2".......	[_ _ _]	No. 8........	[_ _]
1"...........	[_ _ _]	No. 10.......	[_ _]
7/8".........	[_ _ _]	No. 16.......	[_ _]
3/4 "........	[_ _ _]	No. 30.......	[_ _]
5/8".........	[_ _ _]	No. 40.......	[_ _]
1/2".........	[_ _ _]	No. 50.......	[_ _]
3/8".........	[_ _]	No. 80.......	[_ _]
		No. 100......	[_ _]
		No. 200......	[_ _]

BULK SPECIFIC GRAVITIES (Items 3. to 6.)

* 3. COARSE AGGREGATE (AASHTO T85 OR ASTM C127) [_._ _ _]

* 4. FINE AGGREGATE (AASHTO T84 OR ASTM C128) [_._ _ _]

* 5. MINERAL FILLER (AASHTO T100 OR ASTM D854) [_._ _ _]

* 6. AGGREGATE COMBINATION (CALCULATED - EQ. 7.1) [_._ _ _]

7. EFFECTIVE SPECIFIC GRAVITY OF AGGREGATE COMBINATION (CALCULATED - EQ. 7.2) _._ _ _

SHEET 14	*STATE ASSIGNED ID [_ _ _ _]
REHABILITATION DATA	*STATE CODE [_ _]
LTPP PROGRAM	*SHRP SECTION ID [_ _ _ _]

HOT MIX RECYCLED ASPHALT PAVEMENT COMBINED AGGREGATE PROPERTIES

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. AMOUNT OF UNTREATED AGGREGATE ADDED [_ _._]
(PERCENT BY WEIGHT OF COMBINED AGGREGATE IN RECYCLED MIX)

* 3. GRADATION OF COMBINED AGGREGATES

Sieve Size or No.	% Passing	Sieve Size or No.	% Passing
2"...........	[_ _ _]	No. 4........	[_ _]
1 1/2".......	[_ _ _]	No. 8........	[_ _]
1"...........	[_ _ _]	No. 10.......	[_ _]
7/8".........	[_ _ _]	No. 16.......	[_ _]
3/4 "........	[_ _ _]	No. 30.......	[_ _]
5/8".........	[_ _ _]	No. 40.......	[_ _]
1/2".........	[_ _ _]	No. 50.......	[_ _]
3/8".........	[_ _]	No. 80.......	[_ _]
		No. 100......	[_ _]
		No. 200......	[_ _]

BULK SPECIFIC GRAVITIES (Items 4. to 7.)

* 4. COARSE AGGREGATE (AASHTO T85 OR ASTM C127) [_._ _ _]

* 5. FINE AGGREGATE (AASHTO T84 OR ASTM C128) [_._ _ _]

* 6. MINERAL FILLER (AASHTO T100 OR ASTM D854) [_._ _ _]

* 7. AGGREGATE COMBINATION (CALCULATED - EQ. 7.1) [_._ _ _]

8. EFFECTIVE SPECIFIC GRAVITY OF AGGREGATE COMBINATION (CALCULATED - EQ. 7.2) _._ _ _

*STATE ASSIGNED ID [_ _ _ _]

SHEET 15

REHABILITATION DATA

LTPP PROGRAM

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

HOT MIX RECYCLED ASPHALT PAVEMENT
RECLAIMED ASPHALT CEMENT PROPERTIES

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. SPECIFIC GRAVITY OF ASPHALT CEMENT (AASHTO T220 OR ASTM D70) [_._ _ _]

* 3. VISCOSITY OF ASPHALT AT 140°F (POISES) (AASHTO T202 OR ASTM D2171) [_ _ _ _ _ _.]

* 4. VISCOSITY OF ASPHALT AT 275°F (CENTISTOKES) (AASHTO T201 OR ASTM D2170) [_ _ _ _._ _]

* 5. PENETRATION AT 77°F (AASHTO T49 OR ASTM D5) (TENTHS OF A MM) (100 G., 5 SEC.) [_ _ _.]

6. DUCTILITY AT 77°F (CM) (AASHTO T51) _ _ _.

7. DUCTILITY AT 39.2°(CM) (AASHTO T51) _ _ _.

8. TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (CM/MIN) _ _ _.

9. PENETRATION AT 39.2°F (AASHTO T49) (TENTHS OF A MM) (200 G., 60 SEC.) _ _ _.

10. RING AND BALL SOFTENING POINT (AASHTO T53) (°F) _ _ _.

*STATE ASSIGNED ID [_ _ _ _]

SHEET 16

*STATE CODE [_ _]

REHABILITATION DATA

*SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

HOT MIX RECYCLED ASPHALT PAVEMENT
NEW ASPHALT CEMENT PROPERTIES

* 1.LAYER NUMBER (FROM SHEET 2) [_]

* 2.ASPHALT GRADE (SEE ASPHALT CODE SHEET, TABLE A.16) [_ _]
(IF OTHER, SPECIFY ____________________)

* 3.SOURCE (SEE SUPPLY CODE SHEET, TABLE A.14) [_ _]
(IF OTHER, SPECIFY ____________________)

* 4.SPECIFIC GRAVITY OF ASPHALT CEMENT
(AASHTO T228 OR ASTM D70) [_._ _ _]

* 5.VISCOSITY OF ASPHALT AT 140°F (POISES)
(AASHTO T202 OR ASTM D2171) [_ _ _ _ _ _.]

* 6.VISCOSITY OF ASPHALT AT 275°F (CENTISTOKES)
(AASHTO T201 OR ASTM D2170) [_ _ _ _._ _]

* 7.PENETRATION AT 77°F (AASHTO T49 OR ASTM D5)
(TENTHS OF A MM) (100 G., 5 SEC.) [_ _ _.]

8.DUCTILITY AT 77°F (CM)
(AASHTO T51 OR ASTM D113) _ _ _.

9.DUCTILITY AT 39.2°(CM)
(AASHTO T51 OR ASTM D113) _ _ _.

10.TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (CM/MIN) _ _ _.

11.PENETRATION AT 39.2°F (AASHTO T49 OR ASTM D5)
(TENTHS OF A MM) (200 G., 60 SEC.) _ _ _.

12.RING AND BALL SOFTENING POINT (AASHTO T53) (°F) _ _ _.

*STATE ASSIGNED ID [_ _ _ _]

SHEET 17

REHABILITATION DATA

LTPP PROGRAM

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

HOT MIX RECYCLED ASPHALT PAVEMENT
COMBINED ASPHALT CEMENT PROPERTIES

* 1.LAYER NUMBER (FROM SHEET 2) [_]

	TYPE	QUANTITY(%)
* 2.RECYCLING AGENT (SEE TYPE CODE, TABLE A.20)	[_ _]	[_ _.]

(IF OTHER, SPECIFY TYPE ____________________)

* 3.AMOUNT OF NEW ASPHALT CEMENT ADDED
(PERCENT BY WEIGHT OF RECYCLED MIXTURE WEIGHT) [_ _._]

* 4.SPECIFIC GRAVITY OF ASPHALT CEMENT
(AASHTO T228 OR ASTM D70) [_._ _ _]

* 5.VISCOSITY OF ASPHALT AT 140°F (POISES)
(AASHTO T202 OR ASTM D2171) [_ _ _ _ _ _.]

* 6.VISCOSITY OF ASPHALT AT 275°F (CENTISTOKES)
(AASHTO T201 OR ASTM D2170) [_ _ _ _._ _]

* 7.PENETRATION AT 77°F (AASHTO T49 OR ASTM D5)
(TENTHS OF A MM) (100 G., 5 SEC.) [_ _ _.]

ASPHALT MODIFIERS (SEE TYPE CODE, TABLE A.15) (Items 8. and 9.)
(OTHER THAN RECYCLING AGENT)

	TYPE	QUANTIFY(%)
* 8.MODIFIER #1	[_ _.]	[_ _.]
* 9.MODIFIER #2	[_ _.]	[_ _.]

(IF OTHER, SPECIFY TYPE ____________________)

10.DUCTILITY AT 77°F (CM)
(AASHTO T51 OR ASTM D113) _ _ _.

11.DUCTILITY AT 39.2°(CM)
(AASHTO T51) _ _ _.

12.TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (CM/MIN) _ _ _.

13.PENETRATION AT 39.2°F (AASHTO T49 OR ASTM D5)
(TENTHS OF A MM) (200 G., 60 SEC.) _ _ _.

14.RING AND BALL SOFTENING POINT (AASHTO T53) (°F) _ _ _.

SHEET 18

REHABILITATION DATA

LTPP PROGRAM

***STATE ASSIGNED ID** [_ _ _ _]

***STATE CODE** [_ _]

***SHRP SECTION ID** [_ _ _ _]

HOT MIX RECYCLED ASPHALT PAVEMENT
LABORATORY AGED COMBINED ASPHALT CEMENT PROPERTIES

* 1. **LAYER NUMBER (FROM SHEET 2)** [_]

2. TEST PROCEDURE USED TO MEASURE AGING EFFECTS _
   ASTM D1754 - Thin Film Oven Test.................. 1
   ASTM D2872 - Rolling Thin Film Oven Test.......... 2
   Other (Specify)______________________ 3

3. VISCOSITY OF ASPHALT AT 140°F (POISES) _ _ _ _ _ _.
   (AASHTO T202 OR ASTM D2171)

4. VISCOSITY OF ASPHALT AT 275°F (CENTISTOKES) _ _ _ _._ _
   (AASHTO T201 OR ASTM D2170)

5. DUCTILITY AT 77°F (CM) (AASHTO T51 OR ASTM D113) _ _ _.

6. DUCTILITY AT 39.2°F (CM) (AASHTO T51 OR ASTM D113) _ _ _.

7. TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (CM/MIN) _ _._

8. PENETRATION AT 77°F, 100 G., 5 SEC.
   (TENTHS OF A MM) (AASHTO T49 OR ASTM D5) _ _ _.

9. PENETRATION AT 39.2°F, 200 G., 60 SEC.
   (TENTHS OF A MM) (AASHTO T49 OR ASTM D5) _ _.

10. RING AND BALL SOFTENING POINT (°F) (AASHTO T53) _ _ _.

11. WEIGHT LOSS (PERCENT) _._

SHEET 19

REHABILITATION DATA

LTPP PROGRAM

***STATE ASSIGNED ID** [_ _ _ _]

***STATE CODE** [_ _]

***SHRP SECTION ID** [_ _ _ _]

HOT MIX RECYCLED ASPHALT PAVEMENT
LABORATORY MIXTURE DESIGN

* 1. **LAYER NUMBER (FROM SHEET 2)**	[_]
2. MAXIMUM SPECIFIC GRAVITY (NO AIR VOIDS) (EQ. 7.3)	_._ _ _
3. BULK SPECIFIC GRAVITY (ASTM D1188)	_._ _ _
4. OPTIMUM ASPHALT CONTENT (PERCENT WEIGHT OF TOTAL MIX) (AASHTO T164 OR ASTM D2172)	_ _._
5. PERCENT AIR VOIDS (EQ. 7.4)	_ _._
6. MARSHALL STABILITY (LBS) (AASHTO T245 OR ASTM D1559)	_ _ _ _.
7. NUMBER OF BLOWS	_ _.
8. MARSHALL FLOW (HUNDREDTHS OF AN INCH) (AASHTO T245 OR ASTM D1559)	_ _ _ _.
9. HVEEM STABILITY (AASHTO T246 OR ASTM D1561)	_ _ _.
10. HVEEM COHESIOMETER VALUE (GRAMS/25 MM OF WIDTH) (AASHTO T246 OR ASTM D1561)	_ _ _ _.

*STATE ASSIGNED ID [_ _ _ _]

SHEET 20

*STATE CODE [_ _]

REHABILITATION DATA

*SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

HOT MIX RECYCLED ASPHALT PAVEMENT
MIXTURE PROPERTIES AS PLACED

* 1.LAYER NUMBER (FROM SHEET 2) [_]

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

* 3.MAXIMUM SPECIFIC GRAVITY (NO AIR VOIDS) (EQ. 7.3) [_._ _ _]

* 4.BULK SPECIFIC GRAVITY (ASTM D1188)
MEAN ....[_._ _ _] NUMBER OF TESTS ...... _ _.
MINIMUM ...... _._ _ _ MAXIMUM .... _._ _ _
STD. DEV. .... _._ _ _

* 5.ASPHALT CONTENT (PERCENT WEIGHT OF TOTAL MIX)
(AASHTO T164 OR ASTM D2172)
MEAN ....[_ _._] NUMBER OF TESTS ...... _ _.
MINIMUM .... _ _._ MAXIMUM .... _ _._
STD. DEV. .... _ _._

* 6.PERCENT AIR VOIDS (EQ. 7.4)
MEAN ....[_ _._] NUMBER OF TESTS ...... _ _.
MINIMUM .... _ _._ MAXIMUM .... _ _._
STD. DEV. .... _ _._

7.VOIDS IN MINERAL AGGREGATE (PERCENT) (EQ. 7.5)
MEAN ....[_ _._] NUMBER OF TESTS .... _ _.
MINIMUM ...... _ _._ MAXIMUM .... _ _._
STD. DEV. .... _ _._

8.EFFECTIVE ASPHALT CONTENT (PERCENT) (EQ. 7.6)
MEAN ....[_ _._] NUMBER OF TESTS .... _ _.
MINIMUM ...... _ _._ MAXIMUM .... _ _._
STD. DEV. .... _ _._

*STATE ASSIGNED ID [_ _ _ _]

SHEET 21

*STATE CODE [_ _]

REHABILITATION DATA

*SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

HOT MIX RECYCLED ASPHALT PAVEMENT
MIXTURE PROPERTIES AS PLACED (CONTINUED)

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. TYPE ASPHALT PLANT [_]
Batch Plant............ 1 Drum Mix Plant......... 2
Other (Specify)________________________________ 3

* 3. TYPE OF ANTISTRIPPING AGENT
(SEE TYPE CODES, TABLE A.21) [_ _]
(OTHER, SPECIFY ________________________________)

* 4. ANTISTRIPPING AGENT LIQUID OR SOLID CODE [_]
Liquid................. 1 Solid................. 2

* 5. AMOUNT OF ANTISTRIPPING AGENT [_ _._]
(If LIQUID, ENTER AMOUNT AS PERCENT OF ASPHALT CEMENT WEIGHT.
IF SOLID, ENTER AMOUNT AS PERCENT OF AGGREGATE WEIGHT.)

6. MOISTURE SUSCEPTIBILITY TEST TYPE _
AASHTO T165 (ASTM D1075).......................... 1
Texas Freeze-Thaw Pedestal Test (Ref 21)........... 2
Texas Boiling Test (Ref 22)....................... 3
Revised Lottman Procedure (AASHTO T283)............ 4
Other (Specify)________________________________ 5

7. MOISTURE SUSCEPTIBILITY TEST RESULTS
HVEEM STABILITY NO. _ _.
PERCENT STRIPPED _ _.
TENSILE STRENGTH RATIO (AASHTO T283) _._ _
INDEX OF RETAINED STRENGTH (AASHTO T165) _ _ _.

SHEET 22

REHABILITATION DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

HOT MIX RECYCLED ASPHALT PAVEMENT CONSTRUCTION DATA

* 1. **LAYER NUMBER (SEE SHEET 2)** [_]

2. MIXING TEMPERATURE (°F) _ _ _.

LAYDOWN TEMPERATURES (°F) (Items 3., 4., and 5.)

3. MEAN .... _ _ _. NUMBER OF TESTS .... _ _.
4. MINIMUM .... _ _ _. MAXIMUM .... _ _ _.
5. STD. DEV. .... _ _ _.

ROLLER DATA (Items 6. to 22.)

	ROLLER CODE #	ROLLER DESCRIPTION	GROSS WGT (TONS)	TIRE PRES. (PSI)	FREQ. (VIBR/MIN)	AMPLITUDE (IN)	SPEED (MPH)
6.	A	STEEL-WHL TANDEM	_ _._				
7.	B	STEEL-WHL TANDEM	_ _._				
8.	C	STEEL-WHL TANDEM	_ _._				
9.	D	STEEL-WHL TANDEM	_ _._				
10.	E	PNEUMATIC-TIRED	_ _._	_ _ _.			
11.	F	PNEUMATIC-TIRED	_ _._	_ _ _.			
12.	G	PNEUMATIC-TIRED	_ _._	_ _ _.			
13.	H	PNEUMATIC-TIRED	_ _._	_ _ _.			
14.	I	SINGLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
15.	J	SINGLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
16.	K	SINGLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
17.	L	SINGLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
18.	M	DOUBLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
19.	N	DOUBLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
20.	O	DOUBLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
21.	P	DOUBLE-DRUM VIBR.	_ _._		_ _ _ _.	._ _ _	_ _._
22.	Q	OTHER ________					

COMPACTION DATA (Items 23. to 31.)

	FIRST LIFT	SECOND LIFT	THIRD LIFT	FOURTH LIFT
<u>BREAKDOWN</u>:				
23. ROLLER CODE # (A-Q)	_	_	_	_
24. COVERAGES	_ _.	_ _.	_ _.	_ _.
<u>INTERMEDIATE</u>:				
25. ROLLER CODE # (A-Q)	_	_	_	_
26. COVERAGES	_ _.	_ _.	_ _.	_ _.
<u>FINAL</u>:				
27. ROLLER CODE # (A-Q)	_	_	_	_
28. COVERAGES	_ _.	_ _.	_ _.	_ _.
29. AIR TEMPATURE (°F)	_ _ _.	_ _ _.	_ _ _.	_ _ _.
30. COMPACTED THICKNESS(IN)	_._	_._	_._	_._
31. CURING PERIOD (DAYS)	_ _.	_ _.	_ _.	_ _.

*STATE ASSIGNED ID [_ _ _ _]

SHEET 23

REHABILITATION DATA

LTPP PROGRAM

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

COLD MIX RECYCLED ASPHALT PAVEMENT
GENERAL INFORMATION AND RECLAIMED AGGREGATE PROPERTIES

* 1. LAYER NUMBER (FROM SHEET 2) [_]

GENERAL INFORMATION

* 2. PROCEDURE USED TO BREAK UP AND/OR REMOVE THE ASPHALT PAVEMENT [_]

Scarifying.............. 1   Ripping............... 3
Grid Rolling............ 2   Cold Milling.......... 4
Other (Specify)________________________ 5

* 3. PAVEMENT PROCESSING [_]

None.. 1
Crushed and Screened.................................. 2
Pulverized by Hammermill.............................. 3
Pulverized by Grid or V-Cleated Roller................ 4
Other (Specify)________________________ 5

RECLAIMED AGGREGATE PROPERTIES

* 4. GRADATION OF RECLAIMED AGGREGATES

Sieve Size or No.	% Passing	Sieve Size or No.	% Passing
2"...........	[_ _ _]	No. 4........	[_ _]
1 1/2".......	[_ _ _]	No. 8........	[_ _]
1"...........	[_ _ _]	No. 10.......	[_ _]
7/8".........	[_ _ _]	No. 16.......	[_ _]
3/4 "........	[_ _ _]	No. 30.......	[_ _]
5/8".........	[_ _ _]	No. 40.......	[_ _]
1/2".........	[_ _ _]	No. 50.......	[_ _]
3/8".........	[_ _]	No. 80.......	[_ _]
		No. 100......	[_ _]
		No. 200......	[_ _]

BULK SPECIFIC GRAVITIES (Items 5. to 8.)

* 5. COARSE AGGREGATE (AASHTO T85 OR ASTM C127) [_._ _ _]
* 6. FINE AGGREGATE (AASHTO T84 OR ASTM C128) [_._ _ _]
* 7. MINERAL FILLER (AASHTO T100 OR ASTM D854) [_._ _ _]
* 8. AGGREGATE COMBINATION (CALCULATED - EQ. 7.1) [_._ _ _]

9. EFFECTIVE SPECIFIC GRAVITY OF AGGREGATE COMBINATION (CALCULATED - EQ. 7.2) _._ _ _

*STATE ASSIGNED ID [_ _ _ _]

SHEET 24

REHABILITATION DATA

LTPP PROGRAM

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

COLD MIX RECYCLED ASPHALT PAVEMENT
UNTREATED AGGREGATE PROPERTIES

* 1. LAYER NUMBER (FROM SHEET 2) [_]

COMPOSITION OF COARSE AGGREGATE (Items 2., 3., and 4.)

			TYPE	PERCENT
Crushed Stone.... 1	Crushed Slag...... 4	* 2.	[_]	[_ _ _._]
Gravel........... 2	Manufactured	* 3.	[_]	[_ _ _._]
Crushed Gravel... 3	Lightweight..... 5	* 4.	[_]	[_ _ _._]
Other (Specify)________ 6				

* 5. GEOLOGIC CLASSIFICATION OF COARSE AGGREGATE [_ _]
(SEE GEOLOGIC CLASSIFICATION CODES, TABLE A.9)

COMPOSITION OF FINE AGGREGATE (Items 6., 7., and 8.)

		TYPE	PERCENT
Natural Sand...................... 1	* 6.	[_]	[_ _ _._]
Manufactured Sand (From	* 7.	[_]	[_ _ _._]
Crushed Gravel or Stone)......... 2	* 8.	[_]	[_ _ _._]
Recycled Concrete................. 3			
Other (Specify)________ 4			

SOURCE (Items 9. and 10.)

Reclaimed Base Material............... 1	* 9.	COARSE	[_]
Pit (Original Use).................... 2	* 10.	FINE	[_]

*11. TYPE OF MINERAL FILLER [_]

Stone Dust........ 1 Portland Cement... 3
Hydrated Lime..... 2 Fly Ash........... 4
Other (Specify)________ 5

AGGREGATE DURABILITY TEST RESULTS (Items 12. to 15.)
(SEE DURABILITY TEST TYPE CODES, TABLE A.13)

	TYPE OF AGGREGATE	TYPE OF TEST	RESULTS
12.	COARSE	_ _	_ _ _._ _ _
13.	COARSE	_ _	_ _ _._ _ _
14.	COARSE	_ _	_ _ _._ _ _
15.	COMBINED COARSE AND FINE	_ _	_ _ _._ _ _

16. POLISH VALUE OF COARSE AGGREGATES _ _.
(SURFACE LAYER ONLY) (AASHTO T279, ASTM D3319)

SHEET 25	*STATE ASSIGNED ID [_ _ _ _]
REHABILITATION DATA	*STATE CODE [_ _]
LTPP PROGRAM	*SHRP SECTION ID [_ _ _ _]

COLD MIX RECYCLED ASPHALT PAVEMENT
UNTREATED AGGREGATE PROPERTIES (CONTINUED)

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. GRADATION OF UNTREATED AGGREGATES

SIEVE SIZE OR NO.	% PASSING	SIEVE SIZE OR NO.	% PASSING
2"...........	[_ _ _]	No. 4........	[_ _]
1 1/2".......	[_ _ _]	No. 8........	[_ _]
1"...........	[_ _ _]	No. 10.......	[_ _]
7/8".........	[_ _ _]	No. 16.......	[_ _]
3/4 "........	[_ _ _]	No. 30.......	[_ _]
5/8".........	[_ _ _]	No. 40.......	[_ _]
1/2".........	[_ _ _]	No. 50.......	[_ _]
3/8".........	[_ _]	No. 80.......	[_ _]
		No. 100......	[_ _]
		No. 200......	[_ _]

BULK SPECIFIC GRAVITIES (Items 3. to 6.)

* 3. COARSE AGGREGATE (AASHTO T85 OR ASTM C127) [_._ _ _]

* 4. FINE AGGREGATE (AASHTO T84 OR ASTM C128) [_._ _ _]

* 5. MINERAL FILLER (AASHTO T100 OR ASTM D854) [_._ _ _]

* 6. AGGREGATE COMBINATION (CALCULATED - EQ. 7.1) [_._ _ _]

7. EFFECTIVE SPECIFIC GRAVITY OF AGGREGATE COMBINATION (CALCULATED - EQ. 7.2) _._ _ _

SHEET 26

REHABILITATION DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

COLD MIX RECYCLED ASPHALT PAVEMENT
COMBINED AGGREGATE PROPERTIES

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. AMOUNT OF NEW UNTREATED AGGREGATE ADDED [_ _._]
(PERCENT BY WEIGHT OF COMBINED AGGREGATE IN RECYCLED MIX)

* 3. GRADATION OF COMBINED AGGREGATES

Sieve Size or No.	% Passing	Sieve Size or No.	% Passing
2"...........	[_ _ _]	No. 4........	[_ _]
1 1/2".......	[_ _ _]	No. 8........	[_ _]
1"...........	[_ _ _]	No. 10.......	[_ _]
7/8".........	[_ _ _]	No. 16.......	[_ _]
3/4 "........	[_ _ _]	No. 30.......	[_ _]
5/8".........	[_ _ _]	No. 40.......	[_ _]
1/2".........	[_ _ _]	No. 50.......	[_ _]
3/8".........	[_ _]	No. 80.......	[_ _]
		No. 100......	[_ _]
		No. 200......	[_ _]

BULK SPECIFIC GRAVITIES (Items 4. to 7.)

* 4. COARSE AGGREGATE (AASHTO T85 OR ASTM C127) [_._ _ _]

* 5. FINE AGGREGATE (AASHTO T84 OR ASTM C128) [_._ _ _]

* 6. MINERAL FILLER (AASHTO T100 OR ASTM D854) [_._ _ _]

* 7. AGGREGATE COMBINATION (CALCULATED - EQ. 7.1) [_._ _ _]

8. EFFECTIVE SPECIFIC GRAVITY OF AGGREGATE
COMBINATION (CALCULATED - EQ. 7.2) _._ _ _

SHEET 27	*STATE ASSIGNED ID [_ _ _ _]
REHABILITATION DATA	*STATE CODE [_ _]
LTPP PROGRAM	*SHRP SECTION ID [_ _ _ _]

COLD MIX RECYCLED ASPHALT PAVEMENT
RECLAIMED ASPHALT CEMENT PROPERTIES

* 1. LAYER NUMBER (FROM SHEET 2)	[_]
* 2. SPECIFIC GRAVITY OF ASPHALT CEMENT (AASHTO T228 OR ASTM D70)	[_._ _ _]
* 3. VISCOSITY OF ASPHALT AT 140°F (POISES) (AASHTO T202 OR ASTM D2171)	[_ _ _ _ _ _ _.]
* 4. VISCOSITY OF ASPHALT AT 275°F (CENTISTOKES) (AASHTO T201 OR ASTM D2170)	[_ _ _ _._ _]
* 5. PENETRATION AT 77°F (AASHTO T49 OR ASTM D5) (TENTHS OF A MM) (100 G., 5 SEC.)	[_ _ _.]
6. DUCTILITY AT 77°F (CM) (AASHTO T51 OR ASTM D113)	_ _ _.
7. DUCTILITY AT 39.2°F (CM) (AASHTO T51 OR ASTM D113)	_ _ _.
8. TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (CM/MIN)	_ _ _.
9. PENETRATION AT 39.2°F (AASHTO T49 OR ASTM D5) (TENTHS OF A MM) (200 G., 60 SEC.)	_ _ _.
10. RING AND BALL SOFTENING POINT (AASHTO T53) (°F)	_ _ _.

SHEET 28

REHABILITATION DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

COLD MIX RECYCLED ASPHALT PAVEMENT
NEW ASPHALT CEMENT PROPERTIES

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. ASPHALT GRADE (SEE ASPHALT CODE SHEET, TABLE A.16) [_ _]
(IF OTHER, SPECIFY ____________________)

* 3. SOURCE (SEE SUPPLY CODE SHEET, TABLE A.14) [_ _]
(IF OTHER, SPECIFY ____________________)

* 4. SPECIFIC GRAVITY OF ASPHALT CEMENT
(AASHTO T228 OR ASTM D70) [_._ _ _]

* 5. VISCOSITY OF ASPHALT AT 140°F (POISES)
(AASHTO T202 OR ASTM D2171) [_ _ _ _ _ _.]

* 6. VISCOSITY OF ASPHALT AT 275°F (CENTISTOKES)
(AASHTO T201 OR ASTM D2170) [_ _ _ _._ _]

* 7. PENETRATION AT 77°F (AASHTO T49 OR ASTM D5)
(TENTHS OF A MM) (100 G., 5 SEC.) _ _ _.

* 8. SAYBOLT FUROL VISCOSITY OF EMULSIFIED ASPHALT AT 77°F (IN SECONDS)
(AASHTO T72 OR ASTM D88) [_ _ _ _._ _]

* 9. RESIDUE BY DISTILLATION (PERCENT) [_ _.]
(AASHTO T59 OR ASTM D244)

10. COATING ABILITY AND WATER TEST
(AASHTO T59 OR ASTM D244)

Good..... 1		DRY AGGREGATE	_
Fair..... 2		AFTER SPRAYING	_
Poor..... 3		WET AGGREGATE	_
		AFTER SPRAYING	_

11. DUCTILITY AT 77°F (CM)
(AASHTO T51 OR ASTM D113) _ _ _.

12. DUCTILITY AT 39.2°(CM)
(AASHTO T51 OR ASTM D113) _ _ _.

13. TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (CM/MIN) _ _ _.

14. PENETRATION AT 39.2°F (AASHTO T49 OR ASTM D5)
(TENTHS OF A MM) (200 G., 60 SEC.) _ _ _.

15. RING AND BALL SOFTENING POINT (AASHTO T53) (°F) _ _ _.

SHEET 29	*STATE ASSIGNED ID [_ _ _ _]
REHABILITATION DATA	*STATE CODE [_ _]
LTPP PROGRAM	*SHRP SECTION ID [_ _ _ _]

COLD MIX RECYCLED ASPHALT PAVEMENT
COMBINED ASPHALT CEMENT PROPERTIES

* 1. LAYER NUMBER (FROM SHEET 2) [_]

	TYPE	QUANTITY(%)
* 2. RECYCLING AGENT (SEE TYPE CODE, TABLE A.20) (IF OTHER, SPECIFY TYPE ____________)	[_ _.]	[_ _.]

* 3. AMOUNT OF NEW ASPHALT CEMENT ADDED (PERCENT BY WEIGHT OF RECYCLED MIXTURE WEIGHT) [_ _._]

* 4. SPECIFIC GRAVITY OF ASPHALT CEMENT (AASHTO T228 OR ASTM D70) [_._ _ _]

* 5. VISCOSITY OF ASPHALT AT 140°F (POISES) (AASHTO T202 OR ASTM D2171) [_ _ _ _ _ _.]

* 6. VISCOSITY OF ASPHALT AT 275°F (CENTISTOKES) (AASHTO T201 OR ASTM D2170) [_ _ _ _._ _]

* 7. PENETRATION AT 77°F (AASHTO T49 OR ASTM D5) (TENTHS OF A MM) (100 G., 5 SEC.) [_ _ _.]

ASPAHLT MODIFIERS (SEE TYPE CODE, TABLE A.15) (Items 8. and 9.)

(OTHER THAN RECYCLING AGENT)	TYPE	QUANTITY(%)
* 8. MODIFIER #1	[_ _]	[_ _.]
* 9. MODIFIER #2	[_ _]	[_ _.]

(IF OTHER, SPECIFY TYPE ____________)

10. DUCTILITY AT 77°F (CM) (AASHTO T51 OR ASTM D113) _ _ _.

11. DUCTILITY AT 39.2°(CM) (AASHTO T51 OR ASTM D113) _ _ _.

12. TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (CM/MIN) _ _ _.

13. PENETRATION AT 39.2°F (AASHTO T49 OR ASTM D5) (TENTHS OF A MM) (200 G., 60 SEC.) _ _ _.

14. RING AND BALL SOFTENING POINT (AASHTO T53) (°F) _ _ _.

SHEET 30

REHABILITATION DATA

LTPP PROGRAM

*STATE ASSIGNED ID	[_ _ _ _]
*STATE CODE	[_ _]
*SHRP SECTION ID	[_ _ _ _]

COLD MIX RECYCLED ASPHALT PAVEMENT
LABORATORY AGED COMBINED ASPHALT CEMENT PROPERTIES

* 1. LAYER NUMBER (FROM SHEET 2)	[_]
2. TEST PROCEDURE USED TO MEASURE AGING EFFECTS ASTM D1754 - Thin Film Oven Test.......... 1 ASTM D2872 - Rolling Thin Film Oven Test.. 2 Other (Specify)____________________________ 3	_
3. VISCOSITY OF ASPHALT AT 140°F (POISES) (AASHTO T202 OR ASTM D2171)	_ _ _ _ _ _.
4. VISCOSITY OF ASPHALT AT 275°F (CENTISTOKES) (AASHTO T201 OR ASTM D2170)	_ _ _ _._ _
5. DUCTILITY AT 77°F (CM) (AASHTO T51 OR ASTM D113)	_ _ _.
6. DUCTILITY AT 39.2°F (CM) (AASHTO T51 OR ASTM D113)	_ _ _.
7. TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (CM/MIN)	_ _._
8. PENETRATION AT 77°F, 100 G., 5 SEC. (TENTHS OF A MM) (AASHTO T49 OR ASTM D5)	_ _ _.
9. PENETRATION AT 39.2°F, 200 G., 60 SEC. (TENTHS OF A MM) (AASHTO T49 OR ASTM D5)	_ _.
10. RING AND BALL SOFTENING POINT (°F) (AASHTO T53)	_ _ _.
11. WEIGHT LOSS (PERCENT)	_._

SHEET 31	*STATE ASSIGNED ID [_ _ _ _]
REHABILITATION DATA	*STATE CODE [_ _]
LTPP PROGRAM	*SHRP SECTION ID [_ _ _ _]

COLD MIX RECYCLED ASPHALT PAVEMENT
LABORATORY MIXTURE DESIGN

* 1. **LAYER NUMBER (FROM SHEET 2)** [_]

2. MAXIMUM SPECIFIC GRAVITY (NO AIR VOIDS) (EQ. 7.3) _._ _ _

3. BULK SPECIFIC GRAVITY (ASTM D1188) _._ _ _

4. OPTIMUM ASPHALT CONTENT (PERCENT WEIGHT OF TOTAL MIX) (AASHTO T164 OR ASTM D2172) [_ _._]

5. PERCENT AIR VOIDS (EQ. 7.4) _ _._

6. MARSHALL STABILITY (LBS) (AASHTO T245 OR ASTM D1559) _ _ _ _.

7. NUMBER OF BLOWS _ _.

8. MARSHALL FLOW (HUNDREDTHS OF AN INCH) (AASHTO T245 OR ASTM D1559) _ _ _ _.

9. HVEEM STABILITY (AASHTO T246 OR ASTM D1561) _ _ _.

10. HVEEM COHESIOMETER VALUE (GRAMS/25 MM OF WIDTH) (AASHTO T246 OR ASTM D1561) _ _ _ _.

*STATE ASSIGNED ID [_ _ _ _]

SHEET 32

REHABILITATION DATA

LTPP PROGRAM

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

COLD MIX RECYCLED ASPHALT PAVEMENT MIXTURE PROPERTIES AS PLACED

* 1. LAYER NUMBER (FROM SHEET 2) [_]

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

* 3. MAXIMUM SPECIFIC GRAVITY (NO AIR VOIDS) (EQ. 7.3) [_._ _ _]

* 4. BULK SPECIFIC GRAVITY (ASTM D1188)
 MEAN ....[_._ _ _] NUMBER OF TESTS ...... _ _
 MINIMUM ...... _._ _ _ MAXIMUM .... _._ _ _
 STD. DEV. ..... _._ _ _

* 5. ASPHALT CONTENT (PERCENT WEIGHT OF TOTAL MIX) (AASHTO T164 OR ASTM D2172)
 MEAN ....[_ _._] NUMBER OF TESTS ...... _ _
 MINIMUM .... _ _._ MAXIMUM .... _ _._
 STD. DEV. .... _ _._

* 6. PERCENT AIR VOIDS (EQ. 7.4)
 MEAN ....[_ _._] NUMBER OF TESTS ...... _ _
 MINIMUM .... _ _._ MAXIMUM .... _ _._
 STD. DEV. .... _ _._

7. VOIDS IN MINERAL AGGREGATE (PERCENT) (EQ. 7.5)
 MEAN .... _ _._ NUMBER OF TESTS .... _ _
 MINIMUM ...... _ _._ MAXIMUM .... _ _._
 STD. DEV...... _ _._

8. EFFECTIVE ASPHALT CONTENT (PERCENT) (SEE EQ. 7.6)
 MEAN .... _ _._ NUMBER OF TESTS .... _ _
 MINIMUM .... _ _._ MAXIMUM .... _ _._
 STD. DEV. ..... _ _._

*STATE ASSIGNED ID [_ _ _ _]

SHEET 33

*STATE CODE [_ _]

REHABILITATION DATA

*SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

COLD MIX RECYCLED ASPHALT PAVEMENT
MIXTURE PROPERTIES AS PLACED (CONTINUED) AND CONSTRUCTION DATA

*** 1. LAYER NUMBER (FROM SHEET 2)** [_]

MIXTURE PROPERTIES AS PLACED (CONTINUED)

*** 2. TYPE OF ANTISTRIPPING AGENT**
(SEE TYPE CODES, TABLE A.21) [_ _]
(OTHER, SPECIFY_______________________________)

*** 3. ANTISTRIPPING AGENT LIQUID OR SOLID CODE** [_]
Liquid......... 1 Solid 2

*** 4. AMOUNT OF ANTISTRIPPING AGENT** [_ _._]
(IF LIQUID, ENTER AMOUNT AS PERCENT OF ASPHALT CEMENT WEIGHT.
IF SOLID, ENTER AMOUNT AS PERCENT OF AGGREGATE WEIGHT.)

5. MOISTURE SUSCEPTIBILITY TEST TYPE _
AASHTO T165 (ASTM D1075)............................1
Texas Freeze-Thaw Pedestal Test (Ref 21)............2
Texas Boiling Test (Ref 22)..........................3
Revised Lottman Procedure (AASHTO T283).............4
Other (Specify) ____________________________5

6. MOISTURE SUSCEPTIBILITY TEST RESULTS
HVEEM STABILITY NO. _ _.
PERCENT STRIPPED _ _.
TENSILE STRENGTH RATIO (AASHTO T283) _._ _
INDEX OF RETAINED STRENGTH (AASHTO T165) _ _ _.

CONSTRUCTION DATA

*** 7. TYPE OF RECYCLING** [_]
IN-PLACE................1 CENTRAL PLANT...........2

*** 8. PROCEDURES FOR MIXING IN PLACE** [_]
BLADE MIXING............1 TRAVEL PLANT MIXING.....3
ROTARY MIXING...........2 OTHER (SPECIFY)_________4

*** 9. TYPE ASPHALT PLANT (IF CENTRALLY MIXED)** [_]
BATCH PLANT.............1 DRUM MIX PLANT..........2
OTHER (SPECIFY)_____________________________3

10. WAS MIXTURE AERATED? (YES - 1, NO - 2) _
11. PERIOD BETWEEN MIXING AND SPREADING (IN HOURS) _ _ _.

*STATE ASSIGNED ID [_ _ _ _]

SHEET 34

*STATE CODE [_ _]

REHABILITATION DATA

*SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

COLD MIX RECYCLED ASPHALT PAVEMENT
CONSTRUCTION DATA (CONTINUED)

* 1. LAYER NUMBER (SEE SHEET 2) [_]

2. METHOD OF SPREADING MIXTURE [_]
   Motor Grader........... 1   Front-Mounted Spreader. 3
   Asphalt Paver.......... 2   Towed Spreader......... 4
   Other (Specify)________________ 5

ROLLER DATA (Items 3. to 19.)

	ROLLER CODE #	ROLLER DESCRIPTION	GROSS WGT (TONS)	TIRE PRES. (PSI)	FREQ. (VIBR/MIN)	AMPLITUDE (IN)	SPEED (MPH)
3.	A	STEEL-WHL TANDEM	_ _ . _				
4.	B	STEEL-WHL TANDEM	_ _ . _				
5.	C	STEEL-WHL TANDEM	_ _ . _				
6.	D	STEEL-WHL TANDEM	_ _ . _				
7.	E	PNEUMATIC-TIRED	_ _ . _	_ _ _ .			
8.	F	PNEUMATIC-TIRED	_ _ . _	_ _ _ .			
9.	G	PNEUMATIC-TIRED	_ _ . _	_ _ _ .			
10.	H	PNEUMATIC-TIRED	_ _ . _	_ _ _ .			
11.	I	SINGLE-DRUM VIBR.	_ _ . _		_ _ _ _ .	. _ _ _	_ _ . _
12.	J	SINGLE-DRUM VIBR.	_ _ . _		_ _ _ _ .	. _ _ _	_ _ . _
13.	K	SINGLE-DRUM VIBR.	_ _ . _		_ _ _ _ .	. _ _ _	_ _ . _
14.	L	SINGLE-DRUM VIBR.	_ _ . _		_ _ _ _ .	. _ _ _	_ _ . _
15.	M	DOUBLE-DRUM VIBR.	_ _ . _		_ _ _ _ .	. _ _ _	_ _ . _
16.	N	DOUBLE-DRUM VIBR.	_ _ . _		_ _ _ _ .	. _ _ _	_ _ . _
17.	O	DOUBLE-DRUM VIBR.	_ _ . _		_ _ _ _ .	. _ _ _	_ _ . _
18.	P	DOUBLE-DRUM VIBR.	_ _ . _		_ _ _ _ .	. _ _ _	_ _ . _
19.	Q	OTHER ________________					

COMPACTION DATA (Item 20. to 28.)

BREAKDOWN:
20. ROLLER CODE # (A-Q) _
21. COVERAGES _ _ .

INTERMEDIATE:
22. ROLLER CODE # (A-Q) _
23. COVERAGES _ _ .

FINAL:
24. ROLLER CODE # (A-Q) _
25. COVERAGES _ _ .
26. AIR TEMPERATURE (°F) _ _ _ .
27. COMPACTED THICKNESS (IN) _ . _
28. CURING PERIOD (DAYS) _ _ .

*STATE ASSIGNED ID [_ _ _ _]

SHEET 35

REHABILITATION DATA

LTPP PROGRAM

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

HEATER SCARIFICATION SURFACE RECYCLED ASPHALT PAVEMENT

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. TYPE OF HEATER SCARIFICATION [_]
Multiple Unit Process.. 1 Single Unit Process.... 2

* 3. DEPTH OF SCARIFICATION (INCHES) [_ . _]

* 4. TYPE OF SURFACE TREATMENT [_]

None..................	1	Slurry Seal............	4
Aggregate Seal........	2	Sand Seal..............	5
Fog Seal..............	3	HMAC Overlay...........	6
Other (Specify)________________________			7

* 5. TYPE OF REJUVENATING AGENT (CODES - TABLE A.20) [_ _]

* 6. AMOUNT OF REJUVENATING AGENT [_ _ . _]
(PERCENT OF MIXTURE BY WEIGHT)

7. ROLLER DATA

ROLLER CODE #	ROLLER DESCRIPTION	GROSS WGT (TONS)	TIRE PRES. (PSI)	FREQ. (VIBR/MIN)	AMPLITUDE (IN)	SPEED (MPH)
A	STEEL-WHL TANDEM	_ _ . _				
B	STEEL-WHL TANDEM	_ _ . _				
C	PNEUMATIC-TIRED	_ _ . _	_ _ _ .			
D	PNEUMATIC-TIRED	_ _ . _	_ _ _ .			
E	SINGLE-DRUM VIBR.	_ _ . _		_ _ _ _ .	. _ _ _	_ _ . _
F	SINGLE-DRUM VIBR.	_ _ . _		_ _ _ _ .	. _ _ _	_ _ . _
G	DOUBLE-DRUM VIBR.	_ _ . _		_ _ _ _ .	. _ _ _	_ _ . _
H	DOUBLE-DRUM VIBR.	_ _ . _		_ _ _ _ .	. _ _ _	_ _ . _
I	OTHER (SPECIFY)________________________					

8. COMPACTION DATA

	ROLLER CODE	COVERAGES
BREAKDOWN	_	_ _
INTERMEDIATE	_	_ _
FINAL	_	_ _

9. LENGTH OF TIME BETWEEN HEATER SCARIFICATION AND ADDITION OF SURFACE TREATMENT (DAYS) _ _ .

10. LENGTH OF TIME BETWEEN SURFACING AND OPENING ROAD TO TRAFFIC (DAYS) _ _ .

SHEET 36

REHABILITATION DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

PORTLAND CEMENT CONCRETE OVERLAY
JOINT DATA

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. AVERAGE CONTRACTION JOINT SPACING (FEET) [_ _ _._]

3. (RANDOM JOINT SPACING, IF ANY:_______________)

* 4. BUILT-IN EXPANSION JOINT SPACING (FEET) [_ _ _ _.]

* 5. SKEWNESS OF JOINTS (FT/LANE) [_._]

* 6. TRANSVERSE CONTRACTION JOINT LOAD TRANSFER SYSTEM [_]

Round Dowels	1	I-Beams	3
Aggregate Interlock	2	Star Lugs	4
		Keyways	5
Other (Specify)_______________			6

* 7. ROUND DOWEL DIAMETER (INCHES) [_._]

* 8. DOWEL OR MECHANICAL LOAD TRANSFER DEVICE SPACING (INCHES) [_ _.]

9. AVERAGE INTERMEDIATE SAWED JOINT SPACING (FEET) _ _._

DIMENSIONS FOR I-BEAMS OR KEYWAYS (Items 10. and 11.)

10. HEIGHT (INCHES) _._ _
11. WIDTH (INCHES) _._ _

12. DISTANCE OF NEAREST DOWEL (OR MECHANICAL LOAD TRANSFER DEVICE) FROM OUTSIDE LANE-SHOULDER EDGE (INCHES) _ _._

13. DOWEL LENGTH (INCHES) _ _.

14. DOWEL COATING _

Paint and/or Grease	1	Stainless Steel	4
Plastic	2	Epoxy	5
Monel	3		
Other (Specify)_______________			6

15. METHOD USED TO INSTALL MECHANICAL LOAD TRANSFER DEVICES _

Preplaced on Baskets	1
Mechanically Installed	2
Other (Specify)_______________	3

SHEET 37

REHABILITATION DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

PORTLAND CEMENT CONCRETE OVERLAY JOINT DATA (CONTINUED)

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. METHOD USED TO FORM TRANSVERSE JOINTS [_]

Sawed.................. 1 Metal Insert
Plastic Insert......... 2 (i.e., Uni-Tube).... 3
Other (Specify)_______________ 4

* 3. TYPE OF LONGITUDINAL JOINT (BETWEEN LANES) [_]

Butt................... 1 Sawed Weakened Plane... 3
Keyed.................. 2 Insert Weakened Plane.. 4
Other (Specify)_______________ 5

* 4. TYPE OF SHOULDER-TRAFFIC LANE JOINT [_]

Butt................... 1 Insert Weakened Plane.. 4
Keyed.................. 2 Tied Concrete Curb..... 5
Sawed Weakened Plane... 3
Other (Specify)_______________ 6

5. TRANSVERSE JOINT SEALANT TYPE (AS BUILT) _

Preformed (Open Web)... 1 Rubberized Asphalt..... 3
Asphalt................ 2 Low-Modulus Silicone... [illegible]
Other (Specify)_______________ [illegible]

6. TRANSVERSE JOINT SEALANT RESERVOIR WIDTH (INCHES) _._ _
7. TRANSVERSE JOINT SEALANT RESERVOIR DEPTH (INCHES) _._ _
8. LONGITUDINAL JOINT SEALANT RESERVOIR WIDTH (INCHES) _._ _
9. LONGITUDINAL JOINT SEALANT RESERVOIR DEPTH (INCHES) _._ _

10. JOINT SEALANT BACKER MATERIAL TYPE _

Foam Backer Rod....1 Tape......2 Rope........3
None...............4 Other (Specify)__________4

11. JOINT SEALANT BACKER DIMENSION (INCHES) _._ _
(Enter diameter of rod/rope or width of tape)

12. BETWEEN LANE TIE BAR DIAMETER (INCHES) _._ _
13. BETWEEN LANE TIE BAR LENGTH (INCHES) _ _.
14. BETWEEN LANE TIE BAR SPACING (INCHES) _ _._

SHOULDER-TRAFFIC LANE JOINT SEALANT RESERVOIR (Items 15. and 16.)

15. WIDTH (INCHES) _._ _
16. DEPTH (INCHES) _._ _

SHOULDER-TRAFFIC LANE JOINT TIE BARS (Items 17, 18., and 19.)

17. DIAMETER (INCHES) _._ _
18. LENGTH (INCHES) _ _.
19. SPACING (INCHES) _ _.

SHEET 38

REHABILITATION DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

PORTLAND CEMENT CONCRETE OVERLAY
REINFORCING STEEL DATA

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. TYPE OF REINFORCING [_]
  Deformed Bars 1
  Welded Wire Fabric 2
  Other (specify)________________ 3

* 3. TRANSVERSE BAR DIAMETER (INCHES) [_._ _]

* 4. TRANSVERSE BAR SPACING (INCHES) [_ _._]

* 5. LONGITUDINAL BAR DIAMETER (INCHES) [_._ _]

* 6. DESIGN PERCENTAGE OF LONGITUDINAL STEEL (%) [_._ _]

* 7. DEPTH TO REINFORCEMENT FROM SLAB SURFACE (INCHES) _._

* 8. LONGITUDINAL BAR SPACING (INCHES) _ _._

9. YIELD STRENGTH OF REINFORCING STEEL (KSI) _ _._

10. METHOD USED TO PLACE REINFORCEMENT _
  Preset on Chairs 1
  Mechanically 2
  Between Layers of Concrete 3
  Other (Specify)________________ 4

11. LAP LENGTH OF LONGITUDINAL STEEL SPLICES (INCHES) _ _.
  (CRCP ONLY)

*STATE ASSIGNED ID [_ _ _ _]

SHEET 39

*STATE CODE [_ _]

REHABILITATION DATA

*SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

PORTLAND CEMENT CONCRETE OVERLAY MIXTURE DATA

* 1. LAYER NUMBER (FROM SHEET 2) [_]

MIX DESIGN (LB./CU.YD. - OVEN DRIED WEIGHT) (Items 2. to 5.)

* 2. COARSE AGGREGATE [_ _ _ _ .]
* 3. FINE AGGREGATE [_ _ _ _ .]
* 4. CEMENT [_ _ _ _ .]
* 5. WATER [_ _ _ _ .]

* 6. CEMENT TYPE USED (See Cement Type Codes, Table A.11) [_ _]
(IF OTHER, SPECIFY ______________________________)

* 7. ALKALI CONTENT OF CEMENT (PERCENT BY WEIGHT OF CEMENT) [_ _ . _]

ENTRAINED AIR CONTENT (PERCENT) (Items 8., 9., and 10.)
(AASHTO T121, T152, OR T196)

* 8. MEAN [_ . _]
9. MINIMUM _ . _
10. MAXIMUM _ . _

ADMIXTURES (Items 11., 12., and 13.)

	TYPE CODE	AMOUNT
*11. ADMIXTURE #1	[_ _]	[_ _ _ . _ _ _]
*12. ADMIXTURE #2	[_ _]	[_ _ _ . _ _ _]
*13. ADMIXTURE #3	[_ _]	[_ _ _ . _ _ _]

(SEE PCC ADMIXTURE CODES, TABLE A.12)
(IF OTHER, SPECIFY ______________________________)

SLUMP (Items 14. to 18.) (AASHO T119 OR ASTM C143)

14. MEAN (INCHES) _ . _
15. MINIMUM (INCHES) _ . _
16. MAXIMUM (INCHES) _ . _
17. STANDARD DEVIATION (INCHES) _ . _
18. NUMBER OF TESTS _ _ _ .

*STATE ASSIGNED ID [_ _ _ _]

SHEET 40

*STATE CODE [_ _]

REHABILITATION DATA

*SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

PORTLAND CEMENT CONCRETE OVERLAY
AGGREGATE DATA

* 1. LAYER NUMBER (FROM SHEET 2) [_]

COMPOSITION OF COARSE AGGREGATE (Items 2., 3., and 4.)

			TYPE	PERCENT
Crushed Stone.. 1	Manufactured	* 2.	[_]	[_ _ _.]
Gravel......... 2	Lightweight....... 5	* 3.	[_]	[_ _ _.]
Crushed Gravel. 3	Recycled Concrete... 6	* 4.	[_]	[_ _ _.]
Crushed Slag... 4				
Other (Specify)_______ 7				

* 5. GEOLOGIC CLASSIFICATION OF COARSE AGGREGATE [_ _]
(SEE GEOLOGIC CLASSIFICATION CODES, TABLE A.9)

COMPOSITION OF FINE AGGREGATE (Items 6., 7., and 8.)

		TYPE	PERCENT
Natural Sand....................... 1	* 6.	[_]	[_ _ _.]
Manufactured Sand (From	* 7.	[_]	[_ _ _.]
Crushed Gravel or Stone)........... 2	* 8.	[_]	[_ _ _.]
Recycled Concrete.................. 3			
Other (Specify)_______ 4			

9. INSOLUBLE RESIDUE (PERCENT) (ASTM D3042) _ _ _.

GRADATION OF AGGREGATES (Items 10. and 11.)

* 10. COARSE AGGREGATE Sieve Size	% Passing	* 11. FINE AGGREGATE Sieve Size	% Passing
2".........	_ _ _	No. 4......	_ _ _
1 1/2".....	_ _ _	No. 8......	_ _ _
1".........	_ _ _	No. 10.....	_ _ _
7/8".......	_ _ _	No. 16.....	_ _
3/4".......	_ _ _	No. 30.....	_ _
5/8".......	_ _ _	No. 40.....	_ _
1/2".......	_ _	No. 50.....	_ _
3/8".......	_ _	No. 80.....	_ _
		No. 100....	_ _
		No. 200....	_ _

BULK SPECIFIC GRAVITIES (Items 12. and 13.)

*12. COARSE AGGREGATE (AASHTO T85 OR ASTM C127) _._ _ _

*13. FINE AGGREGATE (AASHTO T84 OR ASTM C128) _._ _ _

*STATE ASSIGNED ID [_ _ _ _]

SHEET 41

REHABILITATION DATA

LTPP PROGRAM

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

PORTLAND CEMENT CONCRETE OVERLAY
AGGREGATE DATA (CONTINUED) AND CONSTRUCTION DATA

* 1.LAYER NUMBER (FROM SHEET 2) [_]

AGGREGATE DATA (CONTINUED)

AGGREGATE DURABILITY TEST RESULTS (Items 2. to 5.)
(SEE DURABILITY TEST TYPE CODES, TABLE A.13)

TYPE OF AGGREGATE	TYPE OF TEST	RESULTS
2. COARSE	_ _	_ _ _._
3. COARSE	_ _	_ _ _._
4. COARSE	_ _	_ _ _._
5. COARSE AND FINE	_ _	_ _ _._

CONSTRUCTION DATA

* 6.TYPE OF PAVER USED [_]
Slip-Form Paver............ 1 Side-Form.............. 2
Other (Specify)________________________________ 3

AIR TEMPERATURES DURING PLACEMENT (°F) (Items 7., 8., and 9.)
* 7. MEAN [_ _ _.]
* 8. MINIMUM [_ _ _.]
* 9. MAXIMUM [_ _ _.]

*10.CURING PERIOD BEFORE OPENING TO ANY TRAFFIC (DAYS) [_ _.]

*11.TIME BEFORE SAWING JOINTS (HOURS) [_ _.]

12.METHOD USED TO CURE CONCRETE _
Membrane Curing Compound... 1 Burlap-Polyethylene Blanket. 5
Burlap Curing Blankets..... 2 Cotton Mat Curing........... 6
Waterproof Paper Blankets.. 3 Hay........................ 7
White Polyethylene Sheeting 4
Other (Specify)________________________________ 8

13.METHOD USED TO TEXTURE CONCRETE _
Tine...................... 1 Grooved Float.............. 4
Broom..................... 2 Astro Turf................. 5
Burlap Drag............... 3
Other (Specify)________________________________ 6

*STATE ASSIGNED ID [_ _ _ _]

SHEET 42

REHABILITATION DATA

LTPP PROGRAM

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

PORTLAND CEMENT CONCRETE OVERLAY
CONSTRUCTION DATA (CONTINUED)

* 1.LAYER NUMBER (FROM SHEET 2) [_]

* 2.BONDING CONDITION OF OVERLAY [_]
Unbonded.............. 1 Fully Bonded........... 3
Partially Bonded...... 2

* 3.SURFACE PREPARATION [_]
None.................. 1 Sand Blast............. 5
Sweep................. 2 Cold Mill.............. 6
Air Blast............. 3 Shot Blast............. 7
Water Blast........... 4
Other (Specify)___________________________________ 8

* 4.TYPE OF GROUT USED FOR BONDED OVERLAYS [_]
None.................. 1 Water/Cement/Sand...... 3
Water/Cement.......... 2 Epoxy-Resin............ 4
Other (Specify)___________________________________ 5

* 5.MATERIAL USED TO PREVENT BONDING FOR UNBONDED OVERLAYS [_]
Asphalt Concrete...... 1 Polypropylene Sheeting. 2
Other (Specify)___________________________________ 3

* 6.MEAN DIRECT SHEAR STRENGTH OF CORE AT
OVERLAY/SLAB INTERFACE (PSI) [_ _ _._]

* 7.AGE OF OVERLAY AT TIME OF DIRECT SHEAR TESTING (DAYS) [_ _ _.]

* 8.OVERLAY JOINTS MATCHED WITH EXISTING PAVEMENT SLAB JOINTS? [_]
No.................... 1 Yes.................... 2

SHEET 43

REHABILITATION DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

PORTLAND CEMENT CONCRETE OVERLAY
STRENGTH DATA

* 1. LAYER NUMBER (FROM SHEET 2) [_]

FLEXURAL STRENGTH (MODULUS OF RUPTURE) (Items 2. to 8.)

* 2. TYPE OF TEST [_]
THIRD-POINT LOADING (AASHTO T97 OR ASTM C78) 1
CENTER-POINT LOADING (AASHTO T177 OR ASTM C293) .. 2

* 3. AGE (DAYS) [_ _ _.]
* 4. MEAN (PSI) [_ _ _ _ _.]
5. MINIMUM (PSI) _ _ _ _ _.
6. MAXIMUM (PSI) _ _ _ _ _.
7. NUMBER OF TESTS _ _.
8. STD. DEV (PSI) _ _ _ _ _.

COMPRESSIVE STRENGTH (Items 9. to 14.) (TEST METHOD AASHTO T22 OR ASTM C39)

* 9. AGE (DAYS) [_ _ _.]
*10. MEAN (PSI) [_ _ _ _ _.]
11. MINIMUM (PSI) _ _ _ _ _.
12. MAXIMUM (PSI) _ _ _ _ _.
13. NUMBER OF TESTS _ _.
14. STD. DEV. (PSI) _ _ _ _ _.

SPLITTING TENSILE STRENGTH (Items 15. to 20.)
(TEST METHOD AASHTO T198 or ASTM C496)

15. AGE (DAYS) _ _ _.
16. MEAN (PSI) _ _ _ _ _.
17. MINIMUM (PSI) _ _ _ _.
18. MAXIMUM (PSI) _ _ _ _.
19. NUMBER OF TESTS _ _.
20. STD. DEV. (PSI) _ _ _ _.

ELASTIC MODULUS (Items 21. to 26.)

21. MEAN (KSI) _ _ _ _ _.
22. MINIMUM (KSI) _ _ _ _ _.
23. MAXIMUM (KSI) _ _ _ _ _.
24. NUMBER OF TESTS _ _.
25. STD. DEV. (KSI) _ _ _ _ _.
26. METHOD FOR DETERMINATION OF ELASTIC MODULUS _
Compression Test on Cores (ASTM C469).............. 1
Compression Test on Cylinders Molded
During Construction (ASTM C469)................. 2
Calculated Using ACI Relation Between
Elastic Modulus and Compressive Strength
(ACI 318, Section 8.5) 3
Other (Specify)________________________________ 4

*STATE ASSIGNED ID [__ __ __ __]

SHEET 44

REHABILITATION DATA

LTPP PROGRAM

*STATE CODE [__ __]

*SHRP SECTION ID [__ __ __ __]

RECYCLED PORTLAND CEMENT CONCRETE
JOINT DATA

* 1. LAYER NUMBER (FROM SHEET 2) [__]

* 2. AVERAGE CONTRACTION JOINT SPACING (FEET) [__ __ __.__]

3. (RANDOM JOINT SPACING, IF ANY:________________)

* 4. BUILT-IN EXPANSION JOINT SPACING (FEET) [__ __ __ __.]

* 5. SKEWNESS OF JOINTS (FT/LANE) [__.__]

* 6. TRANSVERSE CONTRACTION JOINT LOAD TRANSFER SYSTEM [__]

Round Dowels...........	1	I-Beams................	3
Aggregate Interlock....	2	Star Lugs..............	4
		Keyways................	5
Other (Specify)________________________			6

* 7. ROUND DOWEL DIAMETER (INCHES) [__.__]

* 8. DOWEL OR MECHANICAL LOAD TRANSFER DEVICE SPACING (INCHES) [__ __.]

9. AVERAGE INTERMEDIATE SAWED JOINT SPACING (FEET) __ __.__

DIMENSIONS FOR I-BEAMS OR KEYWAYS (Items 10. and 11.)

10. HEIGHT (INCHES) __.__ __

11. WIDTH (INCHES) __.__ __

12. DISTANCE OF NEAREST DOWEL (OR MECHANICAL LOAD TRANSFER DEVICE) FROM OUTSIDE LANE-SHOULDER EDGE (INCHES) __ __.__

13. DOWEL LENGTH (INCHES) __ __.

14. DOWEL COATING __

Paint and/or Grease....	1	Stainless Steel........	4
Plastic................	2	Epoxy	5
Monel..................	3		
Other (Specify)________________________			6

15. METHOD USED TO INSTALL MECHANICAL LOAD TRANSFER DEVICES __

Preplaced on Baskets.............................. 1
Mechanically Installed............................ 2
Other (Specify)________________________ 3

*STATE ASSIGNED ID [_ _ _ _]

SHEET 45

REHABILITATION DATA

LTPP PROGRAM

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

RECYCLED PORTLAND CEMENT CONCRETE JOINT DATA (CONTINUED)

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. METHOD USED TO FORM TRANSVERSE JOINTS [_]
Sawed.................. 1   Metal Insert
Plastic Insert......... 2   (i.e., Uni-Tube).... 3
Other (Specify)________ 4

* 3. TYPE OF LONGITUDINAL JOINT (BETWEEN LANES) [_]
Butt................... 1   Sawed Weakened Plane... 3
Keyed.................. 2   Insert Weakened Plane.. 4
Other (Specify)________ 5

* 4. TYPE OF SHOULDER-TRAFFIC LANE JOINT [_]
Butt................... 1   Insert Weakened Plane.. 4
Keyed.................. 2   Tied Concrete Curb..... 5
Sawed Weakened Plane... 3
Other (Specify)________ 6

5. TRANSVERSE JOINT SEALANT TYPE (AS BUILT) _
Preformed (Open Web)... 1   Rubberized Asphalt..... 3
Asphalt................ 2   Low-Modulus Silicone... 4
Other (Specify)________ 5

6. TRANSVERSE JOINT SEALANT RESERVOIR WIDTH (INCHES) _._ _
7. TRANSVERSE JOINT SEALANT RESERVOIR DEPTH (INCHES) _._ _
8. LONGITUDINAL JOINT SEALANT RESERVOIR WIDTH (INCHES) _._ _
9. LONGITUDINAL JOINT SEALANT RESERVOIR DEPTH (INCHES) _._ _

10. JOINT SEALANT BACKER MATERIAL TYPE _
Foam Backer Rod....1   Tape......2   Rope........3
None...............4   Other (Specify)________4

11. JOINT SEALANT BACKER DIMENSION (INCHES) _._ _
(Enter diameter of rod/rope or width of tape)

12. BETWEEN LANE TIE BAR DIAMETER (INCHES) _._ _
13. BETWEEN LANE TIE BAR LENGTH (INCHES) _ _.
14. BETWEEN LANE TIE BAR SPACING (INCHES) _ _._

SHOULDER-TRAFFIC LANE JOINT SEALANT RESERVOIR (Items 15. and 16.)
15. WIDTH (INCHES) _._ _
16. DEPTH (INCHES) _._ _

SHOULDER-TRAFFIC LANE JOINT TIE BARS (Items 17, 18., and 19.)
17. DIAMETER (INCHES) _._ _
18. LENGTH (INCHES) _ _.
19. SPACING (INCHES) _ _.

*STATE ASSIGNED ID [_ _ _ _]

SHEET 46

*STATE CODE [_ _]

REHABILITATION DATA

*SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

RECYCLED PORTLAND CEMENT CONCRETE
REINFORCING STEEL DATA

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. TYPE OF REINFORCING [_]
- Deformed Bars 1
- Welded Wire Fabric 2
- Other (specify)________________ 3

* 3. TRANSVERSE BAR DIAMETER (INCHES) [_._ _]

* 4. TRANSVERSE BAR SPACING (INCHES) [_ _._]

* 5. LONGITUDINAL BAR DIAMETER (INCHES) [_._ _]

* 6. DESIGN PERCENTAGE OF LONGITUDINAL STEEL (%) [_._ _]

* 7. DEPTH TO REINFORCEMENT FROM SLAB SURFACE (INCHES) _._

* 8. LONGITUDINAL BAR SPACING (INCHES) _ _._

9. YIELD STRENGTH OF REINFORCING STEEL (KSI) _ _._

10. METHOD USED TO PLACE REINFORCEMENT _
- Preset on Chairs 1
- Mechanically 2
- Between Layers of Concrete 3
- Other (Specify)________________ 4

11. LAP LENGTH OF LONGITUDINAL STEEL SPLICES (INCHES) _ _.
(CRCP ONLY)

*STATE ASSIGNED ID [_ _ _ _]

SHEET 47

*STATE CODE [_ _]

REHABILITATION DATA

*SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

RECYCLED PORTLAND CEMENT CONCRETE MIXTURE DATA

* 1.LAYER NUMBER (FROM SHEET 2) [_]

MIX DESIGN (LB./CU. YD. - OVEN DRIED WEIGHT) (Items 2. to 5.)

* 2. COARSE AGGREGATE [_ _ _ _.]
* 3. FINE AGGREGATE [_ _ _ _.]
* 4. CEMENT [_ _ _ _.]
* 5. WATER [_ _ _ _.]

* 6.TYPE CEMENT USED (SEE CEMENT TYPE CODES, TABLE A.11) [_ _]
(IF OTHER, SPECIFY ________________________________)

* 7.ALKALI CONTENT OF CEMENT (PERCENT BY WEIGHT OF CEMENT) [_ _._]

ENTRAINED AIR CONTENT (PERCENT) (Items 8., 9., and 10.)
(AASHTO T121, T152, OR T196)

* 8. MEAN [_._]
9. MINIMUM _._
10. MAXIMUM _._

PCC ADMIXTURES (Items 11., 12., and 13.)

	TYPE CODE	AMOUNT
*11.ADMIXTURE #1	[_ _]	[_ _ _._ _ _]
*12.ADMIXTURE #2	[_ _]	[_ _ _._ _ _]
*13.ADMIXTURE #3	[_ _]	[_ _ _._ _ _]

(SEE PCC ADMIXTURE CODES, TABLE A.12)
(IF OTHER, SPECIFY ________________________________)

SLUMP (Items 14. to 18.) (AASHTO T119 or ASTM C143)

14. MEAN (INCHES) _._
15. MINIMUM (INCHES) _._
16. MAXIMUM (INCHES) _._
17. STANDARD DEVIATION (INCHES) _._
18. NUMBER OF TESTS _ _ _.

*STATE ASSIGNED ID [_ _ _ _]

SHEET 48

REHABILITATION DATA

LTPP PROGRAM

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

RECYCLED PORTLAND CEMENT CONCRETE
NEW AGGREGATE DATA

* 1. LAYER NUMBER (FROM SHEET 2) [_]

COMPOSITION OF COARSE AGGREGATE (Items 2., 3., and 4.)

			TYPE	PERCENT
Crushed Stone.... 1	Manufactured	* 2.	[_]	[_ _ _ .]
Gravel........... 2	Lightweight....... 5	* 3.	[_]	[_ _ _ .]
Crushed Gravel... 3	Recycled Concrete... 6	* 4.	[_]	[_ _ _ .]
Crushed Slag..... 4				
Other (Specify)_______ 7				

* 5. GEOLOGIC CLASSIFICATION OF COARSE AGGREGATE [_ _ .]
(SEE GEOLOGIC CLASSIFICATION CODES, TABLE A.9)

COMPOSITION OF FINE AGGREGATE (Items 6., 7., and 8.)

		TYPE	PERCENT
Natural Sand....................... 1	* 6.	[_]	[_ _ _ .]
Manufactured Sand (From	* 7.	[_]	[_ _ _ .]
Crushed Gravel or Stone)........... 2	* 8.	[_]	[_ _ _ .]
Recycled Concrete.................. 3			
Other (Specify)_______ 4			

9. INSOLUBLE RESIDUE (PERCENT) (ASTM D3042) _ _ _ .

GRADATION OF NEW AGGREGATES (Items 10. and 11.)

*10. COARSE AGGREGATE Sieve Size	% Passing	*11. FINE AGGREGATE Sieve Size	% Passing
2".........	[_ _ _]	No. 4......	[_ _ _]
1 1/2".....	[_ _ _]	No. 8......	[_ _ _]
1".........	[_ _ _]	No. 10.....	[_ _ _]
7/8".......	[_ _ _]	No. 16.....	[_ _]
3/4".......	[_ _ _]	No. 30.....	[_ _]
5/8".......	[_ _ _]	No. 40.....	[_ _]
1/2".......	[_ _]	No. 50.....	[_ _]
3/8".......	[_ _]	No. 80.....	[_ _]
		No. 100....	[_ _]
		No. 200....	[_ _]

BULK SPECIFIC GRAVITIES OF NEW AGGREGATES (Items 12. and 13.)

12. COARSE AGGREGATE (AASHTO T85 OR ASTM C127) [_._ _ _]

13. FINE AGGREGATE (AASHTO T84 OR ASTM C128) [_._ _ _]

*STATE ASSIGNED ID [_ _ _ _]

SHEET 49

*STATE CODE [_ _]

REHABILITATION DATA

*SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

RECYCLED PORTLAND CEMENT CONCRETE
NEW AGGREGATE DATA (CONTINUED) AND COMBINED AGGREGATE DATA

* 1.LAYER NUMBER (FROM SHEET 2) [_]

NEW AGGREGATE DATA (CONTINUED)
DURABILITY OF NEW AGGREGATES (Items 2. to 5.)
(SEE DURABILITY TEST TYPE CODES, TABLE A.13)

TYPE OF AGGREGATE	TYPE OF TEST	RESULTS
2. COARSE	_ _	_ _ _._
3. COARSE	_ _	_ _ _._
4. COARSE	_ _	_ _ _._
5. COARSE AND FINE	_ _	_ _ _._

* 6.AMOUNT OF NEW COARSE AGGREGATE ADDED [_ _ _.]
(PERCENT BY WEIGHT OF COMBINED COARSE AGGREGATE IN RECYCLED MIXTURE)

* 7.AMOUNT OF NEW FINE AGGREGATE ADDED [_ _ _.]
(PERCENT BY WEIGHT OF COMBINED FINE AGGREGATE IN RECYCLED MIXTURE)

COMBINED AGGREGATE DATA
GRADATION OF COMBINED AGGREGATES (Items 8. and 9.)

* 8.COARSE AGGREGATE Sieve Size	% Passing	* 9. FINE AGGREGATE Sieve Size	% Passing
2".........	[_ _ _]	No. 4......	[_ _ _]
1 1/2".....	[_ _ _]	No. 8......	[_ _ _]
1".........	[_ _ _]	No. 10.....	[_ _ _]
7/8".......	[_ _ _]	No. 16.....	[_ _]
3/4".......	[_ _ _]	No. 30.....	[_ _]
5/8".......	[_ _ _]	No. 40.....	[_ _]
1/2".......	[_ _]	No. 50.....	[_ _]
3/8".......	[_ _]	No. 80.....	[_ _]
		No. 100....	[_ _]
		No. 200....	[_ _]

BULK SPECIFIC GRAVITIES OF COMBINED AGGREGATES (Items 10. and 11.)

*10. COARSE AGGREGATE (AASHTO T85 OR ASTM C127) [_._ _ _]

*11. FINE AGGREGATE (AASHTO T84 OR ASTM C128) [_._ _ _]

DURABILITY OF COMBINED AGGREGATES (Items 12. to 15.)
(SEE DURABILITY TEST TYPE CODES, TABLE A.13)

TYPE OF AGGREGATE	TYPE OF TEST	RESULTS
12. COARSE	_ _	_ _ _._
13. COARSE	_ _	_ _ _._
14. COARSE	_ _	_ _ _._
15. COARSE AND FINE	_ _	_ _ _._

SHEET 50

REHABILITATION DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

RECYCLED PORTLAND CEMENT CONCRETE CONSTRUCTION DATA

*** 1. LAYER NUMBER (FROM SHEET 2)** [_]

*** 2. EQUIPMENT USED TO BREAK UP PCC PAVEMENT** [_]

- Surface Milling.. 1
- Vibratory Chisel or Hammer............................. 2
- Hydraulic Chisel or Hammer............................. 3
- Pneumatic Chisel or Hammer............................. 4
- Diesel Chisel or Hammer................................ 5
- Resonant Breaker....................................... 6
- Other (Specify)____ 7

*** 3. AVERAGE SIZE OF PCC PIECES AFTER BREAKING (INCHES)**

- **WIDTH** [_ _]
- **LENGTH** [_ _]

*** 4. HOW WERE CONCRETE PIECES AND REINFORCING STEEL (IF PRESENT) SEPARATED INITIALLY ON SITE?** [_]

- Reinforcing Steel Ruptured During PCC Breakup.......... 1
- Reinforcing Steel Cut by Torches....................... 2
- Reinforcing Steel Cut by Vibratory or Hydraulic Shears. 3
- Reinforcing Steel Removed by "Rhino Bars"............. 4
- Other (Specify)____ 5

SHEET 51

REHABILITATION DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

RECYCLED PORTLAND CEMENT CONCRETE
CONSTRUCTION DATA (CONTINUED)

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. TYPE OF PAVER USED [_]
Slip-Form Paver............ 1 Side-Form............... 2
Other (Specify)________________________________ 3

AIR TEMPERATURES DURING PLACEMENT (°F) (Items 3., 4., and 5.)
* 3. MEAN [_ _ _.]
* 4. MINIMUM [_ _ _.]
* 5. MAXIMUM [_ _ _.]

* 6. CURING PERIOD BEFORE OPENING TO ANY TRAFFIC (DAYS) [_ _.]

* 7. TIME BEFORE SAWING JOINTS (HOURS) [_ _.]

8. METHOD USED TO CURE CONCRETE _
Membrane Curing Compound... 1 Burlap-Polyethylene Blanket. 5
Burlap Curing Blankets..... 2 Cotton Mat Curing........... 6
Waterproof Paper Blankets.. 3 Hay......................... 7
White Polyethylene Sheeting 4
Other (Specify)________________________________ 8

9. METHOD USED TO TEXTURE CONCRETE _
Tine....................... 1 Grooved Float............... 4
Broom...................... 2 Astro Turf.................. 5
Burlap Drag................ 3
Other (Specify)________________________________ 6

SHEET 52

REHABILITATION DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

RECYCLED PORTLAND CEMENT CONCRETE STRENGTH DATA

* 1. LAYER NUMBER (FROM SHEET 2) [_]

FLEXURAL STRENGTH (MODULUS OF RUPTURE) (Items 2. to 8.)

* 2. TYPE OF TEST [_]
  THIRD-POINT LOADING (AASHTO T97 OR ASTM C78) 1
  CENTER-POINT LOADING (AASHTO T177 OR ASTM C293) .. 2

* 3. AGE (DAYS) [_ _ _.]
* 4. MEAN (PSI) [_ _ _ _ _.]
5. MINIMUM (PSI) _ _ _ _ _.
6. MAXIMUM (PSI) _ _ _ _ _.
7. NUMBER OF TESTS _ _.
8. STD. DEV (PSI) _ _ _ _ _.

COMPRESSIVE STRENGTH (Items 9. to 14.) (TEST METHOD AASHTO T22 OR ASTM C39)

* 9. AGE (DAYS) [_ _ _.]
*10. MEAN (PSI) [_ _ _ _ _.]
11. MINIMUM (PSI) _ _ _ _ _.
12. MAXIMUM (PSI) _ _ _ _ _.
13. NUMBER OF TESTS _ _.
14. STD. DEV. (PSI) _ _ _ _ _.

SPLITTING TENSILE STRENGTH (Items 15. to 20.)
(TEST METHOD AASHTO T198 or ASTM C496)

15. AGE (DAYS) _ _ _.
16. MEAN (PSI) _ _ _ _ _.
17. MINIMUM (PSI) _ _ _ _.
18. MAXIMUM (PSI) _ _ _ _.
19. NUMBER OF TESTS _ _.
20. STD. DEV. (PSI) _ _ _ _.

ELASTIC MODULUS (Items 21. to 26.)

21. MEAN (KSI) _ _ _ _ _.
22. MINIMUM (KSI) _ _ _ _ _.
23. MAXIMUM (KSI) _ _ _ _ _.
24. NUMBER OF TESTS _ _.
25. STD. DEV. (KSI) _ _ _ _ _.
26. METHOD FOR DETERMINATION OF ELASTIC MODULUS _
  Compression Test on Cores (ASTM C469).............. 1
  Compression Test on Cylinders Molded During Construction (ASTM C469)................. 2
  Calculated Using ACI Relation Between Elastic Modulus and Compressive Strength (ACI 318, Section 8.5) 3
  Other (Specify)________________________ 4

SHEET 53

REHABILITATION DATA

LTPP PROGRAM

***STATE ASSIGNED ID** [_ _ _ _]

***STATE CODE** [_ _]

***SHRP SECTION ID** [_ _ _ _]

PRESSURE RELIEF JOINTS IN PCC PAVEMENTS

* 1. **LAYER NUMBER (FROM SHEET 2)** [_]

* 2. **REASON FOR PRESSURE RELIEF JOINT INSTALLATION** [_]
- Major Blowup Has Occurred.......................... 1
- Major Blowup Anticipated.......................... 2
- Bridge Pushing.......................... 3
- Policy.......................... 4
- Other (Specify)__________ 5

* 3. **AVERAGE PRESSURE RELIEF JOINT INTERVAL (FEET)** [_ _ _ _ _ .]

* 4. **AVERAGE DISTANCE BETWEEN PRESSURE RELIEF JOINT AND NEAREST WORKING JOINT (FEET)** [_ _ _ . _]

* 5. **RELIEF JOINT INITIAL DIMENSIONS (INCHES)**
- DEPTH [_ _ . _ _]
- WIDTH [_ _ . _ _]

* 6. **METHOD OF CUTTING AND REMOVAL OF CONCRETE** [_]
- Two Diamond Blade Saw Cuts with Light Jackhammer Breakup.......................... 1
- Carbide Blade With Above Procedure.......................... 2
- Single Carbide Blade Tooth Saw Cut.......................... 3
- Other (Specify)__________ 4

* 7. **IS ORIGINAL AGGREGATE EXPANSIVE IN CONCRETE?** [_]
- No.................... 1 Yes.................... 2

SHEET 54

REHABILITATION DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

PRESSURE RELIEF JOINTS IN PCC PAVEMENTS (CONTINUED)

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. TYPE OF PRESSURE RELIEF JOINT SEALANT [_]
(ASTM SPECIFICATIONS)

D1850	Concrete Joint Sealer Cold-Application Type	1
D1190	Concrete Joint Sealer Hot-Poured Elastic Type	2
D3406	Joint Sealants, Hot-Poured Elastomeric-Type, For PCC Pavements	3
D3405	Joint Sealants, Hot-Poured For Concrete and Asphalt Pavements	4
D3542	Preformed Polychloroprene Elastomeric Joint Seals For Bridges	5
D2628	Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements	6
Other (Specify) ______________		7

ADDITIONAL INFORMATION ON SEALANT TYPE (Items 3. and 4.)

3. MANUFACTURER NAME ______________
4. MANUFACTURER'S SEALANT NAME ______________

* 5. TYPE OF PRESSURE RELIEF JOINT FILLER [_]
(ASTM SPECIFICATIONS)

D3204	Preformed Cellular Plastic Joint Fillers for Relieving Pressure	1
D 994	Preformed Expansion Joint Filler for Concrete (Bituminous Type)	2
D1751	Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)	3
D1752	Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction	4
Hot Mix Asphalt Concrete		5
Other (Specify) ______________		6

ADDITIONAL INFORMATION ON FILLER TYPE (Items 6. and 7.)

6. MANUFACTURER NAME ______________
7. MANUFACTURER'S FILLER NAME ______________

SHEET 55	*STATE ASSIGNED ID [__ __ __ __]
REHABILITATION DATA	*STATE CODE [__ __]
LTPP PROGRAM	*SHRP SECTION ID [__ __ __ __]

SUBSEALING PCC PAVEMENT

*** 1. LAYER NUMBER OF PCC PAVEMENT (FROM SHEET 2)** [__]

*** 2. TYPE OF MIXTURE USED IN SUBSEALING** [__]

Cement-Loam Top Soil Slurry........................ 1
Cement-Limestone Dust Slurry...................... 2
Cement-Pozzolzan Slurry.......................... 3
Cement-Fine Sand Slurry.......................... 4
Asphalt Cement................................... 5
Other (Specify)________________________ 6

ASPHALT CEMENT DATA (Items 3., 4., and 5.)

* 3. AC GRADE (SEE CODES, TABLE A.16) [__ __]
* 4. PENETRATION AT 77°F, 100G, 5 SEC. (TENTHS OF A MM) (AASHTO T49) [__ __ __.]
* 5. RING AND BALL SOFTENING POINT (°F) (AASHTO T53) [__ __ __.]

MIX DESIGN OF PORTLAND CEMENT GROUT (Items 6. to 10.)

* 6. CEMENT TYPE (SEE CEMENT TYPE CODES, TABLE A.11) [__ __]
* 7. CEMENT TO SAND RATIO (BY WEIGHT) [__.__]
* 8. WATER/CEMENT RATIO (BY WEIGHT) [__.__ __]
* 9. ADDITIVE TYPE (SEE TABLE A.12) [__ __]
*10. AMOUNT OF ADDITIVE (BY PERCENT OF CEMENT WEIGHT) [__ __ __.]

***11. FLUIDITY OF PORTLAND CEMENT GROUT** [__ __.__]
(FLOW CONE METHOD ASTM C939) (SEC)

12. CUBE COMPRESSIVE STRENGTH OF PORTLAND CEMENT GROUT __ __ __.

13. CURING PERIOD FOR PORTLAND CEMENT GROUT (DAYS) __ __.

***14. DETERMINATION OF AREA TO BE UNDERSEALED** [__]

Blanket Coverage................................. 1
Deflection Data.................................. 2
Visual Signs of Pumping.......................... 3
Other (Specify)________________________ 4

*STATE ASSIGNED ID [_ _ _ _]

SHEET 56

REHABILITATION DATA

LTPP PROGRAM

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

SUBSEALING PCC PAVEMENT (CONTINUED)

* 1.LAYER NUMBER OF PCC PAVEMENT (FROM SHEET 2) [_]

* 2.DEPTH OF SUBSEALING HOLE FROM TOP OF SLAB (IN) [_ _._ _]

* 3.MAXIMUM ALLOWABLE PUMPING PRESSURE (GAUGE AT PLANT) (PSI) [_ _ _.]

* 4.MAXIMUM SURGE PRESSURE (PSI) [_ _ _.]

* 5.SLABS IN TEST SECTION (JOINTED CONCRETE PAVEMENTS ONLY)
TOTAL NUMBER [_ _ _.] NUMBER SUBSEALED [_ _ _.]

* 6.AVERAGE NUMBER OF HOLES PER SLAB SUBSEALED (JCP ONLY) [_ _.]

* 7.TYPICAL NUMBER OF SUBSEALING HOLES NEAR JOINT OR CRACK (JCP ONLY) [_ _.]

* 8.AVERAGE NUMBER OF HOLES PER LINEAL FOOT OF PAVEMENT (CRCP ONLY) [_ _._]

* 9.AVERAGE VOLUME OF MATERIAL PUMPED PER HOLE (CUBIC FEET) [_ _._]

*10.MONITORING OF LIFT [_]
- Deflection Device (e.g., Benkelman Beam).......... 1
- Maximum Pumping Time............................ 2
- Appearance of Material in Adjacent Joints or Cracks.................... 3
- Other______________________________ 4

*11.TYPICAL TIME BETWEEN SUBSEALING AND REOPENING TO TRAFFIC (HOURS) [_ _.]

*12.WERE DEFLECTION MEASUREMENTS TAKEN BEFORE AND AFTER SUBSEALING? (Yes......... 1, No......... 2)
BEFORE SUBSEALING [_]
AFTER SUBSEALING [_]

*13.TIME OF DAY THAT DEFLECTION MEASUREMENTS WERE CONDUCTED (HOURS)

	STARTING TIME	ENDING TIME
BEFORE SUBSEALING	[_ _ _ _]	[_ _ _ _]
AFTER SUBSEALING	[_ _ _ _]	[_ _ _ _]

*STATE ASSIGNED ID [_ _ _ _]

SHEET 57

REHABILITATION DATA

LTPP PROGRAM

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

SUBDRAINAGE (RETROFIT) DATA

*** 1.TYPE OF SUBDRAINS** [_]

Transverse............. 1 Longitudinal........... 2

*** 2.EXTENT OF SUBDRAINS** [_]

Continuous............. 1 Intermittent........... 2
Adjacent to Full Depth Repairs................... 3

*** 3.TYPE OF DRAINAGE PIPE** [_]

Clay Tile.............. 1
Concrete Tile.......... 2
Vitrified Clay......... 3
Perforated Plastic Bituminous Fiber..... 4
Perforated Corrugated Metal..... 5
Corrugated Plastic Tubing............... 6
Drainage Mat........... 7
Other (Specify) ______________________ 8

*** 4.DIAMETER OF PIPE (INCHES)** [_ _._]

*** 5.DEPTH OF PIPE BELOW TOP OF PAVEMENT SURFACE (INCHES)** [_ _._]

*** 6.HORIZONTAL PLACEMENT OF PIPE FROM OUTER EDGE OF PAVEMENT (IN)** [_ _._]

*** 7.TYPE OF PRIMARY FILTER USED** [_]

Graded Aggregate....... 1
Uniformly Graded Aggregate (One Size). 2
Woven Fabric........... 3
Non-Woven Fabric....... 4
Porous PCC............. 5
Porous Bituminous Concrete............. 6
Other (Specify) ______________________ 7

*** 8.MAXIMUM PARTICLE SIZE OF PRIMARY FILTER MATERIAL (INCHES)** [_._]

*** 9.GRADATION OF PRIMARY FILTER MATERIAL**

% PASSING # 4 SIEVE [_ _._] % PASSING # 40 SIEVE [_ _._]
% PASSING #10 SIEVE [_ _._] % PASSING #100 SIEVE [_ _._]

10.PERMEABILITY OF PRIMARY FILTER MATERIAL (FT/DAY) _ _._ _

***11.TYPE AND LOCATION OF SECONDARY FILTER MATERIAL** [_]

Fabric Encapsulating the Primary Filter Material.. 1
Fabric Encapsulating the Drainage Pipe............ 2
Other (Specify) ______________________ 3

***12.AVERAGE OUTLET INTERVAL (FEET)** [_ _ _.]

***13.PRIMARY PURPOSE OF SUBDRAINAGE INSTALLATION** [_]

Remove Free Water From Pavement Layers............ 1
Cut Off Side-Hill/Through Hill Seepage............ 2
Lower Water Table................................. 3
Other (Specify) ______________________ 4

***STATE ASSIGNED ID** [_ _ _ _]

SHEET 58

***STATE CODE** [_ _]

REHABILITATION DATA

***SHRP SECTION ID** [_ _ _ _]

LTPP PROGRAM

LOAD TRANSFER RESTORATION DATA

*** 1. LAYER NUMBER (FROM SHEET 2)** [_]

*** 2. TYPE OF LOAD TRANSFER RESTORATION** [_]
- Retrofit Dowels (Placed in Slots).................. 1
- Compressed Double-Vee Shear Device................. 2
- Uncompressed Double-Vee Shear Device............... 3
- Plate and Stud Connector Shear Device.............. 4
- Other (Specify) ____________________ 5

*** 3. FREQUENCY OF INSTALLATION** [_]
- At Every Joint...................................... 1
- At Every Joint and Working Crack.................... 2
- At Intermittent Joints and Cracks Showing Poor Load Transfer.................... 3
- Other (Specify) ____________________ 4

*** 4. NUMBER OF DEVICES PER JOINT** [_ _.]

*** 5. LOCATION OF DOWELS OR SHEAR DEVICES (INCHES)**

(DISTANCE FROM THE OUTER LANE EDGE TO THE CENTER OF EACH DEVICE)

1st	[_ _ _.]
2nd	[_ _ _.]
3rd	[_ _ _.]
4th	[_ _ _.]
5th	[_ _ _.]
6th	[_ _ _.]
7th	[_ _ _.]
8th	[_ _ _.]
9th	[_ _ _.]
10th	[_ _ _.]
11th	[_ _ _.]
12th	[_ _ _.]

*** 6. DIAMETER OF RETROFIT DOWEL BARS (INCHES)** [_._ _]

*** 7. LENGTH OF RETROFIT DOWEL BARS (INCHES)** [_ _._]

*STATE ASSIGNED ID [_ _ _ _]

SHEET 59

*STATE CODE [_ _]

REHABILITATION DATA

*SHRP SECTION ID [_ _ _ _]

LTPP PROGRAM

LOAD TRANSFER RESTORATION DATA (CONTINUED)

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. MATERIAL USED TO BACKFILL SLOT/CORE HOLE [_]

Cement Based Grout.............................. 1
Polymer Concrete................................ 2
Epoxy Resin Grout............................... 3
Other (Specify)________________________________ 4

* 3. BONDING AGENT USED BETWEEN EXISTING PCC AND BACKFILL MATERIAL [_]

None.. 1
Epoxy... 2
Cement/Water.................................... 3
Other (Specify) ______________________________ 4

* 4. LOAD TRANSFER EFFICIENCY BEFORE AND AFTER RESTORATION

POINT DISTANCE (FEET)	LOAD TRANSFER DEVICE NUMBER	LOAD TRANSFER EFFICIENCY (%) BEFORE RESTORATION	AFTER RESTORATION
[_ _ _ _._]	1	[_ _ _._]	[_ _ _._]
	2	[_ _ _._]	[_ _ _._]
	3	[_ _ _._]	[_ _ _._]
[_ _ _ _._]	1	[_ _ _._]	[_ _ _._]
	2	[_ _ _._]	[_ _ _._]
	3	[_ _ _._]	[_ _ _._]
[_ _ _ _._]	1	[_ _ _._]	[_ _ _._]
	2	[_ _ _._]	[_ _ _._]
	3	[_ _ _._]	[_ _ _._]
[_ _ _ _._]	1	[_ _ _._]	[_ _ _._]
	2	[_ _ _._]	[_ _ _._]
	3	[_ _ _._]	[_ _ _._]

* 5. DATE OF LOAD TRANSFER EFFICIENCY TESTS

BEFORE RESTORATION [_ _/_ _/_ _]
AFTER RESTORATION [_ _/_ _/_ _]

*STATE ASSIGNED ID [_ _ _ _]

SHEET 60

REHABILITATION DATA

LTPP PROGRAM

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

CRACK AND SEAT PORTLAND CEMENT CONCRETE PAVEMENT

* 1. LAYER NUMBER (FROM SHEET 2) [_]

* 2. AVERAGE PCC BREAKAGE SIZE (INCHES)
WIDTH [_ _.]
LENGTH [_ _.]

* 3. PAVEMENT BREAKER PASSES/LANE [_.]

* 4. PAVEMENT BREAKER TYPE [_]
Roller.................. 1 Guillotine Drop Hammer. 4
Pile Driver Hammer..... 2 Air Hammer............. 5
Whip Hammer............ 3 Hydraulic Hammer....... 6
Other (Specify) ________________ 7

* 5. PROOF ROLLER TYPE [_]
Steel Wheeled.......... 1 Pneumatic.............. 2

* 6. PROOF ROLLER WEIGHT (TONS) [_ _.]

* 7. BROKEN PAVEMENT EXPOSURE TO TRAFFIC (DAYS) [_ _ _.]

* 8. DEFLECTION MEASUREMENTS TAKEN (Yes...1, No...2)
BEFORE BREAKING [_]
AFTER BREAKING (PRIOR TO SEATING) [_]
AFTER SEATING (PRIOR TO OVERLAY) [_]
AFTER OVERLAY [_]

* 9. DEFLECTION MEASUREMENT DEVICE USED [_]
FWD.................... 1 Road Rater............. 3
Benkleman Beam......... 2 Dynaflect.............. 4
Other (Specify) ________________ 5

*10. MAGNITUDE OF LOAD USED FOR DEFLECTION TEST, LBS [_ _ _ _ _.]

*11. LOADING FREQUENCY (HERTZ) [_ _.]
(FOR CYCLIC LOADING DEVICES ONLY)

*12. BROKEN PAVEMENT SURFACE PREPARATION [_]
None................... 1 Tack Coat.............. 3
Sweeping............... 2 Leveling Course........ 4
Full Depth Repair of Failed Areas................ 5
Other (Specify) ________________ 6

SHEET 61

REHABILITATION DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

RESTORATION OF AC SHOULDERS

* 1. SHOULDER RESTORED [_]
- Outside 1
- Inside 2
- Both 3

		INSIDE SHOULDER	OUTSIDE SHOULDER
* 2.	SURFACE TYPE (CODES-TABLE A.5)	_	[_]
* 3.	TOTAL WIDTH (FEET)	_ _.	[_ _.]
* 4.	PAVED WIDTH (FEET)	_ _.	[_ _.]
* 5.	SHOULDER BASE TYPE (CODES-TABLE A.6)	_ _	[_ _]
* 6.	SURFACE THICKNESS (INCHES)	_ _._	[_ _._]
* 7.	BASE THICKNESS (INCHES)	_ _._	[_ _._]

* 8. TYPE OF SHOULDER RESTORATION [_]
- AC Overlay Without Removal of Existing AC........................ 1
- Cold Milling and AC Overlay............. 2
- Complete Shoulder Removal and Replacement...................... 3
- In-place Recycling and Overlay.......... 4
- Other (Specify)________________________ 5

* 9. TYPE OF AC MATERIALS [_]
- New Materials........................... 1
- Hot Recycled Materials.................. 2
- Cold Recycled Materials................. 3
- Other (Specify)________________________ 4

*10. THICKNESS OF AC MATERIAL REMOVED BY COLD MILLING (IN) [_._]

*11. AC OVERLAY THICKNESS (IN) [_._]

12. LANE/SHOULDER JOINT SEALANT [_]
- None.................................... 1
- Sealed Without Providing Reservoir....... 2
- Saw Reservoir and Seal.................. 3
- Other (Specify)________________________ 4

13. LANE/SHOULDER JOINT SEALANT RESERVOIR
- WIDTH (INCHES) _._
- DEPTH (INCHES) _._

14. TYPE OF JOINT SEALANT _
- Poured.................................. 1
- Preformed............................... 2

NOTE: DATA ITEMS 8. TO 14. PERTAIN ONLY TO THE RESTORED OUTSIDE SHOULDER.

SHEET 62

REHABILITATION DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

RESTORATION OF PCC SHOULDERS

* 1. SHOULDER RESTORED [_]
Outside............ 1
Inside............. 2
Both............... 3

		INSIDE SHOULDER	OUTSIDE SHOULDER
* 2.	SURFACE TYPE (CODES-TABLE A.5)	_	[_]
* 3.	TOTAL WIDTH (FEET)	_ _.	[_ _.]
* 4.	PAVED WIDTH (FEET)	_ _.	[_ _.]
* 5.	SHOULDER BASE TYPE (CODES-TABLE A.6)	_ _	[_ _]
* 6.	SURFACE THICKNESS (INCHES)	_ _._	[_ _._]
* 7.	BASE THICKNESS (INCHES)	_ _._	[_ _._]

* 8. TYPE OF SHOULDER SYSTEM [_]
JPCP Shoulder.......... 1 CRCP Shoulder.......... 3
JRCP Shoulder.......... 2 Other__________________ 4

* 9. AVERAGE JOINT SPACING (FEET) [_ _ _.]

*10. SKEWNESS OF JOINTS (FEET) [_._]

*11. JOINTS MATCH PAVEMENT JOINTS? [_]
(Yes...........1, No...............2)

*12. TYPE OF LANE/SHOULDER JOINT [_]
Tied........... 1 Keyed......................... 3
Butt........... 2 Other (Specify)______________ 4

LANE/SHOULDER JOINT TIE SYSTEM (Items 13. to 16.)

*13. TYPE [_]
None.................. 1 Hook Bolts.............. 3
Deformed Bars......... 2 Other____________________ 4

*14. BAR DIAMETER (INCHES) [_._ _]

*15. BAR LENGTH (INCHES) [_ _.]

*16. BAR SPACING (INCHES) [_ _.]

NOTE: DATA ITEMS 8. TO 16. PERTAIN ONLY TO THE RESTORED OUTSIDE SHOULDER.

SHEET 63

REHABILITATION DATA

LTPP PROGRAM

*STATE ASSIGNED ID [_ _ _ _]

*STATE CODE [_ _]

*SHRP SECTION ID [_ _ _ _]

RESTORATION OF PCC SHOULDERS (CONTINUED)

* 1. **LANE/SHOULDER JOINT SEALANT** [_]
None..1
Sealed Without Providing Reservoir............ 2
Saw Reservoir and Seal........................ 3
Other (Specify)________________________ 4

2. LANE/SHOULDER JOINT SEALANT RESERVOIR
WIDTH (INCHES) _._
DEPTH (INCHES) _._

3. TYPE OF JOINT SEALANT _
Poured......... 1 Preformed......... 2

4. JOINT SEALANT BACKER MATERIAL TYPE _
Foam Backer Rod........ 1 Rope......... 3
Tape.................... 2 None......... 4
Other (Specify)________________________ 5

5. JOINT SEALANT BACKER DIMENSION (INCHES) _._
(Enter diameter of rod/rope or width of tape)

NOTE: DATA ITEMS 1. TO 5. PERTAIN ONLY TO THE RESTORED OUTSIDE SHOULER.

SHEET 64

REHABILITATION DATA

LTPP PROGRAM

***STATE ASSIGNED ID** [_ _ _ _]

***STATE CODE** [_ _]

***SHRP SECTION ID** [_ _ _ _]

MILLING AND GRINDING DATA FOR PAVEMENT SURFACES

***1. LAYER NUMBER(S) (FROM SHEET 2)** [_]
[_]

***2. METHOD USED** [_]
- Diamond Grinding 1
- Milling 2
- Other (Specify)________________________ ... 3

***3. EXTENT OF EXISTING SURFACE PREPARATION** [_]
- Entire Test Section Length 1
- Individual Joints or Cracks 2
- Patches Only 3
- Other (Specify)________________________ ... 4

***4. AVERAGE DEPTH OF CUT (INCHES)** [_._]

NOTE: If an overlay will <u>not</u> be placed after the milling/grinding work, record the milling/grinding data on the appropriate maintenance data sheet (refer to Chapter 6).

APPENDIX A. STANDARD CODES

This appendix provides standard codes to simplify entry of data during collection and the subsequent storage and processing of this data. These codes are tabulated as follows:

Table A.1 Table of Standard Codes for States, District of Columbia, Puerto Rico, American Protectorates and Canadian Provinces

State	Code	State	Code
Alabama	01	New York	36
Alaska	02	North Carolina	37
Arizona	04	North Dakota	38
Arkansas	05	Ohio	39
California	06	Oklahoma	40
Colorado	08	Oregon	41
Connecticut	09	Pennsylvania	42
Delaware	10	Rhode Island	44
District of Columbia	11	South Carolina	45
Florida	12	South Dakota	46
Georgia	13	Tennessee	47
Hawaii	15	Texas	48
Idaho	16	Utah	49
Illinois	17	Vermont	50
Indiana	18	Virginia	51
Iowa	19	Washington	53
Kansas	20	West Virginia	54
Kentucky	21	Wisconsin	55
Louisiana	22	Wyoming	56
Maine	23	American Samoa	60
Maryland	24	Guam	66
Massachusetts	25	Puerto Rico	72
Michigan	26	Virgin Islands	78
Minnesota	27	Alberta	81
Mississippi	28	British Columbia	82
Missouri	29	Manitoba	83
Montana	30	New Brunswick	84
Nebraska	31	Newfoundland	85
Nevada	32	Nova Scotia	86
New Hampshire	33	Ontario	87
New Jersey	34	Prince Edward Island	88
New Mexico	35	Quebec	89
		Saskatchewan	90

Note: The U.S. codes are consistent with the Federal Information Processing Standards (FIPS) and HPMS

Table A.2. Functional class codes.

Functional Class	Code
Rural:	
Principal Arterial - Interstate	01
Principal Arterial - Other	02
Minor Arterial	06
Major Collector	07
Minor Collector	08
Local Collector	09
Urban:	
Principal Arterial - Interstate	11
Principal Arterial - Other Freeways or Expressways	12
Other Principal Arterial	14
Minor Arterial	16
Collector	17
Local	19

Note: These codes are consistent with the HPMS system.

Table A.3 Experiment Type Definitions for the General Pavement Studies

Note: The numbers in parentheses in the following paragraphs refer to the material codes found in Tables A.5, A.6, A.7, and A.8 unless indicated otherwise.

(01) ASPHALT CONCRETE PAVEMENT WITH GRANULAR BASE

Acceptable pavements for this study include a dense-graded hot mix asphalt concrete (HMAC) surface layer (1), with or without other HMAC layers (28), placed over an untreated granular base (22 or 23). One or more subbase layers (22, 23, 24, 25, 26, 42, or 43) may also be present but are not required. Two or more consecutive lifts of the same mixture design are to be treated as one layer. "Full depth" asphalt concrete pavements are also included in this study. They include an HMAC surface layer (1) and usually one or more HMAC layers (28) beneath the surface with a minimum total HMAC thickness of 8 inches placed directly upon treated or untreated subgrade. For "full depth" asphalt concrete pavements, a base layer (Layer Description 5) of zero thickness and material code of 21 should be indicated. If a treated subgrade (42 or 43) is present, it should be shown as a subbase (Layer Description 6). Seal coats or porous friction courses are allowed on the surface, but not in combination, i.e., a porous friction course placed over a seal coat is not acceptable. Seal coats are also permissible on top of granular base layers. At least one layer of dense-graded HMAC is required, regardless of the existence of seal coats or porous friction courses.

(02) ASPHALT CONCRETE PAVEMENT WITH BOUND BASE

Acceptable pavements for this study include a dense-graded HMAC surface layer (1) with or without other HMAC layers (28), placed over a bound base layer (27-39, 42-44, 46). To properly account for a variety of bound base types in the sampling design, two classifications of binder types, bituminous and non-bituminous, are defined as the factor levels. Bituminous binders include asphalt cements, cutbacks, emulsions, and road tars. Non-bituminous binders include all hydraulic cements (those which harden by a chemical reaction with water and are capable of hardening under water), lime, fly ashes and natural pozzolans, or combinations thereof. Stabilized bases with lower quality materials such as sand asphalt or soil cement are also allowed. Stabilization practices of primary concern for this study are those in which the structural characteristics of the material are improved due to the cementing action of the stabilizing agent. Thus, the description of the study actually refers to treatments improving the structural properties of the base

Table A.3 Characteristics of acceptable pavement types for the General Pavement Studies (Continued)

materials. Two or more consecutive lifts of the same mixture design are to be treated as one layer. One or more subbase layers (22, 23, 24, 25, 26, 42, or 43) may be present but are not required. Seal coats or porous friction courses are permitted on the surface but not in combination, i.e., a porous friction course placed over a seal coat is not acceptable. Project selection is open to those constructed on both fine and coarse subgrades (51-65).

(03) JOINTED PLAIN CONCRETE PAVEMENT - JPCP

Acceptable projects include a jointed, unreinforced portland cement concrete slab (4) placed over untreated granular base (22 or 23), HMAC (28, 31) or stabilized base (29, 30, 37, or 38). One or more subbase layers (22, 23, 24, 25, 26, 42, or 43) may also be present but are not required. The joints may have either no load transfer devices or smooth dowel bars. A seal coat is also permissible above a granular base layer. Jointed slabs with load transfer devices other than dowel bars and pavements placed directly upon a treated or untreated subgrade are not acceptable.

(04) JOINTED REINFORCED CONCRETE PAVEMENT - JRCP

Acceptable projects include jointed reinforced portland cement concrete pavements (5) with doweled joints spaced between 20 and 65 feet. The slab may rest directly upon a layer of any material listed in Table A.6 (except 25 and 45) or upon unstabilized coarse-grained subgrade (57-65). A base layer and one or more subbase layers may exist but are not required. These layers may consist of any of the material types indicated in Table A.6. A seal coat is also permissible above a granular base layer. JRCP placed directly upon a fine-grained soil/aggregate layer (25) or a fine-grained subgrade (51-56) will not be considered for this study. JRCP's without load transfer devices or using devices other than smooth dowel bars at the joints are not acceptable.

(05) CONTINUOUSLY REINFORCED CONCRETE PAVEMENT - CRCP

Acceptable projects include continuously reinforced portland cement concrete pavements (6) placed directly on a layer of any material listed in Table A.6 (except 25 or 45) or upon unstabilized coarse-grained subgrade (57-65). CRCP's placed directly upon a fine-grained soil/aggregate layer (25) or a fine-grained subgrade (51-56) are not acceptable for this study.

Table A.3 Characteristics of acceptable pavement types for the General Pavement Studies (Continued)

(06) AC OVERLAY OF AC PAVEMENT

Acceptable pavements for this study include a dense-graded HMAC surface layer (1) with or without other HMAC layers (28) placed over a previously existing asphalt concrete pavement meeting the requirements of GPS-1 or GPS-2. Seal coats or porous friction courses are allowed but not in combination. Fabric interlayers (75 and 76) and Stress Absorbing Membrane Interlayers (SAMIs) (77) are permitted between the original surface and the overlay. The total thickness of HMAC used in the overlay must be at least 1.0 inches. Pavements which have been overlaid more than once since they were originally constructed are not acceptable. Pavements in both bad and good condition as measured by levels of specific distress types present prior to the overlay are needed.

(07) AC OVERLAY OF CONCRETE PAVEMENT

Acceptable pavements for this study include a dense-graded HMAC surface layer (1) with or without other HMAC layers (28) placed on either a JPCP (4), JRCP (5), or CRCP (6). The slab may rest upon any combination of the base and/or subbase layers indicated in Table A.6 (except 45). The previously existing concrete slab may also have been placed directly on lime or cement treated fine or coarse-grained subgrade (27, 42, and 43) or on untreated coarse-grained subgrade (57-65). Slabs placed directly on untreated fine-grained subgrade (51-56) are not acceptable. Seal coats or porous friction courses are permissible but not in combination. Fabric interlayers (75 or 76) and SAMI's (77) are acceptable when placed between the original surface (concrete) and the overlay. Overlaid pavements with aggregate interlayers (79) and open-graded asphalt concrete (80) will not be considered for this study. The total thickness of HMAC used in the overlay must be at least 1.5 inches. Pavements which have been overlaid more than once since they were originally constructed are not acceptable. Pavements in both bad and good condition as measured by levels of specific distress types present prior to the overlay are needed.

(09) UNBONDED PCC OVERLAYS OF CONCRETE PAVEMENT

Acceptable projects for this study include unbonded JPCP (4), JRCP (5), or CRCP (6) overlays with a thickness of 5 inches or more placed over an existing JPCP (4), JRCP (5), or CRCP (5) pavement. The overlaid concrete pavement may rest on any of the base and subbase types listed in Table A.6 or directly upon the subgrade.

Table A.4 Pavement Type Codes

Type of Pavement	Code
Asphalt Concrete (AC) Surfaced Pavements:	
AC With Granular Base	01
AC With Bituminous Treated Base	02
AC with Non-Bituminous Treated Base	07
AC Overlay on AC Pavement	03
AC Overlay on JPCP Pavement	28
AC Overlay on JRCP Pavement	29
AC Overlay on CRCP Pavement	30
Other	10
Portland Cement Concrete Surfaced Pavements:	
JPCP - Placed Directly On Untreated Subgrade	11
JRCP - Placed Directly On Untreated Subgrade	12
CRCP - Placed Directly On Untreated Subgrade	13
JPCP - Placed Directly On Treated Subgrade	14
JRCP - Placed Directly On Treated Subgrade	15
CRCP - Placed Directly On Treated Subgrade	16
JPCP - Over Unbound Base	17
JRCP - Over Unbound Base	18
CRCP - Over Unbound Base	19
JPCP Over Bituminous Treated Base	20
JRCP Over Bituminous Treated Base	21
CRCP Over Bituminous Treated Base	22
JPCP Over Non-Bituminous Treated Base	23
JRCP Over Non-Bituminous Treated Base	24
CRCP Over Non-Bituminous Treated Base	25
JPCP Overlay on JPCP Pavement	31
JPCP Overlay on JRCP Pavement	33
JPCP Overlay on CRCP Pavement	35
JRCP Overlay on JPCP Pavement	32
JRCP Overlay on JRCP Pavement	34
JRCP Overlay on CRCP Pavement	36
CRCP Overlay on JPCP Pavement	38
CRCP Overlay on JRCP Pavement	39
CRCP Overlay on CRCP Pavement	37
JPCP Overlay on AC Pavement	04
JRCP Overlay on AC Pavement	05
CRCP Overlay on AC Pavement	06
Prestressed Concrete Pavement	40
Other	49

Table A.4 Pavement Type Codes
(Continued)

*Composite Pavements (Wearing Surface Included in Initial Construction):

JPCP With Asphalt Concrete Wearing Surface	51
JRCP With Asphalt Concrete Wearing Surface	52
CRCP With Asphalt Concrete Wearing Surface	53
Other	59

Definitions:

JPCP - Jointed Plain Concrete Pavement

JRCP - Jointed Reinforced Concrete Pavement

CRCP - Continuously Reinforced Concrete Pavement

* "Composite Pavements" are pavements originally constructed with an asphalt concrete wearing surface over a portland cement concrete slab (1986 "AASHTO Guide for Design of Pavement Structures").

Table A.5 Pavement Surface Material Type Classification Codes

Material Type	Code
Hot Mixed, Hot Laid Asphalt Concrete, Dense Graded	01
Hot Mixed, Hot Laid Asphalt Concrete, Open Graded (Porous Friction Course)	02
Sand Asphalt	03
Portland Cement Concrete (JPCP)	04
Portland Cement Concrete (JRCP)	05
Portland Cement Concrete (CRCP)	06
Portland Cement Concrete (Prestressed)	07
Portland Cement Concrete (Fiber Reinforced)	08
Plant Mix (Emulsified Asphalt) Material, Cold Laid	09
Plant Mix (Cutback Asphalt) Material, Cold Laid	10
Single Surface Treatment	11
Double Surface Treatment	12
Recycled Asphalt Concrete	
Hot, Central Plant Mix	13
Cold Laid Central Plant Mix	14
Cold Laid Mixed-In-Place	15
Heater Scarification/Recompaction	16
Recycled Portland Cement Concrete	
JPCP	17
JRCP	18
CRCP	19
Other	20

Table A.14. Codes for Asphalt Refiners and Processors in the United States (Continued).*

	Code
Cenex--Laurel, Montana	44
Conoco, Inc.--Billings, Montana	45
Exxon Co.--Billings, Montana	46
Chevron USA, Inc.--Perth Amboy, New Jersey	47
Exxon Co., Linden, New Jersey	48
Giant Industries, Inc.--Gallup, New Mexico	85
Navahoe Refining Co.--Artesia, New Mexico	49
Cibro Petroleum Products Co.--Albany, New York	86
Ashland Petroleum Co.--Canton, Ohio	50
Standard Oil Co.--Toledo, Ohio	51
Sohio Oil Co (BP America)--Toledo, Ohio	87
Kerr-McGee Refining Co.--Wynnewood, Oklahoma	52
Sinclair Oil Corp.--Tulsa, Oklahoma	53
Sun Co. Inc.--Tulsa, Oklahoma	54
Total Petroleum Inc.--Ardmore, Oklahoma	55
Chevron USA, Inc.--Portland, Oregon	56
Atlantic Refining & Marketing Corp.--Philadelphia, PA	57
United Refining Co.--Warren, Pennsylvania	58
Mapco Petroleum Inc.--Memphis, Tennessee	59
Charter International Oil Co.--Houston, Texas	60
Chevron USA, Inc.--El Paso, Texas	61
Coastal Refining & Marketing, Inc.--Corpus Christi, Texas	88
Coastal States Petroleum Co.--Corpus Christi, Texas	62
Diamond Shamrock Corp.--Sunray, Texas	63
Exxon Co. USA--Baytown, Texas	64
Fina Oil and Chemical Co.--Big Spring, Texas	65
Fina Oil and Chemical Co.--Port Arthur, Texas	89
Hill Petroleum Co.--Houston, Texas	90
Shell Oil Co.--Deer Park, Texas	66
Star Enterprise--Port Arthur & Port Neches, Texas	91
Texaco Refining & Marketing Inc.--Port Arthur & Port Neches, Texas	67
Trifinery--Corpus Christi, Texas	92
Unocal Corp.--Nederland, Texas	68
Valero Refining Co.--Corpus Christi, Texas	69
Phillips 66 Co.--Woods Cross, Utah	70
Chevron USA Inc.--Seattle, Washington	71
Sound Refining, Inc.--Tacoma, Washington	72
US Oil and Refining Co.--Tacoma, Washington	73
Murphy Oil USA, Inc.--Superior, Wisconsin	74
Big West Oil Co.--Cheyenne, Wyoming	75
Little America Refining Co.--Casper, Wyoming	93
Sinclair Oil Corp.--Sinclair, Wyoming	76
Other	77

* Taken from Oil and Gas Journal, March 20, 1989, pp. 72-89.

Table A.15 Asphalt Cement Modifier Codes

	Code
Stone Dust	01
Lime	02
Portland Cement	03
Carbon Black	04
Sulfur	05
Lignin	06
Natural Latex	07
Synthetic Latex	08
Block Copolymer	09
Reclaimed Rubber	10
Polyethylene	11
Polypropylene	12
Ethylene-Vinyl Acetate	13
Polyvinyl Chloride	14
Asbestos	15
Rock Wool	16
Polyester	17
Manganese	18
Other Mineral Salts	19
Lead Compounds	20
Carbon	21
Calcium Salts	22
Recycling Agents	23
Rejuvenating Oils	24
Amines	25
Fly Ash	26
Other	27

Table A.16 Grades of Asphalt, Emulsified Asphalt, and Cutback Asphalt Codes

	Code
Asphalt Cements	
AC-2.5	01
AC-5	02
AC-10	03
AC-20	04
AC-30	05
AC-40	06
AR-1000 (AR-10 by AASHTO Designation)	07
AR-2000 (AR-20 by AASHTO Designation)	08
AR-4000 (AR-40 by AASHTO Designation)	09
AR-8000 (AR-80 by AASHTO Designation)	10
AR-16000 (AR-160 by AASHTO Designation)	11
200-300 pen	12
120-150 pen	13
85-100 pen	14
60-70 pen	15
40-50 pen	16
Other Asphalt Cement Grade	17
Emulsified Asphalts	
RS-1	18
RS-2	19
MS-1	20
MS-2	21
MS 2h	22
HFMS-1	23
HFMS-2	24
HFMS-2h	25
HFMS-2s	26
SS-1	27
SS-1h	28
CRS-1	29
CRS-2	30
CMS-2	31
CMS-2h	32
CSS-1	33
CSS-1h	34
Other Emulsified Asphalt Grade	35
Cutback Asphalts (RC, MC, SC)	
30 (MC only)	36
70	37
250	38
800	39
3000	40
Other Cutback Asphalt Grade	99

Taken from MS-5, "A Brief Introduction to Asphalt," and Specification Series No. 2 (SS-2), "Specifications for Paving and Industrial Asphalts," both publications by the Asphalt Institute.

Table A.17 Maintenance and Rehabilitation Work Type Codes

	Code
Crack Sealing (linear ft.)	01
Transverse Joint Sealing (linear ft.)	02
Lane-Shoulder, Longitudinal Joint Sealing (linear ft.)	03
Full Depth Joint Repair Patching of PCC (sq. yards)	04
Full Depth Patching of PCC Pavement Other than at Joint (sq. yards)	05
Partial Depth Patching of PCC Pavement Other than at Joint (sq. yards)	06
PCC Slab Replacement (sq. yards)	07
PCC Shoulder Restoration (sq. yards)	08
PCC Shoulder Replacement (sq. yards)	09
AC Shoulder Restoration (sq. yards)	10
AC Shoulder Replacement (sq. yards)	11
Grinding/Milling Surface (sq. yards)	12
Grooving Surface (sq. yards)	13
Pressure Grout Subsealing (no. of holes)	14
Slab Jacking Depressions (no. of depressions)	15
Asphalt Subsealing (no. of holes)	16
Spreading of Sand or Aggregate (sq. yards)	17
Reconstruction (Removal and Replacement) (sq. yards)	18
Asphalt Concrete Overlay (sq. yards)	19
Portland Cement Concrete Overlay (sq. yards)	20
Mechanical Premix Patch (using motor grader and roller) (sq. yards)	21
Manual Premix Spot Patch (hand spreading and compacting with roller) (sq. yards)	22
Machine Premix Patch (placing premix with paver, compacting with roller) (sq. yards)	23
Full Depth Patch of AC Pavement (removing damaged material, repairing supporting material, and repairing) (sq. yards)	24
Patch Pot Holes - Hand Spread, Compacted with Truck (no. of holes)	25
Skin Patching (hand tools/hot pot to apply liquid asphalt and aggregate) (sq. yards)	26
Strip Patching (using spreader and distributor to apply hot liquid asphalt and aggregate) (sq. yards)	27
Surface Treatment, single layer (sq. yards)	28
Surface Treatment, double layer (sq. yards)	29
Surface Treatment, three or more layers (sq. yards)	30
Aggregate Seal Coat (sq. yards)	31
Sand Seal Coat (sq. yards)	32
Slurry Seal Coat (sq. yards)	33
Fog Seal Coat (sq. yards)	34
Prime Coat (sq. yards)	35
Tack Coat (sq. yards)	36
Dust Layering (sq. yards)	37
Longitudinal Subdrains (linear feet)	38
Transverse Subdrainage (linear feet)	39

Table A.17 Maintenance and Rehabilitation Work Type Codes (continued)

	Code
Drainage Blankets (sq. yards)	40
Well System	41
Drainage Blankets with Longitudinal Drains	42
Hot-Mix Recycled Asphalt Concrete (sq. yards)	43
Cold-Mix Recycled Asphalt Concrete (sq. yards)	44
Heater Scarification, Surface Recycled Asphalt Concrete (sq. yards)	45
Crack and Seat PCC Pavement as Base for New AC Surface (sq. yards)	46
Crack and Seat PCC Pavement as Base for New PCC Surface (sq. yards)	47
Recycled Portland Cement Concrete (sq. yards)	48
Pressure Relief Joints in PCC Pavements (linear feet)	49
Joint Load Transfer Restoration in PCC Pavements (linear feet)	50
Mill Off Existing Pavement and Overlay with AC (sq. yards)	51
Mill Off Existing Pavement and Overlay with PCC (sq. yards)	52
Other	53
Partial Depth Patching of PCC Pavement at Joints (sq. yards)	54

Table A.18. Maintenance location codes.

	Code
Outside Lane (Number 1)	01
Inside Lane (Number 2)	02
Inside Lane (Number 3)	03
All Lanes	09
Shoulder	04
All Lanes Plus Shoulder	10
Curb and Gutter	05
Side Ditch	06
Culvert	07
Other	08

Note: SHRP LTPP only studies outside lanes.

Table A.19 Maintenance Materials Type Codes

	Code
Preformed Joint Fillers	01
Hot-Poured Joint and Crack Sealer	02
Cold-Poured Joint and Crack Sealer	03
Open Graded Asphalt Concrete	04
Hot Mix Asphalt Concrete Laid Hot	05
Hot Mix Asphalt Concrete Laid Cold	06
Sand Asphalt	07
Portland Cement Concrete (overlay or replacement)	
Jointed Plain (JPCP)	08
Jointed Reinforced (JRCP)	09
Continuously Reinforced (CRCP)	10
Portland Cement Concrete (Patches)	11
Hot Liquid Asphalt and Aggregate (Seal Coat)	12
Hot Liquid Asphalt and Mineral Aggregate	13
Hot Liquid Asphalt and Sand	14
Emulsified Asphalt and Aggregate (Seal Coat)	15
Emulsified Asphalt and Mineral Aggregate	16
Emulsified Asphalt and Sand	17
Hot Liquid Asphalt	18
Emulsified Asphalt	19
Sand Cement (Using Portland Cement)	20
Lime Treated or Stabilized Materials	21
Cement Treated or Stabilized Materials	22
Cement Grout	23
Aggregate (Gravel, Crushed Stone or Slag)	24
Sand	25
Mineral Dust	26
Mineral Filler	27
Other	28

Table A.20. Recycling Agent Type Codes

	Code
RA 1	42
RA 5	43
RA 25	44
RA 75	45
RA 250	46
RA 500	47
Other	48

Note: The recycling agent groups shown in this table are defined in ASTM D4552.

Table A.21. Anti-Stripping Agent Type Codes

	Code
Permatac	01
Permatac Plus	02
Betascan Roads	03
Pavebond	04
Pavebond Special	05
Pavebond Plus	06
BA 2000	07
BA 2001	08
Unichem "A"	09
Unichem "B"	10
Unichem "C"	11
AquaShield AS4115	12
AquaShield AS4112	13
AquaShield AS4113	14
Portland Cement	15
Hydrated Lime:	
Mixed Dry With Asphalt Cement	16
Mixed Dry with Dry Aggregate	17
Mixed Dry with Wet Aggregate	18
Slurried Lime Mixed with Aggregate	19
Hot Lime Slurry (Quick Lime Slaked and Slurried at Job Site)	20
Nostrip Chemicals A-500	21
No Strip Chemical Works ACRA RP-A	22
No Strip Chemical Works ACRA Super Conc.	23
No Strip Chemical Works ACRA 200	24
No Strip Chemical Works ACRA 300	25
No Strip Chemical Works ACRA 400	26
No Strip Chemical Works ACRA 500	27
No Strip Chemical Works ACRA 512	28
No Strip Chemical Works ACRA 600	29
Darakote	30
De Hydro H86C	31
Emery 17065	32
Emery 17319	33
Emery 17319 - 6880	34
Emery 17320	35
Emery 17321	36
Emery 17322	37
Emery 17339	38
Emery 1765-6860	39
Emery 6886B	40
Husky Anti-Strip	41
Indulin AS-Special	42
Indulin AS-1	43

Table A.21. Anti-Stripping Agent Type Codes
(Continued)

	Code
Jetco AD-8	44
Kling	45
Kling Beta ZP-251	46
Kling Beta L-75	47
Kling Beta LV	48
Kling Beta 1000	49
Kling Beta 200	50
Nacco Anti Strip	51
No Strip	52
No Strip Concentrate	53
Redi-Coat 80-S	54
Redi-Coat 82-S	55
Silicone	56
Super AD-50	57
Tap Co 206	58
Techni H1B7175	59
Techni H1B7173	60
Techni H1B7176	61
Techni H1B7177	62
Tretolite DH-8	63
Tretolite H-86	64
Tretolite H-86C	65
Tyfo A-45	66
Tyfo A-65	67
Tyfo A-40	68
Edoco 7003	69
Other	70

Table A.22 Distress Types

Distress Type	Code
Asphalt Concrete Pavement	
Alligator Cracking	01
Block Cracking	02
Edge Cracking	03
Longitudinal Cracking	04
Reflection Cracking	05
Transverse Cracking	06
Patch Deterioration	07
Potholes	08
Rutting	09
Shoving	10
Bleeding	11
Polished Aggregate	12
Raveling and Weathering	13
Lane Shoulder Dropoff	14
Water Bleeding	15
Pumping	16
Other	17
Portland Cement Concrete Pavement	
Corner Breaks	20
Durability Cracking	21
Longitudinal Cracking	22
Transverse Cracking	23
Joint Seal Damage	24
Spalling	25
Map Cracking/Scaling	26
Polished Aggregate	27
Popouts	28
Punchouts	29
Blowouts	30
Faulting	31
Lane/Shoulder Dropoff	32
Lane/Shoulder Separation	33
Patch Deterioration	34
Water Bleeding/Pumping	35
Slab Settlement	36
Slab Upheaval	37
Other	38

APPENDIX B. EQUATION FOR STANDARD DEVIATION

Values for standard deviation are requested for a variety of items throughout the Data Collection Guide. The standard deviation should be entered only if there are at least four test results for the item of concern. The formula for standard deviation is:

$$\sigma = \sqrt{\frac{\sum_{1}^{n} (x_i - \bar{x})^2}{n - 1}}$$

where:

σ is the standard deviation.

x_i are the individual results for each of "n" tests.

$\bar{x}$ is the mean of the test results.

Where possible, it is preferable to use only the results of tests performed on samples obtained from the specific test section for determining the range, mean, and standard deviation. If this cannot be done, test results from all or part of the project may be considered provided that similar materials, construction methods, and conditions existed.

DATE	ISSUED TO