Long-Term Pavement Performance Maintenance and Rehabilitation Data Collection Guide

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Research, Development, and Technology
Turner-Fairbank Highway Research Center
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FOREWORD

The LTPP program is an ongoing and active program. To obtain current information and access to other technical references, LTPP data users should visit the LTPP Web site at http://www.tfhrc.gov/pavement/ltpp/ltpp.htm. LTPP data requests, technical questions, and data user feedback can be submitted to LTPP customer service via e-mail at ltppinfo@fhwa.dot.gov.

T. Paul Teng, P.E.
Director, Office of Infrastructure
Research and Development

NOTICE

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16. Abstract

This document provides guidelines and forms for documenting maintenance and rehabilitation treatments on test sections in the Long-Term Pavement Performance (LTPP) program and is an update to Chapters 6 and 7 of the 1993 version of the LTPP Data Collection Guide. The terms maintenance and rehabilitation are used within the LTPP program to classify how various treatments which alter a test section's structure are documented in the database. This is an important distinction since classification of some of these treatments may differ from highway agency terminology. For example, thin overlays which some agencies may classify as maintenance are classified within the LTPP program as rehabilitation since the data forms for overlays of any thickness are the same.

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asphalt concrete, chip seal, continuously reinforced concrete pavement, crack and seat, crack sealing, fog seal, grinding, grooving, heater scarification, joint load transfer restoration, joint resealing, jointed plain concrete pavement, jointed reinforced concrete pavement, LTPP, maintenance, milling, overlay, patching, portland cement concrete, pressure relief joints, recycled overlay, rehabilitation, retrofit subdrainage, seal coat, shoulder restoration, slab replacement, slurry seal, subsealing, surface treatment, undersealing PCC	No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22161.

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
	NOTE: volumes greater than 1000 L shall be shown in m^3			
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact degrees)		
°C	Celsius	1.8C+32	Fahrenheit	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

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

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LIST OF ACRONYMS AND ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
AC	Asphalt concrete
ACI	American Concrete Institute
ASTM	American Society for Testing and Materials
CPR	Concrete Pavement Restoration
CRCP	Continuously reinforced concrete pavement
FHWA	Federal Highway Administration
FWD	Falling weight deflectometer
GPS	General Pavement Studies
HMAC	Hot-mix asphalt concrete
JPCP	Jointed plain concrete pavement
JRCP	Jointed reinforced concrete pavement
LTE	Load transfer efficiency
LTPP	Long-Term Pavement Performance
PCC	Portland cement concrete
RSC	Regional Support Contractor
SAMI	Stress-absorbing membrane interlayers
SHA	State Highway Agency
SHRP	Strategic Highway Research Program
SMP	Seasonal Monitoring Program
SPS	Specific Pavement Studies
TSSC	Technical Support Services Contractor
VMA	Voids in mineral aggregate

CHAPTER 1. INTRODUCTION

1.1 DEFINITION OF MAINTENANCE AND REHABILITATION

It is desired that Long-Term Pavement Performance (LTPP) pavement test sections remain in-service for as long as possible so that performance trends can be established. However, since the pavement test sections used in the LTPP program are located on public roads, some form of modification to the pavement structure will ultimately occur to keep the road in a safe and serviceable condition.

The terms maintenance and rehabilitation are used within the LTPP program to classify how various treatments which alter a test section's structure are documented in the database. This is an important distinction since classification of some of these treatments may differ from highway agency terminology. For example, thin overlays which some agencies may classify as maintenance are classified within the LTPP program as rehabilitation since the data forms for overlays of any thickness are the same.

Maintenance activities include seal coats, crack sealing, patching, joint sealing, grinding, milling less than 1 inch (25 mm) deep, and grooving. Limitations on maintenance are intended to eliminate those activities that would reduce or destroy the amount of information that can be obtained from a test site. Maintenance of non-pavement related items such as guard rails, lighting, and signs are not affected by these guidelines.

Rehabilitation activities include overlays and associated pretreatments (patching, milling, joint repair, etc.), inlays (mill and fill), pressure relief joints in portland cement concrete (PCC) pavements, subsealing or undersealing, retrofitted subdrainage, joint load transfer restoration, and shoulder restoration.

1.1.1 Maintenance Control Zones

A maintenance control zone beginning 500 feet (152.4 m) prior to the monitoring site and ending 250 feet (76.2 m) past the monitoring site has been established around each LTPP test section or project to coordinate maintenance activities in this area and to reduce the influence of other maintenance activities on the performance of the test section. Therefore, these guidelines pertain only to the maintenance activities within this 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.

For General Pavement Studies (GPS) test sections, the maintenance control zone is located adjacent to the ends of the test section. For Specific Pavement Studies (SPS) projects, the maintenance control zone is established prior to the first test section and terminated after the last test section. For SPS sites with test sections located more than 1 mile (1.6 km) apart, the maintenance control zone should be established for each group of test sections.

Rehabilitation work, or any activities that will significantly alter the pavement performance, should not be applied to the test sections in the study period. These include extensive milling, grinding, grooving, or use of heater planer, undersealing, overlays (hot-mix asphalt concrete (HMAC)/PCC), slab jacking, retro-fitting underdrains or edge drains, other specific types of 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. (61 m) ± 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 RSC must be notified as soon as possible.

Although application of these treatments is strongly discouraged during the LTPP monitoring performance period, at some point the condition of the test section will drop to a level that requires some type of extensive rehabilitative measure. In this event, the RSC 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 the section is continued as one of the LTPP rehabilitation experiments, then data on the types of treatments should be collected following the guidelines established in the Rehabilitation Chapter (Chapter 4) of this Guide.

1.1.2 Timing of Activities

Safety-related maintenance may be performed according to the participating agency's standards at any time. Safety-related maintenance used in this context refers to spot patching of potholes, punchouts, blowups, or other surface defects as well as restoration of friction resistance. For slowly deteriorating safety conditions, it would be desirable to notify the LTPP Regional Support Contractor (RSC) in advance of any corrective action so that an observation of the pavement condition prior to application of the treatment can be made.

Up until the end of 2003, restoration and rehabilitation were permitted on LTPP test sections as long as the guidelines for monitoring continuation were followed as presented in this document.

When restoration or rehabilitation treatments are applied, transitions from these treatments to the monitoring section should be of sufficient length to ensure that performance of the test section is not influenced. If any of these types of treatments are planned for the pavement surrounding a test section or project, or for an adjoining lane or shoulder, the RSC must be notified as early as possible to enable adequate monitoring of pavement condition prior to treatment application. For test sections that will remain in study after a rehabilitation treatment, it is important that appropriate LTPP rehabilitation forms be completed to document treatment application. These forms can be obtained from the LTPP RSC and should be completed and returned to the RSC as soon as practical following the rehabilitation treatment.

1.2 TEXT ARRANGEMENT

The following chapters provide the data forms used in collecting information about the maintenance or rehabilitation treatments applied to the LTPP test sections along with guidelines for completing these forms. Additionally, these chapters address the restrictions placed on each type of treatment in order to keep these sections in the study for as long as possible.

CHAPTER 2. STATUS CHANGE REQUEST

One set of forms is required for any maintenance or rehabilitation activity. First, when an agency notifies LTPP that rehabilitation of a test section is planned or rehabilitates a test section without previous notification, the RSC must coordinate with the highway agency to get form RI-1, Cause for Rehabilitation, completed in accordance with LTPP guidelines.

If the proposed rehabilitation treatment conforms to current LTPP policy on monitoring continuation of rehabilitated test sections and the highway agency is willing to support continued monitoring, the responsible RSC must coordinate with the highway agency to get form RI-2, Monitoring Continuation Request, completed and signed by the highway agency official.

Regardless of what sort of activity takes place and whether or not the section will continue to be monitored, IMS Form 1, Test Section Status Change Request, shall be completed and submitted by the RSC.

This chapter provides directions for completing these forms.

2.1 IMS FORM-1, TEST SECTION STATUS CHANGE REQUEST

The information provided here is based upon directive I-84 and is geared to the changes associated with rehabilitation of a test section. Additional information about this form and its uses can be found in the directive.

Requests for changes to information contained in the EXPERIMENT_SECTION table in the LTPP Information Management System (IMS) shall be made using the IMS Form-1. Completed copies of this form along with supporting information shall be submitted to the FHWA LTPP team with a copy to the LTPP Technical Support Services Contractor (TSSC). Form 1 submissions must be signed or submitted by either the Regional Database Manager or the Regional Program Manager.

2.1.1 Data Elements

Data elements contained on the form include:

State Code: State code is the number used to identify state or Canadian province in which the pavement section is located. The codes presented in Table A.1 of Appendix A shall be used.

SHRP ID: SHRP ID is the four-digit identification number assigned to the test section by the LTPP program. This number is used to facilitate database referencing and field identification.

Date: This is the date the form was submitted.

Region (Item 1): The numeric code used to identify the region submitting the form. The region code assignments are:

North Atlantic Region	1
North Central Region	2
Southern Region	3
Western Region	4

New Record to be added to Experiment Section (Item 2): Typically, new records are added to the EXPERIMENT_SECTION table due to a change in CONSTRUCTION_NO caused by a maintenance or rehabilitation event. This part of the form is used for the addition of a record with a new construction number for an existing test section, whether or not the experiment type has changed. The fields included in this section are:

CONSTRUCTION_NO: Event number used to relate changes in pavement structure with other time dependent data elements. This field is set to 1 when a test section is initially accepted into LTPP and is incremented with each construction related change to the pavement.

CN_ASSIGN_DATE: The assignment date for the beginning of a construction event. It is equal to the acceptance date when a test section is first accepted into the LTPP program, i.e., CONSTRUCTION_NO = 1. It corresponds to the construction activity start date when the pavement layer structure is modified by maintenance or rehabilitation. CN_ASSIGN_DATE is used by the IMS Software to assign construction numbers (CN) to records contained in other tables. When a construction event occurs that causes an increment in CONSTRUCTION_NO, CN_ASSIGN_DATE (CN) must be less than or occur before CN_ASSIGN_DATE (CN+1).

CN_CHANGE_REASON: Code indicating the reason(s) for changing CONSTRUCTION_NO. A numeric code is assigned to the CN_CHANGE_REASON to indicate the type of maintenance or rehabilitation a test section received. Multiple codes may be assigned to indicate various maintenance/rehabilitation treatments a test section received. When multiple codes are entered, they should be separated with commas. Leading zeroes for single digit codes shall not be used. The codes can be found in Table A.17.

GPS_SPS: Code indicating if the section is either assigned to the General Pavement Studies (G) or Specific Pavement Studies (S).

EXPERIMENT_NO: Indicates which LTPP experiment the pavement section is assigned to. This two-digit code consists of a number followed by an optional suffix letter. The suffix is used for some experiments to indicate a subcategory of test sections.

ASSIGN_DATE: Date when a test section was assigned to the LTPP experiment. The LTPP experiment for a test section is the combination of EXPERIMENT_NO

and GPS_SPS fields in the record. When a section is first accepted into LTPP, ASSIGN_DATE is the acceptance date. ASSIGN_DATE is the construction start date and should equal the CN_ASSIGN_DATE, i.e., ASSIGN_DATE (CN+1) = CN_ASSIGN_DATE (CN+1) if EXPERIMENT_NO (CN) ≠ EXPERIMENT_NO (CN+1).

SEAS_ID: State specific Seasonal Monitoring Program (SMP) identification code indicating that SMP measurements were made for the corresponding construction number. SEAS_ID is set to A for the first SMP site installed in a state, B for the second site, etc. This field shall only be populated for construction numbers in which SMP data were collected. When a construction event occurs on a SMP test section that results in termination of its participation in the SMP, or if SMP monitoring was previously terminated prior to occurrence of a new construction event, SEAS_ID shall be set to null in the EXPERIMENT_SECTION record corresponding to the new CN for which no SMP data are available.

SUPPLEMENTAL: This field is set to S if the test section is a highway agency supplemental section on SPS project sites.

Changes to existing EXPERIMENT_SECTION record(s) (Item 3): This section should be used to make changes to existing records in the EXPERIMENT_SECTION table. For instance, in the case of a rehabilitation event, the DEASSIGN_DATE for all records with the experiment type immediately preceding the new experiment should be set to the ASSIGN_DATE for the new record. Under this heading, there are two columns to be completed for each element. The column on the left should contain the data as it currently exists in the EXPERIMENT_SECTION table and the column on the right should contain the required changes for that record.

CONSTRUCTION_NO: Event number used to relate changes in pavement structure with other time dependent data elements. This field is set to 1 when a test section is initially accepted into LTPP and is incremented with each construction related change to the pavement. Since the change being applied can be for more than one CONSTRUCTION_NO, the first blank should indicate the lowest CONSTRUCTION_NO requiring the change and the second should indicate the largest CONSTRUCTION_NO being changed. If only one CONSTRUCTION_NO is being changed, only the first blank should be completed.

CN_ASSIGN_DATE: The assignment date for the beginning of a construction event. It is equal to the acceptance date when a test section is first accepted into the LTPP program, i.e., CONSTRUCTION_NO = 1. It corresponds to the construction activity start date when the pavement layer structure is modified by maintenance or rehabilitation. CN_ASSIGN_DATE is used by the IMS Software to assign construction numbers (CN) to records contained in other tables. When a construction event occurs that causes an increment in CONSTRUCTION_NO, CN_ASSIGN_DATE (CN) must be less than or occur before

CN_ASSIGN_DATE (CN+1). For changes to more than one CONSTRUCTION_NO, this field should be left blank.

CN_CHANGE_REASON: Code indicating the reason(s) for changing CONSTRUCTION_NO. A numeric code is assigned to the CN_CHANGE_REASON to indicate the type of maintenance or rehabilitation a test section received. Multiple codes may be assigned to indicate various maintenance/rehabilitation treatments a test section received. When multiple codes are entered, they should be separated with commas. Leading zeroes for single digit codes shall not be used. The codes can be found in Table A.17.

GPS_SPS: Code indicating if the section is either assigned to the General Pavement Studies (G) or Specific Pavement Studies (S).

EXPERIMENT_NO: Indicates which LTPP experiment the pavement section is assigned to. This two-digit code consists of a number followed by an optional suffix letter. The suffix is used for some experiments to indicate a subcategory of test sections.

STATUS: Code indicating the current monitoring status of a section. A null value indicates the test section has been approved and has an active monitoring status. A value of O indicates that the test section has been placed out of study and no future monitoring measurements will be made. This field should only be set to O when a test section goes out of study. At that time, the STATUS field in all records in EXPERIMENT_SECTION with matching STATE_CODE and SHRP_ID should be set to O. A value of R indicates a rejected test section that, due to some fatal flaw, is being removed from the LTPP program and all data entries in the IMS deleted.

ASSIGN_DATE: Date when a test section was assigned to the LTPP experiment. The experiment designation for a test section is the combination of EXPERIMENT_NO and GPS_SPS fields in the record. When a section is first accepted into LTPP, ASSIGN_DATE is the acceptance date. ASSIGN_DATE is the construction start date and should equal the CN_ASSIGN_DATE, i.e., ASSIGN_DATE (CN+1) = CN_ASSIGN_DATE (CN+1) if EXPERIMENT_NO (CN) ≠ EXPERIMENT_NO (CN+1).

DEASSIGN_DATE: Date when a test section changed to another experiment or was placed in out of study status in the LTPP program (STATUS = O). This field should be null until a rehabilitation construction event occurs which causes a change in EXPERIMENT_NO, or the test section goes out of test. When a test section changes experiments due to rehabilitation, the DEASSIGN_DATE for the previous CN should equal the CN_ASSIGN_DATE for the next CN, i.e. DEASSIGN_DATE (CN) = CN_ASSIGN_DATE (CN+1), if EXPERIMENT_NO (CN) ≠ EXPERIMENT_NO (CN+1). If a maintenance related construction event occurs which does not result in an experiment change,

the DEASSIGN_DATE for the previous CN should equal the DEASSIGN_DATE for the next CN, i.e. DEASSIGN_DATE (CN) = DEASSIGN_DATE (CN+1) (even if null), if EXPERIMENT_NO (CN) = EXPERIMENT_NO (CN+1).

SEAS_ID: State specific Seasonal Monitoring Program (SMP) identification code indicating that SMP measurements were made for the corresponding construction number. SEAS_ID is set to A for the first SMP site installed in a state, B for the second site, etc. This field shall only be populated for construction numbers in which SMP data were collected. When a construction event occurs on a SMP test section that results in termination of its participation in the SMP, or if SMP monitoring was previously terminated prior to occurrence of a new construction event, SEAS_ID shall be set to null in the EXPERIMENT_SECTION record corresponding to the new CN for which no SMP data are available.

SUPPLEMENTAL: This field is set to S if the test section is a highway agency supplemental section on SPS project sites.

Test Section Out of Study?: This field should be set to Y if the section is being taken out of study. 'Y' indicates a request to set STATUS for every records for this section in EXPERIMENT_SECTION to 'O'.

Other change documentation attached? (Y/N) (Item 4): If changes concerning the test section status, other than those noted above are proposed, provide an explanation under comments in item 5 and enter a Y in the space indicating that the supporting documentation is attached to the form. An explanation and documentation are required for all other changes.

Comments (Item 5): This space is provided for entry of comments or explanations from the requestor on the nature of the requested changes. Additional sheets should be attached to the form if more room is needed or the change requires additional documentation.

Approval Status (Item 6): The approval status of the requested changes is indicated with a check mark in the boxes under this item.

Approval Comments (Item 7): This portion of the form is reserved for comments from the approval authority on actions to be taken to implement changes, explanations, of any modifications to the proposed changes, or reason why the proposed changes were not approved.

Requestor and Organization: Form 1 submissions must be signed or submitted by either the Regional Database Manager or the Regional Program Manager.

Approved by: The signature of the party responsible for approving the change to the EXPERIMENT_SECTION table along with their organization name and date the change was approved.

2.1.2 Adding a New Record With an Experiment Change

If a new record is proposed with an accompanying change in experiment, both Sections 2 and 3 of Form 1 must be completed. In section 2, the CN_ASSIGN_DATE should be equal to the ASSIGN_DATE for the newly created record, and both should equal the date the rehabilitation event started. It is important that the ASSIGN_DATE be set after the date of the last monitoring measurement and prior to or equal to the first day of the construction activity associated with the new CN event.

Data collected after construction events that require a change to a new experiment designation shall not be entered into the IMS until the change to EXPERIMENT_SECTION has been approved and performed. At the very minimum, enough information on the nature of the construction treatments applied to a test section that cause the change in experiment, must be supplied with Form 1 so that the new experiment designation can be verified.

Section 3 of Form 1 must be completed to identify the records that must be given a deassign date due to the assignment of a new experiment to the test section. The DEASSIGN_DATE for all records with the experiment type immediately preceding the new experiment should be set to the ASSIGN_DATE for the new record.

Because a change in experiment requires approval from the FHWA for monitoring continuation, in general, this request should not be made until the form RI-2 has been completed and approved. Therefore, it is expected that a completed form RI-2 will be submitted with all requests to change experiment.

2.1.3 Adding a New Record With No Experiment Change

If a new record is proposed without an accompanying change in experiment, Section 2 of Form 1 must be filled out. In section 2, the CN_ASSIGN_DATE should be equal to the date the rehabilitation/maintenance started, not the day before. The ASSIGN_DATE should be equal to the ASSIGN_DATE for the previous construction number. Section 3 of Form 1 is not required for this operation.

2.2 FORM RI-1, CAUSE FOR REHABILITATION

Rehabilitation Information form RI-1, Cause for Rehabilitation, shall be submitted to the participating highway agency for completion for all LTPP test sections which are scheduled for rehabilitation. A separate form shall be completed for each test section, even when more than one test section located on the same project are rehabilitated at the same time. This form should be completed for all test sections scheduled for rehabilitation regardless of whether or not the test section will remain in the LTPP program after rehabilitation.

The following information is requested on the form:

> *State Code:* The state code is the number used to identify the state or Canadian province in which the pavement section is located.

LTPP Section ID: The LTPP Section ID is the four digit identification number assigned to the test section by the LTPP program. This number is used to facilitate the computer referencing and for field identification.

Date: Enter the date the form was completed.

Primary Reason for Rehabilitation (Item 1): Place an X in the appropriate box which best describes the primary reason why the test section is being rehabilitated. Rehabilitation can be performed to address pavement condition problems or for other reasons. Since pavement condition problems may exist on the project in which the test section is located, and not due to conditions present on the test section, the first two boxes are provided to indicate whether or not a pavement condition problem leading to the rehabilitation is present on the test section. The last box is provided to signify that a non-pavement condition related problem is the cause for the planned rehabilitation.

General Pavement Related Rehabilitation Causes (Item 2): If the reason for rehabilitation is due to a pavement condition problem, the primary general factor affecting the decision to rehabilitate the pavement section should be indicated. This response should be independent of whether or not the problem condition occurs on the test section. If the rehabilitation cause is not due to a pavement condition problem, do not enter a response. A single response indicating the most significant single factor leading to the rehabilitation decision is desired. A response is also provided if the agency uses a pavement condition index based upon combination of multiple pavement distresses and/or roughness attributes. If the pre-defined responses are not adequate to describe the primary reason for the planned rehabilitation, then an "other" response is provided in which a short explanation can be entered.

Contributing Pavement Condition Related Rehabilitation Causes (Item 3): Since many contributing pavement condition factors can affect a rehabilitation decision, these can be indicated under this item. The intent is to indicate those pavement condition items that contributed to the rehabilitation decision, not to indicate all pavement distresses which may be present. Most of the pre-defined responses are pavement distress types as defined in the LTPP Distress Identification Manual. If the cause for the rehabilitation is not pavement condition related, no response should be made in this blank.

Non-pavement condition related reasons (Item 4): If a non-pavement condition reason exists as the cause for the planned rehabilitation, mark the appropriate box or provide a short explanation under "other."

Scheduled date for start of construction activities (Item 5): Indicate the month and year that construction activities are scheduled to begin. When possible, indicate the date when construction activities on the portion of the project on which the test section is located are expected to begin.

2.3 FORM RI-2, MONITORING CONTINUATION REQUEST

When the participating highway agency notifies LTPP that test section rehabilitation is planned and that highway agency is interested in continuing monitoring activities on the rehabilitated section, and the proposed rehabilitation treatment conforms with current LTPP policy on monitoring continuation of rehabilitated test sections, then a form RI-2 should be completed and submitted with the form RI-1.

It is the responsibility of the LTPP RSC to coordinate with the highway agency to get form RI-2, Monitoring Continuation Request, completed and signed by a highway agency official. The completed form should be submitted to FHWA with a copy to the LTPP TSSC.

The following guidelines shall be followed in completing the RI-2.

State Code: State code is the number used to identify the state or Canadian province in which the pavement section is located.

SHRP ID: SHRP ID is the four-digit identification number assigned to the test section by the LTPP program. This number is used to facilitate computer referencing and for field identification.

Date: Enter date when the form was submitted.

Existing Experiment Designation and Pavement Structure (Item 1): Indicate the current experiment designation for the test section. Use G for GPS and S for SPS, the assigned single digit experiment number, and the suffix code as applicable. Please use a P or A suffix code to differentiate between SPS-9P and -9A test sections. For example, if a test section started as a GPS-1, but was subsequently overlaid and is currently in the GPS-6B experiment, a G6B should be entered.

If the test section is in SPS-8, check the box corresponding to the type of pavement structure. If the test section is in SPS-9, check the box corresponding to the type of pavement.

Estimated Rehabilitation Construction Start Date (Item 2): Provide the best available estimate of the planned date for start of rehabilitation construction. Estimates to the nearest month are acceptable.

Proposed Rehabilitation Treatments – AC Surfaced Pavements (Item 3): Check applicable boxes which describe all of the rehabilitation treatment activities planned for AC surfaced test sections. Also provide milling depths and overlay thickness as applicable. Provide details under "other" for rehabilitation treatment activities not adequately covered by one of the provided responses. Attach additional pages if more space is needed.

Proposed Rehabilitation Treatments – PCC Surfaced Pavements (Item 4): Check applicable boxes which describe all of the rehabilitation treatment activities planned for PCC surfaced test sections. If the structure to be rehabilitated is an existing AC overlay on a PCC type pavement, mark any of the treatment activities planned for the PCC layer listed under this item. Provide entries for overlay thickness and debond layer type, as applicable.

Provide details under "other" for rehabilitation treatment activities not adequately covered by one of the provided responses. Attach additional pages if more space is needed.

Other Construction Activities within 300 m of Test Section (Item 5): Check all applicable boxes for other construction activities to be performed within 300 m (985 ft) from either end of the test section. Provide details under other for construction activities within or near this zone around the test section that might affect traffic patterns on the test section or its performance, but which are not adequately covered under one of the provided responses. Attach additional pages if more space is needed.

Dates of Last/Planned Monitoring Measurements (Item 6): The RSC shall provide the dates of the last LTPP monitoring measurements performed on the test section. Also provide an estimated date for any monitoring planned to be performed prior to construction.

Agency Activities: Check all of the activities the agency agrees to perform with respect to the planned rehabilitation and subsequent monitoring. If one of the listed activities is not checked, attach an explanation of the circumstances and how the activity will be accomplished.

Signatures: A highway agency official and the responsible RSC engineer submitting this information must sign the form in the indicated spaces.

Indicate the number of pages of supplemental information included in the data form submission in the space provided.

LTPP Test Section Status IMS Form 1 Test Section Status Change Request	State Code [__ __] SHRP ID [__ __ __ __] Date (dd/mmm/yyyy) [__ __ / __ __ __ / __ __ __ __]

1. Region (1 - North Atlantic; 2 - North Central; 3 - Southern; 4 - Western) [__]

2. New Record to be added to EXPERIMENT_SECTION (provide explanation under comments)

CONSTRUCTION_NO	[__]	EXPERIMENT_NO	[__ __]
CN_ASSIGN_DATE	[__ __ / __ __ __ / __ __ __ __]	ASSIGN_DATE	[__ __ / __ __ __ / __ __ __ __]
CN_CHANGE_REASON	[_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _]	SEAS_ID	[__]
GPS_SPS	[__]	SUPPLEMENTAL	[__]

3. Changes to existing EXPERIMENT_SECTION record(s) (provide explanation under comments)

	Record to be Changed	Proposed Changes
CONSTRUCTION_NO	[__] - [__]	[__] - [__]
CN_ASSIGN_DATE	[__ __ / __ __ __ / __ __ __ __]	[__ __ / __ __ __ / __ __ __ __]
CN_CHANGE_REASON	[_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _]	[_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _]
GPS_SPS	[__]	[__]
EXPERIMENT_NO	[__ __]	[__ __]
STATUS	[__]	[__]
ASSIGN_DATE	[__ __ / __ __ __ / __ __ __ __]	[__ __ / __ __ __ / __ __ __ __]
DEASSIGN_DATE	[__ __ / __ __ __ / __ __ __ __]	[__ __ / __ __ __ / __ __ __ __]
SEAS_ID	[__]	[__]
SUPPLEMENTAL	[__]	[__]

Test section out of study? (Y/N)
CONSTRUCTION_NO must be specified. If only one record, use only first blank.
Codes can be found in Table A.17 of the Data Collection Guide for LTPP Studies.

4. Other change documentation attached? (Y / N) [__]

5. Comments _____

_____

_____

_____

6. __ Approved as submitted __ Approved changes noted under approval comments __ Not Approved

7. Approval comments _____

_____

_____

Requestor _____ Organization _____

Approved by _____ Organization _____

Approval date _____

LTPP Test Section Rehabilitation Rehabilitation Information Form RI-1 Cause for Rehabilitation	State Code [__ __] SHRP ID [__ __ __ __] Date (dd/mmm/yyyy) [__ __ / __ __ __ / __ __ __ __]

1. Primary reason for rehabilitation:
☐ test section pavement condition ☐ non-test section pavement condition ☐ not related to pavement condition

2. General pavement related rehabilitation causes (check the one most important factor)

☐ pavement distress ☐ roughness ☐ friction ☐ agency condition index

Other _____

_____

_____

3. Contributing pavement condition related rehabilitation causes (check all that apply)

☐	wheel path cracking	☐	rutting	☐	roughness	☐	surface friction
☐	non-wheel path cracking	☐	shoving	☐	faulting	☐	polished aggregate
☐	raveling	☐	bleeding	☐	scaling	☐	potholes
☐	joint spalling	☐	punchouts	☐	condition index		

Other _____

_____

_____

_____

4. Non-pavement condition related reasons (check all that apply)

☐	added lane	☐	route realignment	☐	adjacent land use changes
☐	political related causes				

Other _____

_____

_____

_____

5. Scheduled date for start of construction activities (mmm/yyyy) [__ __ __ / __ __ __ __]

Agency Contact Name _____ Employer:_____

Phone Number: _____ E-mail:_____

LTPP Test Section Rehabilitation **Rehabilitation Information Form RI-2** **Monitoring Continuation Request**	State Code [__ __] SHRP ID [__ __ __ __] Date (dd/mmm/yyyy) [__ __ / __ __ __ / __ __ __ __]

1. Existing experiment designation and pavement type ({G-GPS; S-SPS}/ # / suffix – *if applicable*) [__ __ __]
   SPS-8 pavement structure: ☐ Asphalt Concrete; ☐ Portland cement concrete
   SPS-9 pavement structure: ☐ New / reconstructed; ☐ Overlay

2. Estimated rehabilitation construction start date (dd/mmm/yyyy) [__ __ / __ __ __ / __ __ __ __]

3. Proposed rehabilitation treatments – AC surface pavements
   Pre-overlay treatments: ☐ None ☐ Patching ☐ Heater-scarification ☐ Fabric ☐ Milling – Total Depth ____mm
   Overlay thickness _____ mm
   Overlay material: ☐ Conventional virgin HMA mixture ☐ Recycled HMA mixture ☐ HMA with modified binder
   ☐ Plain jointed PCC ☐ Jointed reinforced PCC ☐ Continuously reinforced PCC
   Other _____

4. Proposed rehabilitation treatments – PCC pavements
   ☐ CPR treatments without overlay ☐ Overlay – thickness _____ mm
   Pre-overlay treatments: ☐ Partial depth patching ☐ Full depth patching and joint/crack replacement ☐ Undersealing
   ☐ Load Transfer Restoration ☐ Retrofitted subsurface drainage system ☐ Crack/Break & Seat ☐ Rubblization
   ☐ Full Surface Diamond Grinding ☐ Debond Interlayer: Type _____

   Overlay material: ☐ Conventional virgin HMA mixture ☐ Recycled HMA mixture ☐ HMA with modified binder
   ☐ Plain jointed PCC ☐ Jointed reinforced PCC ☐ Continuously reinforced PCC ☐ Saw and seal HMA overlay layer

   Other _____

5. Other construction activities within 300-m of test section
   ☐ Widening of the LTPP test lane ☐ Lane added next to LTPP test lane ☐ Intersection or ramps
   ☐ Tied concrete shoulder ☐ Traffic signal
   Other _____

6. Dates of last/planned monitoring measurements:

	Last Measurements Performed	Planned Measurements Prior to Rehabilitation
Deflection (mmm/yyyy)	[__ __ __ / __ __ __ __]	[__ __ __ / __ __ __ __]
Distress (manual or PASCO) (mmm/yyyy)	[__ __ __ / __ __ __ __]	[__ __ __ / __ __ __ __]
Profile (mmm/yyyy)	[__ __ __ / __ __ __ __]	[__ __ __ / __ __ __ __]

   Agency activities. The highway agency agrees to provide: *check all applicable*
   ☐ On-site traffic monitoring ☐ Monitoring measurement traffic control ☐ Mark and sign test section
   ☐ Materials field sampling and testing ☐ Rehabilitation construction data ☐ Notification prior to construction

Signatures *Highway agency official and RSC Engineer must sign verifying information*

Highway Agency Official

Name: _____ Organization _____ Signature _____

RSC Engineer

Name: _____ Organization _____ Signature _____

9. Attached number of pages [__ __]

Rehabilitation Information Form RI-2 September 1998

CHAPTER 3. MAINTENANCE

3.1 INTRODUCTION

This chapter provides data sheets and instructions for their use in collecting information concerning maintenance applications and treatments on LTPP monitored test sections. The maintenance data collection plan addresses two separate time periods referred to as (1) historical data and (2) LTPP 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 LTPP guidelines begins. Maintenance Data Sheet No. 1 is used for this period. Maintenance Data Sheets Nos. 2 through 19 are used for the period beginning from the time monitoring of the test section began. 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 order given in Table 3.1.

Table 3.1. Order of Maintenance Data Collection Sheets

Description	Sheet Number
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
Crack Sealing PCC Pavement	18
Improvement Listing	19

AC – Asphalt Concrete
PCC – Portland Cement Concrete

As noted previously, a maintenance control zone has been established around each test section. Any application of treatments within this zone will require certain data to be entered into the database including the IMS Form 1 described in Chapter 2.

For each specific type of treatment (or work type) the appropriate data sheets should be completed (see Table 3.2). Work type codes presented in Appendix A, Table A.17 and not listed in Table 3.2 are considered rehabilitation activities and will be covered in Chapter 4.

The maintenance data sheets provided do not include descriptions of pavements to be repaired; however, the "State Code" and the "Strategic Highway Research Program (SHRP) ID" connect

this information to other descriptive data (i.e. inventory, distress, materials sampling, etc.) for the test section.

Table 3.2. Maintenance Data Sheets to be Completed

Work Item	Work Type Code*	Maintenance Data Sheets**
Crack Sealing (linear ft)	01	5 or 18, 19
Transverse Joint Sealing (linear ft)	02	10–11, 19
Lane-Shoulder, Longitudinal Joint Sealing (linear ft)	03	10–11, 19
Full Depth Joint Repair Patching of PCC (sq. yards)	04	13–16, 19
Full Depth Patching of PCC Pavement Other than at Joint (sq. yards)	05	13–16, 19
Partial Depth Patching of PCC Pavement Other than at Joint (sq. yards)	06	7–9, 19
PCC Slab Replacement (sq. yards)	07	13–16, 19
Grinding/Milling Surface (sq. yards)	12	12, 19
Grooving Surface (sq. yards)	13	12, 19
Mechanical Premix Patch (using motor grader and roller) (sq. yards)	21	6, 19
Manual Premix Spot Patch (hand spreading and compacting with roller) (sq. yards)	22	6, 19
Machine Premix Patch (placing premix with paver, compacting with roller) (sq. yards)	23	6, 19
Full Depth Patch of AC Pavement (removing damaged material, repairing supporting material, and repairing) (sq. yards)	24	6, 19
Patch Pot Holes – Hand Spread, Compacted with Truck (no. of holes)	25	6, 19
Skin Patching (using spreader and distributor to apply hot liquid asphalt and aggregate) (sq. yards)	26	6, 19
Strip Patching (using spreader and distributor to apply hot liquid asphalt and aggregate) (sq. yards)	27	6, 19
Surface Treatment, single layer (sq. yards)	28	3–4, 19
Surface Treatment, double layer (sq. yards)	29	3–4, 19
Surface Treatment, three or more layers (sq. yards)	30	3–4, 19
Aggregate Seal Coat (sq. yards)	31	3–4, 19
Sand Seal Coat (sq. yards)	32	3–4, 19
Slurry Seal Coat (sq. yards)	33	3–4, 19
Fog Seal Coat (sq. yards)	34	3–4, 19
Prime Coat (sq. yards)	35	3–4, 19
Tack Coat (sq. yards)	36	3–4, 19
Dust Layering (sq. yards)	37	3–4, 19
Partial Depth Patching of PCC Pavement at Joints (sq. yards)	54	7–9, 19

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

** Maintenance data sheets 2 and 17 should be completed for all maintenance activities.

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.

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.

Routine or corrective maintenance activities that may be performed on the monitoring sites include Crack Sealing, Joint Cleaning/Sealing, and Isolated Spot Pavement Repairs such as Patching. These activities may be performed without prior communication with the LTPP RSC.

There are other maintenance activities that are permitted, however, notification to the RSC 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 of the entire test section, their placement should be coordinated with the RSC 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 the RSC's as close to application as possible. The following types of measurements are required: Deflection, Distress Survey, and Longitudinal Profile. Guidelines on the timing of these monitoring events are contained in a separate Operational Memorandum.

As noted in section 1.1.1, a maintenance control zone has been established around each test section and treatments within this zone should be limited as much as possible.

3.2 DATA SOURCE IDENTIFICATION

It is anticipated that 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 activity would be done at the actual time of treatment application. If this is not possible or practical, then field notes or project diaries from each 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 used whenever possible.

If project diaries or field notes are not available, then maintenance construction plans 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 State Highway Agency (SHA), American Association of State Highway and Transportation Officials (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 is to specifications, then these values will nominally be representative of that found in the field. Because this information is 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 judgment 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 judgment 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 "judgment" and are as described above.

As maintenance data is collected and subsequently completed data sheets are sent to the RSC, it will be imperative that the RSC review these initial submissions. If sheets submitted from each SHA appear to be completed as described in this chapter, then only spot checking of additional data by the RSC will be required. If problems are apparent in the data, then additional communication and coordination will be required between the SHA and RSC to resolve the questions.

3.3 COMPLETION OF DATA SHEETS

3.3.1 Data 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 Code: The State Code is a number used to identify the state or Canadian province in which the pavement section is located. Codes are provided in Table A.1 of Appendix A.

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

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 last four digits represent the year.

3.3.2 Individual Data Sheets

Historical Maintenance Information (Sheet 1)

Historical maintenance information consists of data collected on or near the monitoring site up to the time that monitoring of the specific site began. These data will frequently be very difficult to obtain from existing records for pre-LTPP monitoring work, but it is extremely important that every effort be made to retrieve them.

Space is provided for identifying a maximum of six maintenance activities by year in which they were accomplished. If more than six maintenance activities have been performed since pavement construction, this sheet must be repeated.

Individual data elements are as follows.

Year (Item 1): The year in which the maintenance activity occurred.

Maintenance Case Number (Item 2): The SHA assigned case number for the specific maintenance being reported. If no number is assigned, leave this space blank.

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

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

Maintenance Material Code (Item 5): 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.

Work Quantity (Item 6): The quantity of work performed within the test section in the appropriate units as listed in Table A.17 (See Item 3).

Thickness (Item 7): The thickness entered to the nearest tenth of an inch (0.1 in) 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).

Total Cost (Item 8): 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 has been 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 LTPP monitoring site. SHAs 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 are 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.

Individual data elements are as follows.

Date Work Began (Item 1): The month, day and year the maintenance operation began.

Primary Reason for Seal Coat (Item 2): Identify the primary purpose for placing the seal on the test section. Codes are provided on the data sheet, and space is provided for entering a reason other than those for which codes are provided.

Percent of Test Section Sealed (Item 3): The percent of the test section surface area over which the seal coat has been placed. For LTPP test sections, the percent of the monitored test section in the outside lane is to be entered.

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

Type/Grade of Bituminous Material in Seal Coat (Item 5): Table A.16 in Appendix A provides a comprehensive list of possible types and grades, as taken from information published by the Asphalt Institute.

Application Rate for Bituminous or Other Cementing Material (Item 6): The amount of bituminous material, to the nearest tenth of a gallon, placed per square yard (0.1 gal/yd^2) of pavement (water added to emulsified asphalt is included).

Application Rate for Aggregate (Item 7): The amount by weight of aggregate, to the nearest tenth of a pound (0.1 lb.) including mineral filler, placed per square yard of pavement (0.1 lb/yd^2).

Approximate Finished Surface Treatment Thickness (Item 8): The approximate thickness of the applied seal coat, to the nearest tenth of an inch (0.1 in).

Ambient Conditions at Time Seal Coat Applied (Item 9): 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.

Average Crack Severity Level (Item 10): The average severity level of the cracks in the test section. The codes are provided on the data forms. The Distress Identification Manual should be used to identify the definitions for the severity levels.

Primary Type of Cracks (Item 11): A code entered to describe the primary type of cracking prevalent in the test section and evaluated in item 10 (above). Codes are provided in Table A.22 of Appendix A. A complete description of each crack type listed in Table A.22 is available in the Distress Identification Manual.

Seal Coat Application Data for Pavements with Asphalt Concrete Surfaces, Continued (Sheet 4)

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

Individual data elements are as follows.

Gradation of Aggregate (Item 1): The percent of 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 space for a sufficient number of sieve sizes to accommodate testing and specification practice for most state and province agencies.

Aggregate Precoated (Item 2): A code entered to indicate whether or not the aggregate used in the seal coat was coated with bituminous material prior to placement. Codes are provided on the data sheet.

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

Estimated Time Allowed for Seal Coat to Cure Prior to Traffic Application (Item 4): A code, as provided on the data sheet, 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 was placed, then from the time the liquid was applied).

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

Initial Existing Pavement Surface Preparation (Item 6): A code entered to indicate the method of initial preparation for the existing pavement surface. 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.

Final Preparation of Existing Pavement Surface (Item 7): A code entered to record the final surface preparation used on the existing AC surface prior to seal coat application. The codes for various surface preparation methods appear on the data sheet.

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.

Individual data elements are as follows.

Date Work Began (Item 1): The month, day, and year the maintenance activity began.

Average Crack Severity Level (Item 2): The average severity level of the cracks in the test section. Codes are provided on the data forms. The Distress Identification Manual should be used to determine the definition of the various severity levels.

Primary Type of Cracks (Item 3): A code entered to describe the primary type of cracking prevalent over the monitored test section and evaluated in item 2 above. Codes are provided in Table A.22 of Appendix A. A complete description of each type of crack listed in Table A.22 is available in the Distress Identification Manual.

Type of Material Used to Seal Cracks (Item 4): 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 additional information to identify the material.

Ambient Conditions at Time of Crack Sealing (Item 5): 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.

Approximate Total Length of Cracks Sealed (Item 6): The approximate total linear feet of individual cracks sealed within the test section to the nearest foot. For LTPP studies, only the total linear feet of cracks sealed within the limits of the test section in the outer lane are to be recorded.

Method Used to Clean Crack Prior to Sealing (Item 7): A code entered to record the procedure used to clean the debris from cracks prior to sealing. Codes are provided on the data sheet.

Patching Data for Pavements with Asphalt Concrete Surfaces (Sheet 6)

This data sheet is for reporting data on patches within a test section with an AC surface, which includes only the outside lane used by LTPP for monitoring.

Individual data elements are as follows:

Date Work Began (Item 1): The month, day, and year that the maintenance work began.

Primary Reason for Patches (Item 2): A code entered for indicating the primary distress requiring patching. Where patching was required for more than one reason, or distress, 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 is provided. For a complete description of each distress type, see the Distress Identification Manual.

Secondary Reason for Patches (Item 3): A code entered for indicating a second reason for patching using codes as discussed under Item 2.

Patches (Item 4): The number and square feet of patches, differentiated by vertical extent of the 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 the full depth of the base. 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.

If Patched Pavement is AC Overlay of PCC, Was Patch (Item 5): A code entered to indicate whether the pavement patched is an AC overlay of a PCC pavement, and whether the patch material is all AC or AC over PCC to match existing materials. If the pavement structure is not AC overlay of PCC, leave the space blank. Codes appear on the data sheet.

Surface Material(s) Used to Patch Pavement (Item 6): A code to identify the type of surface material(s) used for patching. Spaces are provided on the data form for up to two

material types. Where a material other than those listed is used, space is given for providing additional detail. If more than two types of surface material are used, specify the two used in the greatest area of patching.

Method of Compaction (Item 7): A code entered to specify the method used for compacting the new patch material. Codes are provided on the data sheet.

Method Used to Determine Location and Sizes of Patches Required (Item 8): 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 that method.

Method Used to Cut Boundaries (Item 9): A code entered to indicate the method used for cutting the existing pavement at the patch boundary. Codes are provided on the data form.

Partial Depth Patching Data for Pavements with Portland Cement Concrete Surfaces (Sheet 7)

This data sheet is for reporting on patches within a test section with a PCC surface, which includes only the outside lane used by LTPP for monitoring. 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.

Individual data elements are as follows.

Date Work Began (Item 1): The month, day, and year that performance of the maintenance activity began.

Primary Reason for Patches (Item 2): A code entered to indicate the primary distress requiring patching. Where patching was required for more than one reason, or distress, 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 is provided. For a complete description of each distress type listed in Table A.22, see the Distress Identification Manual.

Secondary Reason for Patches (Item 3): A code entered to indicate a second reason, or distress, for patches using codes as discussed above.

Patches (Item 4): 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 (0.1 in).

Method Used for Patch Boundary Determination (Item 5): A code entered to provide the method used to identify the limits of the areas to be patched. Codes are provided on the data form.

Method Used to Cut Boundaries (Item 6): A code entered to indicate the method used for cutting the existing pavement at the patch boundary. Codes are provided on the data form.

Method Used to Break Up and/or Remove Deteriorated Concrete (Item 7): 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.

Method for Final Cleaning of Patch Area (Item 8): 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 the partial depth patching data recorded on Data Sheet 7.

Individual data elements are as follows.

Patch Material Used (Item 1): 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.

Bonding Agent (Item 2): A code entered to identify the material used to bond the patch material to the existing PCC. Codes are provided on the data form.

Mixture Design for Patch Material (Item 3): 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 the No. 4 (4.75 mm) sieve. Appropriate entries are to be made depending on the type of patch material (AC, PCC, etc.) used. For AC patch material, leave the space for "water" blank.

Type Cement Used (Item 4): 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.

Air Content (Item 5): The mean air content in percent by volume and range of air contents in the PCC mix to the nearest tenth of a percent (0.1%). Where AC is used as the patch material, these spaces are to be left blank.

Admixtures (Item 6): This item covers 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 AC has been used as the patch material or where admixtures have not been used, these spaces are to be left blank.

Slump (Item 7): The mean and range (minimum and maximum measure values) of the slump for the PCC patch material to the nearest tenth of an inch (0.1 in). Where AC is used as the patch material, these spaces are to be left blank.

Compressive Strength of Patch Material (Item 8): The compressive strength of a standard cylinder of PCC patch material in psi after a certain curing time period in days. Where AC is used as the patch material, these spaces are to be left blank. 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, American Society for Testing and Materials (ASTM), or other agency.

Maximum Size of Coarse Aggregate (Item 9): The maximum size of coarse aggregate used in the patch material to the nearest tenth of an inch (0.1 in).

Partial Depth Patching Data for Pavements with Portland Cement Concrete Surfaces, Continued (Sheet 9)

This data sheet is for continuation of the partial patching data recorded on Data Sheets 7 and 8.

Individual data elements are as follows.

Curing Method (Item 1): Space is provided to identify up to two methods used for curing the patch material, if any. Codes are provided on the data form. Space is also provided to specify some other method where the method used is not shown on the data form. Where AC 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.

Approximate Time Between Patching and Opening to Traffic (Item 2): The approximate time in hours from placement of materials until traffic was allowed on the patch surface.

Ambient Conditions at Time of Patching (Item 3): 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.

Method of Consolidating Materials (Item 4): A code entered for identification of the means of consolidating the patch materials. Codes are provided on the data form.

Finishing Method (Item 5): A code entered to record the method used to finish the patch surface. Codes are provided on the data form. Where AC is used as the patch material, this space is to be left blank.

Joint Forming Method (Item 6): Codes entered to specify the method used for forming contraction joints in the patched concrete pavement surface for longitudinal, transverse,

and shoulder joints where they may be present. Codes are provided on the data form. Where AC 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. If more than one material or method is used for different joints, repeat Sheets 10 and 11 for each type.

Individual data elements are as follows.

Date Work Began (Item 1): The month, day, and year the maintenance activity began.

Method of Removing Old Sealant (Item 2): A code entered to identify the method used for removing any old or existing joint sealant. Codes are provided on the data form.

New Sealant Reservoir Dimensions (Item 3): The width and depth of the sealant reservoir to the nearest tenth of an inch (0.1 in).

Bond Breaker Under Sealant (Item 4): 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.

Were Jointed Sidewalls Refaced (Item 5): A code entered to specify whether none, one, or both sidewalls were refaced during the joint resealing process. Codes are provided on the data form.

Cleaning of Sidewalls (Item 6): 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.

Individual data elements are as follows.

Type of Contraction Joint Sealant (Item 1): 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 is provided.

Average Depth of Top of Sealant Placement (Item 2): The depth to the nearest tenth of an inch (0.1 in) from the top of the slab to the top of the joint sealant material.

Are Expansion Joints Sealed Differently than Contraction Joints (Item 3): A code entered to indicate differences in sealing materials used for contraction and expansion joints. Codes are provided on the sheet.

Total Linear Feet of Joints Sealed (Item 4): The total linear feet to the nearest tenth of a foot (0.1 ft) 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)

This data sheet is for providing information regarding grinding or milling for safety reasons.

Individual data elements are as follows.

Date Work Began (Item 1): The month, day, and year the maintenance activity began.

Pavement Surface Type (Item 2): A code entered to report whether the surface material was AC or PCC. Codes are provided on the data form.

Method Used (Item 3): A code entered to report whether the surface material was removed by diamond grinding or milling equipment. Codes appear on the data sheet.

Reason for Grinding, Milling, or Grooving (Item 4): The primary reason for grinding or milling the pavement section. Codes are provided on the data form. Space is provided to indicate another reason if an appropriate code has not been provided.

Extent of Grinding, Milling, or Grooving (Item 5): A code entered to indicate whether the grinding or milling has been performed only over individual joints or patches, or has been performed over the entire section. Codes are provided on the data form.

Average Depth of Cut (Item 6): The average depth of the cut in the surface material to the nearest tenth of an inch (0.1 in).

Cutting Head Width (Item 7): The approximate width to the nearest tenth of an inch (0.1 in) of the machine cutting head.

Average Groove Width (Item 8): The average groove width to the nearest tenth of an inch (0.1 in). Leave these spaces blank if diamond grinding or grooving is not the method used.

Average Spacing Between Blades (Item 9): The average spacing between the grinding blades to the nearest one-tenth of an inch (0.1 in). Leave these spaces blank if diamond grinding or grooving is 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.

Individual data elements are as follows:

Date Work Began (Item 1): The month, day, and year the maintenance activity began.

Primary Reason for Patches or Slab Replacement (Item 2): A code entered for indicating the primary distress requiring patching or slab replacement. Where patching or slab replacement was required for more than one reason or distress, enter the distress 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 is provided. For a complete description of each distress type, see the Distress Identification Manual.

Secondary Reason for Patches or Slab Replacement (Item 3): A code entered for indicating a second type of distress requiring patching or slab replacement, using codes as discussed above.

Patches (Item 4): The number and square feet of patches differentiated by depth of material replaced whether only the slab has been replaced, or both the slab and the base.

Patch Material Used (Item 5): A code entered to record the type of surface material used to patch the pavement. Codes are provided on the data form.

Slabs Replaced (Item 6): The number and square feet of slabs replaced, differentiated by whether only the slab has been replaced or both the slab and part of the base.

Base Replaced By (Item 7): The materials used to replace the base for patches and slab replacement, respectively. Codes appear on the data form. Leave this space blank if the base has not been replaced.

Method for Patch Boundary Determination (Item 8): A code entered to indicate the means of determining the extent of the area to be patched, or whether entire slabs should be replaced. Codes are provided on the data form.

Cutting Instrument (Item 9): 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 the full depth repair data for PCC pavements recorded on Sheet 13.

Individual data elements are as follows.

Type of Joint Load Transfer System Used for Repaired Areas (Item 1): 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 no code is provided.

Securing Load Transfer Devices (Item 2): 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.

Reinforcing Steel Placed in Patch (Item 3): A code entered to indicate whether the patched area contains reinforcing steel or not. Codes are provided on the data form.

Bar Diameters (Item 4): 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 are not used, the appropriate spaces may be left blank for these and the next three items.

Bar Lengths (Item 5): The lengths of longitudinal and transverse bars or wire mesh, to the nearest tenth of an inch (0.1 in).

Bar Spacings (Item 6): The approximate center-to-center spacings of adjacent longitudinal and transverse bars or wire mesh, to the nearest tenth of an inch (0.1 in).

Dowel Coatings (Item 7): 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.

Number of Saw Cuts Per Patch (Item 8): The number of saw cuts required per patch, if any.

Depth of Typical Boundary Saw Cut (Item 9): The depth, to the nearest tenth of an inch (0.1 in), of the average boundary saw cut.

Concrete Breakup (Item 10): A code entered to specify the means of breaking up the existing concrete to be removed. Codes are provided on the data form.

Removal of Concrete (Item 11): 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 the full depth repair data recorded on Sheets 13 and 14.

Individual data elements are as follows.

Method of Reinforcing Steel Placement (Item 1): 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.

Mixture Design for Patch Material (Item 2): 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 (4.75 mm) sieve. For AC patch material, leave the space for "water" blank.

Type Cement Used (Item 3): 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.

Air Content (Item 4): The mean air content and the range of the measured values (in percent by volume) in the PCC mix, to the nearest one-tenth of a percent (0.1%). Where AC is used as the patch material, these spaces are to be left blank.

Admixtures (Item 5): 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 AC is used as the patch material, leave these spaces blank.

Slump (Item 6): The mean slump and the range (minimum and maximum measured value) for PCC patch material, to the nearest tenth of an inch (0.1 in). Where AC is used as the patch material, these spaces are to be left blank.

Flexural Strength (Modulus of Rupture) (Item 7): The mean flexural strength of the PCC 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 have not been performed and some other strength test (such as compressive or indirect tensile tests) have been, 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 AC is used as the patch material, leave these spaces blank.

Ambient Conditions at Time of Patching (Item 8): 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.

Maximum Size of Coarse Aggregate (Item 9): The maximum size of the coarse aggregate in the patch material to the nearest tenth of an inch (0.1 in).

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 AC is used as the patch material, the only data to be entered on this sheet are for "Item 4: Approximate Time Between Patching and Opening to Traffic" and "Item 5: Consolidation of Materials."

Individual data elements are as follows.

Joint Forming Method (Item 1): Codes entered to specify the method used for 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 has been used, space is provided to identify specifics.

Was Bond Breaker Used Between Adjacent Lanes (Item 2): A code entered to indicate whether a bond breaker has been used to discourage bonding between the new patch and an adjacent lane. Codes are provided on the data form.

Curing Method (Item 3): Space is provided to identify up to two methods used for curing the patch material. Codes are provided on the data form. Where only one method is used, enter code for "Method 1" and leave "Method 2" blank.

Approximate Time Between Patching and Opening to Traffic (Item 4): The approximate time in hours from placement of materials until traffic was allowed on the patch surface.

Consolidation of Materials (Item 5): A code entered to indicate the means of consolidating the patch materials into the area patched. Codes are provided on the data form.

Finishing (Item 6): 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.

Type of Transverse Joints in Patches or Slabs (Item 7): Codes entered to indicate the type of joints used adjacent to or inside the 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 are adjacent to or include joints. Leave code for slabs blank if no full slabs have been replaced.

Were Old Joints Matched (Item 8): A code entered to indicate whether joints in the patch have been 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.

Crack Sealing Data for Pavements with Portland Cement Concrete Surfaces (Sheet 18)

This data sheet is used for recording data for sealing of cracks in PCC pavements. If more than one material or method is used for different cracks, repeat Sheets 18 for each type.

Individual data elements are as follows:

Date Work Began (Item 1): This is the date on which crack sealing operations began.

New Sealant Reservoir Dimensions (Item 2): The width and depth of sealant reservoir to the nearest tenth of an inch (0.1 in).

Bond Breaker Under Sealant (Item 3): 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 identify other materials, if used.

Cleaning of Cracks (Item 4): A code to specify the means of cleaning the cracks prior to sealing. Codes are provided on the data form.

Type of Sealant (Item 5): A code to specify the AASHTO/ASTM designation of the type of crack sealant material used. Codes are provided on the data form. Space is also provided to enter information regarding the manufacturer and the product's specific name, if no code is provided for the crack sealant used.

Average Depth of Top of Sealant Placement (Item 6): The depth to the nearest tenth of an inch (0.1 in) from the top of the slab to the top of the crack sealant material.

Total Linear Feet of Cracks Sealed (Item 7): The total linear feet to the nearest tenth of a foot (0.1 ft) of cracks sealed on the test section.

Improvement Listing (Sheet 19)

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

Individual data elements are as follows:

Date Completed (Item 1): 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).

Work Type Code (Item 2): A code to identify the type of maintenance work accomplished (Appendix A, Table A.17).

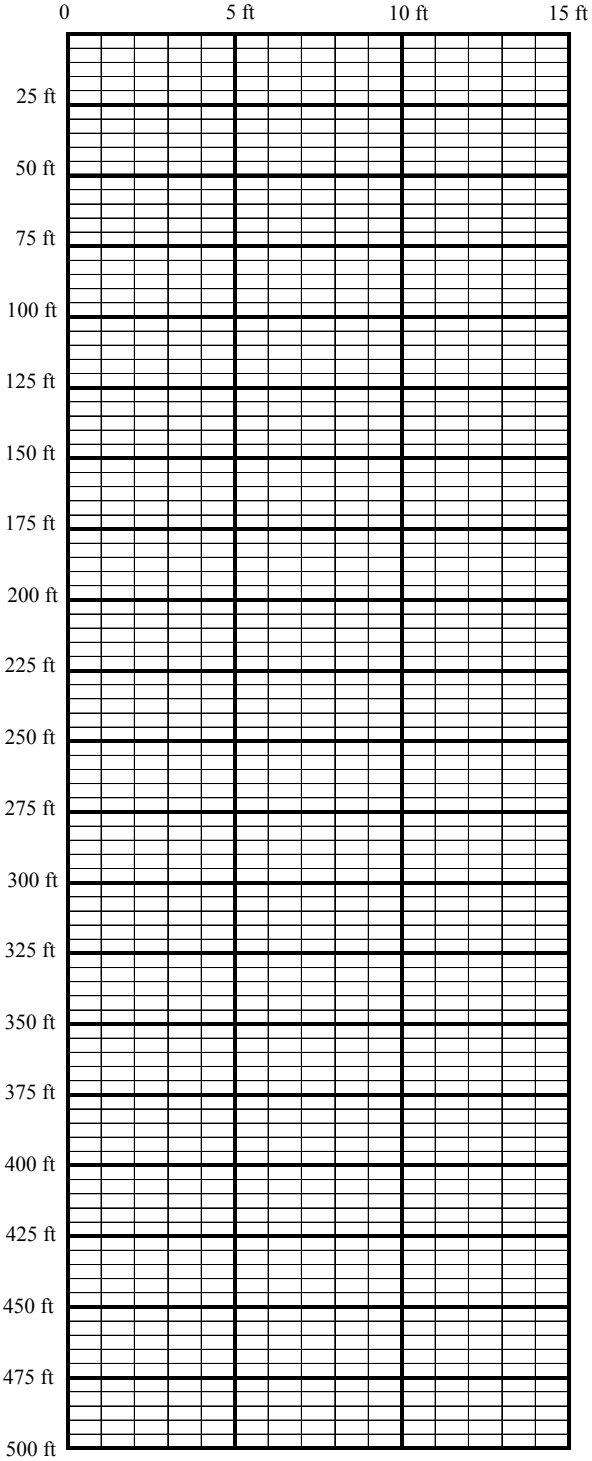
LTPP MAINTENANCE DATA **SHEET 1** HISTORICAL MAINTENANCE INFORMATION	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __]

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 dollars per lane-mile)
__ __ __ __	__ __ __	__ __	__ __	__ __	__ __ __ __ __.	__ __.__	__ __ __.
__ __ __ __	__ __ __	__ __	__ __	__ __	__ __ __ __ __.	__ __.__	__ __ __.
__ __ __ __	__ __ __	__ __	__ __	__ __	__ __ __ __ __.	__ __.__	__ __ __.
__ __ __ __	__ __ __	__ __	__ __	__ __	__ __ __ __ __.	__ __.__	__ __ __.
__ __ __ __	__ __ __	__ __	__ __	__ __	__ __ __ __ __.	__ __.__	__ __ __.
__ __ __ __	__ __ __	__ __	__ __	__ __	__ __ __ __ __.	__ __.__	__ __ __.

Note 1. This data will frequently be very difficult to convert from existing records for pre-LTPP 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.

LTPP MAINTENANCE DATA **SHEET 2** MAINTENANCE LOCATION SUMMARY	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ / __ __ / __ __ __ __]



LTPP MAINTENANCE DATA SHEET 3 SEAL COAT APPLICATION DATA FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. DATE WORK BEGAN** (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 Judgment...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 Judgment...3 [__]
MANUFACTURER NAME [_____]
MANUFACTURER MATERIAL NAME [_____]

***6. APPLICATION RATE FOR BITUMINOUS OR OTHER CEMENTING MATERIAL** [__.__]
(gallons/sq. yard)
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

***7. APPLICATION RATE FOR AGGREGATE** (Including Mineral Filler Where Applicable) (pounds/sq. yard) [__ __.__]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

***8. APPROXIMATE FINISHED SURFACE TREATMENT THICKNESS** (inches) [__.__]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

***9. AMBIENT CONDITIONS AT TIME SEAL COAT APPLIED**
AIR TEMPERATURE (°F) [__ __ __]
SURFACE MOISTURE – Dry...1, Wet...2 [__]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...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)

LTPP MAINTENANCE DATA SHEET 4 SEAL COAT APPLICATION DATA FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES (CONTINUED)	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 Judgment...3 [__]

***2. AGGREGATE PRECOATED?** Yes - 1 No - 2 [__]
DATA SOURCE – Actual...1 Plans/specs...2 Judgment...3 [__]

***3. ROLLER USED FOR SEATING AGGREGATE** [__]

None	1	Steel Wheel	3
Slurry Seal	2	Unknown	4
Other (Specify)[_____]	5		

DATA SOURCE – Actual...1 Plans/specs...2 Judgment...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 Judgment...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

LTPP MAINTENANCE DATA **SHEET 5** CRACK SEALING DATA FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. DATE WORK BEGAN** (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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
Emulsified Asphalt Cement ..2	With Sand..... 5
Cutback Asphalt Cement 3	Proprietary Crack/Joint
Emulsified Asphalt Cement	Sealant..... 6
Slurry Seal 4	Modified Asphalt..... 7

Other (Specify)[_____]8

DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

IF 6 OR 7 ABOVE, COMPLETE FOLLOWING:

MANUFACTURER NAME [_____]

MANUFACTURER SEALANT NAME [_____]

***5. AMBIENT CONDITIONS AT TIME OF CRACK SEALING**

AIR TEMPERATURES (°F) **LOW** [__ __ __]
HIGH [__ __ __]

SURFACE MOISTURE – Dry...1, Wet...2 [__]

DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

6. APPROXIMATE TOTAL LENGTH OF CRACKS SEALED (feet) [__ __ __ __]

7. METHOD USED TO CLEAN CRACK PRIOR TO SEALING [__]

None 1	Steel Wire Brush 4
Compressed Air 2	Brooming 5
Routing 3	Hot Air Lance 6

Other (Specify)[_____] 7

DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

LTPP MAINTENANCE DATA **SHEET 6** PATCHING DATA FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. DATE WORK BEGAN** (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 PCC 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 Judgment...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 Judgment...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 Judgment...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 Judgment...3 [__]

LTPP MAINTENANCE DATA **SHEET 7** PARTIAL DEPTH PATCHING DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. DATE WORK BEGAN** (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 (Specify)[_____] 4
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

6. METHOD USED TO CUT BOUNDARIES [__]
Diamond Blade Saw..... 1 Air Hammer 4
Carbide Blade Saw..... 2 Cold Milling 5
None..... 3
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...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 Judgment...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 Judgment...3 [__]

LTPP MAINTENANCE DATA **SHEET 8** PARTIAL DEPTH PATCHING DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES (CONTINUED)	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. PATCH MATERIAL USED** [__]

Portland Cement Concrete.. 1 Epoxy Mortar 3
Polymer Concrete..... 2 Asphalt Concrete 4
Other (Specify)[_____] 5
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

***2. BONDING AGENT** [__]

None..... 1 Epoxy Resin 3
Cement Grout..... 2 Cutback Asphalt 4
Other (Specify)[_____] 5
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

***3. MIXTURE DESIGN FOR PATCH MATERIAL** (lb./cubic yd.)

COARSE AGGREGATE [__ __ __ __]
FINE AGGREGATE [__ __ __ __]
CEMENT [__ __ __ __]
WATER (gallons/cubic yd.) (Leave Blank for AC) [__ __ __ __]

DATA SOURCE – Actual...1 Plans/specs...2 Judgment...3 [__]

***4. TYPE CEMENT USED** (See Cement Type Codes, Tables A.11 and A.16) [__ __]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

***5. AIR CONTENT** (percent by volume) (Leave Blank for AC)

MEAN [__ __.__]
RANGE [__ __.__ to __ __.__]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

***6. ADMIXTURES** (Leave Blank for AC) [__ __]
(See Cement Additive Codes, Table A.12) [__ __]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

***7. SLUMP** (inches) (Leave Blank for AC)

MEAN [__ __]
RANGE [__ __ to __ __]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

***8. COMPRESSIVE STRENGTH OF PATCH MATERIAL** (psi) [__ __ __ __]
CURING TIME (days) (Leave All of Item 8 Blank for AC) [__ __]
If Unavailable, And Other Strength Test Conducted,
ENTER ALTERNATE TEST [_____]
TYPE OF LOADING [_____]
AGE (days) [__ __]; **STRENGTH** (psi) [__ __ __ __]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

9. MAXIMUM SIZE OF COARSE AGGREGATE (inches) [__.__]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

LTPP MAINTENANCE DATA SHEET 9 PARTIAL DEPTH PATCHING DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES (CONTINUED)	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. CURING METHOD** **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 Sheet... 5
Other (Specify)[_____] 10

DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

***2. APPROXIMATE TIME BETWEEN PATCHING AND OPENING TO TRAFFIC[1]** (hours) [__ __]

DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

***3. AMBIENT CONDITIONS AT TIME OF PATCHING[1]** **LOW** [__ __ __]
AIR TEMPERATURE (°F) **HIGH** [__ __ __]

SURFACE MOISTURE – Dry...1 Wet...2 [__]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

4. METHOD OF CONSOLIDATING MATERIALS[1] [__]

Vibrators..... 1 Rodding/Tamping 4
Vibrating Screeds..... 2 Rolling 5
Troweling..... 3
Other (Specify)[_____] 6

DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

5. FINISHING METHOD [__]

Screeding..... 1 Machine-Troweling 3
Hand-Troweling..... 2
Other (Specify)[_____] 4

DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

6. 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 Judgment...3 [__]

[1]Note: Items 2, 3, and 4 are the only entries to be made if asphalt concrete was used as the patch material.

LTPP MAINTENANCE DATA **SHEET 10** JOINT RESEALING DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. DATE WORK BEGAN** (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***2. METHOD OF REMOVING OLD SEALANT** [__]

- Not Removed..... 1
- Joint Plow -- V-Shaped..... 2
- Joint Plow -- 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 Judgment...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 Judgment...3 [__]

***4. BOND BREAKER UNDER SEALANT** [__]

- None..... 1
- Non-Reactive Adhesive-Backed Tape..... 2
- Backer Rod 3
- Other (Specify)[_____] 4

5. WERE JOINT SIDEWALLS REFACED? [__]

- No..... 1
- Yes -- One-Blade..... 2
- Yes -- 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 Judgment...3 [__]

LTPP MAINTENANCE DATA **SHEET 11** JOINT RESEALING DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES (CONTINUED)	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 Polychloropropene Elastomeric Joint Seals for Bridges 5
D2628 (ASTM) Preformed Polychloropropene Elastomeric Joint Seals for Concrete Pavements 6
Other (Describe – If Silicone Material is Used, Federal Spec. TT-S-001543A, Georgia DOT Spec. 833.06, or Equal Applies)[_____ _____] 7

Manufacturer Information on Type of Crack Sealant
MANUFACTURER NAME [_____]
MANUFACTURER SEALANT NAME [_____]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

***2. AVERAGE DEPTH OF TOP OF SEALANT PLACEMENT** (inches) [__.__]
Below Pavement Surface
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...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 length in Item No. 4.

LTPP MAINTENANCE DATA SHEET 12 DIAMOND GRINDING, MILLING OR GROOVING DATA FOR PAVEMENT SURFACES	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. DATE WORK BEGAN** (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 GRINDING, MILLING, 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 GRINDING, MILLING, OR GROOVING** [__]
- Entire Test Section Length..... 1
- Individual Joints or Cracks..... 2
- Patched Only..... 3
- Other (Specify)[_____] 4

***6. AVERAGE DEPTH OF CUT** (inches) [__.__ __]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

7. CUTTING HEAD WIDTH (inches) [__ __ __.__]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

8. AVERAGE GROOVE WIDTH (Diamond Grinding and Grooving Only) (inches) [__.__]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

9. AVERAGE SPACING BETWEEN BLADES (Diamond Grinding and Grooving Only) [.__]
(inches)
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

LTPP MAINTENANCE DATA SHEET 13 FULL DEPTH REPAIR DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. DATE WORK BEGAN** (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 Judgment...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 Judgment...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 Judgment...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 Judgment...3 [__]

LTPP MAINTENANCE DATA **SHEET 14** FULL DEPTH REPAIR DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES (CONTINUED)	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 Judgment...3 [__]

***2. SECURING LOAD TRANSFER DEVICES** [__]

None..... 1 Epoxy Filler 3
Grout Filler..... 2
Other (Specify)[_____] 4
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...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 Judgment...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 Judgment...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 Judgment...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 Judgment...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 Judgment...3 [__]

LTPP MAINTENANCE DATA **SHEET 15** FULL DEPTH REPAIR DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES (CONTINUED)	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. METHOD OF REINFORCING STEEL PLACEMENT** [__]
Chairs..... 1
Between Layers of Concrete..... 2
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

***2. MIXTURE DESIGN FOR PATCH MATERIAL** (lbs./cubic yd.)
COARSE AGGREGATE [__ __ __ __]
FINE AGGREGATE [__ __ __ __]
CEMENT [__ __ __ __]
WATER (gallons/cubic yd.) (Leave Blank for AC) [__ __ __ __]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

***3. TYPE CEMENT USED** (See Type Codes, Tables A.11 and A.16) [__ __]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

***4. AIR CONTENT** (percent by volume) (Leave Blank for AC)
MEAN [__ __.__]
RANGE [__ __.__ to __ __.__]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

***5. ADMIXTURES** (Leave Blank for AC)
(See Cement Additive Codes, Table A.12) [__ __]
[__ __]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

***6. SLUMP** (inches) (Leave Blank for AC)
MEAN [__.__]
RANGE [__.__ to __.__]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...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 Judgment...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 Judgment...3 [__]

9. MAXIMUM SIZE OF COARSE AGGREGATE (inches) [__.__]
DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...3 [__]

LTPP MAINTENANCE DATA **SHEET 16** FULL DEPTH REPAIR DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES (CONTINUED)	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 Judgment...3 [__]

***2. WAS BOND BREAKER USED BETWEEN ADJACENT LANES?** [__]

Yes	1	No	2

***3. CURING METHOD** **METHOD 1** [__ __] **METHOD 2** [__ __]

None	1	Burlap-Polyethylene Blankets	6
Membrane Curing Compound	2		
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 Judgment...3 [__]

***4. APPROXIMATE TIME BETWEEN PATCHING AND OPENING TO TRAFFIC**[1] (hours) [__ __]

DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...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 Judgment...3 [__]

7. TYPE OF TRANSVERSE JOINTS IN PATCHES [__] Or **SLABS** [__]

None	1	Mixture of Expansion and Contraction Joints	4
All Expansion Joints	2		
All Contraction Joints	3		

DATA SOURCE – Actual...1 Plans/Specs...2 Judgment...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.

LTPP MAINTENANCE DATA **SHEET 17** COST DATA	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. TEST SECTION LENGTH TREATED** (feet)..... [__ __ __ __ __.]

MAINTENANCE TYPE	UNITS	2. *QUANTITY	3. *AVERAGE COST PER UNIT (dollars)	4. *TOTAL COST (thousands of dollars)
Seal Cost	sq. yds.	[__ __ __ __]	[__ __ __.__ __]	[__ __ __ __.__]
Crack Sealing	lin. ft.	[__ __ __ __]	[__ __ __.__ __]	[__ __ __ __.__]
Patches – AC Pavements:				
Surface Only	sq. yds.	[__ __ __ __]	[__ __ __.__ __]	[__ __ __ __.__]
Surace 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 Pavement)	lin. ft.	[__ __ __ __]	[__ __ __.__ __]	[__ __ __ __.__]
Diamond Grinding or Milling: (PCC Pavement)	sq. yds.	[__ __ __ __]	[__ __ __.__ __]	[__ __ __ __.__]

LTPP MAINTENANCE DATA **SHEET 18** CRACK SEALING DATA FOR PAVEMENTS WITH PORTLAND CEMENT CONCRETE SURFACES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE** (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. DATE WORK BEGAN** (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***2. NEW SEALANT RESERVOIR DIMENSIONS** (inches)
WIDTH [__.__]
DEPTH (From Top of Slab to Top of Backer Rod or Tape) [__.__]

***3. BOND BREAKER UNDER SEALANT** (If Used) [__]
None...1 Non-Reactive Adhesive Backed Tape...2 Backer Rod...3
Other (Specify)[_____]4

***4. CLEANING OF CRACKS** [__]
None...1 Routing...2 Air Blast...3 Steel Wire Brush...4
Brooming...5
Other (Specify)[_____]6

***5. TYPE OF 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 Polychloropropene Elastomeric Joint Seals for Bridges 5
D2628 (ASTM) Preformed Polychloropropene Elastomeric Joint Seals for Concrete Pavements 6
Other (Describe – If Silicone Material is Used, Federal Spec. TT-S-001543A, Georgia DOT Spec. 833.06, or Equal Applies)[_____
_____] 7

Manufacturer Information on Type of Crack Sealant
MANUFACTURER NAME [_____]
MANUFACTURER SEALANT NAME [_____]

***6. AVERAGE DEPTH OF TOP OF SEALANT PLACEMENT** (inches) [__.__]
(Below Pavement Surface)

***7. TOTAL LINEAR FEET OF CRACKS SEALED** [__ __ __ __.__]

Note: If different materials or methods are used, repeat Sheet 18 for each – recording their length in Item No. 7.

LTPP MAINTENANCE DATA **SHEET 19** IMPROVEMENT LISTING	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __]

***1. DATE COMPLETED** (mm/dd/yyyy)	***2. WORK TYPE CODE[1]** (Table A.17)
[__ __ /__ __ /__ __ __ __]	[__ __]
[__ __ /__ __ /__ __ __ __]	[__ __]
[__ __ /__ __ /__ __ __ __]	[__ __]
[__ __ /__ __ /__ __ __ __]	[__ __]
[__ __ /__ __ /__ __ __ __]	[__ __]
[__ __ /__ __ /__ __ __ __]	[__ __]
[__ __ /__ __ /__ __ __ __]	[__ __]
[__ __ /__ __ /__ __ __ __]	[__ __]

NOTES:

CHAPTER 4. REHABILITATION

4.1 INTRODUCTION

Rehabilitation activities are those that significantly affect the pavement structure and how it responds to the environment and traffic loading. While these activities should be avoided within the maintenance control zone identified in Chapter 1 during the time-period for which the test section is being monitored, with time, many of the test sections will require some repair work to be performed.

Monitoring of a test section in the LTPP program after rehabilitation is performed will be continued provided certain conditions are met.

- The participating SHA must perform the activities described under highway agency responsibilities below.
- The applied rehabilitation activities need to fall within the range of acceptable measurements described in this document.
- The pavement construction is completed and the test section is re-opened to traffic prior to January 1, 2004.

Test sections that undergo reconstruction will not be retained by the LTPP program for further monitoring. The LTPP program should be notified sufficiently in advance of reconstruction so that a final round of monitoring measurements can be performed.

Highway agency responsibilities include the following:

- Traffic data collection on the test section prior to overlay must have met the minimum requirements relative to the LTPP experimental designation.
- Agency agrees to perform at least the minimum level of traffic data collection on the test section after rehabilitation in accordance with current LTPP guidelines.
- Agency notifies LTPP regional representatives sufficiently in advance of construction to permit scheduling and conduct of deflection, profile, and distress measurements prior to the construction.
- Agency marks and signs the test section in accordance with LTPP program procedures.
- Agency completes and submits all required LTPP data forms including, but not limited to forms RI-1 and RI-2, to document the rehabilitation construction activities.

- Agency performs field materials sampling and testing in accordance with LTPP guidelines.

- Agency performs, or has performed, all laboratory material tests which are not performed by the LTPP contract laboratory.

LTPP program responsibilities include the following:

- Conduct of pavement performance monitoring including deflection, profile, and distress measurements prior to and after rehabilitation.

- Process and store in LTPP database all data collected following LTPP protocols and submitted on LTPP data forms or LTPP electronic file formats.

- Provide LTPP program information to participating highway agencies on test section monitoring and data collection requirements.

- Communicate in a timely fashion decisions concerning monitoring continuation after rehabilitation to the highway agency.

- Provide to the highway agency a material sampling and testing plan tailored to the specific features of the test section.

- Perform resilient modulus and associated tests on cores obtained by the agency from AC overlay materials.

- Perform thermal coefficient of expansion tests on cores obtained from new PCC layers.

- Perform, sponsor, and/or promote the development of usable engineering products and information for rehabilitated pavements from analysis of the collected data.

4.2 GUIDELINES FOR REHABILITATION OF TEST SECTIONS

As noted in section 1.1.1, treatments within the maintenance control zone around and including each section or project should be limited as much as possible. However, it is expected that during the study period some of the test sections will require some maintenance or rehabilitation treatment. The general categories of rehabilitation treatments that are acceptable for continued monitoring by the LTPP program are shown in Table 4.1. Treatments applied to LTPP test sections which are not described in Table 4.1 or activities described under the unsuitable treatments portion of this document are unacceptable for continuation in the LTPP program. For any test section undergoing rehabilitation, it is necessary for the RSC to submit an IMS Form 1 and Rehabilitation Information Form RI-1 as described in Chapter 2. If the section is acceptable for continued monitoring then Rehabilitation Information Form RI-2 is also necessary.

Table 4.1.Acceptable Rehabilitation Treatments for Monitoring Continuation in LTPP Program.

Existing Pavement Type – LTPP Experiment	Pretreatment	Overlay Material and Thickness Restrictions
AC GPS-1 GPS-2 SPS-1 SPS-3 SPS-8 (AC) SPS-9 (New)	None	AC < 5 in (127 mm)
	Maintenance and Repair	AC < 5 in (127 mm)
	Milling	AC < 5 in (127 mm)
	None	PCC
	Maintenance and Repair	PCC
	Milling	PCC
PCC GPS-3 GPS-4 GPS-5 SPS-2 SPS-4 SPS-8 (PCC)	CPR	None
	None	AC > 4 in (102mm), < 8 in (203 mm)
	CPR	AC > 4 in (102 mm), < 8 in (203 mm)
	Fracture	AC > 4 in (102 mm), < 8 in (203 mm)
	Debond Interlayer	PCC > 5 in (127 mm)
AC over AC GPS-6 SPS-5 SPS-9 (Overlay)	None	AC < 5 in (127 mm)
	Maintenance and Repair	AC < 5 in (127 mm)
	Milling	AC < 5 in (127 mm)
AC over PCC GPS-7 SPS-6	None	AC < 8 in (203 mm)
	Milling	AC < 8 in (203 mm)
	Milling + CPR	AC < 8 in (203 mm)
	None	PCC > 5 in (127 mm)
	Milling + Debond Interlayer	PCC > 5 in (127 mm)

The following definitions relate to the items shown in Table 4.1.

AC – Dense graded hot mix asphalt-aggregate concrete using either conventional or modified asphalt cement. Mixtures designed in accordance with current SuperPave™ guidelines are acceptable. Thickness restriction applies to the material in excess of that which is used to replace portions of the milled pavement structure. The thickness restriction does not apply to thin seal coats or open graded friction courses that may be required by agency policy.

PCC – Portland cement concrete pavement layers. PCC pavement layers must be jointed plain concrete pavement (JPCP), jointed reinforced concrete pavement (JRCP), or continuously reinforced concrete pavement (CRCP). JPCP layers must have either no load transfer devices or smooth dowel bars only. JRCP layers must contain smooth dowel bars for joint load transfer. Unbonded PCC layers must be greater than 5-in (127-mm) thick (GPS-9 requirement).

CPR – Concrete pavement restoration. Allowable CPR techniques include partial depth patching, full depth patching and joint replacement, load transfer restoration, full surface diamond grinding, undersealing or subsealing, and retrofitted edge drains. Distinction between classification as CPR or maintenance activity depends on the extent and nature of the applied treatments.

Debond Interlayer – An interlayer of material placed between the original PCC surface and PCC overlay to prevent bonding. Examples include stress-absorbing membrane interlayer (SAMI), asphalt-rubber seal coat, sand asphalt, aggregate interlayer, etc.

Milling – Cold milling of the AC structural layers. The milling depth must be less than half the total thickness of the existing AC structural layers.

Fracture – Fracture pretreatments to PCC pavements include crack and seat, break and seat, and rubblization.

If any of the following treatments or construction activities is applied to a test section, they will render the existing test section unsuitable for continued monitoring as part of the LTPP pavement rehabilitation studies:

- Widening of the LTPP test lane.
- Added lane next to the LTPP test lane.
- Intersections or ramps added inside maintenance control zone around test section.
- Tied concrete shoulders added to test lane.
- On pavements in the non-rehabilitated AC pavement experiments, such as those in GPS-1, GPS-2, SPS-1, or SPS-8, removal of more than half the total thickness of the AC structural layer(s).
- Application of non-uniform treatments which results in differences in layer thicknesses of greater than 1 in (25 mm) over more than one-third of the test section length. This restriction is intended to apply primarily to milling depths and overlay thicknesses and not variations due to spot patching and repair of localized distresses.
- Use of non-standard paving materials that are considered "experimental." Determination of what is considered experimental will depend upon the extent of highway agency's routine use of the material.
- Performing construction activities which either hide surface distresses or alter the structural pavement response, prior to completion of LTPP monitoring measurements to document the condition of the existing pavement prior to rehabilitation.

- Use of bonded PCC overlays on existing PCC pavement sections. (The GPS-8 study on bonded PCC overlays was abandoned in 1988.)

When one or more of the above conditions apply, or the agency does not desire to participate in the continued monitoring of a test section after rehabilitation, the LTPP RSC should be contacted so that final monitoring measurements can be performed prior to the test section going out-of-study.

4.3 RECOMMENDED REHABILITATION ACTIVITIES

In order to provide greater consistency between the pavement structures studied in the LTPP program, use of any combination of the following treatments and specifications is desired. These specifications are based on LTPP construction guidelines for the SPS rehabilitation experiments. Although conformance with these preferred specifications is not required, their use can help to extend the results of the related LTPP experiments.

When AC pavement studies included in LTPP experiments GPS-1, -2, -6 or SPS-1, -3, -5, -8, or -9 are rehabilitated, it is preferred that the materials and construction procedures conform to the SPS-5 Construction Guidelines. It is preferred that all AC mixes be designed in accordance with Federal Highway Administration (FHWA) Technical Advisory T5040.27 Asphalt Concrete Mix Design and Field Control, March 10, 1988 and that milling be limited to less than one third of the total combined thickness of the bound AC structural surface layers. It is preferred that the AC be composed of all new material conforming to the specifications in the SPS-5 Construction Guidelines; however, if the AC mix contains recycled AC materials, the recycled mixture should conform to the specifications in the SPS-5 Construction Guidelines. It is preferred that overlay thicknesses of 2 in (51 mm) or 5 in (127 mm) be placed. This thickness is in addition to any material that was used to replace portions of the pavement structure that were milled.

When PCC pavements included in the LTPP GPS-3, -4, or -5, or SPS-2, -4 or -8 experiments are rehabilitated, it is preferred that the materials and construction procedures conform to the SPS-6 Construction Guidelines. Some of the construction specifications contained in the SPS-6 Construction Guidelines and other preferred practices include:

- Partial depth patching of areas with spalling or scaling that are confined to the upper half of the concrete layer.

- Full depth patching of deteriorated joints or working cracks.

- Load transfer restoration at joints or working cracks.

- Full surface diamond grinding.

- Undersealing or subsealing.

- Retrofitted subsurface drainage systems (particularly on crack/break and seat sections).

- Crack and seat for jointed concrete pavements (JCP) and break and seat for JRCP.

Joint and/or crack sealing prior to placement of an AC overlay is not desired. AC overlays are the preferred rehabilitation treatment for LTPP PCC test sections only because the majority of rehabilitated PCC pavements in the program have this type of overlay. It is preferred that AC overlay mixes be designed in accordance with FHWA Technical Advisory T5040.27; be composed of all new material; and, the thicknesses of the AC overlay be either 4 in (102 mm) or 8 in (203 mm). (These are the same thicknesses used in the SPS-6 experiment.) If sawing and sealing of the AC overlay at joint and working crack locations in the PCC pavement are performed, it is preferred that the procedures and specifications contained in the SPS-6 Construction Guidelines be followed.

A prescribed set of treatments for each test section was established by the LTPP program in 1992. It is preferred that these treatments be followed in order to extend the results of this experiment. All construction activities and materials used to rehabilitate existing SPS-6 test sections should conform to the specifications contained in the SPS-6 Construction Guidelines.

Routine Maintenance Section. This test section should be rehabilitated using the applicable SPS-6 intensive restoration techniques and overlaid with a 4-in (102-mm) thick AC overlay. It is desired that the materials used in the AC mixture be reasonably similar to those used in the original overlay mixtures for the other SPS-6 test sections at the site.

Minimum Restoration Sections. SPS-6 test sections 2, 3, and 4 should be rehabilitated using the applicable SPS-6 intensive restoration techniques for the PCC layer and overlaid with a 4-in (102-mm) thick AC overlay. It is desired that the materials used in the AC mixture be reasonably similar to those used in the original overlay mixtures for the other SPS-6 test sections at the site. On Section 2 (the minimum restoration section without overlay), the entire 1000-ft (305-m) length of the test section should be overlaid and established as the new test section. On Sections 3 and 4, the existing AC overlay layer should be completely removed prior to application of restoration treatments and placement of the new overlay.

Intensive Restoration Test Sections. SPS-6 test sections 5 and 6 should be rehabilitated by using applicable SPS-6 intensive restoration techniques on the PCC layer and overlaid with a 4-in (102-mm) thick AC overlay. It is desired that the materials used in the AC mixture be reasonably similar to those used in the original overlay mixtures for the other SPS-6 test sections at the site. On Section 5 (maximum restoration without overlay), the entire 1000-ft (305-m) length of the test section should be overlaid and established as the new test section. On Section 6, the existing AC overlay layer should be completely removed prior to the application of restoration treatments and placement of the new overlay.

Crack/Break and Seat Sections. SPS-6 test sections 7 and 8 should be rehabilitated by using applicable SPS-5 intensive surface preparation techniques and a 2-in (51-mm) thick

AC overlay. The 2-in (51-mm) overlay thickness is in addition to the amount of material used to replace any portion of the existing AC overlay layer that was milled.

4.3.1 New Experiment Designation for Rehabilitated Sections

When LTPP test sections are rehabilitated in accordance with current LTPP policy, they will be classified into one of the GPS experiments as defined in this document.

The following suffixes are used for rehabilitated test sections classified into either GPS-6 or GPS-7 experiments:

Suffix A – Designates pavement structures which have been rehabilitated with a single AC overlay prior to the start of the LTPP program and monitoring. The overlay must consist of conventional hot-mix asphalt with no modifiers and no structural milling or modifications performed prior to overlay placement. (No new test sections shall be accepted in this classification.)

Suffix B – Designates pavement structures receiving a first AC overlay using conventional HMAC with no modifiers and no structural milling or modifications. The condition of the pavement prior to overlay was monitored by the LTPP program.

Suffix C – Designates pavements receiving an overlay (any number) that uses modified asphalts (including hot recycled, rubberized- wet process, and asphalt additives) in the HMAC without any structural milling or modification. The condition of the pavement prior to overlay was monitored by the LTPP program.

Suffix D – Designates a previously overlaid pavement which receives another AC overlay using conventional HMAC with no modifiers and no structural milling or modifications. The condition of the pavement prior to overlay was monitored by the LTPP program.

Suffix F – Designates an existing PCC pavement structure which has been subjected to a crack and seat or break and seat treatment in combination with placement of any type of HMAC overlay.

Suffix R – Designates an existing PCC pavement structure which has been rehabilitated by CPR treatments without application of an overlay.

Suffix S – Designates pavement structures in which the existing AC structural layer is modified by structural milling or application of fabric, etc. in combination with placement of any type of HMAC overlay.

The terms structural milling and asphalt modifiers are defined as:

Structural Milling – For test section classification purposes, structural milling is considered to be cold milling of AC greater than 1 in (25 mm) in depth. Milling depths

less than 1 in (25 mm), for purposes of rut level-up or to remove weathered AC from the surface, are not considered structural milling.

Asphalt Modifiers – Asphalt modifiers are materials used to alter the properties of the asphalt cement or asphalt mixture, such as polymers, crumb rubber, sulfur, glass, etc.

When an agreement between the participating highway agency and LTPP program has been reached to continue monitoring a rehabilitated test section, the rehabilitated pavement structure should be classified in accordance with the experimental designation shown in Table 4.2. Details of these classifications are provided below based on the test section's current LTPP classification and pavement structure type.

Table 4.2. Classification of Rehabilitated LTPP Test Sections.

Existing Class and Pavement Type	Pretreatment	Overlay	New Class
AC *GPS-1* *GPS-2* *SPS-1* *SPS-3 (Non-overlay)* *SPS-8 (AC)* *SPS-9 (New)*	None, or Maintenance and Repair	Conventional AC	GPS-6B
		Modified AC	GPS-6C
	Structural Milling, Fabric	Any AC	GPS-6S
	None, Maintenance and Repair, or Structural Milling	JPCP	GPS-3
		JRCP	GPS-4
		CRCP	GPS-5
PCC *GPS-3* *GPS-4* *GPS-5* *GPS-7R* *SPS-2* *SPS-4* *SPS-6 (Non-overlay)* *SPS-8 (PCC)*	CPR	None	GPS-7R
	None, or CPR	Conventional AC	GPS-7B
		Modified AC	GPS-7C
	Fracture	Any AC	GPS-7F
	Debonding Layer	JPCP, JRCP, CRCP	GPS-9
AC over AC *GPS-6* *SPS-3 (Overlay)* *SPS-5* *SPS-9 (Overlay)*	None, or Maintenance and Repair	Conventional AC	GPS-6D
		Modified AC	GPS-6C
	Structural Milling, Fabric	Any AC	GPS-6S
AC over PCC *SPS-6* *GPS-7*	None	Conventional AC	GPS-7D
		Modified AC	GPS-7C
	Structural Milling, CPR, and/or Fabric	Any AC	GPS-7S
	None, Milling + Debonding Layer	PCC	GPS-9

4.3.2 Rehabilitation of GPS-1, GPS-2, SPS-1, SPS-3 (Non-Overlay), SPS-8 (AC), or SPS-9 (New Construction) Test Sections

Existing test sections in this category are either new construction or reconstructed AC pavement structures in their first performance cycle which has not previously been rehabilitated. This includes test sections in the SPS-8 experiment that are constructed with an AC surface layer and SPS-9 test sections which are either newly constructed or reconstructed at the start of the LTPP monitoring period.

Test sections rehabilitated with conventional HMAC overlay with no structural milling or modifications will be classified in GPS-6B. Test sections rehabilitated with HMAC overlay containing asphalt modifiers with no structural milling or modifications will be classified in GPS-6C. Test sections rehabilitated with structural milling or use of geotextile and subsequent placement of a conventional or modified HMAC overlay will be classified in GPS-6S. GPS-1 or GPS-2 test section rehabilitated with a PCC overlay shall be classified into the new PCC pavement GPS experiments depending on the type of overlay:

Jointed plain concrete overlay - GPS-3

Jointed reinforced concrete overlay - GPS-4

Continuously reinforced concrete overlay - GPS-5

4.3.3 Rehabilitation of GPS-3, GPS-4, GPS-5, GPS-7R, SPS-2, SPS-4, SPS-6 (Non-Overlay) and SPS-8 (PCC) Test Sections

Existing test sections in this category are either new construction or reconstructed PCC test sections which have not previously been rehabilitated with application of an overlay. This includes PCC test sections in the SPS-8 experiment.

Test sections rehabilitated with a conventional HMAC overlay and any combination of restoration treatments contained in the SPS-6 Construction Guidelines will be classified in GPS-7B.

Test sections rehabilitated with a HMAC overlay containing asphalt modifiers and any combination of restoration treatments contained in the SPS-6 Construction Guidelines will be classified in GPS-7C.

Test sections subjected to a fracture pretreatment, such as crack and seat, break and seat, or rubblization, in combination with placement of any type of HMAC overlay will be classified in GPS-7F.

Test sections rehabilitated by CPR treatments without application of an overlay will be classified in GPS-7R. The decision on classification of treatments into this category will depend upon the extent and nature of the CPR treatments applied. In general, the applied treatments must exceed what might be considered routine maintenance to be classified as CPR.

4.3.4 Rehabilitation of GPS-6, SPS-3 (Overlay), SPS-5, and SPS-9 (Overlay) Test Sections

Test sections in this category are AC pavement structures which have been previously rehabilitated with an AC overlay.

Test sections rehabilitated with a second conventional HMAC overlay with no structural milling or modifications will be classified in GPS-6D.

Test sections rehabilitated with a second HMAC overlay containing asphalt modifiers with no structural milling or modifications will be classified in GPS-6C.

Test sections rehabilitated with structural milling or use of geotextile and subsequent placement of a second overlay composed of conventional or modified HMAC will be classified in GPS-6S.

4.3.5 Rehabilitation of GPS-7 or SPS-6 Overlay Test Sections

Test sections in this category are rehabilitated PCC pavement structures which have previously been overlaid with a layer of HMAC.

Test sections rehabilitated with a second conventional HMAC overlay with no structural milling or modifications will be classified in GPS-7D.

Test sections rehabilitated with a second HMAC overlay that contains asphalt modifiers with no structural milling or modifications will be classified in GPS-7C.

Test sections rehabilitated with structural milling or use of geotextile and subsequent placement of a second overlay composed of conventional or modified HMAC will be classified in GPS-7S.

Test sections rehabilitated by complete removal of the existing HMAC overlay, then application of crack and seat or break and seat treatment to the underlying PCC layer and placement of any type of HMAC overlay will be classified in GPS-7F.

Test sections rehabilitated by the application of an unbound PCC overlay will be classified in GPS-9.

4.3.6 Rehabilitated of GPS-9 Test Sections

GPS-9 test sections which are rehabilitated will not be considered for continued monitoring under the LTPP program.

4.4 REHABILITATION DATA SHEETS

The remainder of this chapter provides data sheets and instructions for their use in collecting rehabilitation data. The rehabilitation data sheets should be filled out as rehabilitation work is completed. These 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) LTPP accumulated data.

Historical data consists of information collected on the monitoring site up to the time that site-specific rehabilitation data collection using LTPP guidelines begins. The historical data are recorded on Sheet 4 of the inventory data sheets contained in the Inventory Data Collection Guide.

LTPP accumulated data are recorded on the rehabilitation data sheets provided in this chapter. The rehabilitation sheets are presented in the order illustrated by Table 4.3.

Table 4.3. Listing of Rehabilitation Data Sheets

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
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
AC Overlay - SUPERPAVE™ Properties	65-67

For each specific work type, the appropriate set of sheets should be completed (as indexed in Table 4.4). It is recognized that parts of both Chapter 3 (Maintenance Data Collection) and Chapter 4 (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 3 and 4 will be required).

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.

Table 4.4 Rehabilitation data sheets to be completed

Work Item	Work Type Code[1]	Rehabilitation Data Sheets[2]
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, 65-67[3]
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[4]
Crack and Seat PCC Pavements as Base for New PCC Surface	47	60[4]
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[4]
Mill Off Existing Pavement and Overlay with PCC	52	64[4]
Mill Off Existing Pavement and Overlay with Hot-Mix Recycled Asphalt Concrete	55	64[4]
Mill Off Existing Pavement and Overlay with Cold-Mix Recycled Asphalt Concrete	56	64[4]

[1] Work Type Code from Table A.17, Appendix A.
[2] Rehabilitation Sheets 1 and 2 should be completed for every rehabilitated test section.
[3] Data sheets 65 through 67 should be used in addition to sheets 3-10 when Superpave mix design procedures are used for the overlay.
[4] Plus appropriate overlay rehabilitation 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.

4.4.1 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 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 section ID is a four-digit identification number assigned by LTPP. This number is used to facilitate the computer filing of the projects and will identify the section in the field.

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 four digits are the year.

The rehabilitation data sheets do not include detailed descriptions of the pavements prior to rehabilitation, but the "State Code", the "SHRP Section ID", and the "Date Completed" described above connect the rehabilitation data to the other data for the test section. For LTPP studies, the full range of data described in the Guidelines for Collection of LTPP Data 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.

4.4.2 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.

4.4.3 Individual 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.

Individual data elements are as follows:

Date Completed (Item 1): 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.

Work Type Code (Item 2): A code to identify the type of maintenance work accomplished (Appendix A, Table A.17).

Work Quantity (Item 3): The quantity of work applied to the section in appropriate units (refer to Table A.17 of Appendix A for units).

Thickness (Item 4): For improvements that alter the thickness of the pavement structure (such as overlays, etc.), enter the thickness of the rehabilitation activity to the nearest tenth of an inch (0.1 in). For items that do not alter the thickness of the pavement structure, enter "N" to indicate the data element is not applicable.

Cost (Item 5): The cost of the improvement is reported in thousands of dollars per lane-mile. The cost reported should include only the cost of the pavement structure. Non-pavement costs such as cut and fill work, work on bridges, culverts, lighting, and guardrails should be excluded. Labor, traffic control, or other incidental costs should also 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.

Individual data elements are as follows:

Layer Number (Item 1): Space is provided for nine or fewer layer numbers, with number 1 as the subgrade and the last, and largest, number identifying the surface layer.

Layer Description (Item 2): A layer description code is to be entered for each of the layers in the system. Codes are provided on the data form. For 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.

Material Type Classification (Item 3): 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 Appendix A Tables A.5, A.6, A.7, and A.8, respectively. If the material type was not changed during the rehabilitation, enter "99" for the material classification.

Layer Thickness (Item 4): Four numbers can be provided to indicate the mean, minimum, maximum, and standard deviation of thickness for each specific layer in inches (enter to the nearest tenth of an inch (0.1 in)). If only a single specified design value for thickness is available for the project records, enter it as the "mean value." For 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. If the thickness of the layer has not changed during rehabilitation, then leave the layer thickness blank for that layer.

Asphalt Concrete Overlay, Aggregate Properties (Sheet 3)

This sheet and the following Sheets 4 through 10 are to be filled out from project records for each AC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm). 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 is to be applied for LTPP studies. All aggregate retained on the No. 8 (2.36 mm) sieve is coarse aggregate as defined by the Asphalt Institute. All aggregate passing the No. 8 (2.36-mm) sieve is fine aggregate. "Mineral Filler" is defined (ASTM D242) as that portion passing the No. 30 (600-µm) sieve (at least 95 percent must pass the No. 50 (300-µm) sieve and at least 70 percent must also pass the No. 200 (75-µm) sieve).

Individual data elements are as follows:

Layer Number (Item 1): The number of the AC layer for which a description is being provided (from Sheet 2).

Composition of Coarse Aggregate (Items 2, 3, and 4): When more than one coarse aggregate is used, the type code as provided on the data sheet and percentage by total weight of coarse aggregate should be indicated for each coarse aggregate. Space is provided for up to three different types of coarse aggregate. If only one type of coarse aggregate is used, enter its type and 100 percent in the top set of the data spaces, leaving the others blank. Space is provided for identifying another type of material if one was

used other than those for which codes are provided. Coarse aggregate is considered to be that portion retained on the No. 8 (2.36-mm) sieve.

Geologic Classification of Coarse Aggregate (Item 5): The geologic classification of the natural stone used as coarse aggregate in the concrete. These codes appear in Table A.9 of Appendix A 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".

Composition of Fine Aggregate (Items 6, 7, and 8): When more than one fine aggregate is used, the type code as provided on the data sheet and percentage by total weight of fine aggregate should be indicated for each fine aggregate. Fine aggregate is defined as that passing the No. 8 (2.36-mm) sieve and retained on the No. 200 (75-µm) sieve. Space is provided for up to three different fine aggregate types. If only one type of fine aggregate is used, enter its type code and 100 percent in the top set of the data spaces, leaving the others blank.

Type of Mineral Filler (Item 9): The type of mineral filler used as identified by one of the codes appearing on the data sheet.

Aggregate Durability Test Results (Items 10 thru 13): The type of tests used to evaluate the durability of the aggregate used in the mix and the results in thousandths (0.001) recorded in units specified for the test. Three of these sets are for coarse (Items 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 of Appendix A. Items 10, 11, and 12 are to correlate with Items 2, 3, and 4 above, respectively.

Polish Value of Coarse Aggregates (Item 14): 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)

This data sheet is a continuation of the data on Data Sheet 3. It should be completed for each AC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the AC layer for which a description is being provided (from Sheet 2).

Gradation of Combined Aggregates (Item 2): 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 a

sufficient number of sieve sizes to accommodate testing and specification practice for most highway agencies.

Bulk Specific Gravities (Items 3 thru 6): The bulk specific gravities (to the nearest thousandth (0.001)) for coarse aggregate (Item 3), fine aggregate (Item 4), mineral filler (Item 5), and the aggregate combination (Item 6). 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:

$$G_{sb} = \frac{P_1 + P_2 + P_3}{\frac{P_1}{G_1} + \frac{P_2}{G_2} + \frac{P_3}{G_3}} \quad \textbf{(4.1)}$$

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 aggregates, fine aggregates, and mineral filler

Effective Specific Gravity of Aggregate Combination (Item 7): The calculated effective specific gravity to the nearest thousandth (0.001). This calculation requires the maximum specific gravity (no air voids) of the paving mixture, which is obtained by Test Method AASHTO T209 or ASTM D2041. The effective specific gravity of the aggregate is calculated as follows:

$$G_{se} = \frac{100 - P_b}{\frac{100}{G_{mm}} - \frac{P_b}{G_b}} \quad \textbf{(4.2)}$$

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)

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. This data sheet should be completed for each AC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows:

Layer Number (Item 1): The number of the AC layer to be described on this sheet (from Sheet 2).

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

Source (Item 3): The refinery that produced the asphalt cement used in the HMAC layer being described. 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.

Specific Gravity of Asphalt Cement (Item 4): The specific gravity of the asphalt cement (to the nearest thousandth (0.001)) when it is available. If unavailable, a typical specific gravity for asphalt cements produced at the source refinery may be entered. If the source is unknown, enter 1.010 as a reasonable estimate. This specific gravity is measured as specified by AASHTO T228 (ASTM D70).

Viscosity of Asphalt at 140°F (Item 5): The result in poises from absolute viscosity testing using Test Method AASHTO T202 (ASTM D2171) on samples of the original asphalt cement prior to its use in construction of the pavement section.

Viscosity of Asphalt at 275°F (Item 6): The results in centistokes (to the nearest hundredth (0.01)) from kinematic viscosity testing using Test Method AASHTO T201 (ASTM D2170) on samples of the original asphalt cement.

Penetration at 77°F (Item 7): The penetration (in tenths of a millimeter (0.1 mm)) at 77°F (25°C) with a 100-gram load and a five-second load duration using Test Method AASHTO T49 (ASTM D5) on the original asphalt cement in the mixture.

Asphalt Modifiers (Items 8 and 9): Space is provided to list the type and quantity of up to two modifiers added to the asphalt cement for whatever purpose. A list of possible asphalt cement modifiers and codes for data entry are provided in Table A.15, Appendix A. 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.

Ductility at 77°F (Item 10): The ductility in centimeters at 77°F (25°C) using Test Method AASHTO T51 (ASTM D113).

Ductility at 39.2°F (Item 11): The ductility in centimeters at 39.2°F (4°C), using the procedures of Test Method AASHTO T51 (ASTM D113).

Test Rate for Ductility Measurement at 39.2°F (Item 12): The test speed in centimeters per minute for the ductility measurement taken at 39.2°F (4°C).

Penetration at 39.2°F (Item 13): The penetrating (in tenths of a millimeter (0.1 mm)) at 39.2°F (4°C), with a 200-gram load and a 60-second load duration using Test Method AASHTO T49 (ASTM D5) on samples of the original asphalt cement, prior to its use as a construction material.

Ring and Ball Softening Point (Item 14): The softening point of the asphalt cement in degrees Fahrenheit as measured with the ring-and-ball apparatus used in Test Method AASHTO T53 (ASTM D36), on samples of the original asphalt cement prior to its use as a construction material.

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). This data sheet should be complete for each AC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the AC layer for which a description is being provided (from Sheet 2).

Test Procedure Used to Measure Aging Effects (Item 2): 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, along with space to identify a process used other than those for which codes are provided.

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

Viscosity of Asphalt at 275°F (Item 4): The result in centistokes (to the nearest hundredth (0.01)) from kinematic viscosity testing using Test Method AASHTO T201 (ASTM D2170) on laboratory aged asphalt cement samples.

Ductility at 77°F (Item 5): The ductility in centimeters at 77°F (25°C) using Test Method AASHTO T51 (ASTM D113) on laboratory aged asphalt cement samples.

Ductility at 39.2°F (Item 6): The ductility in centimeters at 39.2°F (4°C) using Test Method AASHTO T51 (ASTM D113) on laboratory aged asphalt cement samples.

Test Rate for Ductility Measurement at 39.2°F (Item 7): The test speed in centimeters per minute for the ductility measurement taken at 39.2°F (4°C) on the laboratory aged asphalt cement specimens.

Penetration at 77°F (Item 8): The penetration (in tenths of a millimeter (0.1 mm)) at 77°F (25°C) with a 100-gram load and a five-second load duration using Test Method AASHTO T39 (ASTM D5) on the laboratory aged asphalt cement used in the mixture.

Penetration at 39.2°F (Item 9): The penetration (in tenths of a millimeter (0.1 mm)) at 39.2°F (4°C), with a 200-gram load and a 60-second load duration using the Test Method AASHTO T49 (ASTM D5) on the laboratory aged asphalt cement used in the mixture.

Ring and Ball Softening Point (Item 10): The results in degrees Fahrenheit from the ring and ball softening point test for laboratory aged bitumens (AASHTO T53 (ASTM D36)).

Weight Loss (Item 11): The weight loss resulting from the laboratory aging process to the nearest one-tenth of one percent (0.1%).

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. This data sheet should be completed for each AC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the AC layer to be described on this sheet (from Sheet 2).

Maximum Specific Gravity (Item 2): The maximum specific gravity (to the nearest thousandth (0.001)) of the mixture, calculated using Equations 4.2 and 4.3 as below:

$$G_{mm} = \frac{100}{\frac{P_s}{G_{se}} + \frac{P_b}{G_b}} \qquad \textbf{(4.3)}$$

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

Bulk Specific Gravity (Item 3): The bulk specific gravity (to the nearest thousandth (0.001)) 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.

Optimum Asphalt Content (Item 4): The optimum amount of asphalt cement added to the AC mixture to the nearest one-tenth of a percent (0.1%). This optimum asphalt content is obtained from the Marshall or Hveem Stability Testing.

Percent Air Voids (Item 5): The calculated air voids (to the nearest tenth of a percent (0.1%)) in the mixture, compacted in the laboratory to the optimum asphalt content and by appropriate procedures for Marshall or Hveem stability. Equation 4.4 may be used for calculating the percent air voids.

$$P_a = 100\,\frac{G_{mm} - G_{mb}}{G_{mm}} \quad \textbf{(4.4)}$$

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

Voids in Mineral Aggregate (Item 6): Enter the design void space between the aggregate particles of a compacted AC mixture, which includes the air voids and the effective asphalt content, to the nearest tenth of a percent (0.1%). Percent of voids in mineral aggregate (VMA) is calculated as follows:

$$VMA = 100 - \frac{G_{mb}\,P_s}{G_{sb}} \quad \textbf{(4.5)}$$

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)

Effective Asphalt Content (Item 7): The design effective asphalt content (total asphalt content of the paving mixture minus the portion of asphalt that is lost by absorption onto the aggregate particles as a percentage of the total mixture, to the nearest tenth of a percent (0.1%). The asphalt absorption may be calculated as a percent of total weight of mixture as follows:

$$P_{ab} = P_{ba}\,P_s = \frac{G_{se} - G_{sb}}{G_{sb}\,G_{se}}\,G_b\,P_s \quad \textbf{(4.6)}$$

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

Marshall Stability (Item 8): The Marshall Stability (Test Method AASHTO T245 (ASTM D1559)) of the mixture at optimum asphalt content in pounds.

Number of Blows (Item 9): The number of blows of the compaction hammer that were applied to each end of the specimen to compact it for Marshall Stability and flow testing.

Marshall Flow (Item 10): The Marshall Flow (Test Method AASHTO T245 (ASTM D1559)) of the mixture at optimum asphalt content. This item is to be entered as the whole number of the measured hundredth of an inch (i.e. if 0.15 is measured, enter "15").

Hveem Stability (Item 11): The Hveem Stability or "stabilometer value" of the mixture at optimum asphalt content as measured with the Hveem apparatus using Test Method AASHTO T246 (ASTM D1560).

Hveem Cohesiometer Value (Item 12): The cohesiometer value of the mixture at optimum asphalt content, in grams per 25-mm (1-in) width (or diameter) of specimen, obtained by Test Method AASHTO T246 (ASTM D1560).

Superpave Gyratory Compaction N_{design} (Item 13): Enter the number of revolutions of the Superpave gyratory compactor to achieve 4% air voids.

Asphalt Grade (Item 14): Enter the code for the asphalt grade used in asphalt mixtures, if available. (See asphalt code sheet Table A.16 in Appendix A). Space is provided to enter a grade other than those coded in the table.

Superpave Asphalt Binder Grade (Item 15): Enter the performance grade for the asphalt binder used.

Asphalt Concrete Overlay, Mixture Properties as Placed (Sheet 8)

This data sheet is to be filled out from project records for each AC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm). The data items are results from tests conducted on the mixture during or soon after construction. Calculated values (i.e., percent air voids) should be determined 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 LTPP (and reported on other data sheets), data from project files should be entered when available.

Individual data elements are as follows.

Layer Number (Item 1): The number of the AC layer to be described on the sheet (from Sheet 2).

Type of Samples (Item 2): Whether the test samples were sampled in the field and compacted in the laboratory, or removed from the compacted pavement. The codes appear on the data sheet.

Maximum Specific Gravity (Item 3): The Maximum Specific Gravity (no air voids) of a mixture sampled during or soon after construction according to AASHTO T209 or ASTM D2041. 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 the aggregate using Equation 4.2. 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 4.3.

Bulk Specific Gravity (Item 4): The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of bulk specific gravities (to the nearest thousandth (0.001)) of compacted mixtures measured on cores removed from the pavement during or right after construction. While the test method specified in ASTM D1188 is preferable, the results from nuclear density tests (ASTM D2950), appropriately calibrated to measurements on cores, may also be used.

Asphalt Content (Item 5): The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of percents by weight of the total asphalt cement (including that absorbed by the aggregate) in the AC mixture to the nearest one-tenth of a percent (0.1%). Asphalt contents measured by extraction tests (AASHTO T164 (ASTM D2172)) on field samples are preferred, but results from nuclear test methods may also be used. If no such test results are available, enter the specified asphalt content as the mean, and leave the other spaces blank.

Percent Air Voids (Item 6): The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of calculated air voids (to the nearest tenth of a percent (0.1%)) 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 3.4.

Voids in Mineral Aggregate (Item 7): The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of mean void space between the aggregate particles of a compacted AC mixture, which includes air voids and the effective asphalt content, to the nearest one-tenth of one percent (0.1%). Percent of VMA is calculated as shown in equation 4.5.

Effective Asphalt Content (Item 8): The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of effective asphalt content (total asphalt content of the paving mixture minus the portion of asphalt that is lost by absorption into the aggregate particles), expressed by weight of total mixture to the nearest tenth of a percent

(0.1%). The asphalt absorption may be calculated as a percent of total weight of mixture as shown in equation 4.6.

Asphalt Concrete Overlay, Mixture Properties as Placed (Continued) (Sheet 9)

The data on this sheet is a continuation of the data from Sheet 8. The data items are results from tests conducted on the mixture during or soon after construction. Calculated values (i.e., percent air voids) should be determined separately for individual samples, using data applicable to those samples. This data sheet should be completed for each AC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the AC layer for which a description is being provided (from Sheet 2).

Type Asphalt Plant (Item 2): The type of plant that produced the AC mixture. Codes are provided on the data sheet. Additionally, space is provided to identify a type of plant other than those for which codes are provided.

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

Antistripping Agent Liquid or Solid Code (Item 4): A code to indicate whether the antistripping agent used is a liquid or solid. Codes are provided on the data sheet.

Amount of Antistripping Agent (Item 5): The amount of antistripping agent used in the mixture by weight to the nearest tenth of a percent (0.1%) of weight of asphalt if the agent is liquid and weight of aggregate if it is solid.

Moisture Susceptibility Test Type (Item 6): The type of test used to evaluate the moisture susceptibility of the AC. Codes are provided on Data Sheet 9.

Moisture Susceptibility Test Results (Item 7): Space is provided to record the Hveem Stability Number or Percent Stripped and the Tensile Strength Ratio or Index of Retained Strength, depending on the test procedure used.

Asphalt Concrete Overlay, Construction Data (Sheet 10)

This data sheet is to be filled out from project records for each AC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm). This data sheet provides information regarding the construction of the asphalt overlay.

Individual data elements are as follows.

Layer Number (Item 1): The number of the AC overlay layer for which the compaction data are to be described on this sheet (from Sheet 2).

Mixing Temperature (Item 2): The temperature of the mixture during mixing at the plant (i.e., the mix as discharged) in degrees Fahrenheit.

Laydown Temperatures (Items 3, 4, and 5): 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.

Roller Data (Items 6 thru 22): 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 (0.1 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 (0.1 ton), frequency in vibrations per minute, amplitude in inches to the nearest thousandth (0.001 in), and roller speed in miles per hour to the nearest tenth (0.1 mph).

Compaction Data (Items 23 thru 31): Spaces are provided to enter the following data regarding the compaction of the AC. Space is provided to record data for each of up to four AC lifts.

> *Description of the Roller (Items 23 thru 28)*: Descriptive data to identify the type of roller used (code from data sheet) and Number of Coverages for breakdown, intermediate, and final compactions for each of up to four AC lifts. A "coverage" in this case is defined as one trip of the roller across the pavement.
>
> *Air Temperature (Item 29)*: The ambient temperature measured in degrees Fahrenheit while compaction is accomplished.
>
> *Compacted Thickness (Item 30)*: The thickness of the compacted mat measured in inches to the nearest tenth (0.1 in). If coring is not performed, the planned thickness should be recorded.
>
> *Curing Period (Item 31)*: Enter the number of days before a new lift is placed or opened to traffic.

Hot Mix Recycled Asphalt Pavement, General Information and Reclaimed Aggregate Properties (Sheet 11)

The properties of the original AC 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. This data sheet is to be filled out from project records for each hot mix recycled AC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled layer for which a description is being provided (from Sheet 2).

Procedure Used to Break Up and/or Remove the Asphalt Pavement (Item 2): A code to indicate the procedure used for removal of the asphalt pavement to be recycled. Codes are provided on the data sheet. Additionally, space is provided to describe some other type of treatment if none of those for which codes are provided was used.

Pavement Processing (Item 3): A code, as provided on the data sheet, to indicate how the pavement material was processed after removal.

Gradation of Reclaimed Aggregates (Item 4): 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 a sufficient number of sieve sizes to accommodate testing and specification practices for most agencies.

Bulk Specific Gravities (Items 5 thru 8): The bulk specific gravities (to the nearest thousandth (0.001)) for coarse aggregate (Item 5), fine aggregate (Item 6), mineral filler (Item 7), and the aggregate combination (Item 8). The bulk specific gravities for the aggregate fractions are measured using the laboratory procedures indicated on the data sheet. The bulk specific gravity for the aggregate combination (usually called "bulk specific gravity of aggregate") is calculated as shown in Equation 4.1.

Effective Specific Gravity of Aggregate Combination (Item 9): The calculated effective specific gravity to the nearest thousandth (0.001). This calculation requires the maximum specific gravity (no air voids) of the paving mixture, which is obtained by Test Method AASHTO T209 or ASTM D2041. The effective specific gravity of the aggregate is calculated as shown in Equation 4.2.

Hot Mix Recycled Asphalt Pavement, Untreated Aggregate Properties (Sheet 12)

This data sheet is to be filled out from project records for each AC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm). This data sheet is to be filled out when untreated aggregate (new or reclaimed from base layer) is added to a hot mix recycled AC mixture. If no untreated aggregate was added, this sheet will not be applicable and should be so noted.

Individual data elements are as follows.

Layer Number (Item 1): The number of the AC layer for which a description is being provided (from Sheet 2).

Composition of Coarse Aggregate (Items 2, 3, and 4): When more than one coarse aggregate is used, the type code as provided on the data sheet and percentage by total weight of coarse aggregate should be indicated for each coarse aggregate. Space is provided for up to three types of 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. Space is provided to identify a type of aggregate other than those for which codes are given. The coarse aggregate is considered to be that portion retained on the No. 8 (2.36-mm) sieve.

Geologic Classification of Coarse Aggregate (Item 5): The geologic classification of the untreated aggregate used as coarse aggregate in the concrete mixture. The codes appear in Table A.9, Appendix A 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."

Composition of Fine Aggregate (Items 6, 7, and 8): When more than one fine aggregate is used, the type code as provided on the data sheet and percentage by total weight of fine aggregate should be indicated for each fine aggregate. Fine aggregate is defined as that passing the No. 8 (2.36-mm) sieve and retained on the No. 200 (75-µm) sieve. Space is provided for up to three types of aggregate. 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.

Source (Items 9 and 10): Two one-digit codes to reflect whether the coarse aggregates and the fine aggregates 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.

Type of Mineral Filler (Item 11): The type of mineral filler used. The codes appear on the data sheet.

Aggregate Durability Test Results (Items 12 thru 15): The type of test used to evaluate the durability of the aggregate and the results in thousandths (0.001) 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, Appendix A.

Polish Value of Coarse Aggregates (Item 16): 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)

The data on this sheet is a continuation of the information from Data Sheet 12. This sheet is to be filled out from project records for each recycled HMAC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled HMAC layer for which a description is being provided (from Sheet 2).

Gradation of Untreated Aggregates (Item 2): 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 space for data from a sufficient number of sieve sizes to accommodate testing and specification practice for most agencies.

Bulk Specific Gravities (Items 3 thru 6): The bulk specific gravities (to the nearest thousandth (0.001)) for coarse aggregate (Item 3), fine aggregate (Item 4), mineral filler (Item 5), and the aggregate combination (Item 6). 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 4.1.

Effective Specific Gravity of Aggregate Combination (Item 7): The calculated effective specific gravity to the nearest thousandth (0.001). This calculation requires the maximum specific gravity (no air voids) of the paving mixture, which is obtained by Test Method AASHTO T209 or ASTM D2041. The effective specific gravity of the aggregate is calculated as shown in Equation 4.2.

Hot Mix Recycled Asphalt Pavement, Combined Aggregate Properties (Sheet 14)

This data sheet is to be filled out from project records for each recycled HMAC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm). This data sheet is provided to note the combined (the reclaimed and the untreated) aggregate properties.

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled HMAC layer for which a description is being provided (from Sheet 2).

Amount of New Untreated Aggregate Added (Item 2): The amount of new untreated aggregate added, to the nearest tenth of a percent (0.1%) of the combined weight of the aggregates in the recycled mixture.

Gradation of Combined Aggregates (Item 3): The percent passing on various standard sieve sizes to the nearest one percent of the combined (reclaimed and untreated) aggregate. It is not expected that values will be available for all eighteen sieve sizes; the objective is to provide space for data from a sufficient number of sieve sizes to accommodate testing and specification practices for most agencies.

Bulk Specific Gravities (Items 4 thru 7): The bulk specific gravities (to the nearest thousandth (0.001)) for coarse aggregate (Item 4), fine aggregate (Item 5), mineral filler (Item 6), and the aggregate combination (Item 7). 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 4.1.

Effective Specific Gravity of Aggregate Combination (Item 8): The calculated effective specific gravity to the nearest thousandth (0.001). This calculation requires the maximum specific gravity (no air voids) of the paving mixture, which is obtained by Test Method AASHTO T209 or ASTM D2041. The effective specific gravity of the aggregate is calculated as shown in Equation 4.2.

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 AC mixture to be reclaimed and used in the recycled mixture. This data sheet is to be filled out from project records for each recycled HMAC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled HMAC layer to be described on this sheet (from Sheet 2).

Specific Gravity of Asphalt Cement (Item 2): The specific gravity (to the nearest thousandth (0.001)) of the reclaimed asphalt cement 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).

Viscosity of Asphalt at 140°F (Item 3): The result in poises from absolute viscosity testing using Test Method AASHTO T202 (ASTM D2171) on samples of the extracted asphalt cement from the recycled material.

Viscosity of Asphalt at 275°F (Item 4): The result in centistokes (to the nearest hundredth (0.01)) from kinematic viscosity testing using Test Method AASHTO T201 (ASTM D2170) on samples of the extracted asphalt cement from the recycled material.

Penetration at 77°F (Item 5): The penetration (in tenths of a millimeter (0.1 mm)) at 77°F (25°C) with a 100-gram load and a five-second load duration using Test Method AASHTO T49 (ASTM D5) on extracted asphalt cement from the recycled mixture.

Ductility at 77°F (Item 6): The ductility in centimeters at 77°F (25°C) using Test Method AASHTO T51 (ASTM D113) on extracted asphalt cement from the recycled mixture.

Ductility at 39.2°F (Item 7): The ductility in centimeters at 39.2°F (4°C) using Test Method AASHTO T51 (ASTM D113) on extracted asphalt cement from the recycled mixture.

Test Rate for Ductility Measurement at 39.2°F (Item 8): The test speed in centimeters per minute for the ductility measurement taken at 39.2°F (4°C) on samples of extracted asphalt cement from the recycled material.

Penetration at 39.2°F (Item 9): The penetration (in tenths of a millimeter (0.1 mm)) at 39.2°F (4°C), with a 200-gram load and a 60-second load duration using Test Method AASHTO T49 (ASTM D5) on samples of extracted asphalt cement from the recycled mixture.

Ring and Ball Softening Point (Item 10): The softening point in degrees Fahrenheit from testing extracted asphalt cement from the recycled mixture as measured with the ring-and-ball apparatus used in Test Method AASHTO T53 (ASTM D36).

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. This data sheet is to be filled out from project records for each recycled HMAC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the AC layer to be described on this sheet (from Sheet 2).

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

Source (Item 3): The refiner that produced the new asphalt cement being added to the recycled mix. 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.

Specific Gravity of Asphalt Cement (Item 4): The specific gravity (to the nearest thousandth (0.001)) of the asphalt cement 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).

Viscosity of Asphalt at 140°F (Item 5): The result in poises from absolute viscosity testing using Test Method AASHTO T202 (ASTM D2171) on samples of the new asphalt cement prior to its addition to the recycled mix.

Viscosity of Asphalt at 275°F (Item 6): The result in centistokes (to the nearest hundredth (0.01)) from kinematic viscosity testing using test method AASHTO T201 (ASTM D2170) on samples of the new asphalt cement to be added to the recycled mix.

Penetration at 77°F (Item 7): The penetration (in tenths of a millimeter (0.1 mm)) at 77°F (25°C) with a 100-gram load and a five-second load duration using Test Method AASHTO T49 (ASTM D5) on samples of the new asphalt cement material in the mixture.

Ductility at 77°F (Item 8): The ductility in centimeters at 77°F (25°C) using Test Method AASHTO T51 (ASTM D113) on samples of the new asphalt cement prior to its addition to the recycled mix.

Ductility at 39.2°F (Item 9): The ductility in centimeters at 39.2°F (4°C) using Test Method AASHTO T51 (ASTM D113) on samples of the new asphalt cement prior to its addition to the recycled mix.

Test Rate for Ductility Measurement at 39.2°F (Item 10): The test speed in centimeters per minute for the ductility measurement taken at 39.2°F (4°C).

Penetration at 39.2°F (Item 11): The penetration (in tenths of a millimeter (0.1 mm)) at 39.2°F (4°C) with a 200-gram load and a 60-second load duration using Test Method AASHTO T49 (ASTM D5) on samples of the new asphalt cement, prior to its addition to the recycled mix.

Ring and Ball Softening Point (Item 12): The softening point of the asphalt cement in degrees Fahrenheit as measured with the ring and ball apparatus used in test method AASHTO T53 (ASTM D36), 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. This data sheet is to be filled out from project records for each recycled HMAC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled HMAC layer to be described on this sheet (from Sheet 2).

Recycling Agent (Item 2): Codes to identify the Type and Quantity of recycling agent used. The codes for type appear in Table A.20 of Appendix A. The amount of recycling agent should be provided by weight added to the reclaimed (aged) asphalt, to the nearest tenth of a percent (0.1%) 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.

Amount of New Asphalt Cement Added (Item 3): The quantity of new asphalt cement to the nearest tenth of a percent (0.1%) of total recycled mixture weight (includes reclaimed AC and untreated aggregate and asphalt cement/recycling agent added).

Specific Gravity of Asphalt Cement (Item 4): The specific gravity (to the nearest thousandth (0.001)) of the asphalt cement when it is available. If unavailable, a typical specific gravity for asphalt cements produced at the source refinery may be entered. If the source is unknown, enter 1.010 as a reasonable estimate. This specific gravity is measured as specified by AASHTO T228 (ASTM D70).

Viscosity of Asphalt at 140°F (Item 5): The result in poises from absolute viscosity testing using Test Method AASHTO T202 (ASTM D2171) on samples of the combined asphalt cement prior to its use in construction of the recycled pavement section.

Viscosity of Asphalt at 275°F (Item 6): The result in centistokes (to the nearest hundredth (0.01)) from kinematic viscosity testing using test method AASHTO T201 (ASTM D2170) on samples of the combined asphalt cement.

Penetration at 77°F (Item 7): The penetration (in tenths of a millimeter (0.1 mm)) at 77°F (25°C) with a 100-gram load and a five-second load duration using Test Method AASHTO T49 (ASTM D5) on the combined asphalt cement in the mixture.

Asphalt Modifiers (Items 8 and 9): 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 in 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.

Ductility at 77°F (Item 10): The ductility in centimeters at 77°F (25°C) using Test Method AASTHO T51 (ASTM D113) on samples of the combined asphalt cement.

Ductility at 39.2°F (Item 11): The ductility in centimeters at 39.2°F (4°C) using Test Method AASHTO T51 (ASTM D113) on samples of the combined asphalt cement.

Test Rate for Ductility Measurement at 39.2°F (Item 12): The test speed in centimeters per minute for the ductility measurement taken at 39.2°F (4°C) on samples of the combined asphalt cement.

Penetration at 39.2°F (Item 13): The penetration (in tenths of a millimeter (0.1 mm)) at 39.2°F (4°C) with a 200-gram load and a 60-second load duration using Test Method AASHTO T49 (ASTM D5) on samples of the combined asphalt cement, prior to its use as a construction material.

Ring and Ball Softening Point (Item 14): The softening point of the asphalt cement in degrees Fahrenheit as measured with the ring and ball apparatus used in test method AASHTO T53 (ASTM D36), on samples of 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). This data sheet is to be filled out from project records for each recycled HMAC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled HMAC layer for which a description is being provided (from Sheet 2).

Test Procedure Used to Measure Aging Effects (Item 2): 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 and coded on the data sheet.

Viscosity of Asphalt at 140°F (Item 3): The result in poises from absolute viscosity testing using Test Method AASHTO T202 (ASTM D2171) on laboratory aged asphalt cement samples.

Viscosity of Asphalt at 275°F (Item 4): The result in centistokes (to the nearest hundredth (0.01)) from kinematic viscosity testing using Test Method AASHTO T201 (or ASTM D2170) on laboratory aged asphalt cement samples.

Ductility at 77°F (Item 5): The ductility in centimeters at 77°F (25°C) using Test Method AASHTO T51 (ASTM D113) on laboratory aged samples of the asphalt cement.

Ductility at 39.2°F (Item 6): The ductility in centimeters at 39.2°F (4°C) using Test Method AASHTO T51 (ASTM D113) on laboratory aged samples of the asphalt cement.

Test Rate for Ductility Measurement at 39.2°F (Item 7): The test speed in centimeters per minute for the ductility measurement taken at 39.2°F (4°C).

Penetration at 77°F (Item 8): The penetration (in tenths of a millimeter (0.1 mm)) at 77°F (25°C) with a 100-gram load and a five-second load duration using Test Method AASHTO T49 (ASTM D5) on laboratory aged samples of the asphalt cement.

Penetration at 39.2°F (Item 9): The penetration (in tenths of a millimeter (0.1 mm)) at 39.2°F (4°C) with a 200-gram load and a 60-second load duration using Test Method AASHTO T49 (ASTM D5) on the laboratory aged asphalt cement used in the mixture.

Ring and Ball Softening Point (Item 10): The results in degrees Fahrenheit from the ring and ball softening point test for bitumens (AASHTO T53 (ASTM D36)).

Weight Loss (Item 11): The weight loss resulting from the laboratory aging process to the nearest one-tenth of one percent (0.1%).

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. This data sheet should be completed for each recycled HMAC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled AC layer to be described on this sheet (from Sheet 2).

Maximum Specific Gravity (Item 2): The maximum specific gravity (to the nearest thousandth (0.001)) of the recycled mixture, calculated using Equations 4.2 and 4.3.

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

Optimum Asphalt Content (Item 4): The optimum amount of asphalt cement as obtained from Marshall or Hveem Stability testing that is added to the recycled AC mixture to the nearest one-tenth of a percent (0.1%).

Percent Air Voids (Item 5): The calculated air voids (to the nearest tenth of a percent (0.1%)) in the recycled mixture, compacted in the laboratory to the optimum asphalt

content and by appropriate procedures for Marshall or Hveem stability. Equation 4.4 may be used for calculating the percent air voids.

Marshall Stability (Item 6): The Marshall Stability (Test Method AASHTO T245, (ASTM D1559)) of the mixture at optimum asphalt content in pounds.

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

Marshall Flow (Item 8): The Marshall Flow (Test Method AASHTO T245 (ASTM D1559)) of the mixture at optimum asphalt content. This item is to be entered as the whole number of the measured hundredth of an inch (i.e. if 0.15 is measured, enter "15.").

Hveem Stability (Item 9): The Hveem Stability or "stabilometer value" of the mixture at optimum asphalt content as measured with the Hveem apparatus using Test Method AASHTO T246 (ASTM D1560).

Hveem Cohesiometer Value (Item 10): The cohesiometer value of the mixture at optimum asphalt content, in grams per 25-mm (1-in) width (or diameter) of specimen, obtained by Test Method AASHTO T246 (ASTM D1560).

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. This data sheet is to be filled out from project records for each recycled HMAC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled AC layer to be described on this sheet (from Sheet 2).

Type of Samples (Item 2): 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.

Maximum Specific Gravity (Item 3): The theoretical maximum specific gravity (no air voids) of the mixture sampled during or soon after construction 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 4.2. 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 4.3.

Bulk Specific Gravity (Item 4): The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of bulk specific gravities (to the nearest thousandth (0.001)) of compacted mixtures measured on cores removed from the pavement during or right after construction. While the test method specified in ASTM D1188 is preferable, the results from nuclear density tests (ASTM D2950), appropriately calibrated to measurements on cores, may also be used.

Asphalt Content (Item 5): The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation in percent by weight of the total asphalt cement (including that absorbed by the aggregate) in the AC mixture to the nearest one-tenth of a percent (0.1%). Asphalt content measured by extraction tests (AASHTO T164 (ASTM D2172)) 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.

Percent Air Voids (Item 6): The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of calculated air voids (to the nearest tenth of a percent (0.1%)) 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 4.4.

Voids in Mineral Aggregate (Item 7): The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of void space between the aggregate particles of a compacted AC mixture, which includes air voids and the effective asphalt content, to the nearest one-tenth of one percent (0.1%). Percent of VMA is calculated as shown in Equation 4.5.

Effective Asphalt Content (Item 8): The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of effective asphalt content (total asphalt content of the paving mixture minus the portion of asphalt that is lost by absorption into the aggregate particles), expressed by weight of total mixture to the nearest one-tenth of one percent (0.1%). The asphalt absorption may be calculated as a percent of total weight of mixture as shown in Equation 4.6.

Hot Mix Recycled Asphalt Pavement, Mixture Properties as Placed (Continued) (Sheet 21)

This data sheet is a continuation of Data Sheet 22. This sheet is to be filled out from project records for each recycled HMAC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled AC layer for which a description is being provided (from Sheet 2).

Type Asphalt Plant (Item 2): Type of plant that produced the AC mixture. Codes are provided on the data sheet. Additionally, space is provided to identify a type of plant other than those for which codes are provided.

Type of Antistripping Agent (Item 3): The type of antistripping agent used in the mixture. The codes are provided in Table A.21 in Appendix A. Space is provided to identify an antistripping agent other than those for which codes are provided.

Antistripping Agent Liquid or Solid Code (Item 4): A code to indicate whether the antistripping agent used is a liquid or solid. Codes are provided on the data sheet.

Amount of Antistripping Agent (Item 5): The amount of antistripping agent used in the mixture by weight to the nearest tenth of a percent (0.1%) of weight of asphalt if the agent is liquid and weight of aggregate if it is solid.

Moisture Susceptibility Test Type (Item 6): The type of test used to evaluate the moisture susceptibility of the mixture. Codes are provided on the data sheet. If a procedure other than those for which codes are provided is used, space is provided to specify a name or reference for the test.

Moisture Susceptibility Test Results (Item 7): Space is provided to record the Hveem Stability Number or Percent Stripped and the Tensile Strength Ratio or Index of Retained Strength, depending on the test procedure used.

Hot Mix Recycled Asphalt Pavement, Construction Data (Sheet 22)

This data sheet provides information about the construction of the overlay layers. This sheet is to be filled out from project records for each recycled HMAC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled HMAC layer for which the compaction data are to be described on this sheet (from Sheet 2).

Mixing Temperature (Item 2): The temperature of the mixture at the plant (i.e., the mix as discharged) in degrees Fahrenheit.

Laydown Temperatures (Items 3, 4, and 5): The Number of Temperature Measurements taken and the Mean, Minimum, Maximum, and Standard Deviation of temperatures measured. The temperatures should be measured just behind the screed. Three to five measurements should be made.

Roller Data (Items 6 thru 22): 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 (0.1 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 (0.1 ton), frequency in vibrations per minute, amplitude in inches to the nearest thousandth (0.001 in), and roller speed in miles per hour to the nearest tenth (0.1 mph).

Compaction Data (Items 23 thru 31): Spaces are provided for Items 23 to 31 to enter the following data regarding the compaction of the recycled mix. Space is provided to record data for each of up to four AC lifts.

Description of the Roller (Items 23 thru 28): Use code from data sheet for items 6 through 22 and Number of Coverages for breakdown, intermediate, and final compactions for each of up to four AC lifts. A "coverage" in this case is defined as one trip of the roller across the pavement.

Air Temperature (Item 29): The ambient temperature in degrees Fahrenheit while compaction is accomplished. Space is provided to record data for each of up to four AC lifts.

Compacted Thickness (Item 30): The compacted mat thickness in inches to the nearest tenth (0.1 in). If coring is not performed, the planned thickness should be recorded. Space is provided to record data for each of up to four AC lifts.

Curing Period (Item 31): The number of days before a new lift is placed or the pavement is opened to traffic.

Cold Mix Recycled Asphalt Pavement, General Information and Reclaimed Aggregate Properties (Sheet 23)

The properties of the original AC 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. This data sheet is to be filled out from project records for each cold mix recycled AC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled layer for which a description is being provided (from Sheet 2).

Procedure Used to Break Up and/or Remove the Asphalt Pavement (Item 2): A code to indicate the procedure used for removing the asphalt pavement to be recycled from the

roadway. Codes are provided on the data sheet. Space is also provided to identify a procedure used other than those for which codes are provided.

Pavement Processing (Item 3): A code to indicate how the pavement material was processed after removal from the roadway. Codes are provided on the data sheet. Space is provided to identify a procedure other than those for which codes are provided.

Gradation of Reclaimed Aggregates (Item 4): 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 space for data from a sufficient number of sieve sizes to accommodate testing and specification practices for most agencies.

Bulk Specific Gravities (Items 5 thru 8): The bulk specific gravities (to the nearest thousandth (0.001)) for coarse aggregate (Item 5), fine aggregate (Item 6), mineral filler (Item 7), and the aggregate combination (Item 8). The bulk specific gravities for the aggregate fractions are measured using the laboratory procedures indicated on the data sheet. The bulk specific gravity for the aggregate combination (usually called "bulk specific gravity of aggregate") is calculated as shown in Equation 4.1.

Effective Specific Gravity of Aggregate Combination (Item 9): The calculated effective specific gravity to the nearest thousandth (0.001). This calculation requires the maximum specific gravity (no air voids) of the paving mixture, which is obtained by Test Method AASHTO T209 or ASTM D2041. The effective specific gravity of the aggregate is calculated as shown in Equation 4.2.

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. This data sheet is to be filled out from project records for each cold mix recycled AC overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the AC layer for which a description is being provided (from Sheet 2).

Composition of Coarse Aggregate (Items 2, 3, and 4): When more than one coarse aggregate is used, the type as coded on the data sheet and percentage by total weight of coarse aggregate should be indicated for each coarse aggregate. Coarse aggregate is defined as that portion retained on the No. 8 (2.36-mm) 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. If an aggregate type other than those coded on the form was used, space is provided to identify that type.

Geologic Classification of Coarse Aggregate (Item 5): The geologic classification of the untreated aggregate used as coarse aggregate in the concrete mixture (when applicable). These codes appear in Table A.9 of Appendix A 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."

Composition of Fine Aggregate (Items 6, 7, and 8): When more than one fine aggregate is used, the type as coded on the data sheet and percentage by total weight of fine aggregate should be indicated for each fine aggregate. Fine aggregate is defined as that portion passing the No. 8 (2.36-mm) sieve and retained on the No. 200 (75-µm) 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.

Source (Items 9 and 10): 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.

Type of Mineral Filler (Item 11): The type of mineral filler used. The codes appear on the data sheet.

Aggregate Durability Test Results (Items 12 thru 15): The type of test used to evaluate the durability of the aggregate used in the mix and the results in thousandths (0.001) recorded in the units specified for the test. Three of these sets are for coarse aggregate (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, Appendix A.

Polish Value of Coarse Aggregates (Item 16): 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)

This sheet is a continuation of the data provided on Sheet 24. This data sheet should be completed for each cold mix recycled asphalt overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The cold mix recycled AC layer for which a description is being provided (from Sheet 2).

Gradation of Untreated Aggregates (Item 2): 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 space for data from a sufficient number of sieve sizes to accommodate testing and specification practice for most agencies.

Bulk Specific Gravities (Items 3 thru 6): The bulk specific gravities (to the nearest thousandth (0.001)) for coarse aggregate (Item 3), fine aggregate (Item 4), mineral filler (Item 5), and the aggregate combination (Item 6). 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 4.1.

Effective Specific Gravity of Aggregate Combination (Item 7): The calculated effective specific gravity to the nearest thousandth (0.001). This calculation requires the maximum specific gravity (no air voids) of the paving mixture, which is obtained by Test Method AASHTO T209 or ASTM D2041. The effective specific gravity of the aggregate is calculated as shown in Equation 4.2.

Cold Mix Recycled Asphalt Pavement, Combined Aggregate Properties (Sheet 26)

This data sheet is provided to note the properties of the combined (the reclaimed and the untreated) aggregate. This sheet should be completed for each cold mix recycled asphalt overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the cold mix asphalt recycled layer for which a description is being provided (from Sheet 2).

Amount of New Untreated Aggregate Added (Item 2): The amount of untreated aggregate added, to the nearest tenth of a percent (0.1%) of the combined weight of the aggregates in the recycled mixture.

Gradation of Combined Aggregates (Item 3): The percent passing on various standard sieve sizes to the nearest one percent of the combined (untreated and reclaimed) aggregate. It is not expected that values will be available for all eighteen sieve sizes; the objective is to provide space for data from a sufficient number of sieve sizes to accommodate testing and specification practices for most agencies.

Bulk Specific Gravities (Items 4 thru 7): The bulk specific gravities (to the nearest thousandth (0.001)) for coarse aggregate (Item 4), fine aggregate (Item 5), mineral filler (Item 6), and the aggregate combination (Item 7). 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 4.1.

Effective Specific Gravity of Aggregate Combination (Item 8): The calculated effective specific gravity to the nearest thousandth (0.001). This calculation requires the maximum specific gravity (no air voids) of the paving mixture, which is obtained by Test Method AASHTO T209 or ASTM D2041. The effective specific gravity of the aggregate is calculated as shown in Equation 4.2.

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 AC mixture to be reclaimed and used in the recycled mixture. This data sheet should be completed for every cold mix recycled asphalt overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the cold mix recycled AC layer to be described on this sheet (from Sheet 2).

Specific Gravity of Asphalt Cement (Item 2): The specific gravity (to the nearest thousandth (0.001)) of the asphalt cement in the reclaimed portion of the mix 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).

Viscosity of Asphalt at 140°F (Item 3): The result in poises from absolute viscosity testing using Test Method AASHTO T202 (ASTM D2171) on samples of the extracted asphalt cement from the existing AC mixture.

Viscosity of Asphalt at 275°F (Item 4): The result in centistokes (to the nearest hundredth (0.01)) from kinematic viscosity testing using Test Method AASHTO T201 (ASTM D2170) on samples of the extracted asphalt cement from the existing AC mixture.

Penetration at 77°F (Item 5): The penetration (in tenths of a millimeter (0.1 mm)) at 77°F (25°C) with a 100-gram load and a five-second load duration using Test Method AASHTO T49 (ASTM D5) on the original asphalt cement in the mixture.

Ductility at 77°F (Item 6): The ductility in centimeters at 77°F (25°C) using Test Method AASHTO T51 (ASTM D113) on samples of extracted asphalt cement from the existing AC mixture.

Ductility at 39.2°F (Item 7): The ductility in centimeters at 39.2°F (4°C) using Test Method AASHTO T51 (ASTM D113) on samples of extracted asphalt cement from the existing AC mixture.

Test Rate for Ductility Measurement at 39.2°F (Item 8): The test speed in centimeters per minute for the ductility measurement taken at 39.2°F (4°C) on samples of extracted asphalt cement from the existing concrete mixture.

Penetration at 39.2°F (Item 9): The penetration (in tenths of a millimeter (0.1 mm)) at 39.2°F (4°C) with a 200-gram load and a 60-second load duration using Test Method AASHTO T49 (ASTM D5) on samples of the extracted asphalt cement from the existing AC mixture.

Ring and Ball Softening Point (Item 10): The softening point in degrees Fahrenheit as measured with the ring-and-ball apparatus used in Test Method AASHTO T53 (ASTM D36), on samples of the extracted asphalt cement from the existing AC mixture.

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. This sheet should be completed for each cold mix recycled asphalt overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the cold mix recycled AC layer to be described on this sheet (from Sheet 2).

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

Source (Item 3): The source refinery that produced 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.

Specific Gravity of Asphalt Cement (Item 4): The specific gravity (to the nearest thousandth (0.001)) of the asphalt cement 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).

Viscosity of Asphalt at 140°F (Item 5): The result in poises from absolute viscosity testing using test method AASHTO T202 (ASTM D2171) on samples of the new asphalt cement prior to its addition to the recycled mix.

Viscosity of Asphalt at 275°F (Item 6): The result in centistokes (to the nearest hundredth (0.01)) from kinematic viscosity testing using Test Method AASHTO T201 (ASTM D2170) on samples of the new asphalt cement prior to its addition to the recycled mix.

Penetration at 77°F (Item 7): The penetration (in tenths of a millimeter (0.1 mm)) at 77°F (25°C) with a 100-gram load and a five-second load duration using Test Method AASHTO T49 (ASTM D5) on the original asphalt cement in the mixture.

Saybolt Furol Viscosity of Emulsified Asphalt at 77°F (Item 8): The Saybolt Furol viscosity at 77°F (to the nearest tenth of a second (0.1 sec)) as measured by test method AASHTO T72 or ASTM D88 on the new asphalt material. If the asphalt cement added was not an emulsified asphalt, enter "N."

Residue by Distillation (Item 9): 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."

Coating Ability and Water Test (Item 10): The coating on a reference aggregate in initially dry and wet states, and its ability to remain on the aggregates after spraying with water. Codes are provided on the data sheet for ratings of good, fair, and poor. These ratings 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."

Ductility at 77°F (Item 11): The ductility in centimeters at 77°F (25°C) using Test Method AASHTO T51 (ASTM D113) on the new asphalt cement prior to its addition to the recycled mix.

Ductility at 39.2°F (Item 12): The ductility in centimeters at 39.2°F (4°C) using Test Method AASHTO T51 (ASTM D113) on the new asphalt cement prior to its addition to the recycled mix.

Test Rate for Ductility Measurement at 39.2°F (Item 13): The test speed in centimeters per minute for the ductility measurement taken at 39.2°F (4°C).

Penetration at 39.2°F (Item 14): The penetration (in tenths of a millimeter (0.1 mm)) at 39.2°F (4°C) with a 200-gram load and a 60-second load duration using Test Method AASHTO T49 (ASTM D5) on samples of the new asphalt cement, prior to its addition to the recycled mix.

Ring and Ball Softening Point (Item 15): The softening point of the asphalt cement in degrees Fahrenheit as measured with the ring and ball apparatus used in test method AASHTO T53 (ASTM D36), 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. This data sheet should be completed for each cold mix recycled asphalt overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the cold mix recycled AC layer to be described on this sheet (from Sheet 2).

Recycling Agent (Item 2): Codes to identify the Type and Quantity of recycling agent used. The codes for type appear in Table A.20 of Appendix A. Space is provided for identifying another type not appearing in Table A.20, if needed. The amount of recycling agent should be provided by weight added to the reclaimed (aged) asphalt, to the nearest one-tenth of a percent (0.1%) 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.

Amount of New Asphalt Cement Added (Item 3): The quantity of new asphalt cement to the nearest tenth of a percent (0.1%) of total recycled mixture weight (includes reclaimed AC and untreated aggregate and asphalt cement/recycling agent added).

Specific Gravity of Asphalt Cement (Item 4): The specific gravity of the asphalt cement (to the nearest thousandth (0.001)) when it is available. If unavailable, a typical specific gravity for asphalt cements produced at the source refinery may be entered. If source is unknown, enter 1.010 as a reasonable estimate. This specific gravity is measured as specified by AASHTO T228 (or ASTM D70).

Viscosity of Asphalt at 140°F (Item 5): The result in poises from absolute viscosity testing using test method AASHTO T202 (ASTM D2171) on samples of the combined asphalt cement prior to its use in construction of the recycled pavement section.
Viscosity of Asphalt at 275°F (Item 6): The result in centistokes (to the nearest hundredth (0.01)) from kinematic viscosity testing using test method AASHTO T201 (ASTM D2170) on samples of the combined asphalt cement.

Penetration at 77°F (Item 7): The penetration (in tenths of a millimeter (0.1 mm)) at 77°F (25°C) with a 100-gram load and a five-second load duration using Test Method AASHTO T49 (ASTM D5) on testing the combined asphalt cement in the mixture.

Asphalt Modifiers (Items 8 and 9): 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.

Ductility at 77°F (Item 10): The ductility in centimeters at 77°F (25°C) using Test Method AASTHO T51 (ASTM D113) on samples of the combined asphalt cement material.

Ductility at 39.2°F (Item 11): The ductility in centimeters at 39.2°F (4°C) using Test Method AASHTO T51 (ASTM D113) on samples of the combined asphalt cement material.

Test Rate for Ductility Measurement at 39.2°F (Item 12): The test speed in centimeters per minute for the ductility measurement taken at 39.2°F (4°C) on samples of the combined asphalt cement.

Penetration at 39.2°F (Item 13): The penetration (in tenths of a millimeter (0.1 mm)) at 39.2°F (4°C) with a 200-gram load and a 60-second load duration using Test Method AASHTO T49 (ASTM D5) on samples of the combined asphalt cement, prior to its use as a construction material.

Ring and Ball Softening Point (Item 14): The softening point of the asphalt cement in degrees Fahrenheit as measured with the ring and ball apparatus used in test method AASHTO T53 (ASTM D36), 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). This data sheet should be completed for each cold mix recycled asphalt overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the cold mix recycled AC layer for which a description is being provided (from Sheet 2).

Test Procedure Used to Measure Aging Effects (Item 2): 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. Additionally, space is provided on the data sheet to indicate the aging process used if other than those stated above.

Viscosity of Asphalt at 140°F (Item 3): The result in poises from absolute viscosity testing using Test Method AASHTO T202 (ASTM D2171) on laboratory aged asphalt cement samples.

Viscosity of Asphalt at 275°F (Item 4): The result in centistokes (to the nearest hundredth (0.01)) from kinematic viscosity testing using Test Method AASHTO T201 (ASTM D2170) on laboratory aged asphalt cement samples.

Ductility at 77°F (Item 5): The ductility in centimeters at 77°F (25°C) using Test Method AASHTO T51 (ASTM D113) on laboratory aged samples of the asphalt cement.

Ductility at 39.2°F (Item 6): The ductility in centimeters at 39.2°F (4°C) using Test Method AASHTO T51 (ASTM D113) on laboratory aged asphalt specimens.

Test Rate for Ductility Measurement at 39.2°F (Item 7): The test speed in centimeters per minute for the ductility measurement taken at 39.2°F (4°C).

Penetration at 77°F (Item 8): The penetration (in tenths of a millimeter (0.1 mm)) at 77°F (25°C) with a 100 gram load and a five-second load duration using Test Method AASHTO T49 (ASTM D5) on laboratory aged samples of the combined asphalt cement used in the mixture.

Penetration at 39.2°F (Item 9): The penetration (in tenths of a millimeter (0.1 mm)) at 39.2°F (4°C) with a 200 gram load and a 60-second load duration using Test Method AASHTO T49 (ASTM D5) on laboratory aged samples of the combined asphalt cement used in the mixture.

Ring and Ball Softening Point (Item 10): The results in degrees Fahrenheit from the ring and ball softening point test for bitumens (AASHTO T53 (ASTM D36)).

Weight Loss (Item 11): The weight loss resulting from the laboratory aging process to the nearest one-tenth of one percent (0.1%).

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. This data sheet should be completed for each cold mix recycled asphalt overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled AC layer to be described on this sheet (from Sheet 2).

Maximum Specific Gravity (Item 2): The theoretical maximum specific gravity (to the nearest thousandth (0.001)) of the recycled mixture, calculated using Equations 4.2 and 4.3.

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

Optimum Asphalt Content (Item 4): The optimum amount of asphalt cement added to the recycled AC mixture to the nearest one-tenth of a percent (0.1%). This optimum asphalt content is obtained from the Marshall or Hveem Stability Testing.

Percent Air Voids (Item 5): The calculated air voids (to the nearest tenth of a percent (0.1%)) in the recycled mixture, compacted in the laboratory to the optimum asphalt content and by appropriate procedures for Marshall or Hveem stability. Equation 4.4 may be used for calculating the percent air voids.

Marshall Stability (Item 6): The Marshall Stability (Test Method AASHTO T245 (ASTM D1559)) of the mixture at optimum asphalt content in pounds.

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

Marshall Flow (Item 8): The Marshall Flow (Test Method AASHTO T245 (ASTM D1559)) of the mixture at optimum asphalt content. This item is to be entered as the whole number of the measured hundredth of an inch (i.e. if 0.15 is measured, enter "15.").

Hveem Stability (Item 9): The Hveem Stability or "stabilometer value" of the mixture at optimum asphalt content as measured with the Hveem apparatus using Test Method AASHTO T246 (ASTM D1560).

Hveem Cohesiometer Value (Item 10): The cohesiometer value of the mixture at optimum asphalt content, in grams per 25-mm (1-inch) width (or diameter) of specimen, obtained by Test Method AASHTO T246 (or ASTM D1560).

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. This data sheet should be completed for each cold mix recycled asphalt overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled AC layer to be described on this sheet (from Sheet 2).

Type of Samples (Item 2): 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.

Maximum Specific Gravity (no air voids) (Item 3): The theoretical maximum specific gravity of a mixture sampled during or soon after construction 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 4.2. 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 4.3.

Bulk Specific Gravity (Item 4): The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of bulk specific gravities (to the nearest thousandth (0.001)) of compacted mixtures measured on cores removed from the pavement during or right after construction. While the test method specified in ASTM D1188 is preferable, the results from nuclear density tests (ASTM D2950), appropriately calibrated to measurements on cores, may also be used.

Asphalt Content (Item 5): The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of percents by weight of the total asphalt cement (including that absorbed by the aggregate) in the AC mixture to the nearest one-tenth of a percent (0.1%). Asphalt content measured by extraction tests (AASHTO T164 (ASTM D2172)) 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.

Percent Air Voids (Item 6): The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of calculated air voids (to the nearest tenth of a percent (0.1%)) 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 4.4.

Voids in Mineral Aggregate (Item 7): The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of void space between the aggregate particles of a compacted AC mixture, which includes air voids and the effective asphalt content, to the nearest one-tenth of one percent (0.1%). Percent of VMA is calculated as shown in Equation 4.5.

Effective Asphalt Content (Item 8): The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of effective asphalt content (total asphalt content of the paving mixture minus the portion of asphalt that is lost by absorption into the aggregate particles), expressed by weight of total mixture to the nearest one-tenth of one

percent (0.1%). The asphalt absorption may be calculated as a percent of total weight of mixture as shown in Equation 4.6.

Cold Mix Recycled Asphalt Pavement, Mixture Properties as Placed (Continued) and Construction Data (Sheet 33)

The data on this sheet are a continuation of the data from Sheet 32. This data sheet also provides information about the construction of the individual layers. This sheet should be completed for each cold mix recycled asphalt overlay layer identified on Sheet 2 that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled AC layer for which a description is being provided (from Sheet 2).

Type of Antistripping Agent (Item 2): The type of antistripping agent used in the mixture. The codes are provided in Table A.21 in Appendix A.

Antistripping Agent Liquid or Solid Code (Item 3): A code to indicate whether the antistripping agent used is a liquid or solid. Codes are provided on the data sheet.

Amount of Antistripping Agent (Item 4): The amount of antistripping agent used in the mixture by weight to the nearest tenth of a percent (0.1%) of weight of asphalt if the agent is liquid and weight of aggregate if it is solid.

Moisture Susceptibility Test Type (Item 5): The type of test used to evaluate the moisture susceptibility of the mixture. Codes are provided on the data sheet. If a procedure other than those provided is used, space is provided to specify a name or reference for the test.

Moisture Susceptibility Test Results (Item 6): Space is provided to record the Hveem Stability Number or Percent Stripped and the Tensile Strength Ratio or Index of Retained Strength, depending on the test procedure used.

Construction Data (Items 7 thru 11): The following data should be provided to describe the construction operations involved in the cold mix recycling process.

Type of Recycling (Item 7): A code to indicate whether the recycling was done in place or mixed in a central plant. Codes are provided on the data sheet.

Procedures for Mixing In Place (Item 8): A code, as provided on the data sheet, to indicate the procedure used for mixing the materials during recycling.

Type Asphalt Plant (Item 9): Type of plant that produced the AC mixture, if centrally mixed. Codes are provided on the data sheet.

Was Mixture Aerated? (Item 10): A code to indicate whether the mixture was aerated before spreading. The codes appear on the data sheet.

Period Between Mixing and Spreading (Item 11): The period between mixing and spreading (to the nearest hour).

Cold Mix Recycled Asphalt Pavement, Construction Data (Continued) (Sheet 34)

The data on this sheet are a continuation of the construction data provided on Sheet 33. This sheet should be completed for each cold mix recycled asphalt overlay layer that is thicker than 0.75 inches (19 mm).

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled AC layer for which the compaction data are to be described on this sheet (from Sheet 2).

Method of Spreading Mixture (Item 2): Codes are provided on the data sheet to describe the method used to spread the cold mix recycled AC mixture. Space is provided to identify a method for which a code was not provided, if needed.

Roller Data (Items 3 thru 19): 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 (0.1 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 (0.1 ton), frequency in vibrations per minute, amplitude in inches to the nearest thousandth (0.001 in), and roller speed in miles per hour to the nearest tenth (0.1 mph).

Compaction Data (Items 20 thru 28): Spaces are provided to enter the following data regarding the compaction of the recycled mix:

Description of the Roller Used (Items 20 thru 25): A roller code from the data sheet fully described by Items 3 thru 19 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.

Air Temperature (Item 26): Record the ambient temperature in degrees Fahrenheit while compaction is accomplished.

Compacted Thickness (Item 27): The compacted mat thickness in inches to the nearest tenth (0.1 in). If coring is not performed, the planned thickness should be recorded.

Curing Period (Item 28): The number of days before a new lift is placed or the pavement is opened to traffic.

Heater Scarification Surface Recycled Asphalt Pavement (Sheet 35)

This data sheet provides data regarding scarification of the existing pavement surface for recycling the AC surface layer.

Individual data elements are as follows.

Layer Number (Item 1): The layer number of the surface layer prior to heater scarification (from Sheet 2).

Type of Heater Scarification (Item 2): A code to indicate what type of heater scarification was employed. Codes appear on the data sheet.

Depth of Scarification (Item 3): The average depth of cut to the nearest one-tenth of an inch (0.1 in) during scarification. This is the reduction in thickness of the existing surface prior to replacement of recycled material.

Type of Surface Treatment (Item 4): 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. Additionally, space is provided to identify a type of treatment for which a code was not provided, if needed.

Type of Rejuvenating Agent (Item 5): A code to identify the type of rejuvenating agent added to the broken AC to restore cohesion and flexibility. Codes for various agents used are provided on Table A.20 of Appendix A.

Amount of Rejuvenating Agent (Item 6): A three-digit number to record to the nearest one-tenth of a gallon per square yard (0.1 gal/yd^2) the application rate of the rejuvenating agent.

Roller Data (Item 7): 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 of up to two different rollers for each roller type. Steel-wheeled tandem rollers are described by their gross weights to the nearest tenth of a ton (0.1 ton). Pneumatic-tired rollers are described by their gross weight and tire pressure in psi. Vibratory rollers are described by their gross weight in tons to the nearest tenth (0.1 ton), frequency in vibrations per minute, amplitude in inches to the nearest thousandth (0.001), and roller speed in miles per hour to the nearest tenth of a mile (0.1 mph).

Compaction Data (Item 8): 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.

Length of Time Between Heater Scarification and Addition of Surface Treatment (Item 9): The number of days between scarification/recompaction and addition of surface treatment.

Length of Time Between Surfacing and Opening Road to Traffic (Item 10): The number of days between surface treatment and opening the surface to traffic.

Portland Cement Concrete Overlay, Joint Data (Sheet 36)

This data sheet provides information on the joints used in a new PCC overlay layer.

Individual data elements are as follows.

Layer Number (Item 1): The number of the PCC overlay for which a description is being provided (from Sheet 2).

Average Contraction Joint Spacing (Item 2): The average spacing in feet (to the nearest tenth of a foot (0.1 ft)) 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 (Item 3).

Built-in Expansion Joint Spacing (Item 4): 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".

Skewness of Joints (Item 5): The average distance in feet of the contraction joint from a normal (right-angled) joint at the opposite side of the lane. If not skewed, enter "N".

Transverse Contraction Joint Load Transfer System (Item 6): 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.

Round Dowel Diameter (Item 7): 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 (0.1 in).

Dowel or Mechanical Load Transfer Device Spacing (Item 8): 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.

Average Intermediate Sawed Joint Spacing (Item 9): 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".

Dimensions for I-Beams or Keyways (Items 10 and 11): The Height and Width of I-beams or keyways (if used) to the nearest hundredth of an inch (0.01 in).

Distance of Nearest Dowel (or Mechanical Load Transfer Device) From Outside Lane-Shoulder Edge (Item 12): 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 (0.1 in).

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

Dowel Coating (Item 14): 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 has been used other than those for which codes are provided on the data sheet.

Method Used to Install Mechanical Load Transfer Devices (Item 15): 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 on the data sheet.

Portland Cement Concrete Overlay, Joint Data (Continued) (Sheet 37)

This data sheet is a continuation of the data provided on Sheet 36.

Individual data elements are as follows.

Layer Number (Item 1): The number of the PCC overlay for which a description is being provided (from Sheet 2).

Method Used to Form Transverse Joints (Item 2): 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. Codes are provided on the data sheet. Space is provided for describing another method if none of those for which codes were provided was used.

Type of Longitudinal Joint (Item 3): How the longitudinal joint between the lanes was formed. Codes are provided on the data sheet.

Type of Shoulder-Traffic Lane Joint (Item 4): A code indicating 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. Codes are provided on the data form.

Transverse Joint Sealant Type (Item 5): Type of joint sealant used in the transverse joints. Codes are provided on the data sheet.

Transverse Joint Sealant Reservoir Width (Item 6): The as-constructed width of the transverse joint sealant reservoir to the nearest hundredth of an inch (0.01 in).

Transverse Joint Sealant Reservoir Depth (Item 7): The as-constructed depth of the transverse joint sealant reservoir to the nearest hundredth of an inch (0.01 in).

Longitudinal Joint Sealant Reservoir Width (Item 8): The width of the as-built longitudinal joint sealant reservoir to the nearest hundredth of an inch (0.01 in). If butt or keyed joints have been used without a sealant reservoir, enter "0.00."

Longitudinal Joint Sealant Reservoir Depth (Item 9): The depth of the as-built longitudinal joint sealant reservoir to the nearest hundredth of an inch (0.01 in). If butt or keyed joints were used without a sealant reservoir, enter "0.00."

Joint Sealant Backer Material Type (Item 10): A code to indicate the type of blocking material used (placed prior to the joint sealant). Codes are provided on the data sheet.

Joint Sealant Backer Dimension (Item 11): If the joint sealant backer material type is a rod or rope, enter the diameter, in inches to the nearest tenth of an inch (0.1 in). If the joint sealant backer material type is tape, enter the width, in inches to the nearest hundredth of an inch (0.01 in).

Between Lane Tie Bar Diameter (Item 12): The diameter of the tie bars used across longitudinal joints between lanes entered to the nearest one hundredth of an inch (0.01 in).

Between Lane Tie Bar Length (Item 13): The length in inches of the tie bars used across the longitudinal joint between the lanes.

Between Lane Tie Bar Spacing (Item 14): The center-to-center spacing between consecutive tie bars across the longitudinal joint between the lanes to the nearest tenth of an inch (0.1 in).

Shoulder-Traffic Lane Joint Sealant Reservoir (Items 15 and 16): The Width and Depth of the as-built joint sealant reservoir between the shoulder and traffic lane. If butt or keyed joints have been used without a sealant reservoir, enter "0.00" in both of the spaces provided.

Shoulder-Traffic Lane Joint Tie Bars (Items 17, 18, and 19): 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 (0.01 in), 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)

This data sheet provides information regarding the reinforcement used in the PCC overlay layer, if any was used.

Individual data elements are as follows.

Layer Number (Item 1): The number of the PCC overlay layer for which a description is being provided (from Sheet 2).

Type of Reinforcing (Item 2): The type of reinforcing used in the PCC layer being described. Codes for deformed bars and welded wire fabric are provided on the data sheet. A space is provided for entering a written description of a reinforcing type other than deformed bars or welded wire fabric.

Transverse Bar Diameter (Item 3): The diameter of the transverse bars or wire to the nearest one hundredth of an inch (0.01 in).

Transverse Bar Spacing (Item 4): The mean center-to-center spacing between transverse bars or wires to the nearest tenth of an inch (0.1 in).

Longitudinal Bar Diameter (Item 5): The diameter of the longitudinal bars or wire to the nearest hundredth of an inch (0.01 in).

Design Percentage of Longitudinal Steel (Item 6): The percentage of reinforcing steel of the PCC cross-section required in the design to the nearest hundredth of one percent (0.01%).

Depth to Reinforcement From Slab Surface (Item 7): The depth (to the nearest tenth of an inch (0.1 in)) of the concrete cover over the reinforcing steel.

Longitudinal Bar Spacing (Item 8): The center-to-center spacing between longitudinal bars or wires to the nearest tenth of an inch (0.1 in).

Yield Strength of Reinforcing Steel (Item 9): The yield strength of the reinforcing steel in the bars to the nearest tenth of a kip per square inch (0.1 ksi). If tests were not conducted for the steel used, enter the minimum yield strength allowed for the grade of steel used.

Method Used to Place Reinforcement (Item 10): 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. Codes for these methods

are provided on the data sheet. A space is also provided to describe another method of placement if a code is not provided on the data sheet for the method used.

Lap Length of Longitudinal Steel Splices (Item 11): 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)

This data sheet provides information regarding the mix proportions used in the PCC overlay mixture.

Individual data elements are as follows.

Layer Number (Item 1): The number of the PCC overlay layer for which a description is being provided (from Sheet 2).

Mix Design (Items 2 thru 5): 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.

Cement Type Used (Item 6): Type of cement used in the slab concrete. These cement type codes appear in Table A.11 in Appendix A. Additionally, if none of the codes provided are applicable to the type used, space is provided for identifying another type.

Alkali Content of Cement (Item 7): The alkali content of the cement to the nearest tenth of a percent (0.1%), expressed as sodium oxide equivalent.

Entrained Air Content (Items 8, 9, and 10): The Mean, Minimum, and Maximum values of entrained air (percent of mixture volume) as measured (by Test Methods AASHTO T121 (ASTM C138), AASHTO T152 (ASTM C231), and AASHTO T196 (ASTM C173)) during construction to the nearest tenth of a percent (0.1%).

Admixtures (Items 11, 12, and 13): The types and amounts (in percent by weight of cement to the nearest thousandth (0.001)) of admixtures used in the concrete. The codes for concrete admixtures appear in Table A.12 in Appendix A.

Slump (Items 14 thru 18): 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 (0.1 in) and the Number of Tests from which the values are obtained. The slump test is described in AASHTO T119 (ASTM C143). The maximum and minimum values and standard deviation of slump should be left blank if only one test result is available.

Portland Cement Concrete Overlay, Aggregate Data (Sheet 40)

This data sheet provides information regarding the aggregate used in the PCC overlay layer.

Individual data elements are as follows.

Layer Number (Item 1): The number of the PCC overlay layer for which a description is being provided (from Sheet 2).

Composition of Coarse Aggregate (Items 2, 3, and 4): When more than one coarse aggregate is used, the type code as provided on the data sheet 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 (4.75-mm) sieve as defined by the Portland Cement Association. Space is provided for the description of another type if none of the types for which codes were provided were used. Space is provided for up to three different types of 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.

Geologic Classification of Coarse Aggregate (Item 5): The geologic classification of the natural stone used as coarse aggregate in the concrete. These codes appear in Table A.9 of Appendix A 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."

Composition of Fine Aggregate (Items 6, 7, and 8): When more than one fine aggregate is used, the type code as provided on the data sheet 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 (4.75-mm) sieve and retained on the No. 200 (75-µm) 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. Space is provided for up to three different types of fine aggregate.

Insoluble Residue (Item 9): The percentage of insoluble residue (noncarbonate material) as determined using ASTM D3042.

Gradation of Aggregates (Items 10 and 11): 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.

Bulk Specific Gravities (Items 12 and 13): The mean bulk specific gravities (to the nearest thousandth (0.001)) 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 (ASTM C127), and b) Fine Aggregate - AASHTO T84 (ASTM C128).

Portland Cement Concrete Overlay, Aggregate Data (Continued) and Construction Data (Sheet 41)

This data sheet provides a continuation of the data from Sheet 40 and also includes information regarding the construction of the PCC overlay.

Individual data elements are as follows.

Layer Number (Item 1): The number of the PCC overlay layer for which a description is being provided (from Sheet 2).

Aggregate Durability Test Results (Items 2 thru 5): The type of tests used to evaluate the durability of the aggregate and the results in tenths (0.1) recorded in units specified for the test. Three of these sets are for coarse aggregate 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 of Appendix A.

Type of Paver Used (Item 6): Record whether a slip-form or side-form paver was used to place the concrete. The codes appear on the data sheet along with space for identifying another type of paver, if needed. Enter "N" if a paver was not used (i.e., roller compacted concrete).

Air Temperatures During Placement (Items 7, 8, and 9): The Mean air temperature at the time the overlay concrete was placed (in degrees Fahrenheit) and the range of air temperatures (Minimum and Maximum) occurring during placement.

Curing Period Before Opening to Any Traffic (Item 10): The number of days the concrete was allowed to cure before opening the pavement to traffic (including construction traffic).

Time Before Sawing Joints (Item 11): The number of hours between the time the concrete was placed and the joints were sawed.

Method Used to Cure Concrete (Item 12): The method used to cure the concrete pavement. Codes are provided on the data sheet. Space is provided for identifying another curing method if none of those with codes was used.

Method Used to Texture Concrete (Item 13): The method used to provide texture to the concrete surface. Codes are provided on the data sheet.

Portland Cement Concrete Overlay, Construction Data (Continued) (Sheet 42)

This data sheet is a continuation of the construction data provided on Sheet 41.

Individual data elements are as follows.

Layer Number (Item 1): The number of the PCC overlay layer to be described on this sheet (from Sheet 2).

Bonding Condition of Overlay (Item 2): A code to identify the degree of bonding present between the overlay and the original pavement surface. Codes are provided on the data sheet.

Surface Preparation (Item 3): A code to record the method used to prepare the pavement surface prior to placement of the overlay. Codes are provided on the data sheet along with space for identifying another method if those for which codes are provided are not applicable.

Type of Grout Used for Bonded Overlays (Item 4): 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 along with space for identifying another type of grout, if needed.

Material Used to Prevent Bonding for Unbonded Overlays (Item 5): 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. Enter "N" if the overlay is bonded to the surface overlaid.

Mean Direct Shear Strength of Core at Overlay/Slab Interface (Item 6): The results of direct shear testing (average of measured results) to the nearest tenth of a pound per square inch (0.1 psi) to determine the degree of bonding between the overlay and the existing surface.

Age of Overlay at Time of Direct Shear Testing (Item 7): The number of days for which the overlay is allowed to cure prior to testing cores for shear strength as recorded for Item 6.

Overlay Joints Matched with Existing Pavement Slab Joints? (Item 8): 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.

Individual data elements are as follows.

Layer Number (Item 1): The layer number of the PCC overlay for which a description is being provided (from Sheet 2).

Flexural Strength (Items 2 thru 8): The Type of Test (third-point or center-point loading, as coded on the data sheet), the Age of the samples at the time of 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 LTPP test sections is the third-point loading (AASHTO T97 (ASTM C78)).

Compressive Strength (Items 9 thru 14): The Age of the samples at the time of testing, the Number of Tests performed, and the Mean, Minimum, Maximum, and Standard Deviation of compressive strength in psi, measured according to AASHTO T22 (ASTM C39).

Splitting Tensile Strength (Items 15 thru 20): The Age of the samples at the time of testing, the Number of Tests, and the Mean, Minimum, Maximum, and Standard Deviation of splitting tensile strength in psi, measured according to AASHTO T198 (ASTM C496).

Elastic Modulus (Items 21 thru 26): 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 American Concrete Institute (ACI) and others relating elastic modulus to compressive strength. The ACI formula in general use (ACI 318-83, Section 8.5) is:

$$E_c = 57{,}000\sqrt{f_c} \qquad \textbf{(4.7)}$$

where:

E_c = Modulus of Elasticity, psi
f_c = 28-Day Compressive Strength, psi

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. 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)

The data on this sheet provides information regarding joints in a recycled PCC overlay layer.

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled PCC layer for which a description is being provided (from Sheet 2).

Average Contraction Joint Spacing (Item 2): The average spacing in feet (to the nearest tenth of a foot (0.1 ft)) 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 (Item 3).

Built-in Expansion Joint Spacing (Item 4): 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."

Skewness of Joints (Item 5): The average distance in feet of the contraction joint from a normal (right-angled) joint at the opposite side of the lane. If not skewed, enter "N."

Transverse Contraction Joint Load Transfer System (Item 6): 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.

Round Dowel Diameter (Item 7): 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 (0.1 in).

Dowel or Mechanical Load Transfer Device Spacing (Item 8): 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.

Average Intermediate Sawed Joint Spacing (Item 9): 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."

Dimensions for I-Beams or Keyways (Items 10 and 11): The Height and Width of I-beams or keyways (if used) to the nearest hundredth of an inch (0.01 in).

Distance of Nearest Dowel or Mechanical Load Transfer Device From Outside Lane-Shoulder Edge (Item 12): 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 (0.1 in).

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

Dowel Coating (Item 14): 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.

Method Used to Install Mechanical Load Transfer Devices (Item 15): Whether the devices have been 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)

This data sheets is a continuation of the data presented on Sheet 44.

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled PCC layer for which a description is being provided (from Sheet 2).

Method Used to Form Transverse Joints (Item 2): Whether the contraction joints have been 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. Codes for each of these methods are provided on the data sheet. Space also is provided for describing another method if none of those for which codes are provided on the data sheet has been used.

Type of Longitudinal Joint (Between Lanes) (Item 3): How the longitudinal joint between the lanes was formed. Codes are provided on the data sheet.

Type of Shoulder-Traffic Lane Joint (Item 4): How the joint between the concrete shoulder and the traffic lane was formed. "Tied concrete curb" indicates that a curb is provided in lieu of a shoulder.

Transverse Joint Sealant Type (Item 5): Type of joint sealant used in the transverse joints. Codes are provided on the data sheet.

Transverse Joint Sealant Reservoir Width (Item 6): The as-constructed width of the transverse joint sealant reservoir to the nearest hundredth of an inch (0.01 in).

Transverse Joint Sealant Reservoir Depth (Item 7): The as-constructed depth of the transverse joint sealant reservoir to the nearest hundredth of an inch (0.01 in).

Longitudinal Joint Sealant Reservoir Width (Item 8): The width of the as-built longitudinal joint sealant reservoir to the nearest hundredth of an inch (0.01 in). If butt or keyed joints are used without a sealant reservoir, enter "0.00."

Longitudinal Joint Sealant Reservoir Depth (Item 9): The depth of the as-built longitudinal joint sealant reservoir to the nearest hundredth of an inch (0.01 in). If butt or keyed joints are used without a sealant reservoir, enter "0.00."

Joint Sealant Backer Material Type (Item 10): A code to indicate the type of blocking material used (placed prior to the joint sealant). Codes are provided on the data sheet.

Joint Sealant Backer Dimension (Item 11): If the joint sealant backer material type is a rod or rope, enter the diameter, in inches to the nearest tenth of an inch (0.1 in). If the joint sealant backer material type is tape, enter the width, in inches to the nearest hundredth of an inch.

Between Lane Tie Bar Diameter (Item 12): The diameter of the tie bars used across longitudinal joints between lanes entered to the nearest one hundredth of an inch (0.01 in).

Between Lane Tie Bar Length (Item 13): The length in inches of the tie bars used across the longitudinal joint between the lanes.

Between Lane Tie Bar Spacing (Item 14): The center-to-center spacing between consecutive tie bars across the longitudinal joint between the lanes to the nearest tenth of an inch (0.1 in).

Shoulder-Traffic Lane Joint Sealant Reservoir (Items 15 and 16): The Width and Depth of the as-built joint sealant reservoir between the shoulder and traffic lane. If butt or keyed joints are used without a sealant reservoir, enter "0.00" in both of the spaces provided.

Shoulder-Traffic Lane Joint Tie Bars (Items 17, 18, and 19): 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 (0.01 in), 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)

The data on this sheet provides information regarding the reinforcing steel used in the PCC layer.

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled PCC layer for which a description is being provided (from Sheet 2).

Type of Reinforcing (Item 2): The type of reinforcing used in the PCC layer being described. Codes for deformed bars and welded wire fabric are provided on the data sheet. A space also is provided for entering a written description of a reinforcing type other than deformed bars or welded wire fabric.

Transverse Bar Diameter (Item 3): The diameter of the transverse bars or wire to the nearest one hundredth of an inch (0.01 in).

Transverse Bar Spacing (Item 4): The mean center-to-center spacing between transverse bars or wires to the nearest tenth of an inch (0.1 in).

Longitudinal Bar Diameter (Item 5): The diameter of the longitudinal bars or wire to the nearest hundredth of an inch (0.01 in).

Design Percentage of Longitudinal Steel (Item 6): The percentage of reinforcing steel of the PCC cross-section required in the design to the nearest hundredth of one percent (0.01%).

Depth to Reinforcement From Slab Surface (Item 7): The depth (to the nearest tenth of an inch (0.1 in)) of the concrete cover over the reinforcing steel.

Longitudinal Bar Spacing (Item 8): The center-to-center spacing between longitudinal bars or wires to the nearest tenth of an inch (0.1 in).

Yield Strength of Reinforcing Steel (Item 9): The yield strength of the reinforcing steel in the bars to the nearest tenth of a kip per square inch (0.1 ksi). If tests were not conducted for the steel used, enter the minimum yield strength allowed for the grade of steel used.

Method Used to Place Reinforcement (Item 10): 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. Codes for these methods are provided on the data sheet.

Lap Length of Longitudinal Steel Splices (Item 11): 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" to indicate that this element is not applicable.

Recycled Portland Cement Concrete, Mixture Data (Sheet 47)

This data sheet records information regarding the mixture proportions used in the recycled PCC layer.

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled PCC layer for which a description is being provided (from Sheet 2).

Mix Design (Items 2 thru 5): 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.

Cement Type Used (Item 6): Type of cement used in the concrete. The cement type codes appear in Table A.11 in Appendix A. Space is provided on the form for identifying another type of cement if the types identified in Table A.11 are not applicable.

Alkali Content of Cement (Item 7): The alkali content of the cement to the nearest tenth of one percent (0.1%) expressed as sodium oxide equivalent.

Entrained Air Content (Items 8, 9, and 10): The Mean, Minimum, and Maximum values of entrained air (percent of mixture volume) as measured (by Test Methods AASHTO T121 (ASTM C138), AASHTO T152 (ASTM C231), AASHTO T196 (ASTM C173)) during construction to the nearest tenth of a percent (0.1%).

Admixtures (Items 11, 12, and 13): The types and amounts (in percent by weight of cement to the nearest thousandth (0.001%)) 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 is not provided.

Slump (Items 14 thru 18): 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 (0.1 in) and the Number of Tests from which the values are obtained. The slump test is described in AASHTO T119 (ASTM C143). The maximum and minimum values and standard deviation of slump should be left blank if only one test result is available.

Recycled Portland Cement Concrete, New Aggregate Data (Sheet 48)

This data sheet provides information regarding the new aggregate that is added to the recycled material for construction of the recycled PCC overlay layer.

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled PCC layer for which a description is being provided (from Sheet 2).

Composition of Coarse Aggregate (Items 2, 3, and 4): The type code as provided on the data sheet and percentage by weight of up to three separate materials in the coarse aggregate (that portion of an aggregate retained on the No. 4 (4.75-mm) sieve) used in the concrete mix. Space is provided for the description of another type if none of the types for which codes are provided were used. Space is provided for up to three different types of coarse aggregate. Where only one type of material has been used, enter its type code and 100 in the top set of data spaces, leaving the others blank.

Geologic Classification of Coarse Aggregate (Item 5): The geologic classification of the natural stone used as coarse aggregate in the concrete. These codes appear in Table A.9 of Appendix A 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" has been 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" has been used, enter "N."

Composition of Fine Aggregate (Items 6, 7, and 8): 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-µm) sieve). Space is provided for identifying another type if none of those for which codes are provided has been 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. Space is provided for up to three different types of fine aggregate.

Insoluble Residue (Item 9): The percentage of insoluble residue (noncarbonate material) as determined using ASTM D3042.

Gradation of New Aggregates (Items 10 and 11): 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.

Bulk Specific Gravities of New Aggregates (Items 12 and 13): The mean bulk specific gravities (to the nearest thousandth (0.001)) 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 (ASTM C127), and b) Fine Aggregate - AASHTO T84 (ASTM C128).

Recycled Portland Cement Concrete, New Aggregate Data (Continued) and Combined Aggregate Data (Sheet 49)

This data sheet continues the information provided on Sheet 48 and provides a place to record data about the combined new aggregate and aggregate from the recycled PCC material.

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled PCC layer for which a description is being provided (from Sheet 2).

Durability of New Aggregates (Items 2 thru 5): The type of tests used to evaluate the durability of the new aggregate and the results from those tests recorded to the nearest tenth (0.1) 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, Appendix A.

Amount of New Coarse Aggregate Added (Item 6): The percent of new coarse aggregate added to the recycled concrete mixture (by weight of the combined coarse aggregate).

Amount of New Fine Aggregate Added (Item 7): The percent of new fine aggregate added to the recycled concrete mixture (by weight of the combined fine aggregate).

Gradation of Combined Aggregates (Items 8 and 9): 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 of the sieve sizes shown; the objective is to provide space for data from a sufficient number of sieve sizes to accommodate testing and specification practice for most agencies.

Bulk Specific Gravities of Combined Aggregates (Items 10 and 11): The mean bulk specific gravities (to the nearest thousandth (0.001)) 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 (ASTM C127), and b) Fine Aggregate - AASHTO T84 (ASTM C128).

Durability of Combined Aggregates (Items 12 thru 15): The type of test used to evaluate the durability of the combined aggregate and the result recorded in tenths (0.1) in units specified for the test. Three of these sets are for coarse aggregate 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, Appendix A.

Recycled Portland Cement Concrete, Construction Data (Sheet 50)

This data sheet provides information regarding the construction practices used in building the recycled PCC layer.

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled PCC layer for which a description is being provided (from Sheet 2).

Equipment Used to Break Up PCC Pavement (Item 2): A code to indicate the equipment used to break up the PCC pavement for recycling. Codes are provided on the data sheet along with space to identify another type of equipment, if needed.

Average Size of PCC Pieces After Breaking (Item 3): 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 judgment to select approximate averages.

How Were Concrete Pieces and Reinforcing Steel (if present) Separated Initially On Site? (Item 4): 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)

This data sheet is a continuation of the data from Sheet 50.

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled PCC layer for which a description is being provided (from Sheet 2).

Type of Paver Used (Item 2): Record whether a slip-form or side-form paver has been used to place the concrete. The codes appear on the data sheet along with space to identify another type of material, if needed. Enter "N" if a paver has not been used (i.e., roller compacted concrete).

Air Temperature During Placement (Items 3, 4, and 5): The Mean air temperature at the time the overlay concrete was placed (in degrees Fahrenheit) and the range of air temperatures (Minimum and Maximum) occurring during placement.

Curing Period Before Opening to Any Traffic (Item 6): The number of days the concrete was allowed to cure before opening the pavement to traffic (including construction traffic).

Time Before Sawing Joints (Item 7): The number of hours between the time the concrete was placed and the joints were sawed.

Method Used to Cure Concrete (Item 8): The method used to cure the concrete pavement. Codes are provided on the data sheet. Space also is provided for identifying another curing method if none of those with codes has been used.

Method Used to Texture Concrete (Item 9): The method used to provide texture to the concrete surface. Codes are provided on the data sheet.

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.

Individual data elements are as follows.

Layer Number (Item 1): The number of the recycled PCC layer for which a description is being provided (from Sheet 2).

Flexural Strength (Items 2 thru 8): The Type of Test (third-point or center-point loading as coded on the data sheet), the Age of the sample at the time of testing, the Number of Tests performed, and the Mean, Minimum, Maximum, and Standard Deviation of

flexural strength tests, in psi. Testing for LTPP test sections which are to be built after 1988 should be done using third-point loading (AASHTO T97 (ASTM C78)).

Compressive Strength (Items 9 thru 14): The Age of the samples at the time of testing, the Number of Tests performed, and the Mean, Minimum, Maximum, and Standard Deviation of compressive strength in psi, measured according to AASHTO T22 (ASTM C39).

Splitting Tensile Strength (Items 15 thru 20): The Age of the samples at the time of testing, the Number of Tests, and the Mean, Minimum, Maximum, and Standard Deviation of splitting tensile strength in psi, measured according to AASHTO T198 (ASTM C496).

Elastic Modulus (Items 21 thru 26): The Mean, Minimum, Maximum, and Standard Deviation of elastic moduli of the concrete in kips per square inch and the Number of Tests performed. 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. 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 has been conducted upon a sample of the concrete prepared during construction, by some other test procedures, or calculated using Equation 3.7 (from ACI318-83, Section 8.5). 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.

Pressure Relief Joints in PCC Pavements (Sheet 53)

This data sheet provides information regarding the installation of pressure relief joints in the PCC layer.

Individual data elements are as follows.

Layer Number (Item 1): The number of the PCC layer in which pressure relief joints are being installed (from Sheet 2).

Reason for Pressure Relief Joint Installation (Item 2): A code to record the primary reason for the pressure relief joint installation. Codes are provided on the data sheet. Additionally, space is provided to identify a reason other than those for which codes are provided, if needed.

Average Pressure Relief Joint Interval (Item 3): The average spacing between consecutive pressure relief joints to the nearest tenth of a foot (0.1 ft).

Average Distance Between Pressure Relief Joint and Nearest Working Joint (Item 4): The average spacing between pressure relief joints installed and the nearest adjacent existing pavement joints, to the nearest tenth of a foot (0.1 ft).

Relief Joint Initial Dimensions (Item 5): The average Depth and Width of the pressure relief joints at the time of installation, to the nearest hundredth of an inch (0.01 in).

Method of Cutting and Removal of Concrete (Item 6): A code, as shown on the data sheet, to record the procedure used to install the pressure relief joints.

Is Original Aggregate Expansive in Concrete? (Item 7): 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)

This data sheet is a continuation of the data presented on Sheet 53.

Individual data elements are as follows.

Layer Number (Item 1): The number of the PCC layer in which pressure relief joints are being installed (from Sheet 2).

Type of Pressure Relief Joint Sealant (Items 2, 3, and 4): 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.

Type of Pressure Relief Joint Filler (Items 5, 6, and 7): 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)

This data sheet provides information regarding subsealing operations on PCC pavements.

Individual data elements are as follows.

Layer Number of PCC Pavement (Item 1): The number of the PCC layer under which subsealing is being performed (from Sheet 2).

Type of Mixture Used in Subsealing (Item 2): A code to identify the type of material used to subseal the project. Codes are provided on the data sheet. Additionally, space is provided to identify a method other than those listed.

Asphalt Cement Data (Items 3, 4, and 5): Spaces are provided to record grade (from Table A.16, Appendix A), penetration at 77°F (25°C), and ring and ball softening point for asphalt cement used for subsealing.

Mix Design of Portland Cement Grout (Items 6 thru 10): Spaces are provided to record mix design information for a portland cement grout used to subseal the pavement. This includes Cement Type (from Table A.11, Appendix A), the Cement to Sand Ratio, the Water/Cement Ratio by weight, Additive Type (enter code from Table A.12, Appendix A or "N" if none is used), and Amount of Additive in percent by weight of cement.

Fluidity of Portland Cement Grout (Item 11): The fluidity of the grout, to the nearest 0.2 seconds, as measured by Test Method ASTM C939.

Cube Compressive Strength of Portland Cement Grout (Item 12): The compressive strength measured by Test Methods AASHTO T106 (ASTM C109) in psi.

Curing Period for Portland Cement Grout (Item 13): Number of days the grout cube was cured before compressive strength testing by Test Methods AASHTO T106 (ASTM C109).

Determination of Area to be Undersealed (Item 14): 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 recorded on Sheet 55.

Individual data elements are as follows.

Layer Number of PCC Pavement (Item 1): The number of the PCC layer under which subsealing is being performed (from Sheet 2).

Depth of Subsealing Hole from Top of Slab (Item 2): The thickness of the slab at the subsealing hole to the nearest hundredth of an inch (0.01in).

Maximum Allowable Pumping Pressure (Item 3): The maximum pressure allowed in pumping material under the slab during subsealing to the nearest pound per square inch.

Maximum Surge Pressure (Item 4): The maximum pressure allowed initiating subsealing to the nearest pound per square inch.

Slabs in Test Section (Item 5): 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 LTPP, the numbers should refer to only those slabs included in the test section in the outside lane.

Average Number of Holes per Slab Subsealed (Item 6): The average number of holes per slab in the jointed concrete test sections that were subsealed. For LTPP, the numbers are to represent only the outside lane within the limits of the test section.

Typical Number of Subsealing Holes Near Joint or Crack (Item 7): 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).

Average Number of Holes per Linear Foot of Pavement (Item 8): For CRCP record the average number of holes per lineal foot of pavement to the nearest hundredth (0.01). If the pavement surface is not CRCP, enter "N". For LTPP, the numbers are to represent only the outside lane within the limits of the test section.

Average Volume of Material Pumped per Hole (Item 9): The average volume per hole of material pumped to the nearest tenth of a cubic foot (0.1 ft^3).

Monitoring of Lift (Item 10): Code to identify the method used for monitoring the subsealing work and amount of lift. Codes are provided on the data sheet.

Typical Time Between Subsealing and Reopening to Traffic (Item 11): The approximate time in hours between the time of subsealing and allowing traffic over the project.

Were Deflection Measurements Taken Before and After Subsealing?(Item 12): A code to identify whether or not deflection measurements were taken before subsealing and after subsealing. A separate entry is required for the two time-frames. Codes are provided on the data sheet.

Time of Day that Deflection Measurements were Conducted (Item 13): Provide the hour of the day, in military time (i.e., 1:00 p.m. is 1300 hours) at which the deflection measurements started and ended, for measurements performed before and after subsealing. 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).

Individual data elements are as follows.

Type of Subdrains (Item 1): A code to identify whether the subdrains are transverse or longitudinal with respect to the pavement centerline. Codes are provided on the data sheet.

Extent of Subdrains (Item 2): A code to indicate whether the drains are evenly spaced, or localized. Codes are provided on the data sheet.

Type of Drainage Pipe (Item 3): 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".

Diameter of Pipe (Item 4): The diameter or width of the subdrain pipe to the nearest tenth of an inch (0.1 in). Where the drainage system does not employ pipes, enter "N".

Depth of Pipe Below Top of Pavement Surface (Item 5): The average depth from the top of the pavement surface to the top of the subdrain pipe, to the nearest tenth of an inch (0.1 in). Where the drainage system does not employ pipes, enter "N".

Horizontal Placement of Pipe From Outer Edge of Pavement (Item 6): 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 (0.1 in). Where the drainage system does not employ pipes, enter "N".

Type of Primary Filter Used (Item 7): A code to identify the type of primary filter material used to prevent clogging of the drain. Codes are provided on the data sheet along with a space to provide a description of a different filter type if none of the codes provided are applicable.

Maximum Particle Size of Primary Filter Material (Item 8): Where the primary filter material is granular in composition, the maximum aggregate dimension allowed, to the nearest tenth of an inch (0.1 in). If the primary filter material is not granular in composition, this entry should be left blank.

Gradation of the Primary Filter Material (Item 9): 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. If the primary filter material is not granular in composition, these fields should be left blank.

Permeability of Primary Filter Material (Item 10): The average permeability of the primary filter material to the nearest hundredth of a foot per day (0.01 ft/day).

Type and Location of Secondary Filter Material (Item 11): A code to record the use of a secondary filter material, if applicable. Codes are provided on the data sheet along with space for identifying a type other than those listed.

Average Outlet Interval (Item 12): The approximate average distance in feet between adjacent subdrainage outlets.

Primary Purpose of Subdrainage Installation (Item 13): A code to identify the primary reason for which subdrains were installed. Codes are provided on the data sheet along with space for identifying a purpose other than those listed.

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.

Individual data elements are as follows.

Layer Number (Item 1): The number of the PCC layer in which load transfer was restored (from Sheet 2).

Type of Load Transfer Restoration (Item 2): A code to identify the means used to restore load transfer across an affected joint. Codes are provided on the data sheet along with space for identifying a type other than those listed.

Frequency of Installation (Item 3): A code, as shown on the data sheet, to identify, on average, how many of the joints or cracks had restoration of load transfer.

Number of Devices Per Joint (Item 4): The number of load restoration devices installed per joint.

Location of Dowels or Shear Devices (Item 5): 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.

Diameter of Retrofit Dowel Bars (Item 6): The average dowel bar diameter to the nearest hundredth of an inch (0.01 in), where dowel bars are installed. If dowel bars are not used, enter "N".

Length of Retrofit Dowel Bars (Item 7): The average length of the retrofit dowel bars, to the nearest tenth of an inch (0.1 in). If dowel bars are not used, enter "N".

Load Transfer Restoration Data (Continued) (Sheet 59)

This data sheet is a continuation of the data provided on Sheet 58.

Individual data elements are as follows.

Layer Number (Item 1): The number of the PCC layer in which load transfer was restored (from Sheet 2).

Material Used to Backfill Slot/Core Hole (Item 2): 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 along with space for identifying a material other than those listed.

Bonding Agent Used Between Existing PCC and Backfill Material (Item 3): A code to identify the material used to bond the backfill material to the existing PCC pavement. Codes are provided on the data sheet.

Load Transfer Efficiency Before and After Restoration (Item 4): 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 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 (LTE) 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 for retrofit dowel bars, or for retrofit shear devices.

Step 2. A load of approximately 9,000 lbf (40 kN) (plus or minus 500 lbf (2 kN)) is applied and the deflections at Sensors 1 and 2 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.

Step 4. The LTE is calculated as follows:

$$LTE = \frac{d_{j2}\, x\, 100}{d_{j1}}\, x\, \frac{d_{c1}}{d_{c2}} \qquad \textbf{(4.8)}$$

where:

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 LTE.)

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.

Date of Load Transfer Efficiency Tests (Item 5): 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)

This data sheet provides information regarding crack and seat operations on a PCC surfaced pavement.

Individual data elements are as follows.

Layer Number (Item 1): The number of the PCC layer for which crack and seat data are being provided (from Sheet 2).

Average PCC Breakage Size (Item 2): The estimated average length and width of the broken PCC pieces to the nearest inch.

Pavement Breaker Passes/Lane (Item 3): The number of pavement breaker passes per lane.

Pavement Breaker Type (Item 4): A code to identify the type of pavement breaker used on this particular project. Codes are provided on the data sheet along with space for identifying a type other than those for which codes are provided.

Proof Roller Type (Item 5): The type of the proof roller used after breaking the pavement. Codes are provided on the data sheet.

Proof Roller Weight (Item 6): The weight of the proof roller (to the nearest ton) used after breaking the pavement.

Broken Pavement Exposure to Traffic (Item 7): The approximate length of time for which the pavement was exposed to traffic after cracking, in days.

Deflection Measurements Taken (Item 8): Codes to record if and when deflection measurements were taken at various times during performance of the work including before breaking operation, after breaking and prior to seating operation, after seating and prior to overlay, and after overlay. Codes are provided on the data sheet.

Deflection Measurement Device Used (Item 9): A code, as provided on the data sheet, to identify the type of deflection device used to measure deflections.

Magnitude of Load Used for Deflection Test (Item 10): The magnitude of the load produced by the deflection testing device in pounds.

Loading Frequency (Item 11): The frequency that the load is applied in hertz (for cyclic loading devices only). These spaces will not apply for LTPP as only FWDs are to be used for LTPP test sections.

Broken Pavement Surface Preparation (Item 12): 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.

Individual data elements are as follows. 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.

Shoulder Restored (Item 1): A code, provided on the data sheet, to indicate whether the outside, inside, or both shoulders were restored.

Surface Type (Item 2): The type of restored shoulder surface (See Table A.5 of Appendix A for codes).

Total Width (Item 3): The total (paved and unpaved) width of the restored shoulder to the nearest whole number of feet.

Paved Width (Item 4): The total paved width of the restored shoulder to the nearest whole number of feet.

Shoulder Base Type (Item 5): The type of base material used in the restored shoulder (See Table A.6, Appendix A for codes).

Surface Thickness (Item 6): The average thickness of the restored shoulder surface at the outside lane-shoulder edge to the nearest tenth of an inch (0.1 in).

Base Thickness (Item 7): The average thickness of the restored shoulder base at the outside lane-shoulder edge to the nearest tenth of an inch (0.1 in).

Type of Shoulder Restoration (Item 8): A code to identify the procedure used to restore the outside shoulder. Codes are provided on the data sheet.

Type of AC Materials (Item 9): The type of AC materials used in the outside shoulder restoration. Codes are provided on the data sheet.

Thickness of AC Material Removed by Cold Milling (Item 10): If cold milling was used, the thickness of the AC removal on the outside shoulder, to the nearest tenth of an inch (0.1 in).

AC Overlay Thickness (Item 11): If an AC overlay was placed on the outside shoulder, the thickness of the overlay to the nearest tenth of an inch (0.1 in).

Lane/Shoulder Joint Sealant (Item 12): The method used to seal the joint separating the outside shoulder and traffic lane. Codes are provided on the data sheet.

Lane/Shoulder Joint Sealant Reservoir (Item 13): The average Width and Depth of the as-built joint sealant reservoir between the restored outside shoulder and traffic lane. If butt or keyed joints were used without a sealant reservoir, enter "0.0" in both of the spaces provided.

Type of Joint Sealant (Item 14): A code to indicate whether the sealant used in the longitudinal joint between the outside shoulder and the traffic lane 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.

Individual data elements are as follows. Note that Data Items 2 to 7 pertain to restored inside and/or outside shoulders. The remaining data items (Items 8 to 16) pertain to restored outside shoulders only.

Shoulder Restored (Item 1): A code to indicate whether the outside, inside, or both shoulders were restored. Codes are provided on the data sheet.

Surface Type (Item 2): The type of restored shoulder surface (See Table A.5, Appendix A for codes).

Total Width (Item 3): The total (paved and unpaved) width of the restored shoulder to the nearest whole number of feet.

Paved Width (Item 4): The total paved width of the restored shoulder to the nearest whole number of feet.

Shoulder Base Type (Item 5): The type of base material used in the restored shoulder (See Table A.6, Appendix A for codes).

Surface Thickness (Item 6): The average thickness of the restored shoulder surface at the outside lane-shoulder edge to the nearest tenth of an inch (0.1 in).

Base Thickness (Item 7): The average thickness of the restored shoulder base at the outside lane-shoulder edge to the nearest tenth of an inch (0.1 in).

Type of Shoulder System (Item 8): A code to indicate whether the outside shoulder restoration is JPCP, JRCP, or CRCP. Codes are provided on the data sheet along with space for identifying a shoulder type other than those listed.

Note that Data Items 9-11 pertain only to JPCP and JRCP shoulders.

Average Joint Spacing (Item 9): Average joint spacing for JPCP or JRCP outside shoulders to the nearest whole foot.

Skewness of Joints (Item 10): The average distance in feet of the contraction joint from a normal (right-angled) joint at the opposite side of the shoulder. This is measured in feet to the nearest tenth (0.1 ft). If joints are not skewed, enter "N".

Joints Match Pavement Joints? (Item 11): Code, provided on the data sheet, to indicate whether the joints in the restored outside shoulder were constructed to match the joint spacing in the adjacent pavement slab.

Type of Lane/Shoulder Joint (Item 12): A code to identify the type of longitudinal joint present between the travel lane and the outside shoulder. Codes are provided on the data sheet.

Lane/Shoulder Joint Tie System (Items 13 thru 16): Specify the Type of system employed using the codes provided on the data sheet, the Bar Diameter of the tie bars across the joint between the outside shoulder and the traffic lane to the nearest hundredth of an inch (0.01 in), 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 longitudinal joint between the outside shoulder and the traffic lane.

Restoration of PCC Shoulders (Continued) (Sheet 63)

This data sheet is a continuation of Sheet 62.

Individual data elements are as follows. All of the data elements on this sheet refer to the restored outside shoulder only.

Lane/Shoulder Joint Sealant (Item 1): The method used to seal the joint separating the outside shoulder and traffic lane. Codes are provided on the data sheet along with space for identifying a sealant other than those listed.

Lane/Shoulder Joint Sealant Reservoir (Item 2): The average Width and Depth of the as-built joint sealant reservoir between the restored outside shoulder and traffic lane. If butt or keyed joints were used without a sealant reservoir, enter "0.0" in both of the spaces provided.

Type of Joint Sealant (Item 3): A code to indicate whether the sealant used in the longitudinal joint between the outside shoulder and the travel lane was poured (molded in place) or preformed (compression-type). Codes are provided on the data sheet.

Joint Sealant Backer Material Type (Item 4): A code to indicate the type of blocking material used (placed prior to the joint sealant) in the longitudinal joint between the outside shoulder and the travel lane.

Joint Sealant Backer Dimension (Item 5): If the joint sealant backer material type used in the longitudinal joint between the outside shoulder and the travel lane is a rod or rope, enter the diameter, in inches to the nearest tenth of an inch (0.1 in). If the joint sealant backer material type is tape, enter the width, in inches to the nearest tenth of an inch (0.1 in).

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 3 (Maintenance Data Collection) for the appropriate data sheet.

Individual data elements are as follows.

Layer Number(s) (Item 1): 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 lowest (deepest) layer.

Method Used (Item 2): A code to indicate whether milling, grinding, or another method was used. Codes appear on the data sheet along with space for identifying a method other than those listed.

Extent of Existing Surface Preparation (Item 3): A code to indicate what portion of the test section was ground or milled.

Average Depth of Cut (Item 4): The average depth of cut in the surface to the nearest tenth of an inch (0.1 in).

Asphalt Concrete Overlay, Superpave Aggregate Properties (Sheet 65)

This sheet contains additional information to be used with rehabilitation sheets 3 and 4 when Superpave mix design procedures are used for an AC overlay. The following data items should be provided where available for each AC layer identified on Sheet 2.

Individual data elements are as follows.

Layer Number (Item 1): The AC layer to be described on this sheet (from Sheet 2).

Angularity (Item 2): Both the coarse and fine aggregate angularity should be determined. The coarse aggregate angularity shall be determined by finding the count percentage of aggregate with one or more and two or more crushed faces. This determination shall be performed in accordance with the Pennsylvania Test Method 621 with the results reported to the nearest tenth of a percent (0.1%). The fine aggregate angularity shall be determined by ASTM C1252 with the void determined reported to the nearest tenth of a percent (0.1%).

Soundness (Item 3): The coarse and fine aggregate soundness shall be determined by AASHTO T104, with the weighted percent loss reported to the nearest tenth of a percent (0.1%).

Toughness of Coarse Aggregate (Item 4): The coarse aggregate toughness shall be determined by use of the Los Angeles Abrasion Apparatus by following AASHTO T96 (ASTM C131). The wear loss determined by this method shall be reported to the nearest tenth of a percent (0.1%).

Deleterious Materials (Item 5): The estimate of percentage of deleterious materials by weight shall be determined through use of AASHTO T112 (ASTM C142) "Clay Lumps and Friable Particles of Fine Aggregate." The test results shall be reported to the nearest tenth of a percent (0.1%).

Clay Content (Item 6): The "clay content" will be determined by the use of the Sand Equivalent (AASHTO T176). The resulting ratio shall be recorded to the nearest tenth of a percent (0.1%).

Thin, Elongated Particles (Item 7): The percentage by weight of aggregate that have a maximum to minimum dimension ratio of greater than 5. ASTM D4791 shall be used to determine this percentage with the results reported to the nearest tenth of a percent (0.1%).

Asphalt Concrete Overlay, Superpave Asphalt Cement Properties (Sheet 66)

This sheet contains additional information to be used with rehabilitation sheet 5 when Superpave mix design procedures are used for an AC overlay. This data sheet is to be completed from available project records for each AC layer identified on Sheet 2.

Individual data elements are as follows.

Layer Number (Item 1): The number of the AC layer to be described on this sheet (from Sheet 2).

Asphalt Grade (Item 2): The PG Grade of asphalt cement used. Space is provided on the sheet to enter the upper and lower temperature ranges of the PG Grading System.

Source (Item 3): The name of the source refinery that produced 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 20, 1989. Space is provided to specify other sources, which may not be included in the table provided.

Specific Gravity of Asphalt Cement (Item 4): The mean specific gravity of the asphalt cement reported to the nearest thousandth (0.001) when 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).

Dynamic Shear Rheometer Complex Modulus and Phase Angle (Item 5): The Dynamic Shear Complex Modulus reported to the nearest hundredth (0.01) kPa for the Tank processed asphalts and the Phase Angle reported to the nearest degree.

Dynamic Shear Rheometer Complex Modulus and Phase Angle (Item 6): The Dynamic Shear Complex Modulus reported to the nearest hundredth (0.01) kPa for the RTFO processed asphalts and the Phase Angle reported to the nearest degree.

Dynamic Shear Rheometer Complex Modulus and Phase Angle (Item 7): The Dynamic Shear Complex Modulus reported to the nearest 1 kPa for the Pressure Aged Vessel processed asphalts and the Phase Angle reported to the nearest degree.

Bending Beam Rheometer Stiffness Modulus and Slope (Item 8): The Stiffness Modulus reported to the nearest MPa and the slope reported to the nearest thousandth (0.001).

Direct Tension Tensile Strength and Tensile Strain (Item 9): The Tensile Stress reported to the nearest 0.1 kPa and the percent strain to the nearest hundredth percent (0.01%).

Asphalt Concrete Overlay, Superpave Mixture Properties (Sheet 67)

This sheet contains additional information to be used with rehabilitation sheets 8 and 9 when Superpave mix design procedures are used for an AC overlay. The data items on this sheet should be provided where available for each AC layer identified on Sheet 2.

The following data items are to be derived from tests conducted on the mixture during construction as part of the contractor/participating agency Quality Control program.

Calculations 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.

Individual data elements include the following.

Layer Number (Item 1): The number of the AC layer to be described on this sheet (from Sheet 2).

Type of Samples (Item 2): Whether the test samples were sampled in the field and compacted in the laboratory, or removed from the compacted pavement. The codes appear on the data sheet.

Frequency Sweep (Item 3): The mean Complex Modulus and Phase Angle (Strategich Highway Research Program (SHRP) Designation M-002) in MPa and to the nearest tenth of a degree (0.1°) for Phase Angle for each of the three temperatures (39.2°F, 68°F, 104°F (4°C, 20°C, and 40°C, respectively)).

Uniaxial Strain (Item 4): The Axial Stress and percent Strain (SHRP Designation M-003) for each of the three temperatures (39.2°F, 68°F, 104°F (4°C, 20°C, and 40°C, respectively)) in kPa and the nearest hundredth of a percent strain (0.01%).

Volumetric Strain (Item 5): The Confining Pressure and percent Strain (SHRP Designation M-003) for each of the three temperatures (39.2°F, 68°F, 104°F (4°C, 20°C, and 40°C, respectively)) in kPa and the nearest hundredth of a percent strain (0.01%).

Simple Shear (Item 6): The Axial Stress, Shear Stress and percent Strain (SHRP Designation M-003) for each of the three temperatures (39.2°F, 68°F, 104°F (4°C, 20°C, and 40°C, respectively)) in kPa and the nearest hundredth of a percent strain (0.01%).

LTPP REHABILITATION DATA **SHEET 1** IMPROVEMENT LISTING	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __]

***1.** **DATE COMPLETED** (mm/dd/yyyy)	***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 4.4). It is recognized that parts of both Chapter 3 (Maintenance Data Collection) and Chapter 4 (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.

LTPP REHABILITATION DATA SHEET 2 REVISED LAYER DESCRIPTIONS	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

1. LAYER[1] NUMBER	*2. LAYER[2] DESCRIPTION	*3. MATERIAL[3,4] TYPE CLASSIFICATION	*4. <----------LAYER THICKNESES----------> (inches) 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	
Original Surface...03	Subgrade.....07	Surface Treatment..10
HMAC Layer (Below Surface Layer).....04	Interlayer.....08	Embankment (Fill)..11
		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.

LTPP REHABILITATION DATA **SHEET 3** ASPHALT CONCRETE OVERLAY AGGREGATE PROPERTIES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 thru 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)

LTPP REHABILITATION DATA SHEET 4 ASPHALT CONCRETE OVERLAY AGGREGATE PROPERTIES (CONTINUED)	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 thru 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. 4.1) [__.__ __ __]

7. EFFECTIVE SPECIFIC GRAVITY OF AGGREGATE COMBINATION (Calculated - EQ. 4.2) [__.__ __ __]

LTPP REHABILITATION DATA **SHEET 5** ASPHALT CONCRETE OVERLAY ASPHALT CEMENT PROPERTIES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From Sheet 2) [__]

***2. ASPHALT GRADE** (See Asphalt Code Sheet, Table A.16, Appendix A) [__ __]
Other (Specify) [_____]

***3. SOURCE** (See Supply Code Sheet, Table A.14, Appendix A) [__ __]
Other (Specify) [_____]

***4. SPECIFIC GRAVITY OF ASPHALT CEMENT** [__.__ __ __]
(AASHTO T228, ASTM D70)

***5. VISCOSITY OF ASPHALT AT 140°F** (poises) [__ __ __ __ __ __]
(AASHTO T202, ASTM D2171)

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

***7. PENETRATION AT 77°F,** 100 g, 5 sec. (tenths of a mm) [__ __ __]
(AASHTO T49, ASTM D5)

ASPHALT MODIFIERS (See Type Code, Table A.15, Appendix A) (Items 8 and 9)

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

Other (Specify) [_____]

10. DUCTILITY AT 77°F (cm) [__ __ __]
(AASHTO T51, ASTM D113)

11. DUCTILITY AT 39.2°F (cm) [__ __ __]
(AASHTO T51, ASTM D113)

12. TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (cm/min) [__ __ __]

13. PENETRATION AT 39.2°F, 200 g, 60 sec. (tenths of a mm) [__ __ __]
(AASHTO T49, ASTM D5)

14. RING AND BALL SOFTENING POINT (°F) [__ __ __]
(AASHTO T53, ASTM D36)

LTPP REHABILITATION DATA **SHEET 6** ASPHALT CONCRETE OVERLAY LABORATORY AGED ASPHALT CEMENT PROPERTIES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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, ASTM D2171)

4. VISCOSITY OF ASPHALT AT 275°F (centistokes) [__ __ __ __.__]
(AASHTO T201, ASTM D2170)

5. DUCTILITY AT 77°F (cm) (AASHTO T51, ASTM D113) [__ __ __]

6. DUCTILITY AT 39.2°F (cm) (AASHTO T51, 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, ASTM D5)

9. PENETRATION AT 39.2°F, 200 g, 60 sec. (tenths of a mm) [__ __]
(AASHTO T49, ASTM D5)

10. RING AND BALL SOFTENING POINT (°F) (AASHTO T53, ASTM D36) [__ __ __]

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

LTPP REHABILITATION DATA **SHEET 7** ASPHALT CONCRETE OVERLAY LABORATORY MIXTURE DESIGN	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From Sheet 2) [__]

2. MAXIMUM SPECIFIC GRAVITY (No Air Voids) (Eq. 4.3) [__.__ __ __]

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

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

5. PERCENT AIR VOIDS (Eq. 4.4) [__ __.__]

6. VOIDS IN MINERAL AGGREGATE (percent) (Eq. 4.5) [__ __.__]

7. EFFECTIVE ASPHALT CONTENT (Percent) (Eq. 4.6) [__ __.__]

8. MARSHALL STABILITY (pounds) (AASHTO T245, ASTM D1559) [__ __ __ __]

9. NUMBER OF BLOWS [__ __]

10. MARSHALL FLOW (hundredths of an inch) [__ __ __ __]
(AASHTO T245, ASTM D1559)

11. HVEEM STABILITY (AASHTO T246, ASTM D1560) [__ __ __]

12. HVEEM COHESIOMETER VALUE (grams/25 mm of width) [__ __ __ __]
(AASHTO T246, ASTM D1560)

13. SUPERPAVE GYRATORY COMPACTION N_{DESIGN} [__ __ __]

14. ASPHALT GRADE (See Asphalt Code Sheet, Table A.16) [__ __]
Other (Specify) [_____]

15. SUPERPAVE ASPHALT BINDER GRADE PG[__ __]-[__ __]

LTPP REHABILITATION DATA **SHEET 8** ASPHALT CONCRETE OVERLAY MIXTURE PROPERTIES AS PLACED	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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. 4.3) [__.__ __ __]

***4. BULK SPECIFIC GRAVITY** (ASTM D1188)

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

***5. ASPHALT CONTENT** (percent by weight of total mix)
(AASHTO T164, ASTM D2172)

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

***6. PERCENT AIR VOIDS** (Eq. 4.4)

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

7. VOIDS IN MINERAL AGGREGATE (percent) (Eq. 4.5)

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

8. EFFECTIVE ASPHALT CONTENT (percent) (Eq. 4.6)

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

LTPP REHABILITATION DATA **SHEET 9** ASPHALT CONCRETE OVERLAY MIXTURE PROPERTIES AS PLACED (CONTINUED)	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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) [__ __ __]

LTPP REHABILITATION DATA **SHEET 10** ASPHALT CONCRETE OVERLAY CONSTRUCTION DATA	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From 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 thru 22)

	Roller Code	Roller Description	Gross Wgt (tons)	Tire Pres. (psi)	Frequency (vibr/min)	Amplitude (inches)	Speed (mph)
6.	A	Steel-Whl Tandem	[__ __.__]				
7.	B	Steel-Whl Tandem	[__ __.__]				
8.	C	Steel-Whl Tandem	[__ __.__]				
9.	D	Steel-Whl Tandem	[__ __.__]				
10.	E	Pneumatic-Tired	[__ __.__]	[__ __ __]			
11.	F	Pneumatic-Tired	[__ __.__]	[__ __ __]			
12.	G	Pneumatic-Tired	[__ __.__]	[__ __ __]			
13.	H	Pneumatic-Tired	[__ __.__]	[__ __ __]			
14.	I	Single-Drum Vibr	[__ __.__]		[__ __ __ __]	[.__ __ __]	[__ __.__]
15.	J	Single-Drum Vibr	[__ __.__]		[__ __ __ __]	[.__ __ __]	[__ __.__]
16.	K	Single-Drum Vibr	[__ __.__]		[__ __ __ __]	[.__ __ __]	[__ __.__]
17.	L	Single-Drum Vibr	[__ __.__]		[__ __ __ __]	[.__ __ __]	[__ __.__]
18.	M	Double-Drum Vibr	[__ __.__]		[__ __ __ __]	[.__ __ __]	[__ __.__]
19.	N	Double-Drum Vibr	[__ __.__]		[__ __ __ __]	[.__ __ __]	[__ __.__]
20.	O	Double-Drum Vibr	[__ __.__]		[__ __ __ __]	[.__ __ __]	[__ __.__]
21.	P	Double-Drum Vibr	[__ __.__]		[__ __ __ __]	[.__ __ __]	[__ __.__]
22.	Q	Other (Specify)	[_____]				

COMPACTION DATA (Items 23 thru 31)

	BREAKDOWN:	First Lift	Second Lift	Third Lift	Fourth Lift
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 TEMP** (°F)	[__ __ __]	[__ __ __]	[__ __ __]	[__ __ __]
30.	**COMPACTED THICKNESS** (in.)	[__.__]	[__.__]	[__.__]	[__.__]
31.	**CURING PERIOD** (days)	[__ __]	[__ __]	[__ __]	[__ __]

LTPP REHABILITATION DATA **SHEET 11** HOT MIX RECYCLED ASPHALT PAVEMENT GENERAL INFORMATION AND RECLAIMED AGGREGATE PROPERTIES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 thru 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. 4.1) [__.__ __ __]

9. EFFECTIVE SPECIFIC GRAVITY OF AGGREGATE COMBINATION [__.__ __ __]
(Calculated - Eq. 4.2)

LTPP REHABILITATION DATA **SHEET 12** HOT MIX RECYCLED ASPHALT PAVEMENT UNTREATED AGGREGATE PROPERTIES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 thru 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)

LTPP REHABILITATION DATA **SHEET 13** HOT MIX RECYCLED ASPHALT PAVEMENT UNTREATED AGGREGATE PROPERTIES (CONTINUED)	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 thru 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. 4.1) [__.__ __ __]

7. EFFECTIVE SPECIFIC GRAVITY OF AGGREGATE COMBINATION [__.__ __ __]
(Calculated - Eq. 4.2)

LTPP REHABILITATION DATA **SHEET 14** HOT MIX RECYCLED ASPHALT PAVEMENT COMBINED AGGREGATE PROPERTIES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 thru 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. 4.1) [__.__ __ __]

8. EFFECTIVE SPECIFIC GRAVITY OF AGGREGATE COMBINATION [__.__ __ __]
(Calculated - Eq. 4.2)

LTPP REHABILITATION DATA SHEET 15 HOT MIX RECYCLED ASPHALT PAVEMENT RECLAIMED ASPHALT CEMENT PROPERTIES	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From Sheet 2) [__]

***2. SPECIFIC GRAVITY OF ASPHALT CEMENT** [__.__ __ __]
(AASHTO T228, ASTM D70)

***3. VISCOSITY OF ASPHALT AT 140°F** (poises) [__ __ __ __ __ __]
(AASHTO T202, ASTM D2171)

***4. VISCOSITY OF ASPHALT AT 275°F** (centistokes) [__ __ __ __.__]
(AASHTO T201, ASTM D2170)

***5. PENETRATION AT 77°F,** 100 g, 5 sec. (tenths of a mm) [__ __ __]
(AASHTO T49, ASTM D5)

6. DUCTILITY AT 77°F (cm) (AASHTO T51, ASTM D113) [__ __ __]

7. DUCTILITY AT 39.2°F (cm) (AASHTO T51, ASTM D113) [__ __ __]

8. TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (cm/min) [__ __.__]

9. PENETRATION AT 39.2°F, 200 g, 60 sec. (tenths of a mm) [__ __]
(AASHTO T49, ASTM D5)

10. RING AND BALL SOFTENING POINT (°F) (AASHTO T53) [__ __ __]

LTPP REHABILITATION DATA SHEET 16 HOT MIX RECYCLED ASPHALT PAVEMENT NEW ASPHALT CEMENT PROPERTIES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From Sheet 2) [__]

***2. ASPHALT GRADE** (See Asphalt Code Sheet, Table A.16) [__ __]
Other (Specify)[_____]

***3. SOURCE** (See Supply Code Sheet, Table A.14) [__ __]
Other (Specify)[_____]

***4. SPECIFIC GRAVITY OF ASPHALT CEMENT** [__.__ __ __]
(AASHTO T228, ASTM D70)

***5. VISCOSITY OF ASPHALT AT 140°F** (poises) [__ __ __ __ __ __]
(AASHTO T202, ASTM D2171)

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

***7. PENETRATION AT 77°F,** 100 g, 5 sec. (tenths of a mm) [__ __ __]
(AASHTO T49, ASTM D5)

8. DUCTILITY AT 77°F (cm) (AASHTO T51, ASTM D113) [__ __ __]

9. DUCTILITY AT 39.2°F (cm) (AASHTO T51, ASTM D113) [__ __ __]

10. TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (cm/min) [__ __.__]

11. PENETRATION AT 39.2°F, 200 g, 60 sec. (tenths of a mm)
(AASHTO T49, ASTM D5) [__ __]

12. RING AND BALL SOFTENING POINT (°F) (AASHTO T53, ASTM D36) [__ __ __]

LTPP REHABILITATION DATA **SHEET 17** HOT MIX RECYCLED ASPHALT PAVEMENT COMBINED ASPHALT CEMENT PROPERTIES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From Sheet 2) [__]

	TYPE	QUANTITY(%)
***2. RECYCLING AGENT** (See Type Code, Table A.20)	[__ __]	[__ __]
Other (Specify)[_____]		

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

***4. SPECIFIC GRAVITY OF ASPHALT CEMENT** [__.__ __ __]
(AASHTO T228, ASTM D70)

***5. VISCOSITY OF ASPHALT AT 140°F** (poises) [__ __ __ __ __ __]
(AASHTO T202, ASTM D2171)

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

***7. PENETRATION AT 77°F,** 100 g, 5 sec. (tenths of a mm) [__ __ __]
(AASHTO T49, ASTM D5)

ASPHALT MODIFIERS (See Type Code, Table A.15, Appendix A) (Items 8 and 9)

	TYPE	QUANTITY(%)
***8. MODIFIER #1**	[__ __]	[__ __]
***9. MODIFIER #2**	[__ __]	[__ __]
Other (Specify) [_____]		

10. DUCTILITY AT 77°F (cm) [__ __ __]
(AASHTO T51, ASTM D113)

11. DUCTILITY AT 39.2°F (cm) [__ __ __]
(AASHTO T51, ASTM D113)

12. TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (cm/min) [__ __ __]

13. PENETRATION AT 39.2°F, 200 g, 60 sec. (tenths of a mm) [__ __ __]
(AASHTO T49, ASTM D5)

14. RING AND BALL SOFTENING POINT (°F) (AASHTO T53, ASTM D36) [__ __ __]

LTPP REHABILITATION DATA **SHEET 18** HOT MIX RECYCLED ASPHALT PAVEMENT LABORATORY AGED COMBINED ASPHALT CEMENT PROPERTIES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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, ASTM D2171)

4. VISCOSITY OF ASPHALT AT 275°F (centistokes) [__ __ __ __.__]
(AASHTO T201, ASTM D2170)

5. DUCTILITY AT 77°F (cm) (AASHTO T51, ASTM D113) [__ __ __]

6. DUCTILITY AT 39.2°F (cm) (AASHTO T51, 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, ASTM D5)

9. PENETRATION AT 39.2°F, 200 g, 60 sec. (tenths of a mm) [__ __]
(AASHTO T49, ASTM D5)

10. RING AND BALL SOFTENING POINT (°F) (AASHTO T53, ASTM D36) [__ __ __]

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

LTPP REHABILITATION DATA **SHEET 19** HOT MIX RECYCLED ASPHALT PAVEMENT LABORATORY MIXTURE DESIGN	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From Sheet 2) [__]

2. MAXIMUM SPECIFIC GRAVITY (No Air Voids) (Eq. 4.3) [__.__ __ __]

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

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

5. PERCENT AIR VOIDS (Eq. 4.4) [__ __.__]

6. MARSHALL STABILITY (pounds) (AASHTO T245, ASTM D1559) [__ __ __ __]

7. NUMBER OF BLOWS [__ __]

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

9. HVEEM STABILITY (AASHTO T246, ASTM D1560) [__ __ __]

10. HVEEM COHESIOMETER VALUE (grams/25 mm of width) [__ __ __ __]
(AASHTO T246, ASTM D1560)

LTPP REHABILITATION DATA SHEET 20 HOT MIX RECYCLED ASPHALT PAVEMENT MIXTURE PROPERTIES AS PLACED	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

*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. 4.3) [__.__ __ __]

*4. **BULK SPECIFIC GRAVITY** (ASTM D1188)

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

*5. **ASPHALT CONTENT** (percent by weight of total mix) (AASHTO T164, ASTM D2172)

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

*6. **PERCENT AIR VOIDS** (Eq. 4.4)

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

7. **VOIDS IN MINERAL AGGREGATE** (percent) (Eq. 4.5)

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

8. **EFFECTIVE ASPHALT CONTENT** (percent) (Eq. 4.6)

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

LTPP REHABILITATION DATA **SHEET 21** HOT MIX RECYCLED ASPHALT PAVEMENT MIXTURE PROPERTIES AS PLACED (CONTINUED)	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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) [__ __ __]

LTPP REHABILITATION DATA **SHEET 22** HOT MIX RECYCLED ASPHALT PAVEMENT CONSTRUCTION DATA	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From 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 thru 22)

	Roller Code	Roller Description	Gross Wgt (tons)	Tire Pres. (psi)	Frequency (vibr/min)	Amplitude (inches)	Speed (mph)
6.	A	Steel-Whl Tandem	[__ __.__]				
7.	B	Steel-Whl Tandem	[__ __.__]				
8.	C	Steel-Whl Tandem	[__ __.__]				
9.	D	Steel-Whl Tandem	[__ __.__]				
10.	E	Pneumatic-Tired	[__ __.__]	[__ __ __]			
11.	F	Pneumatic-Tired	[__ __.__]	[__ __ __]			
12.	G	Pneumatic-Tired	[__ __.__]	[__ __ __]			
13.	H	Pneumatic-Tired	[__ __.__]	[__ __ __]			
14.	I	Single-Drum Vibr	[__ __.__]		[__ __ __ __]	[.__ __ __]	[__ __.__]
15.	J	Single-Drum Vibr	[__ __.__]		[__ __ __ __]	[.__ __ __]	[__ __.__]
16.	K	Single-Drum Vibr	[__ __.__]		[__ __ __ __]	[.__ __ __]	[__ __.__]
17.	L	Single-Drum Vibr	[__ __.__]		[__ __ __ __]	[.__ __ __]	[__ __.__]
18.	M	Double-Drum Vibr	[__ __.__]		[__ __ __ __]	[.__ __ __]	[__ __.__]
19.	N	Double-Drum Vibr	[__ __.__]		[__ __ __ __]	[.__ __ __]	[__ __.__]
20.	O	Double-Drum Vibr	[__ __.__]		[__ __ __ __]	[.__ __ __]	[__ __.__]
21.	P	Double-Drum Vibr	[__ __.__]		[__ __ __ __]	[.__ __ __]	[__ __.__]
22.	Q	Other (Specify)	[_____]				

COMPACTION DATA (Items 23 thru 31)

	BREAKDOWN:	First Lift	Second Lift	Third Lift	Fourth Lift
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 TEMP** (°F)	[__ __ __]	[__ __ __]	[__ __ __]	[__ __ __]
30.	**COMPACTED THICKNESS** (in.)	[__.__]	[__.__]	[__.__]	[__.__]
31.	**CURING PERIOD** (days)	[__ __]	[__ __]	[__ __]	[__ __]

LTPP REHABILITATION DATA **SHEET 23** COLD MIX RECYCLED ASPHALT PAVEMENT GENERAL INFORMATION AND RECLAIMED AGGREGATE PROPERTIES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 thru 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. 4.1) [__.__ __ __]

9. EFFECTIVE SPECIFIC GRAVITY OF AGGREGATE COMBINATION [__.__ __ __]
(Calculated - Eq. 4.2)

LTPP REHABILITATION DATA **SHEET 24** COLD MIX RECYCLED ASPHALT PAVEMENT UNTREATED AGGREGATE PROPERTIES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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
Pit (Original Use)..... 2

***9. COARSE** [__]
***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 thru 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)

LTPP REHABILITATION DATA SHEET 25 COLD MIX RECYCLED ASPHALT PAVEMENT UNTREATED AGGREGATE PROPERTIES (CONTINUED)	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 thru 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. 4.1) [__.__ __ __]

7. EFFECTIVE SPECIFIC GRAVITY OF AGGREGATE COMBINATION [__.__ __ __]
(Calculated - Eq. 4.2)

LTPP REHABILITATION DATA **SHEET 26** COLD MIX RECYCLED ASPHALT PAVEMENT COMBINED AGGREGATE PROPERTIES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 thru 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. 4.1) [__.__ __ __]

8. EFFECTIVE SPECIFIC GRAVITY OF AGGREGATE COMBINATION [__.__ __ __]
(Calculated - Eq. 4.2)

LTPP REHABILITATION DATA **SHEET 27** COLD MIX RECYCLED ASPHALT PAVEMENT RECLAIMED ASPHALT CEMENT PROPERTIES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From Sheet 2) [__]

***2. SPECIFIC GRAVITY OF ASPHALT CEMENT** [__.__ __ __]
(AASHTO T228, ASTM D70)

***3. VISCOSITY OF ASPHALT AT 140°F** (poises) [__ __ __ __ __ __]
(AASHTO T202, ASTM D2171)

***4. VISCOSITY OF ASPHALT AT 275°F** (centistokes) [__ __ __ __.__]
(AASHTO T201, ASTM D2170)

***5. PENETRATION AT 77°F,** 100 g, 5 sec. (tenths of a mm) [__ __ __]
(AASHTO T49, ASTM D5)

6. DUCTILITY AT 77°F (cm) (AASHTO T51, ASTM D113) [__ __ __]

7. DUCTILITY AT 39.2°F (cm) (AASHTO T51, ASTM D113) [__ __ __]

8. TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (cm/min) [__ __.__]

9. PENETRATION AT 39.2°F, 200 g, 60 sec. (tenths of a mm) [__ __]
(AASHTO T49, ASTM D5)

10. RING AND BALL SOFTENING POINT (°F) (AASHTO T53, ASTM D36) [__ __ __]

LTPP REHABILITATION DATA SHEET 28 COLD MIX RECYCLED ASPHALT PAVEMENT NEW ASPHALT CEMENT PROPERTIES	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From Sheet 2) [__]

***2. ASPHALT GRADE** (See Asphalt Code Sheet, Table A.16, Appendix A) [__ __]
Other (Specify) [_____]

***3. SOURCE** (See Supply Code Sheet, Table A.14, Appendix A) [__ __]
Other (Specify) [_____]

***4. SPECIFIC GRAVITY OF ASPHALT CEMENT** [__.__ __ __]
(AASHTO T228, ASTM D70)

***5. VISCOSITY OF ASPHALT AT 140°F** (poises) [__ __ __ __ __ __]
(AASHTO T202, ASTM D2171)

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

***7. PENETRATION AT 77°F,** 100 g, 5 sec. (tenths of a mm) [__ __ __]
(AASHTO T49, ASTM D5)

***8. SAYBOLT FUROL VISCOSITY OF EMULSIFIED ASPHALT AT 77°F** (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, ASTM D113)

12. DUCTILITY AT 39.2°F (cm) [__ __ __]
(AASHTO T51, ASTM D113)

13. TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (cm/min) [__ __ __]

14. PENETRATION AT 39.2°F, 200 g, 60 sec. (tenths of a mm) [__ __ __]
(AASHTO T49, ASTM D5)

15. RING AND BALL SOFTENING POINT (°F) (AASHTO T53, ASTM D36) [__ __ __]

LTPP REHABILITATION DATA SHEET 29 COLD MIX RECYCLED ASPHALT PAVEMENT COMBINED ASPHALT CEMENT PROPERTIES	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From Sheet 2) [__]

	TYPE	QUANTITY(%)
***2. RECYCLING AGENT** (See Type Code, Table A.20)	[__ __]	[__ __]
Other (Specify)[_____]		

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

***4. SPECIFIC GRAVITY OF ASPHALT CEMENT** [__.__ __ __]
(AASHTO T228, ASTM D70)

***5. VISCOSITY OF ASPHALT AT 140°F** (poises) [__ __ __ __ __ __]
(AASHTO T202, ASTM D2171)

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

***7. PENETRATION AT 77°F,** 100 g, 5 sec. (tenths of a mm) [__ __ __]
(AASHTO T49, ASTM D5)

ASPHALT MODIFIERS (See Type Code, Table A.15, Appendix A) (Items 8 and 9)

	TYPE	QUANTITY(%)
***8. MODIFIER #1**	[__ __]	[__ __]
***9. MODIFIER #2**	[__ __]	[__ __]
Other (Specify) [_____]		

10. DUCTILITY AT 77°F (cm) [__ __ __]
(AASHTO T51, ASTM D113)

11. DUCTILITY AT 39.2°F (cm) [__ __ __]
(AASHTO T51, ASTM D113)

12. TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (cm/min) [__ __ __]

13. PENETRATION AT 39.2°F, 200 g, 60 sec. (tenths of a mm) [__ __ __]
(AASHTO T49, ASTM D5)

14. RING AND BALL SOFTENING POINT (°F) (AASHTO T53, ASTM D36) [__ __ __]

LTPP REHABILITATION DATA **SHEET 30** COLD MIX RECYCLED ASPHALT PAVEMENT LABORATORY AGED ASPHALT CEMENT PROPERTIES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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, ASTM D2171)

4. VISCOSITY OF ASPHALT AT 275°F (centistokes) [__ __ __ __.__]
(AASHTO T201, ASTM D2170)

5. DUCTILITY AT 77°F (cm) (AASHTO T51, ASTM D113) [__ __ __]

6. DUCTILITY AT 39.2°F (cm) (AASHTO T51, 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, ASTM D5)

9. PENETRATION AT 39.2°F, 200 g, 60 sec. (tenths of a mm) [__ __]
(AASHTO T49, ASTM D5)

10. RING AND BALL SOFTENING POINT (°F) (AASHTO T53, ASTM D36) [__ __ __]

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

LTPP REHABILITATION DATA **SHEET 31** COLD MIX RECYCLED ASPHALT PAVEMENT LABORATORY MIXTURE DESIGN	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From Sheet 2) [__]

2. MAXIMUM SPECIFIC GRAVITY (No Air Voids) (Eq. 4.3) [__.__ __ __]

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

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

5. PERCENT AIR VOIDS (Eq. 4.4) [__ __.__]

6. MARSHALL STABILITY (pounds) (AASHTO T245, ASTM D1559) [__ __ __ __]

7. NUMBER OF BLOWS [__ __]

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

9. HVEEM STABILITY (AASHTO T246, ASTM D1560) [__ __ __]

10. HVEEM COHESIOMETER VALUE (grams/25 mm of width) [__ __ __ __]
(AASHTO T246, ASTM D1560)

LTPP REHABILITATION DATA SHEET 32 COLD MIX RECYCLED ASPHALT PAVEMENT MIXTURE PROPERTIES AS PLACED	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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. 4.3) [__.__ __ __]

***4. BULK SPECIFIC GRAVITY** (ASTM D1188)

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

***5. ASPHALT CONTENT** (percent by weight of total mix)
(AASHTO T164, ASTM D2172)

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

***6. PERCENT AIR VOIDS** (Eq. 4.4)

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

7. VOIDS IN MINERAL AGGREGATE (percent) (Eq. 4.5)

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

8. EFFECTIVE ASPHALT CONTENT (percent) (Eq. 4.6)

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

LTPP REHABILITATION DATA SHEET 33 COLD MIX RECYCLED ASPHALT PAVEMENT MIXTURE PROPERTIES AS PLACED (CONTINUED) AND CONSTRUCTION DATA	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From Sheet 2) [__]

***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 (hours) [__ __ __]

LTPP REHABILITATION DATA **SHEET 34** COLD MIX RECYCLED ASPHALT PAVEMENT CONSTRUCTION DATA (CONTINUED)	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From 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 thru 19)

	Roller Code	Roller Description	Gross Wgt (tons)	Tire Pres. (psi)	Frequency (vibr/min)	Amplitude (inches)	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 (Specify)	[_____]				

COMPACTION DATA (Items 20 thru 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 TEMP (°F) [__ __ __]

27. COMPACTED THICKNESS (in.) [__.__]

28. CURING PERIOD (days) [__ __]

LTPP REHABILITATION DATA SHEET 35 HEATER SCARIFICATION SURFACE RECYCLED ASPHALT PAVEMENT	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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)	Frequency (vibr/min)	Amplitude (inches)	Speed (mph)
A	Steel-Whl Tandem	[__ __.__]				
B	Steel-Whl Tandem	[__ __.__]				
C	Pneumatic-Tired	[__ __.__]	[__ __ __]			
D	Pneumatic-Tired	[__ __.__]	[__ __ __]			
E	Double-Drum Vibr	[__ __.__]		[__ __ __ __]	[.__ __ __]	[__ __.__]
F	Double-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) [__ __]

LTPP REHABILITATION DATA **SHEET 36** PORTLAND CEMENT CONCRETE OVERLAY JOINT DATA	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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

LTPP REHABILITATION DATA **SHEET 37** PORTLAND CEMENT CONCRETE OVERLAY JOINT DATA (CONTINUED)	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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)[_____] 5

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) [__ __]

LTPP REHABILITATION DATA **SHEET 38** PORTLAND CEMENT CONCRETE OVERLAY REINFORCING STEEL DATA	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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** (percent) [__.__ __]

***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)

LTPP REHABILITATION DATA **SHEET 39** PORTLAND CEMENT CONCRETE OVERLAY MIXTURE DATA	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ / __ __ / __ __ __ __]

***1. LAYER NUMBER** (From Sheet 2) [__]

MIX DESIGN (lb./cu.yd. - Oven Dried Weight) (Items 2 thru 5)

***2. COARSE AGGREGATE** [__ __ __ __]
***3. FINE AGGREGATE** [__ __ __ __]
***4. CEMENT** [__ __ __ __]
***5. WATER** [__ __ __ __]

***6. CEMENT TYPE USED** (See Cement Type Codes, Table A.11) [__ __]
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) (See PCC Admixture Codes, Table A.12)

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

Other (Specify)[_____]

SLUMP (Items 14 thru 18) (AASHO T119 or ASTM C143)

14. MEAN (inches) [__.__]
15. MINIMUM (inches) [__.__]
16. MAXIMUM (inches) [__.__]
17. STANDARD DEVIATION (inches) [__.__]
18. NUMBER OF TESTS [__ __ __]

LTPP REHABILITATION DATA **SHEET 40** PORTLAND CEMENT CONCRETE OVERLAY AGGREGATE DATA	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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**		***11. 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 (Items 12 and 13)

***12. COARSE AGGREGATE** (AASHTO T85 or ASTM C127) [__.__ __ __]

***13. FINE AGGREGATE** (AASHTO T84 or ASTM C128) [__.__ __ __]

LTPP REHABILITATION DATA **SHEET 41** PORTLAND CEMENT CONCRETE OVERLAY AGGREGATE DATA (CONTINUED) AND CONSTRUCTION DATA	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From Sheet 2) [__]

AGGREGATE DATA (Continued)

AGGREGATE DURABILITY TEST RESULTS (Items 2 thru 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

LTPP REHABILITATION DATA SHEET 42 PORTLAND CEMENT CONCRETE OVERLAY CONSTRUCTION DATA (CONTINUED)	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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

LTPP REHABILITATION DATA **SHEET 43** PORTLAND CEMENT CONCRETE OVERLAY STRENGTH DATA	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From Sheet 2) [__]

FLEXURAL STRENGTH (Modulus of Rupture) (Items 2 thru 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 thru 14) (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 thru 20) (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 thru 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

LTPP REHABILITATION DATA SHEET 44 RECYCLED PORTLAND CEMENT CONCRETE JOINT DATA	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

*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

LTPP REHABILITATION DATA SHEET 45 RECYCLED PORTLAND CEMENT CONCRETE JOINT DATA (CONTINUED)	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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) [_____] 5

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) [__ __]

LTPP REHABILITATION DATA **SHEET 46** RECYCLED PORTLAND CEMENT CONCRETE REINFORCING STEEL DATA	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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** (percent) [__.__ __]

***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)

LTPP REHABILITATION DATA **SHEET 47** RECYCLED PORTLAND CEMENT CONCRETE MIXTURE DATA	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From Sheet 2) [__]

MIX DESIGN (lb./cu.yd. - Oven Dried Weight) (Items 2 thru 5)

***2. COARSE AGGREGATE** [__ __ __ __]
***3. FINE AGGREGATE** [__ __ __ __]
***4. CEMENT** [__ __ __ __]
***5. WATER** [__ __ __ __]

***6. CEMENT TYPE USED** (See Cement Type Codes, Table A.11) [__ __]
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) (See PCC Admixture Codes, Table A.12)

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

Other (Specify)[_____]

SLUMP (Items 14 thru 18) (AASHO T119 or ASTM C143)

14. MEAN (inches) [__.__]
15. MINIMUM (inches) [__.__]
16. MAXIMUM (inches) [__.__]
17. STANDARD DEVIATION (inches) [__.__]
18. NUMBER OF TESTS [__ __ __]

LTPP REHABILITATION DATA **SHEET 48** RECYCLED PORTLAND CEMENT CONCRETE NEW AGGREGATE DATA	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ / __ __ / __ __ __ __]

***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**		***11. 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 (Items 12 and 13)

***12. COARSE AGGREGATE** (AASHTO T85, ASTM C127) [__.__ __ __]

***13. FINE AGGREGATE** (AASHTO T84, ASTM C128) [__.__ __ __]

LTPP REHABILITATION DATA **SHEET 49** RECYCLED PORTLAND CEMENT CONCRETE NEW AGGREGATE DATA (CONTINUED) AND COMBINED AGGREGATE DATA	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From Sheet 2) [__]

DURABILITY OF NEW AGGREGATES (Items 2 thru 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)

GRADATION OF COMBINED AGGREGATES (Items 8 and 9)

***8. COARSE AGGREGATE**		***9. 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 OF COMBINED AGGREGATES (Items 10 and 11)

***10. COARSE AGGREGATE** (AASHTO T85, ASTM C127) [__.__ __ __]
***11. FINE AGGREGATE** (AASHTO T84, ASTM C128) [__.__ __ __]

DURABILITY OF COMBINED AGGREGATES (Items 12 thru 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**	[__ __]	[__ __ __.__]

LTPP REHABILITATION DATA **SHEET 50** RECYCLED PORTLAND CEMENT CONCRETE CONSTRUCTION DATA	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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

LTPP REHABILITATION DATA **SHEET 51** RECYCLED PORTLAND CEMENT CONCRETE CONSTRUCTION DATA (CONTINUED)	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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

LTPP REHABILITATION DATA **SHEET 52** RECYCLED PORTLAND CEMENT CONCRETE STRENGTH DATA	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER** (From Sheet 2) [__]

FLEXURAL STRENGTH (Modulus of Rupture) (Items 2 thru 8)

***2. TYPE OF TEST** [__]
Third-Point Loading (AASHTO T97, ASTM C78) 1
Center-Point Loading (AASHTO T177, 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 thru 14) (AASHTO T22, 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 thru 20) (AASHTO T198, 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 thru 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

LTPP REHABILITATION DATA SHEET 53 PRESSURE RELIEF JOINTS IN PCC PAVEMENTS	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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

LTPP REHABILITATION DATA SHEET 54 PRESSURE RELIEF JOINTS IN PCC PAVEMENTS (CONTINUED)	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE (mm/dd/yyyy) [__ __ / __ __ / __ __ __ __]

***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
D994	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 [_____]

LTPP REHABILITATION DATA SHEET 55 SUBSEALING PCC PAVEMENT	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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,** 100 g, 5 sec. (tenths of a mm) [__ __ __]
(AASHTO T49, ASTM D5)
***5. RING AND BALL SOFTENING POINT** (°F) (AASHTO T53, ASTM D36) [__ __ __]

MIX DESIGN OF PORTLAND CEMENT GROUT (Items 6 thru 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 (psi) [__ __ __]
(AASHTO T106, ASTM C109)

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

LTPP REHABILITATION DATA SHEET 56 SUBSEALING PCC PAVEMENT (CONTINUED)	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER OF PCC PAVEMENT** (From Sheet 2) [__]

***2. DEPTH OF SUBSEALING HOLE FROM TOP OF SLAB** (inches) [__ __.__ __]

***3. MAXIMUM ALLOWABLE PUMPING PRESSURE** [__ __ __]
(Gauge at Plant) (psi)

***4. MAXIMUM SURGE PRESSURE** (psi) [__ __ __]

***5. SLABS IN TEST SECTION** (JCP 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 LINEAR 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	[__ __ __ __]	[__ __ __ __]

LTPP REHABILITATION DATA SHEET 57 SUBDRAINAGE (RETROFIT) DATA	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 Perforated
Concrete Tile ..... 2 Corrugated Metal 5
Vitrified Clay ..... 3 Corrugated Plastic
Perforated Plastic Tubing 6
Bituminous Fiber ..... 4 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 Non-Woven Fabric 4
Uniformly Graded ..... Porous PCC 5
Aggregate (One Size) .. 2 Porous Bituminous
Woven Fabric ..... 3 Concrete 6
Other (Specify) [_____] 7

***8. MAXIMUM PARTICLE SIZE OF PRIMARY FILTER MATERIAL** (inches) [__.__]

***9. GRADATION OF PRIMARY FILTER MATERIAL**
PERCENT PASSING # 4 SIEVE [__ __.__] **PERCENT PASSING # 40 SIEVE** [__ __.__]
PERCENT PASSING #10 SIEVE [__ __.__] **PERCENT 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

LTPP REHABILITATION DATA SHEET 58 LOAD TRANSFER RESTORATION DATA	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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) [__ __.__]

LTPP REHABILITATION DATA **SHEET 59** LOAD TRANSFER RESTORATION DATA (CONTINUED)	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE** (mm/dd/yyyy) [__ __ / __ __ / __ __ __ __]

***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 BEFORE RESTORATION	EFFICIENCY (%) AFTER RESTORATION
[__ __ __ __]	1	[__ __ __]	[__ __ __]
	2	[__ __ __]	[__ __ __]
	3	[__ __ __]	[__ __ __]
[__ __ __ __]	1	[__ __ __]	[__ __ __]
	2	[__ __ __]	[__ __ __]
	3	[__ __ __]	[__ __ __]
[__ __ __ __]	1	[__ __ __]	[__ __ __]
	2	[__ __ __]	[__ __ __]
	3	[__ __ __]	[__ __ __]
[__ __ __ __]	1	[__ __ __]	[__ __ __]
	2	[__ __ __]	[__ __ __]
	3	[__ __ __]	[__ __ __]

***5. DATE OF LOAD TRANSFER EFFICIENCY TESTS** (mm/dd/yyyy)

BEFORE RESTORATION [__ __/__ __/__ __ __ __]
AFTER RESTORATION [__ __/__ __/__ __ __ __]

LTPP REHABILITATION DATA **SHEET 60** CRACK AND SEAT PORTLAND CEMENT CONCRETE PAVEMENT	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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** (pounds) [__ __ __ __ __]

***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		

LTPP REHABILITATION DATA SHEET 61 RESTORATION OF AC SHOULDERS	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. SHOULDER RESTORED** [__]

- Outside 1
- Inside 2
- Both 3

	INSIDE SHOULDER	OUTSIDE SHOULDER
***2. SURFACE TYPE** (See Codes, Table A.5)	[__]	[__]
***3. TOTAL WIDTH** (feet)	[__ __]	[__ __]
***4. PAVED WIDTH** (feet)	[__ __]	[__ __]
***5. SHOULDER BASE TYPE** (See 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** (inches) [__.__]

***11. AC OVERLAY THICKNESS** (inches) [__.__]

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 (inches)

WIDTH [__.__]
DEPTH [__.__]

14. TYPE OF JOINT SEALANT [__]

- Poured 1
- Preformed 2

NOTE: Data Items 8 to 14 Pertain Only to the Restored Outside Shoulder.

LTPP REHABILITATION DATA SHEET 62 RESTORATION OF PCC SHOULDERS	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. SHOULDER RESTORED** [__]

Outside 1
Inside 2
Both 3

	INSIDE SHOULDER	OUTSIDE SHOULDER
***2. SURFACE TYPE** (See Codes, Table A.5)	[__]	[__]
***3. TOTAL WIDTH** (feet)	[__ __]	[__ __]
***4. PAVED WIDTH** (feet)	[__ __]	[__ __]
***5. SHOULDER BASE TYPE** (See Codes, Table A.6)	[__ __]	[__ __]
***6. SURFACE THICKNESS** (inches)	[__ __.__]	[__ __.__]
***7. BASE THICKNESS** (inches)	[__ __.__]	[__ __.__]

***8. TYPE OF SHOULDER SYSTEM** [__]

JPCP Shoulder 1
JRCP Shoulder 2
CRCP Shoulder 3
Other Specify) [_____] 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
Butt 2
Keyed 3
Other (Specify) [_____] 4

LANE/SHOULDER JOINT TIE SYSTEM (Items 13 thru 16)

***13. TYPE** [__]

None 1
Deformed Bars 2
Hook Bolts 3
Other (Specify) [_____] 4

***14. BAR DIAMETER** (inches) [__.__ __]

***15. BAR LENGTH** (inches) [__ __]

***16. BAR SPACING** (inches) [__ __]

NOTE: Data Items 8 thru 16 Pertain Only to the Restored Outside Shoulder.

LTPP REHABILITATION DATA SHEET 63 RESTORATION OF PCC SHOULDERS (CONTINUED)	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 (inches)

WIDTH [__.__]
DEPTH [__.__]

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 thru 6 Pertain Only to the Restored Outside Shoulder.

LTPP REHABILITATION DATA **SHEET 64** MILLING AND GRINDING DATA FOR PAVEMENT SURFACES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***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 not be placed after the milling/grinding work, record the milling/grinding data on the appropriate maintenance data sheet (refer to Chapter 3).

LTPP REHABILITATION DATA **SHEET 65** ASPHALT CONCRETE OVERLAY SUPERPAVE AGGREGATE PROPERTIES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER**(S) (From Sheet 2) [__]

2. ANGULARITY

COARSE (percent fractured faces) [__ __.__]
FINE (percent voids) [__ __.__]

3. SOUNDNESS

COARSE (percent loss) [__ __.__]
FINE (percent loss) [__ __.__]

4. TOUGHNESS OF COARSE AGGREGATE (percent loss LAR) [__ __.__]

5. DELETERIOUS MATERIALS (percent) [__ __.__]

6. CLAY CONTENT (Sand Equivalent, Ratio) [__ __.__]

7. THIN, ELONGATED PARTICLES (percent) [__.__]

LTPP REHABILITATION DATA SHEET 66 ASPHALT CONCRETE OVERLAY SUPERPAVE ASPHALT CEMENT PROPERTIES	*STATE CODE [__ __] *SHRP ID [__ __ __ __] *DATE COMPLETE (mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

*1. **LAYER NUMBER(S)** (From Sheet 2) [__]

*2. **ASPHALT GRADE** (Specify Design SHRP PG Grading) PG[__ __] - [__ __]

*3. **SOURCE** (See Supply Code Sheet, Table A.14) [__ __]
Other (Specify) [_____]

*4. **SPECIFIC GRAVITY OF ASPHALT CEMENT** (AASHTO T228, ASTM D70) [__.__ __ __]

GENERAL ASPHALT CEMENT PROPERTIES (If Available From Supplier)

5. **DYNAMIC SHEAR RHEOMETER COMPLEX MODULUS AND PHASE ANGLE** (kPa, deg)
(Tank Asphalt)(AASHTO TP5) [__ __.__ __] [__ __]

6. **DYNAMIC SHEAR RHEOMETER COMPLEX MODULUS AND PHASE ANGLE** (kPa, deg)
(RTFO Asphalt)(AASHTO TP5) [__ __.__ __] [__ __]

7. **DYNAMIC SHEAR RHEOMETER COMPLEX MODULUS AND PHASE ANGLE** (kPa, deg)
(PAV Asphalt)(AASHTO TP5) [__ __ __ __ __] [__ __]

8. **BENDING BEAM RHEOMETER STIFFNESS MODULUS AND SLOPE** (MPa, ratio)
(PAV Asphalt)(AASHTO TP1) [__ __ __ __] [__.__ __ __]

9. **DIRECT TENSION TENSILE STRENGTH AND TENSILE STRAIN** (kPa, ratio)
(PAV Asphalt)(AASHTO TP3) [__ __ __ __.__] [__.__ __]

LTPP REHABILITATION DATA **SHEET 67** ASPHALT CONCRETE OVERLAY SUPERPAVE MIXUTRE PROPRERTIES	***STATE CODE** [__ __] ***SHRP ID** [__ __ __ __] ***DATE COMPLETE**(mm/dd/yyyy) [__ __ /__ __ /__ __ __ __]

***1. LAYER NUMBER(S)** (From Sheet 2) [__]

***2. TYPE OF SAMPLES** [__]

Mixed in Field, Compacted in Laboratory.....1
Mixed and Compacted in Field.....2

***3. FREQUENCY SWEEP** (Complex Modulus, MPa & Phase Angle, δ)

4°C[__ __ __][__ __.__] **20°C**[__ __ __][__ __.__] **40°C**[__ __ __][__ __.__]

***4. UNIAXIAL STRAIN** (Axial Stress, kPa & Strain, mm/mm)

4°C[__ __ __][__.__ __] **20°C**[__ __ __][__.__ __] **40°C**[__ __ __][__.__ __]

***5. VOLUMETRIC STRAIN** (Confining Pressure, kPa & Axial Strain, mm/mm)

4°C[__ __ __][__.__ __] **20°C**[__ __ __][__.__ __] **40°C**[__ __ __][__.__ __]

***6. SIMPLE SHEAR**

	4°C	**20°C**	**40°C**
Axial Stress, kPa	[__ __ __]	[__ __ __]	[__ __ __]
Shear Stress, kPa	[__ __ __]	[__ __ __]	[__ __ __]

APPENDIX A – STANDARD CODES

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	North Carolina	37
Alaska	02	North Dakota	38
Arizona	04	Ohio	39
Arkansas	05	Oklahoma	40
California	06	Oregon	41
Colorado	08	Pennsylvania	42
Connecticut	09	Rhode Island	44
Delaware	10	South Carolina	45
District of Columbia	11	South Dakota	46
Florida	12	Tennessee	47
Georgia	13	Texas	48
Hawaii	15	Utah	49
Idaho	16	Vermont	50
Illinois	17	Virginia	51
Indiana	18	Washington	53
Iowa	19	West Virginia	54
Kansas	20	Wisconsin	55
Kentucky	21	Wyoming	56
Louisiana	22	American Samoa	60
Maine	23	Guam	66
Maryland	24	Puerto Rico	72
Massachusetts	25	Virgin Islands	78
Michigan	26	Alberta	81
Minnesota	27	British Columbia	82
Mississippi	28	Manitoba	83
Missouri	29	New Brunswick	84
Montana	30	Newfoundland	85
Nebraska	31	Nova Scotia	86
Nevada	32	Ontario	87
New Hampshire	33	Prince Edward Island	88
New Jersey	34	Quebec	89
New Mexico	35	Saskatchewan	90
New York	36		

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

Table A.3 – Experiment Type Definitions

General Pavement Studies

(01) Asphalt Concrete Pavement with Granular Base

Acceptable pavements for this study include a dense-graded HMAC surface layer, with or without other HMAC layers, placed over untreated granular base. One or more subbase layers may also be present, but are not required. A treated subgrade is classified as a subbase layer. "Full depth" AC pavements, defined as an HMAC surface layer combined with one or more subsurface HMAC layers beneath the surface layer with a minimum total HMAC thickness of 152 mm (6 inches) placed directly upon a treated or untreated subgrade, are also allowed in this study. Two or more consecutive lifts of the same mixture design are to be treated as one layer.

Seal coats or porous friction courses are allowed on the surface, but not in combination, i.e., a porous friction course placed over a seal coat is not acceptable. Seal coats are permissible on top of granular layers. At least one layer of dense-graded HMAC is required, regardless of the existence of seal coats or porous friction courses.

(02) Asphalt Concrete Pavement with Bound Base

Acceptable pavements for this study include a dense-graded HMAC surface layer with or without other HMAC layers, placed over a bound base layer. To properly account for a variety of bound base types in the sampling design, two classifications of binder types, bituminous and non-bituminous, are defined as factor levels. Bituminous binders include asphalt cements, cutbacks, emulsions, and road tars. Non-bituminous binders include all hydraulic cements (those which harden by a chemical reaction with water and are capable of hardening under water), lime, fly ashes, and natural pozzolans, or combinations thereof. Stabilized bases with lower quality materials such as sand asphalt or soil cement are also allowed. Stabilization practices of primary concern for this study are those in which the structural characteristics of the material are improved due to the cementing action of the stabilizing agent. Thus, the description of the study actually refers to treatments improving the structural properties of the base materials. Two or more consecutive lifts of the same mixture design are to be treated as one layer. One or more subbase layers may be present but are not required.

Seal coats or porous friction courses are permitted on the surface but not in combination, i.e., a porous friction course placed over a seal coat is not acceptable. Project selection is often to those constructed on both fine and coarse subgrades.

(03) Jointed Plain Concrete Pavement – JPCP

Acceptable jointed, unreinforced PCC slab placed over untreated granular base, HMAC, or stabilized base. One or more subbase layers may also be present, but are not required. The joints may have either no load transfer devices or smooth dowel bars. A seal coat is permissible above a granular base layer. Jointed slabs with load transfer devices other than dowel bars and pavements placed directly upon a treated or untreated subgrade are also not acceptable.

Table A.3 – Experiment Type Definitions (continued)

(04) Jointed Reinforced Concrete Pavement – JRCP

Acceptable projects include jointed reinforced PCC pavements with doweled joints spaced between 20 and 65 feet (66 and 213 m). The slab may rest directly upon a base layer or upon unstabilized coarse-grained subgrade. A base layer and one or more subbase layers may exist, but are not required. A seal coat is also permissible over a granular base layer. JRCP placed directly upon a fine-grained soil/aggregate layer or a fine-grained subgrade will not be considered for this study. 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 PCC pavements placed directly upon a base layer or upon unstabilized coarse-grained subgrade. One or more subbase layers can exist but are not required. A seal coat (prime coat) is permissible just above a granular base layer. CRCP's placed directly upon a fine-grained soil/aggregate layer or a fine-grained subgrade is not acceptable for this study.

(06) AC Overlay of AC Pavement

Pavements in the GPS-6A, 6B, 6C, 6D, and 6S experiments include a dense-graded HMAC surface layer with or without other HMAC layers placed over an existing AC pavement.

The designation 6A refers to those sections, which were overlaid prior to acceptance in the GPS program.

The 6B, 6C, 6D, and 6S designation refers to LTPP sections on which an overlay was placed after the section had been accepted into the LTPP program.

Seal coats or porous friction courses are allowed but not in combination. Fabric interlayers and SAMIs are permitted between the original surface and the overlay. The total thickness of HMAC used in the overlay is required to be at least 25.4 mm (1.0 in).

(07) AC Overlay of Concrete Pavement

Pavements classified in the GPS-7A, 7B, 7C, 7D, 7F, 7R, and 7S experiments primarily consist of JPCP, JRCP, and CRCP pavements in which a dense-graded HMAC surface layer with or without other HMAC surface layers was constructed.

The exception is the 7R classification that was added to account for PCC pavement test sections rehabilitated using CPR techniques. (To date, no test sections have been classified in the 7R category.)

Table A.3 – Experiment Type Definitions (Continued)

The designation 7A refers to sections that were overlaid prior to acceptance in the GPS program. The 7B, 7C, 7D, 7F, and 7S designation refers to those test sections on which an overlay was placed after the section had been accepted into the LTPP program.

The PCC slab may rest upon a combination of the base and/or subbase layers. The existing concrete slab can also be placed directly on lime or cement-treated fine or coarse-grained subbase or on untreated coarse-grained subgrade soil. Slabs placed directly on untreated fine-grained subgrade are not acceptable.

Seal coats or porous friction courses are permissible but not allowed in combination. Fabric interlayers and SAMIs are acceptable when placed between the original surface (concrete) and the overlay. Overlaid pavements involving aggregate interlayers and open-graded AC interlayers are not included in this study. The total thickness of HMAC used in the overlay is required to be at least 38 mm (1.5 inches).

(09) Unbonded JCP Overlays of Concrete Pavement

Acceptable projects for this study include unbonded JPCP, JRCP, or CRCP overlays with a thickness of 129 mm (5 inches) or more placed over an existing JPCP, JRCP, or CRCP pavement. An interlayer used to prevent bonding of the existing and the overlay slabs is required. The overlaid concrete pavement can rest on a base and/or a subbase or directly upon the subgrade.

Specific Pavement Studies

(01) Structural Factors for Flexible Pavements

The experiment on Strategic Study of Structural Factors for Flexible Pavements (SPS-1) examines the performance of specific HMAC-surfaced pavement structural factors under different environmental conditions. Pavements within SPS-1 must start with the original construction of the entire pavement structure or removal and complete reconstruction of an existing pavement. The pavement structural factors included in this experiment are in-pavement drainage layer, surface thickness, base type, and base thickness. The experiment design stipulates a traffic loading level in the study lane in excess of 100,000 – 80-kN (18-kip) Equivalent Single Axle Load (ESAL) per year. The combination of the study factors in this experiment result in 24 different pavement structures. The experiment is designed using a fractional factorial approach to enhance implementation practicality; permitting the construction of twelve test sections at one site with the complementary twelve test sections to be constructed at another site within the same climatic region on a similar subgrade type.

Table A.3 – Experiment Type Definitions (Continued)

(02) Structural Factors for Rigid Pavements

The experiment on Strategic Study of Structural Factors for Rigid Pavements (SPS-2) examines the performance of specific JPCP structural factors under different environmental conditions. Pavements within SPS-2 must start with the original construction of the entire pavement structure or removal and complete reconstruction of an existing pavement. The pavement structural factors included in this experiment are in-pavement drainage layer, PCC surface thickness, base type, PCC flexural strength, and lane width. The experiment requires that all test sections be constructed with perpendicular doweled joints at 4.9-m (15-ft) spacing and stipulate a traffic loading level in the lane in excess of 200,000 ESAL/year. The experiment is designed using a fractional factorial approach to enhance implementation practicality; permitting construction of twelve test sections at one site with the complementary twelve test sections to be constructed at another site within the same climatic region on a similar subgrade type.

(03) Preventive Maintenance Effectiveness of Flexible Pavements

The experiment on Preventive Maintenance Effectiveness of Flexible Pavements (SPS-3) examines the performance of 4 preventive maintenance treatments (cracking seal, chip seal, slurry seal, and thin overlay) on AC surfaced pavement sections within the four climatic regions, on the two classes of subgrade soil. The experimental design stipulates that the effectiveness of each of the four treatments be evaluated independently. The effectiveness of combinations of treatments is not considered. Therefore, each site includes four treated test sections in addition to a control section. In most cases the control, or do nothing section, is classified as a GPS test section.

(04) Preventive Maintenance Effectiveness of Jointed Concrete Pavements

The experiment on Preventive Maintenance Effectiveness of Jointed Concrete Pavements (SPS-4) was designed to study the effects of crack/joint sealing and undersealing on jointed PCC pavement structures. Both JRCP and JPCP are included in the study. Undersealing is included as an optional factor and is only performed on a section in which the need for undersealing is indicated. The experiment design stipulates that the effectiveness of each of the two treatments be evaluated independently. The effectiveness of combinations of treatments is not considered. Each test site includes two treated test sections in addition to a control section. The treatment sections on joint/crack seal test sites consists of one section in which all joints have no sealant, and one in which a water tight seal is maintained on all cracks and joints.

(05) Rehabilitation of Asphalt Concrete Pavements

The experiment on Rehabilitation of Asphalt Concrete Pavements (SPS-5) examines the performance of 8 combinations of AC overlays on existing AC-surfaced pavements. The rehabilitation treatment factors included in the study are intensity of surface preparation, recycled vs. virgin AC overlay mixture, and overlay thickness. The experiment design includes

Table A.3 – Experiment Type Definitions (Continued)

all four climatic regions and conditions of existing pavement. The experiment design stipulates a traffic loading level in the study lane in excess of 100,000 ESALs/year.

(06) Rehabilitation of Jointed Portland Cement Concrete Pavements

The experiment on Rehabilitation of Jointed Portland Cement Concrete Pavements (SPS-6) examines the performance of 7 rehabilitation treatment options as a function of climatic region, type of pavement (plain and reinforced), and condition of existing pavement. The rehabilitation methods include surface preparation (a limited preparation and full CPR) with a 102 mm (4 in.) thick AC overlay or without an overlay, crack/break and seat with two AC overlay thicknesses (102 and 203 mm [4 and 8 in.]), and limited surface preparation with a 102 mm (4 in.) thick AC overlay with sawed and sealed joints.

(07) Bonded Concrete Overlays of Concrete Pavements

The experiment on Bonded Concrete Overlays on Concrete Pavements (SPS-7) examines the performance of 8 combinations of bonded PCC treatment alternatives as a function of climatic region, pavement type (jointed and continuously reinforced), and condition of existing pavement. The rehabilitation treatment factors include combinations of surface preparation methods (cold milling plus sand blasting and shot blasting), bonding agents (neat cement grout or none), and overlay thickness (76 and 127 mm [3 and 5 in.]). The experiment design stipulates a traffic loading level in the study lane in excess of 200,000 ESAL/year.

(08) Environmental Effects in the Absence of Heavy Loads

The experiment on Environmental Effects in the Absence of Heavy Loads (SPS-8) examines the effect of climatic factors in the four environmental regions, subgrade type (frost-susceptible, expansive, fine, and coarse) on pavement sections incorporating flexible and rigid pavement designs that are subjected to limited traffic loading. The experiment design requires either 2 flexible pavement structures or 2 rigid pavement structures to be constructed at each site. The 2 flexible pavement sections consist of 102-mm (4-in) AC surface on 102-mm (8-in) thick untreated granular base, and 178-mm (7-in) AC surface over a 305-mm (12-in) thick granular base. Rigid pavement test sections consist of doweled JPCP with 203-mm (8-in) and 279-mm (11-in) PCC surface thickness on 152-mm (6-in) thick dense-graded granular base. The pavement structures included in this study match pavement structures included in the SPS-1 and 2 experiments. The experiment design stipulates that traffic volume in the study lane be at least 100 vehicles per day but not more than 10,000 ESALs/year. The flexible and rigid pavement sections may be constructed at the same site or at different sites.

Table A.3 – Experiment Type Definitions (Continued)

(09) Validation of SHRP Asphalt Specifications and Mix Design

The SPS-9P pilot effort started at the end of the SHRP program in order to get some experience in implementing the SuperPave™ specifications. Test sections classified as SPS-9P were constructed using a very limited set of guidelines. In some instances, specifications were based on interim SuperPave™ specifications that were changed at a later date. Many of the test sections were constructed before material sampling and testing guidelines were established.

The SPS-9A experiment, SuperPave™ Asphalt Binder Study, requires construction of a minimum of two test sections at each project site. Construction can include new construction, reconstruction, or overlay. The minimum test sections consist of (1) Highway agencies' standard mix, (2) SuperPave™ Level 1 designed standard mix, and (3) SuperPave™ mix with alternate binder grade either higher or lower than the specified SuperPave™ binder. The minimum two test sections at some sites results from the agency's declaration that the SuperPave™ test section is the same as the standard agency mixture. This will provide the opportunity to evaluate and improve the practical aspects of implementing SuperPave™ mix design through a hands-on field trial by interested highway agencies, comparison of the performance of the SuperPave™ mixes against mixes designed with current highway agencies' asphalt specifications, asphalt-aggregate specifications, and mix design procedures, and to test the sensitivity of the SuperPave™ asphalt binder specifications relative to low temperature cracking, fatigue, or permanent deformation distress factors.

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)

Type of Pavement	Code
*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 AC wearing surface over a PCC 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
Plain Portland Cement Concrete (Only used for SPS-7 overlays of CRCP)	90
Plant Mix (Emulsified Asphalt) Material, Cold Laid	09
Plant Mix (Cutback Asphalt) Material, Cold Laid	10
Single Surface Treatment	11
Double Surface Treatment	12
Recycled 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.6 – Base and Subbase Material Type Classification Codes

	Code
Gravel (Uncrushed)	22
Crushed Stone, Gravel or Slag	23
Sand	24
Soil-Aggregate Mixture (Predominantly Fine-Grained Soil)	25
Soil-Aggregate Mixture (Predominantly Coarse-Grained Soil)	26
Soil Cement	27
Asphalt Bound Base or Subbase Materials	
Dense Graded, Hot Laid, Central Plant Mix	28
Dense Graded, Cold Laid, Central Plant Mix	29
Dense Graded, Cold Laid, Mixed-In-Place	30
Open Graded, Hot Laid, Central Plant Mix	31
Open Graded, Cold Laid, Central Plant Mix	32
Open Graded, Cold Laid, Mixed-In-Place	33
Recycled Asphalt Concrete, Plant Mix, Hot Laid	34
Recycled Asphalt Concrete, Plant Mix, Cold Laid	35
Recycled Asphalt Concrete, Mixed-In-Place	36
Sand Asphalt	46
Cement-Aggregate Mixture	37
Lean Concrete (<3 sacks cement/cy)	38
Recycled Portland Cement Concrete	39
Sand-Shell Mixture	40
Limerock, Caliche (Soft Carbonate Rock)	41
Lime-Treated Subgrade Soil	42
Cement-Treated Subgrade Soil	43
Pozzolanic-Aggregate Mixture	44
Cracked and Seated PCC Layer	45
Other	49

Table A.7 – Subgrade Soil Description Codes

Soil Description	Code
Fine-Grained Subgrade Soils	
Clay (Liquid Limit > 50)	51
Sandy Clay	52
Silty Clay	53
Silt	54
Sandy Silt	55
Clayey Silt	56
Coarse-Grained Subgrade Soils	
Sand	57
Poorly Graded Sand	58
Silty Sand	59
Clayey Sand	60
Gravel	61
Poorly Graded Gravel	62
Clayey Gravel	63
Shale	64
Rock	65

Table A.8 – Material Type Codes for Thin Seals and Interlayers

	Code
Grout	70
Chip Seal Coat	71
Slurry Seal Coat	72
Fog Seal Coat	73
Woven Geotextile	74
Nonwoven Geotextile	75
Stress Absorbing Membrane Interlayer	77
Dense Graded Asphalt Concrete Interlayer	78
Aggregate Interlayer	79
Open Graded Asphalt Concrete Interlayer	80
Chip Seal with Modified Binder (Does Not Include Crumb Rubber)	81
Sand Seal	82
Asphalt-Rubber Seal Coat (Stress Absorbing Membrane)	83
Sand Asphalt	84
Other	85
Thin Seal Interlayer	86
Plain Portland Cement Concrete (only used for SPS-7)	90

Table A.9 – Geologic Classification Codes

Igneous	Code
Granite	01
Syenite	02
Diorite	03
Gabbro	04
Peridotite	05
Felsite	06
Basalt	07
Diabase	08
Sedimentary	
Limestone	09
Dolomite	10
Shale	11
Sandstone	12
Chert	13
Conglomerate	14
Breccia	15
Metamorphic	
Gneiss	16
Schist	17
Amphibolite	18
Slate	19
Quartzite	20
Marble	21
Serpentine	22
Other Rock Type (Specify if Possible or Unknown)	30
Glacial Soils	
Glacial Soils	31
Boulder Clay	32
Glacial Sands and Gravels	33
Laminated Silts and Laminated Clays	34
Varved Clays	35
Ground Moraine	36
Fluvio-glacial Sands and Gravels	37
Other Glacial Soils	38

Table A.9 – Geologic Classification Codes (Continued)

Residual Soils Code

Plateau Gravels	40
River Gravels	41
Alluvium	42
Alluvial Clays and / or Peat	43
Alluvial Silt	44
Other Alluvial Soils	45
Coastal Shingle and Beach Deposits	46
Wind-blown Sand	47
Loess (collapsible soil)	48
Shale, siltstone, mudstone, claystone	49
Expansive Soils	50
Residual Soils	51
Residual Soils derived from granites, gneisses, and schists	52
Residual Soils derived from limestone, sandstone, and shale	53
Other Residual Soils	54
Coquina	55
Shell	56
Marl	58
Caliche	59

Other 60

Table A.10 – Soil and Soil-Aggregate Mixture Type Codes, AASHTO Classification

	Code
A-1-a	01
A-1-b	02
A-3	03
A-2-4	04
A-2-5	05
A-2-6	06
A-2-7	07
A-4	08
A-5	09
A-6	10
A-7-5	11
A-7-6	12

Table A.11 – Portland Cement Type Codes

	Code
Type I	41
Type II	42
Type III	43
Type IV	44
Type V	45
Type IS	46
Type ISA	47
Type IA	48
Type IIA	49
Type IIIA	50
Type IP	51
Type IPA	52
Type N	53
Type NA	54
Other	55

Table A.12 – Portland Cement Concrete Admixture Codes

	Code
Water-Reducing (AASHTO M194, Type A)	01
Retarding (AASHTO M194, Type B)	02
Accelerating (AASHTO M194, Type C)	03
Water-Reducing and Retarding (AASHTO M194, Type D)	04
Water-Reducing and Accelerating (AASHTO M194, Type E)	05
Water-Reducing, High Range (AASHTO M194, Type F)	06
Water-Reducing, High Range and Retarding (AASHTO M194, Type G)	07
Air-Entraining Admixture (AASHTO M154)	08
Natural Pozzolans (AASHTO M295, Class N)	09
Fly Ash, Class F (AASHTO M295)	10
Fly Ash, Class C (AASHTO M295)	11
Other (Chemical)	12
Other (Mineral)	13

Table A.13 – Aggregate Durability Test Type Codes

Description	AASHTO	ASTM	Code
Resistance to Abrasion of Small Size Coarse Aggregate by Use of Los Angeles Machine (Percent Weight Loss)	T96	C131	01
Soundness of Aggregate by Freezing and Thawing (Percent Weight Loss)	T103	--	02
Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate (Percent Weight Loss)	T104	C88	03
Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine (Percent Weight Loss)	--	C535	04
Potential Volume Change of Cement-Aggregate Combinations (Percent Expansion)	--	C342	05
Evaluation of Frost Resistance of Coarse Aggregates in Air-Entrained Concrete by Critical Dilution Procedures (Number of Weeks of Frost Immunity)	--	C682	06
Potential Alkali Reactivity of Cement Aggregate Combinations (Average Percent Expansion)	--	C227	07
Potential Reactivity of Aggregates (Reduction in Alkalinity-mmol/L)	--	C289	08
Test for Clay Lumps and Friable Particles in Aggregates (Percent by Weight)	T112	C142	09
Test for Potential Alkali Reactivity of Carbonate Rocks for Concrete Aggregates (Percent Change in Specimen Length)	--	C586	11

Table A.14 – Codes for Asphalt Refiners and Processors in the United States*

	Code
Belcher Refining Co. – Mobile Bay, Alabama	78
Hunt Refining Co. – Tuscaloosa, Alabama	01
Chevron USA, Inc. – Kenai, Alaska	02
Mapco Alaska Petroleum – North Pole, Alaska	03
Intermountain Refining Cl. – Fredonia, Arizona	04
Berry Petroleum Company – Stevens, Arkansas	05
Cross Oil and Refining Company – Smackover, Arkansas	06
Lion Oil Company – El Dorado, Arkansas	07
McMillan Ring, Free Oil Cl. – Norphlet, Arkansas	08
Chevron USA, Inc. – Richmond, California	09
Conoco, Inc. – Santa Maria, California	10
Edgington Oil Co., Inc. – Long Beach, California	11
Golden Bear Division, Witco Chemical Corp. – Oildale, California	12
Golden West Refining, Co. – Santa Fe Springs, California	13
Huntway Refining Co. – Benicia, California	14
Huntway Refining Co. – Wilmington, California	15
Lunday-Thagard Co. – South Gate, California	79
Newhall Refining Co., Inc. – Newhall, California	16
Oxnard Refining – Oxnard, California	17
Paramount Petroleum Corp. – Paramount, California	80
Powerline Oil Co. – Santa Fe Springs, California	81
San Joaquin Refining Cl. – Bakersfield, California	18
Shell Oil Co. – Martinez, California	19
Superior Processing Co. – Santa Fe Springs, California	20
Colorado Refining Co. – Commerce City, Colorado	82
Conoco, Inc. – Commerce City, Colorado	21
Amoco Oil, Inc. – Savannah, Georgia	22
Young Refining Corp. – Douglasville, Georgia	23
Chevron USA, Inc. – Barber's Point, Hawaii	24
Clark Oil and Refining Corp. – Blue Island, Illinois	25
Shell Oil Co. – Wood River, Illinois	26
Unacol Corp. – Lemont, Illinois	27
Amoco Oil Co. – Whiting, Indiana	28
Laketon Refining Corp. – Laketon, Indiana	83
Young Refining Corp. – Laketon, Indiana	29
Derby Refining Co. – El Dorado, Kansas	84
Farmland Industries, Inc. – Phillipsburg, Kansas	30
Total Petroleum, Inc. – Arkansas City, Kansas	31
Ashland Petroleum Co. – Catlettsburg, Kentucky	32
Atlas Processing Co. – Shreveport, Louisiana	33
Calumet Refining Co. – Princeton, Louisiana	34
Exxon Co. – Baton Rouge, Louisiana	35

Table A.14 – Codes for Asphalt Refiners and Processors in the United States* (Continued)

	Code
Marathon Petroleum Co. – Garyville, Louisiana	36
Marathon Petroleum Co. – Detroit, Michigan	37
Ashland Petroleum Co. – St. Paul, Minnesota	38
Koch Refining Co. – Rosemount, Minnesota	39
Chevron USA, Inc. – Pascagoula, Mississippi	40
Ergon Refining Inc. – Vicksburg, Mississippi	41
Southland Oil Co. – Lumberton, Mississippi	42
Southland Oil Co. – Sanderson, Mississippi	43
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. – Tulsa, Oklahoma	54
Total Petroleum Inc. – Ardmore, Oklahoma	55
Chevron USA, Inc. – Portland, Oregon	56
Atlantic Refining & Marketing Corp. – Philadelphia, Pennsylvania	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

Table A.14 – Codes for Asphalt Refiners and Processors in the United States* (Continued)

	Code
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

* Originally taken from Oil and Gas Journal, March 20, 1989, pp. 72-89 and updated October 1993.

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 Grades	35
Cutback Asphalts (RC, MC, SC)	
30 (MC only)	36
70	37

Table A.16 – Grades of Asphalt, Emulsified Asphalt, and Cutback Asphalt Codes (Continued)

	Code
250	38
800	39
3000	40
Other Cutback Asphalt Grade	99

Taken from Manual Series No. 5 (MS-5), "A Brief Introduction to Asphalt," and Specification Series No. 2 (SS-2), "Specifications for Paving and Industrial Asphalts," both publications by the Asphalt Institute.

Table A.17 – Maintenance and Rehabilitation Work Type Codes

	Codes
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

Table A.17 – Maintenance and Rehabilitation Work Type Codes (Continued)

Codes

Longitudinal Subdrains (linear ft) 38
Transverse Subdrainage (linear ft) 39
Drainage Blanket (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
Fracture Treatment of PCC Pavement as Base for New AC Surface (sq. yards) 46
Fracture Treatment of 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 ft) 50
Mill Off Existing AC Pavement and Overlay with AC (sq. yards) 51
Mill Off Existing AC Pavement and Overlay with PCC (sq. yards) 52
Other 53
Partial Depth Patching of PCC Pavement at Joints (sq. yards) 54
Mill Existing Pavement and Overlay with Hot-Mix Recycled Asphalt Concrete (sq. yards) 55
Mill Existing Pavement and Overlay with Cold-Mix Recycled Asphalt Concrete (sq. yards) 56
Saw and Seal (linear ft.) 57

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: 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 replacement)	
Joint Plain (JPCP)	08
Joint 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

Table A.21 – Anti-Stripping Agent Type Codes (Continued)

	Code
Indulin AS-Special	42
Indulin AS-1	43
Jetco AD-8	44
Kling	45
Kling-Beta ZP-251	46
Kling-Beta L-75	47
Kling-Beta LV	48
Kling-Beta 1000	49
Kling-Beta 200	50
Nacco Anti-Strip	51
No Strip	52
No Strip Concentrate	53
Redi-Coat 80-S	54
Redi-Coat 82-S	55
Silicone	56
Super AD-50	57
Tap Co 206	58
Techni H1B7175	59
Techni H1B7173	60
Techni H1B7176	61
Techni H1B7177	62
Tretolite DH-8	63
Tretolite H-86	64
Tretolite H-86C	65
Tyfo A-45	66
Tyfo A-65	67
Tyfo A-40	68
Edoco 7003	69
Other	70
No Antistripping Agent Used	00

Table A.22 – Distress Types

	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