Memorandum

U.S. Department
of Transportation

**Federal Highway
Administration**

6300 Georgetown Pike
McLean, Virginia 22101

Subject: **ACTION**: LTPP Directive GO-65
Maintenance and Rehabilitation of LTPP Test Sections:
Status Change Forms and Data Sheets

Date: February 27, 2018

From: Jack Springer
Long-Term Infrastructure Performance Team

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Date: 2018.02.28 08:05:07 -05'00'

Reply to
Attn of: HRDI-30

To: Mr. Gabe Cimini, PM - LTPP Data Collection Contract

Attached is the Long Term Pavement Performance (LTPP) Program Directive GO-65, which provides guidelines for the collection of maintenance and rehabilitation data in support of the LTPP program. This directive supersedes GO-8, GO-12, GO-14, GO-22 and GO-49. The regions should utilize the directive as appropriate. Please ensure that all personnel involved are aware of this new

If you have any questions concerning this directive, please do not hesitate to call me at (202) 493-3144.

Attachments (1)

FHWA:HRDI-30:JSpringer:JHarris:493-3144:02/27/18
File: M:\LTPP Directives\Distress\GO-65
cc:
Jonathan Groeger
Directive Binder
LTPP Team
Official file

LONG TERM PAVEMENT PERFORMANCE PROGRAM DIRECTIVE

FOR THE TECHNICAL DIRECTION OF THE LTPP PROGRAM

Program Area:	General Operations	Directive Number:	GO-65
Date:	February 27, 2018	Supersedes:	GO-8, GO-12, GO-14, GO-22 and GO-49
Subject:	**Maintenance and Rehabilitation of LTPP Test Sections: Status Change Forms and Data Sheets**		

INTRODUCTION

The pavement test sections included in the Long-Term Pavement Performance (LTPP) program are located on public roads and, as a result, some form of modification to the pavement structure often occurs to keep the road in a safe and serviceable condition. Decisions on the timing and choice of applied maintenance or rehabilitation treatments to be applied are the authority of the responsible highway agency. In order to improve the program's ability to better understand pavement performance, information on maintenance or rehabilitations treatments applied to the LTPP test section is needed.

The terms maintenance and rehabilitation are used within the LTPP program to classify how various treatments that 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.

The purpose of this directive is to provide, under a single document:

- Guidelines for the collection of maintenance and rehabilitation data in support of the LTPP program,
- Status change forms for rehabilitated LTPP test sections. These forms are provided in attachment A to this directive, along with the instructions for completing the forms.
- Data sheets to be used to record maintenance and rehabilitation activities at LTPP test sections, along with the instructions for completing the data sheets, are included in attachment B to this directive. These data sheets address a comprehensive range of potential maintenance and rehabilitation activities – they represent a compendium of data sheets developed and compiled over the life of the LTPP program, with updates and

improvements implemented, as needed. It is recognized that these data sheets may need to be revised or that new data sheets may need to be introduced to address elements not covered by this directive. Accordingly, updates to the directive in the future are possible.

MAINTENANCE GUIDELINES

Maintenance activities include seal coats, crack sealing, patching, joint sealing, grinding, milling less than 25 mm (1 inch) 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.

Maintenance performed on LTPP test sites will influence the results of the pavement performance studies. However, some maintenance must be performed on the test sites to keep the pavements in a safe and serviceable condition. Also, some of the test sites have been in service for many years and have already been subjected to some form of maintenance. Changing the types and level of maintenance or eliminating maintenance on a section during the field monitoring program may bias the results.

The maintenance guidelines stated here were developed to allow the application of the same routine maintenance that a study site would have normally received if it had not been selected as a monitoring site, while limiting the use of treatments that influence the structural response of the pavement. The limitations on maintenance activities 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 is not affected by these guidelines.

The objective of these guidelines is to define the extent of preventive or routine maintenance which is representative of participating agencies' practices that should be performed on the monitoring sections. It is desired that the monitoring sections receive maintenance attention in response to an observed pavement need, without consideration to their designation as LTPP test sites.

A maintenance control zone was established around each LTPP 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.

For GPS test sections the maintenance control zone is located adjacent to the ends of the test section as shown in Figure 1. For SPS projects, which generally consist of multiple test sections, the maintenance control zone is established prior to the first test section and is terminated after the last project test section. For SPS sites with a test section(s) located more than 1.6-km (1-mile) apart the maintenance control zone should be established for each group of test sections.

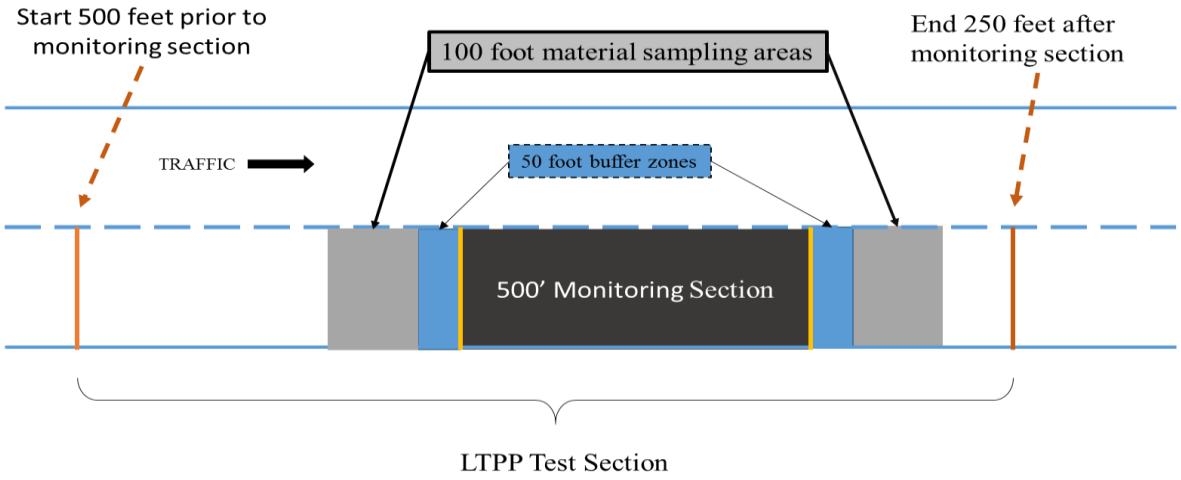

Figure 1. Illustration. Typical GPS test section.

Coordination with LTPP Regional Coordination Office (RCO)

The LTPP RCO must be advised in advance of any maintenance operation that will cover the pavement surface and "hide" distresses in the control zone or change the structural characteristics of the pavement.

Maintenance Records

Details of all maintenance activities performed on LTPP test sections should be recorded on the data forms established by LTPP. These forms can be obtained from the LTPP RCO and should be completed and returned to the RCO as soon as practical following a maintenance treatment.

Procedures and Materials

All maintenance treatments should be performed using the highway agency's standard procedures and materials.

Safety Related Maintenance

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 RCO in advance of any corrective action so that an observation of the pavement condition prior to application of the treatment can be made.

Routine or Preventive Maintenance

Some types of "routine" or "preventive" maintenance activities that may be performed on the LTPP monitoring sections include crack sealing, joint cleaning/sealing, and isolated spot pavement repairs. These activities may be performed without prior notification of the LTPP RSC.

Other Maintenance

Other types of maintenance activities that may be performed on the LTPP monitoring sections include application of the following:

- Milling less than 25-mm (1 inch) deep.
- Surface grinding.
- Sand seal.
- Chip seal.
- Aggregate seal.
- Slurry seal.
- Fog seal.

Since the application of these types of treatments hide the pavement surface or alter the surface profile, their placement should be coordinated with the LTPP RCO prior to conduct of the work. Some lead time is needed in these circumstances to allow LTPP RCO staff to visit the site and document the surface condition prior to application of the treatments.

REHABILITATION GUIDELINES

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

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:

- Test section reconstruction.
- Widening of the LTPP test lane.
- Added lane next to the LTPP test lane.
- Application of tied concrete shoulders to the test lane.
- Application of treatments which hide previous pavement distress without prior notification to the LTPP program. Test sections that had a distress survey performed within six months prior to application of such treatment are still candidates for monitoring continuation.
- Removal of all of the bound non-base pavement layers.

- Application of treatments that result in a non-uniform thickness of bound pavement layers. Non-uniform" is defined as a variance exceeding 25mm (1 inch) for at least one third of the test section.

- Construction of an intersection within test section boundaries.

- Addition of exit ramps, entrance ramps, driveways, or other structures that cause new non-uniform traffic movements along the test section.

- Placement of subsurface utilities within the test section boundaries that require cutting through the pavement surface.

All other rehabilitation construction activities performed at existing LTPP test sections will be considered for monitoring continuation. Monitoring of test sections in the program after rehabilitation will only be done:

- If approved by FHWA,

- Provided agency notifies the LTPP program in advance of the treatment so that monitoring measurements can be performed prior to construction,

- Agency agrees with monitoring continuation, and

- Plan for continued monitoring developed by LTPP data collection contractor in concert with the responsible highway agency is accepted by FHWA.

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 LTPP data collection contractor 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 the study after a rehabilitation treatment, it is important that appropriate LTPP rehabilitation forms be completed to document the treatment application.

Experimental Designations for Rehabilitated Pavement Structures

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

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

> *Suffix A* – Designates pavement structures which were rehabilitated with a single asphalt concrete 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 asphalt concrete overlay using conventional hot-mix asphalt 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 recycle, rubberized wet process, and asphalt additives) in the hot-mix asphalt 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 that receives another asphalt concrete overlay using conventional hot-mix asphalt 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 was subjected to a crack and seat or break and seat treatment in combination with placement of any type of hot mix asphalt overlay.

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

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

Suffix W – Designates pavements receiving an asphalt layer that incorporates WMA technology that falls into four categories: chemical additive, organic additive, forming additive, and foaming process.

For the purposes of designation, the definitions of CPR, Debond Interlayer, Fracture, Structural Milling, Asphalt Modifiers, and WMA are as follows:

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.

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

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.

WMA – Warm Mix Asphalt is dense graded asphalt concrete mixture that incorporates the following four technologies:

Chemical Additives are defined as water-free (non-aqueous) chemistry packages that modify the AC binder properties to enhance coating, adhesion, and workability at reduced temperatures. This includes surfactants, fatty-acid chemical additives, cationic surface-active agents, and rheology modifiers.

Organic Additives are plant-based, wax-based, or sulfur-extended materials designed to provide viscosity reduction, aid in asphaltenes dispersion, and act as a lubricant at mixing temperatures below that of standard HMA.

Foaming Additives are defined as water-containing materials added to the mixture to foam the asphalt. The most common foaming additive is synthetic zeolite. Zeolite contains 20-30% water that is released at temperatures above the boiling point of water. The water from the zeolite foams the asphalt binder.

The ***Foaming Process*** category includes all WMA types that utilize assemblies/modifications to the plant to foam AC binder without additives. This includes foaming nozzles, expansion chambers, vortex mixers, and shearing devices. While the other categories may be added to the mix using some type of nozzle or other addition, the key distinction between the Foaming Process category and others is the absence of additives. WMA technologies that fall into the Foaming Process category only utilize water.

It should be noted that production and compaction temperatures will be recorded in the rehabilitation forms. However, temperature is not used in the definition of WMA for purposes of the GPS-6W or GPS-7W experiments. Mixtures containing the four WMA technology categories described above are candidates for the GPS-6W or GPS-7W, regardless of the production/compaction temperatures.

Classification of Rehabilitated Test Sections

When an agreement between the participating highway agency and LTPP program has been reached to continue monitoring of a rehabilitated test section, the rehabilitated pavement structure shall be classified in accordance with the experimental designation shown in table 1. Details of these classifications are provided in the following portions of this document based on the test section's current LTPP classification and pavement structure type.

Table 1. Classification of rehabilitated LTPP test sections

Existing Class and Pavement Type	Pretreatment	Overlay	New Class
	None, or Maintenance and Repair	Conventional AC	GPS-6B
		Modified AC	GPS-6C
	Structural Milling, Fabric	Any AC	GPS-6S
	Any	WMA	GPS-6W

AC *GPS-1* *GPS-2* *SPS-1* *SPS-3 (Non-overlay)* *SPS-8 (AC)* *SPS-9 (New)*	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
	Fabric	Any AC	GPS-7S
	Any	WMA	GPS-7W
	Debonding Layer	JPCP, JRCP, CRCP	GPS-9
AC over AC *GPS-6* *SPS-3 (Overlay)* *SPS-5* *SPS-9 (Overlay)* SPS-10	None, or Maintenance and Repair	Conventional AC	GPS-6D
		Modified AC	GPS-6C
	Structural Milling, Fabric	Any AC	GPS-6S
	Any	WMA	GPS-6W
AC over PCC *SPS-6* *SPS-9C, 9J* *GPS-7*	None	Conventional AC	GPS-7D
		Modified AC	GPS-7C
	Structural Milling, CPR, and/or Fabric	Any AC	GPS-7S
	Any	WMA	GPS-7W
	None, Milling + Debonding Layer	PCC	GPS-9

Rehabilitation of GPS-1, GPS-2, SPS-1, SPS-3 (Non-Overlay), SPS-8 (AC), SPS-9 (New Construction), or SPS-10 (WMA) 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, SPS-9 test sections which are either newly constructed or reconstructed at the start of the LTPP monitoring period and SPS-10 test sections which are newly constructed with a WMA surface layer.

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.

Test sections rehabilitated with a WMA will be classified in GPS-6W. 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

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.

Test sections rehabilitated with a WMA will be classified in GPS-7W.

Rehabilitation of GPS-6, SPS-3 (Overlay), SPS-5, SPS-9 (Overlay), and SPS-10 (WMA) 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.

Test sections rehabilitated with a WMA will be classified in GPS-6W.

Rehabilitation of GPS-7, SPS-6 (Overlay) or SPS-10 (WMA) 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 with a WMA will be classified in GPS-7W.

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

Rehabilitated of GPS-9 Test Sections

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

Approved by:

JEAN NEHME

Digitally signed by JEAN NEHME
DN: c=US, o=U.S. Government, ou=FHWAHQ, ou=DOT Headquarters, cn=JEAN NEHME
Date: 2018.03.09 10:07:51 -05'00'

Jean Nehme
LTIP Team Leader

ATTACHMENT A: STATUS CHANGE FORMS

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 the section will continue to be monitored, IMS Form 1, Test Section Status Change Request, shall be completed and submitted by the RSC. The experiment designations presented in this directive shall be followed for the proposed new experiment designation. IMS Form 1is covered in a separate directive, the most current version of which can be found on InfoPave.

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 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 that 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 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 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. [(2)] 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.

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 _____

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.

Estimated Rehabilitation Construction Start Date (Item 1): Provide the best available estimate of the planned date for start of rehabilitation construction. Estimates to the nearest month are acceptable.

Proposed Rehabilitation Treatments (Item 2): Check applicable boxes to indicate if the rehabilitation event is an overlay (with associated pretreatments), shoulder restoration, or something else. If the activity is an overlay, please provide overlay thickness. When "other" is selected, please provide further details as necessary. Attach additional pages if more space is needed.

Overlay Materials (Item 3): If the rehabilitation event is an overlay, please indicate the type of material used for the overlay surface. If a material other than those listed is used, select "other", and provide details on the material used.

Pre-Rehabilitation Treatments (Item 4): Check applicable boxes which describe all of the pre-rehabilitation treatment activities planned for the test section. Separate types of treatments are included for AC and PCC pavements. If the structure to be rehabilitated is an existing AC overlay on a PCC type pavement, also mark any of the treatment activities planned for the PCC layer listed under this item. Provide entries for milling thickness and de-bond layer type, as applicable.

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 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 (Item 7): Check all 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 (Item 8): A highway agency official and the responsible RSC engineer submitting this information must sign the form in the indicated spaces.

Attached number of pages (Item 9): Indicate the number of pages of supplemental information included in the data form submission in the space provided.

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

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

2. Proposed rehabilitation treatments
   - ☐ Overlay – Thickness [_____]mm
   - ☐ Shoulder Restoration
   - ☐ Other [_____]

3. Overlay material
   - ☐ Conventional virgin HMA mixture ☐ Recycled HMA mixture ☐ HMA with modified binder
   - ☐ WMA mixture ☐ Plain jointed PCC ☐ Jointed reinforced PCC
   - ☐ Continuously reinforced PCC ☐ Saw and seal HMA Overlay layer
   - ☐ Other [_____]

4. Pre-overlay treatments

   AC Surfaces
   - ☐ None ☐ Patching ☐ Heater-Scarification
   - ☐ Fabric ☐ Milling – Total Depth - ____mm

   PCC Surfaces
   - ☐ None ☐ Partial Depth Patching ☐ Undersealing
   - ☐ Crack/Break and Seat ☐ Rubblization ☐ Load Transfer Restoration
   - ☐ Full Surface Diamond Grinding ☐ Retrofitted Subsurface drainage system
   - ☐ Full Depth patching and joint/crack replacement
   - ☐ Debond Interlayer: Type [_____]

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)	[__ __ __ / __ __ __ __]	[__ __ __ / __ __ __ __]

7. 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

8. 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 [__ __]

ATTACHMENT B: MAINTENACE AND REHABILITATION DATA SHEETS

This attachment provides the data sheets necessary for the collection of data associated with maintenance and rehabilitation activities not associated with initial experimental activities. These data sheets completely replace previously developed maintenance and rehabilitation forms.

The following new LTPP maintenance and rehabilitation data sheets have been developed.

Table 2. List of LTPP Maintenance/Rehabilitation Data Sheets and Titles

Data Sheet Number	Data Sheet Title
M&R Data Sheet 1	IMPROVEMENT LISTING
M&R Data Sheet 2	LAYER
M&R Data Sheet 3	FIELD THICKNESS
M&R Data Sheet 4	QC MEASUREMENTS
M&R Data Sheets 5- 7	AC AGGREGATE PROPERTIES
M&R Data Sheet 8	AC BINDER
M&R Data Sheet 9	AC, DSR, BBR, DIRECT TENSION
M&R Data Sheet 10	RAP
M&R Data Sheet 11- 12	PMA LAB MIX DESIGN
M&R Data Sheet 13	PMA LAB MIX DESIGN WARM MIX
M&R Data Sheet 14- 15	PMA MIX PROP
M&R Data Sheet 16	SUPERPAVE MIXTURE PROPERTIES
M&R Data Sheet 17-18	PMA CONSTRUCTION
M&R Data Sheet 19	HEATER SCARIFICATION SURFACE RECYCLED AC
M&R Data Sheet 20	AC SHOULDER RESTORATION
M&R Data Sheet 21	SUBDRAINAGE RETROFIT
M&R Data Sheet 22	PCC AGGREGATE PROPERTIES
M&R Data Sheet 23	PCC MIX DESIGN
M&R Data Sheet 24	PCC STRENGTH
M&R Data Sheet 25	PCC CONSTRUCTION
M&R Data Sheet 26	PCC CONSTRUCTION - OVERLAY
M&R Data Sheet 27-28	PCC JOINT DATA
M&R Data Sheet 29	PCC REINFORCING STEEL DATA
M&R Data Sheet 30	PCC SHOULDER RESTORATION
M&R Data Sheet 31-32	SUBSEALING PCC PAVEMENT
M&R Data Sheet 33-34	LOAD TRANSFER RESTORATION
M&R Data Sheet 35	CRACK AND SEAT PCC PAVEMENT
M&R Data Sheet 36-38	SEAL COAT APPLICATION DATA
M&R Data Sheet 39	MILLED SECTIONS
M&R Data Sheet 40	PATCHING AC SURFACES
M&R Data Sheet 41	CRACK SEALING AC SURFACES
M&R Data Sheet 42	DIAMOND GRINDING
M&R Data Sheet 43-46	PATCHING PCC SURFACES
M&R Data Sheet 47-48	JOINT SEALANT APPLICATION DATA
M&R Data Sheet 49	PCC PENETRATING SEALER APPLICATION DATA
M&R Data Sheet 50	CRACK SEALING PCC SURFACES

DATA SHEETS TO BE COMPLETED

For each activity or group of activities, Data sheet 1 should be completed. For each activity or group of activities that result in the addition of a layer, or a change in layer thickness or properties, Forms 2-4 should be completed if possible.

In addition, for each specific type of treatment (or work type) the appropriate data sheets should be completed as shown in Table 3. A few work type codes presented in appendix A, table A.17 are not listed in Table 3 for various reasons. Type 18 (reconstruction) results in a section going out of study, and is therefore not an allowed treatment. Types 17, 49, and 57 are not common and do not have specific data sheets or associated database tables – if these activities occur, and data is available, contact the TSSC to determine how best to collect and record that data. When the code of 53 (other) is used, data should be recorded on any applicable forms to the extent possible.

Table 3. Rehabilitation Data Sheets to be Completed.

Work Item	Work Type Code	Data Sheets
Crack Sealing	1	41(AC), 50(PCC)
Transverse Joint Sealing	2	47-48
Lane-Shoulder, Longitudinal Joint Sealing	3	47-48
Full Depth Joint Repair Patching of PCC	4	43-46
Full Depth Patching of PCC Pavement Other than at Joint	5	43-46
Partial Depth Patching of PCC Pavement Other than at Joint	6	43-46
PCC Slab Replacement	7	43-46
PCC Shoulder Restoration	8	30
PCC Shoulder Replacement	9	30
AC Shoulder Restoration	10	20
AC Shoulder Replacement	11	20
Grinding/Milling Surface	12	39 or 42
Grooving Surface	13	42
Pressure Grout Subsealing	14	31-32
Slab Jacking Depressions	15	31-32
Asphalt Subsealing	16	31-32
Asphalt Concrete Overlay	19	5-9, 11-12, 14-18
Portland Cement Concrete Overlay	20	22-29
Mechanical Premix Patch (using motor grader and roller)	21	40
Manual Premix Spot Patch (hand spreading and compacting with roller)	22	40
Machine Premix Patch (placing premix with paver, compacting with roller)	23	40
Full Depth Patch of AC Pavement (removing damaged material, repairing supporting material, and repairing)	24	40
Patch Pot Holes – Hand Spread, Compacted with Truck (no. of holes)	25	40
Skin Patching (using spreader and distributor to apply hot liquid asphalt and aggregate)	26	40
Strip Patching (using spreader and distributor to apply hot liquid asphalt and aggregate)	27	40
Surface Treatment, single layer	28	5-9, 36-38
Surface Treatment, double layer	29	5-9, 36-38
Surface Treatment, three or more layers	30	5-9, 36-38
Aggregate Seal Coat	31	5-9, 36-38

Work Item	Work Type Code	Data Sheets
Sand Seal Coat	32	5-9, 36-38
Slurry Seal Coat	33	5-9, 36-38
Fog Seal Coat	34	8-9, 36-38
Prime Coat	35	8-9, 36-38
Tack Coat	36	8-9, 36-38
Dust Layering	37	5-9, 36-38
Longitudinal Subdrains	38	21
Transverse Subdrainage	39	21
Drainage Blankets	40	21
Well System	41	21
Drainage Blankets with Longitudinal Drains	42	21
Hot-Mix Recycled Asphalt Concrete	43	5-12, 14-18
Cold-Mix Recycled Asphalt Concrete	44	5-12, 14-18
Heater Scarification, Surface Recycled Asphalt Concrete	45	19
Crack and Seat PCC Pavement as Base for New AC Surface	46	35
Crack and Seat PCC Pavements as Base for New PCC Surface	47	35
Recycled Portland Cement Concrete	48	22-29
Joint Load Transfer Restoration in PCC Pavements	50	33-34
Mill Off Existing Pavement and Overlay with AC	51	39, 5-18
Mill Off Existing Pavement and Overlay with PCC	52	39, 22-29
Partial Depth Patching of PCC Pavement at Joints	54	42-45
Mill Off Existing Pavement and Overlay with Hot-Mix Recycled Asphalt Concrete	55	39, 5-12, 14-18
Mill Off Existing Pavement and Overlay with Cold-Mix Recycled Asphalt Concrete	56	39, 5-12, 14-18
Mill Off Existing AC Pavement and Overlay With WMA	58	39, 5-9, 12-18
Warm Mix Asphalt Overlay	59	5-9, 12-18
Warm Mix Asphalt with RAP and/or Recycled Asphalt Shingles (RAS)	60	5-18
Mill Existing Pavement and Overlay with Warm Mix Recycled AC	61	39, 5-18

Completion of Data Sheets

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 enough data to accurately define the treatment. When the data element is not applicable to or represents something that does not exist on the test section, enter an "N" to indicate that the data element is not applicable. If the data element is applicable, but the value is unknown (i.e., not available in project records), enter a "U" to indicate that the value is unknown. Many data items will require codes to be entered. Unless otherwise noted in the following instructions, the codes are listed or referenced on the data sheets.

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

It is anticipated that LTPP maintenance data will be collected from several possible sources of information.

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 SHA, AASHTO or industry standard. If no specific records of this type are available for a project, the most likely source for this data would be an applicable specification. It can be assumed that if the work performed 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.

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.

DESCRIPTION OF MAINTENANCE/REHABILITATION DATA SHEETS

The following provides a description of each available Maintenance/Rehabilitation Data Sheet.

Improvement Listing (Sheet 1)

This data sheet is to be completed each time construction 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)

Work Quantity (Item 3): The quantity of work applied to the section in appropriate units (appendix A, table A.17)

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

Layer (Sheet 2)

The data on this data sheet provide key information as to the structure of the pavement when it is re-opened to traffic after the maintenance or rehabilitation event. This sheet is to be filled out from project records for any event that results in the addition of a new layer (seal coats and overlays), or significant alteration of an existing layer (milling, grinding, etc.). As all subsequent data sheets refer back to this one, special care should be taken in establishing the layering.

Individual data elements are as follows:

Layer Number (Item 1): Space is provided for up to 9 layers. If more than 9 layers are needed, please use an additional copy of the sheet. Layer numbering begins at the bottom of the structure and increases moving to the top of the structure. Therefore, the subgrade is always layer number 1 and the last (and largest) number identifies the surface layer.

Layer Description (Item 2): A layer description code identifying the function of the layer within the pavement structure is to be entered for each of the layers in the system. Codes are provided on Data Sheet 2. For asphalt concrete (AC) layers, separate lifts of the same mixture are not to be identified as separate layers.

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

Material Type Classification (Item3): A code identifying the type of material used in each layer of the pavement structure, including the subgrade should be entered for material type classification. Codes for surfacing materials, base and subbase materials, subgrade soils, and thin seals and interlayers are identified in tables A.5, A.6, A.7, and A.8, respectively.

Layer Thickness (Item 4): Four numbers can be provided to indicate the Mean, Minimum, Maximum, and Standard Deviation of thickness for each specific layer in inches (enter to the nearest tenth of an inch (0.1 in.)). If only a single specified design value for thickness is available from project records, enter it as the "mean value."

Field Thickness (Sheet 3)

This data sheet is used to record the results of the layer thickness measurements within the test section from before and after elevation measurements. This data is unlikely to be available for most rehabilitation events, but should be provided when available.

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

QC Measurements (Sheet 4)

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

Individual data elements are as follows:

Nuclear Density Measurements (Item 1): Space is provided for entry of the results of nuclear density tests on the binder course and surface course layers. Enter information only for the layers on the test sections that were tested. For each layer tested, enter the measurement method (backscatter, direct transmission, air gap), the number of measurements, the average, maximum, minimum and standard deviation of the density measurements (pounds per cubic foot), and the corresponding layer number from Maintenance/Rehabilitation Data Sheet 2.

Manufacturer of Nuclear Density Gauge (Item 2): Indicate the name of the manufacturer of the nuclear density gauge used for the reported measurements.

Nuclear Density Gauge Model Number (Item 3): Enter the manufacturer's model designation of the gauge used.

Nuclear Density Gauge Identification Number (Item 4): Enter the identification number of the nuclear density gauge used.

Nuclear Gauge Count Rate for Standardization (Item 5): Enter the gauge count rate used for standardization.

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

Surface Profile Used as Basis of Incentive Payment (Item 7): This is a yes or no field to indicate if the surface profile was or was not used as a contractual basis for incentive payments to the construction contractor.

AC Aggregate Properties (Sheet 5)

This data sheet provides information regarding asphalt aggregate properties. This data is to be filled out from project records on Maintenance/Rehabilitation Data Sheets 5, 6 and 7. This data sheet should be filled out for all newly placed layers with layer type = 'AC' to the extent possible. This includes new overlay layers of all types, and seal coats that use aggregate such as chip seals and slurry seals.

Individual data elements are as follows:

Layer Number (Item 1): The number of the layer for which the data on this sheet is being provided (from Maintenance/Rehabilitation Data Sheet 2).

Type of Aggregate (Item 2): The type of aggregate used as identified by one of the codes appearing on the data sheet.

Composition of Coarse Aggregate (Items 3, 4, and 5): 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 6): 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 7, 8, and 9): 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 10): The type of mineral filler used as identified by one of the codes appearing on the data sheet.

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

AC Aggregate Properties (Continued) (Sheet 6)

This data sheet is a continuation of the data on Maintenance/Rehabilitation Data Sheet 5.

Individual data elements are as follows.

Layer Number (Item 1): The number of the layer for which the data on this data sheet is being provided (from Maintenance/Rehabilitation Data Sheet 2).

Type of Aggregate (Item 2): The type of aggregate used as identified by one of the codes appearing on the data sheet.

Polish Value of Coarse Aggregates (Item 3): The accelerated polish value of the coarse aggregates used in the surface layer, as determined by AASHTO T279 (ASTM D3319).

Angularity Coarse One Face (Item 4): The coarse aggregate angularity for aggregates with one or more faces.

Angularity Coarse Two Faces (Item 5): The coarse aggregate angularity for aggregates with two or more faces.

Angularity Fine (Item 6): The angularity for fine aggregate.

Soundness Coarse (Item 7): The coarse aggregate soundness.

Soundness Fine (Item 8): The fine aggregate soundness.

Coarse Aggregate Toughness (Item 9): The toughness of coarse aggregate.

Deleterious Materials (Item 10): The estimate of percentage of deleterious materials.

Clay Content (Item 11): The clay content determined by the use of the Sand Equivalent.

Thin Elongated Particles (Item 12): The percentage by weight of aggregate that have a maximum to minimum dimension of greater than 5.

Gradation of Combined Aggregates (Item 13): 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.

AC Aggregate Properties (Continued) (Sheet 7)

This data sheet is a continuation of the data on Maintenance/Rehabilitation Data Sheets 5 and 6.

Individual data elements are as follows.

Layer Number (Item 1): The number of the layer for which the data on this data sheet is being provided (from Maintenance/Rehabilitation Data Sheet 2).

Type of Aggregate (Item 2): The type of aggregate used as identified by one of the codes appearing on the data sheet.

Absorption of Aggregate (Items 3 and 4): The absorption of aggregates (to the nearest thousandth (0.001)) for coarse aggregate (Item 3) and fine aggregate (Item 4). The absorption of aggregates can be determined using AASHTO T85 and ASTM C127 (coarse aggregate) or AASHTO T84 and ASTM C128 (fine aggregate).

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

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

Figure 2. Equation. Bulk specific gravity for the total aggregate.

where:

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

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

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

Figure 3. Equation. Effective specific gravity of aggregate.

where:

G_{se}	=	Effective specific gravity of aggregate
P_b	=	Asphalt cement, percent by total weight of mixture
G_b	=	Specific gravity of asphalt
G_{mm}	=	Maximum specific gravity of paving mixtures (no air voids)

Theoretical Maximum Specific Gravity of the RAP/RAS (Item 10): The theoretical maximum specific gravity for the aggregate combination of the reclaimed asphalt shingles.

AC Binder (Sheet 8)

This data sheet provides information regarding asphalt binder properties for each layer. The sheet should be completed for each new layer that uses asphalt binder where the data is available. A new data sheet should be filled out for each type of binder that is used in the layer (Virgin, RAP, RAS and Combined.).

Individual data elements are as follows:

Layer Number (Item 1): The number of the layer for which the data on this data sheet is being provided (from Maintenance/Rehabilitation Data Sheet 2).

Type of Binder (Item 2): The type of binder used as identified by one of the codes appearing on the data sheet.

Asphalt Grade (Item 3): The PG of performance graded binders. If a PG Binder was not used, enter "N".

Asphalt Grade (Item 4): The grade of asphalt cement used (see table A.16 of appendix A) prior to addition of WMA technology. Space is provided on the data sheet for identifying another grade of asphalt cement not appearing in table A.16.

Source (Item 5): The refinery that produced the asphalt cement used in the WMAC layer being described. If PG Grading was not used, leave this field null. A list of asphalt

refiners and processors is provided in table 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 6): The specific gravity of the asphalt cement (to the nearest thousandth (0.001)) when it is available. If unavailable, a typical specific gravity for asphalt cements produced at the source refinery may be entered. This specific gravity is measured as specified by AASHTO T228 (ASTM D70).

Viscosity of Asphalt at 140°F (Item 7): The result in poises from absolute viscosity testing using Test Method AASHTO T202 (ASTM D2171) on samples of the original asphalt cement prior to its use in construction of the pavement section and prior to addition of WMA technology.

Viscosity of Asphalt at 275°F (Item 8): The results in centistokes (to the nearest hundredth (0.01)) from kinematic viscosity testing using Test Method AASHTO T201 (ASTM D2170) on samples of the original asphalt cement and prior to addition of WMA technology.

Penetration at 77°F (Item 9): 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 and prior to addition of WMA technology.

Asphalt Modifiers (Items 10 and 11): Space is provided to list the type and quantity of up to two modifiers added to the asphalt cement for whatever purpose. A list of possible asphalt cement modifiers and codes for data entry are provided in table 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. WMA technologies are not to be considered modifiers.

Ductility at 77°F (Item 12): The ductility in centimeters at 77°F (25°C) using Test Method AASHTO T51 (ASTM D113) and prior to addition of WMA technology.

Ductility at 39.2°F (Item 13): The ductility in centimeters at 39.2°F (4°C), using the procedures of Test Method AASHTO T51 (ASTM D113) and prior to addition of WMA technology.

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

Penetration at 39.2°F (Item 15): 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 and prior to addition of WMA technology.

Ring and Ball Softening Point (Item 16): 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 and prior to addition of WMA technology.

AC DSR, BBR, Direct Tension (Sheet 9)

This data sheet provides information for Dynamic Shear Rheometer, Bending Beam Rheometer, and Direction Tension properties for each layer. The sheet should be completed for each new layer that uses asphalt binder where the data is available. The sheet can be filled out multiple times for a single layer for binder from different sources.

Individual data elements are as follows:

Layer Number (Item 1): The number of the layer for which the data on this data sheet is being provided (from Maintenance/Rehabilitation Data Sheet 2).

Type of Binder (Item 2): The type of binder used as identified by one of the codes appearing on the data sheet.

Dynamic Shear Rheometer Complex Modulus and Phase Angle (Item 3): The dynamic shear complex modulus reported to the nearest hundredth kilopascal (0.01 kPa) for the tank processed asphalts and the phase angle reported to the nearest degree.

Dynamic Shear Rheometer Complex Modulus and Phase Angle (Item 4): The dynamic shear complex modulus reported to the nearest hundredth kilopascal (0.01 kPa) for the rolling thinned film of RTFO-processed asphalts and the phase angle reported to the nearest degree.

Dynamic Shear Rheometer Complex Modulus and Phase Angle (Item 5): The dynamic shear complex modulus reported to the nearest hundredth kilopascal (0.01 kPa) for the pressure aged vessel processed asphalts and the phase angle reported to the nearest degree.

Bending Beam Rheometer Stiffness Modulus and Slope (Item 6): The stiffness modulus reported to the nearest megapascal and the slope reported to the nearest thousandth (0.001).

Direct Tension Tensile Strength and Tensile Strain (Item 7): The tensile stress reported to the nearest tenth of kilopascal (0.1 kPa) and the percent strain to the nearest hundredth percent (0.01 percent).

RAP (Sheet 10)

This data sheet provides information regarding recycled asphalt pavements and reclaimed asphalt shingles. The sheet should be filled out for each new layer that uses RAP or RAS. If RAP (1) is included in the mix, items 3, 4, 6 and 7 should be completed. If the mix includes RAS (2), items

5, 6 and 7 should be completed. If the mix includes both RAP and RAS, then a separate sheet should be completed for each.

Individual data elements are as follows:

Layer Number (Item 1): The number of the layer for which the data on this data sheet is being provided (from Maintenance/Rehabilitation Data Sheet 2).

Type of Aggregate (Item 2): The type of aggregate used as identified by one of the codes appearing on the data sheet. If RAP or RAS were not used, enter an 'N' in this field.

Procedure Used to Break Up and/or Remove the RAP (Item 3): A code to indicate the procedure used for removal of the asphalt pavement to be recycled. Codes are provided on the data sheet. Additionally, space is provided to describe a different type of procedure if none of those for which codes are provided was used.

RAP Processing (Item 4): A code, as provided on the data sheet, to indicate how the pavement material was processed after removal.

Type of RAS (Item 5): Type of reclaimed asphalt shingles used in the mixture.

Percent of Binder in the RAP/RAS by Mass (%) (Item 6): The percent of binder in the RAP.

RAP Additive (Item 7): A yes or no field to indicate whether an additive was added to the RAP stockpile to maintain workability. If an additive was added, what quantity in percentage by mass. Also enter the type of additive that was used.

PMA Laboratory Mix Design (Sheet 11)

Sheets 11 and 12 provide information regarding AC laboratory mixture design. This sheet should be filled out for all new AC layers where an AC mix design information is available.

Individual data elements are as follows:

Layer Number (Item 1): The number of the layer for which the data on this data sheet is being provided (from Maintenance/Rehabilitation Data Sheet 2).

Maximum Specific Gravity (Item 2): The maximum specific gravity (to the nearest thousandth (0.001)), calculated using **Error! Reference source not found.** and figure 4.

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

Figure 4. Equation. Maximum specific gravity of paving mixture.

where:

G_{mm}	=	Maximum specific gravity of paving mixture (no air voids)
P_s	=	Aggregate, percent by total weight of mixture
G_{se}	=	Effective specific gravity of aggregate
P_b	=	Asphalt, percent by total weight of mixture
G_b	=	Specific gravity of asphalt

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

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

Percent 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. Figure 5 may be used for calculating the percent air voids.

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

Figure 5. Equation. Air voids in compacted mixture.

where:

P_a	=	Air voids in compacted mixture, percent of total volume
G_{mm}	=	Maximum specific gravity of paving mixture (zero air voids) as determined by ASTM D2041
G_{mb}	=	Bulk specific gravity of compacted mixture

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

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).

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

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

Figure 6. Equation. Voids in mineral aggregate.

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 12): 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:

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

Figure 7. Equation. Percent absorbed asphalt.

where:

P_{ab}	=	Absorbed asphalt, percent by weight of total mixture
P_{ba}	=	Absorbed asphalt, percent by weight of aggregate
P_s	=	Aggregate, percent by total weight of mixture
G_{se}	=	Effective specific gravity of aggregate
G_{sb}	=	Bulk specific gravity of aggregate
G_b	=	Specific gravity of asphalt

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

Gyration Ratio: (Item 14): The gyration ratio measured. The recommended compactability criterion is the gyration ratio should be less than or equal to 1.25. The gyration ratio is calculated as follows:

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

Figure 8. Equation. Gyration ratio.

where:

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

Asphalt Grade (Item 15): Enter the code for the asphalt grade used in asphalt mixtures, if available. (See asphalt code sheet table A.16 in appendix A).

Hamburg Wheel Tracking Test Conditioning (Item 16): The condition of the Hamburg Wheel Tracking Test.

Deformation at 20,000 passes (Item 17): The deformation measurement at 20,000 passes during the Hamburg Wheel Tracking Test measured in inches.

Test Temperature (Item 18): The temperature used during the Hamburg Wheel Tracking Test in degrees of Fahrenheit.

Tensile Strength Ratio (AASHTO T283) (Item 19): Percentage of Tensile Strength Ratio using AASHTO T283.

PMA Laboratory Mix Design (Continued) (Sheet 12)

The data on this data sheet is a continuation of the information from Maintenance/Rehabilitation Data Sheet 11.

Individual data elements are as follows:

Layer Number (Item 1): The number of the layer for which the data on this data sheet is being provided (from Maintenance/Rehabilitation Data Sheet 2).

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

Flow Number Temperature (Item 3): The flow number temperature in degrees Fahrenheit.

Planned Production Temperature (Item 4): The planned production temperature of the asphalt mixture in degrees Fahrenheit.

Planned Field Compaction Temperature (Item 5): The planned field compaction temperature in degrees Fahrenheit.

Design Asphalt Binder Content of Mix Without RAS/RAP (Item 6): The percentage of asphalt binder content without RAS or RAP.

Percent RAS in Mixture (Item 7): The percentage of reclaimed asphalt shingles in the mixture.

Percent Shingle Asphalt Binder in RAS (Item 8): The percentage of shingle asphalt binder in the reclaimed asphalt shingles.

Percent RAP in Mixture (Item 9): The percentage recycled asphalt cement in the mixture.

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

Percent of RAP/RAS Binder in the Mix by Mass (Binder Replacement) (Item 11): The amount of binder from RAP/RAS as a percentage of total binder in the mixture (from the mix design.)

Amount of New Untreated Aggregate Added (Item 12): The amount of new untreated aggregate added, to the nearest tenth of a percent (0.1%) of the combined weight of the aggregates in the recycled mixture.

Recycling Agent (Item 13): 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 14): 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).

PMA Laboratory Mix Design –Warm Mix (Sheet 13)

Maintenance/Rehabilitation Data Sheet 13 provides specific warm mix AC design information. The sheet only needs to be filled out for sections that use warm mix asphalt.

Individual data elements are as follows:

Layer Number (Item 1): The number of the layer for which the data on this data sheet is being provided (from Maintenance/Rehabilitation Data Sheet 2).

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

Form of WMA Additive (Item 3): The type of WMA technology, as identified on the data sheet, used in the mixture. If the mix is HMA, enter the code for none.

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

Method of Introducing Additive to the Mix (Item 5): The method used to introduce the WMA technology to the mix. If a method other than those provided is used, space is provided to specify the method used. If the mix is HMA, enter the code for none.

PMA Mix Prop (Sheet 14)

Maintenance/Rehabilitation Data Sheets 14 and 15 provide information regarding as placed properties of AC mixtures. This sheet should be filled out for all new AC layers.

Individual data elements are as follows:

Layer Number (Item 1): The number of the layer for which the data on this data sheet is being provided (from Maintenance/Rehabilitation Data 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 figure 3. 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 figure 4.

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 percentages by weight of the total asphalt cement (including that absorbed by the aggregate) in the asphalt mixture to the nearest one-tenth of a percent (0.1%). 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 figure 5.

Voids in Mineral Aggregate (Item 7): The Number of Tests and the Mean, Minimum, Maximum, and Standard Deviation of mean void space between the aggregate particles of a compacted mixture, which includes air voids and the effective asphalt content, to the nearest one-tenth of one percent (0.1%). Percent of VMA is calculated as shown in figure 6.

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 figure 7.

PMA Mix Prop (Continued) (Sheet 15)

The data on this data sheet is a continuation of the data from Maintenance/Rehabilitation Data Sheet 14.

Layer Number (Item 1): The number of the layer for which the data on this data sheet is being provided (from Maintenance/Rehabilitation Data 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.

Type of Asphalt Plant (Item 3): The type of plant that produced the asphalt concrete mixture. Codes are provided on the data sheet.

Type of Antistripping Agent (Item 4): 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 5): 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 6): The amount of antistripping agent used in the mixture by weight to the nearest tenth of a percent of weight of asphalt if the agent is liquid and weight of aggregate if it is solid.

Moisture Susceptibility Test Type (Item 7): The type of test used to evaluate the moisture susceptibility of the asphalt mixture. Codes are provided on the data sheet.

Moisture Susceptibility Test Results (Item 8): Space is provided to record the Hveem Stability Number or Percent Stripped and the Tensile Strength Ratio or Index of Retained Strength, depending on the test procedure used.

Superpave Mixture Properties (Sheet 16)

This data sheet provides information regarding Superpave properties of the mixture as placed. This sheet should be filled out for all new AC layers that were designed using Superpave procedures.

Individual data elements are as follows:

Layer Number (Item 1): The number of the layer for which the data on this data sheet is being provided (from Maintenance/Rehabilitation Data 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 SHRP Designation M-002 in PSI 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)). (Test method ASTM D7312.)

Uniaxial Strain (Item 4): The Axial Stress and percent Strain (SHRP Designation M-003) for each of the three temperatures (39°F, 68°F and 104°F) 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°F, 68°F and 104°F) 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 three temperatures (preferred 39°F, 68°F and 104°F in PSI and the nearest hundredth of a percent strain (0.01%).

PMA Construction (Sheet 17)

Maintenance/Rehabilitation Data Sheets 17 and 18 provide information regarding construction, roller and compaction data of AC layers. This form should be filled out for all new AC layers.

Individual data elements are as follows:

Layer Number (Item 1): The number of the layer for which the data on this data sheet is being provided (from Maintenance/Rehabilitation Data Sheet 2).

Date Operations Began (Item 2): The date paving operations began.

Date Paving Complete (Item 3): The date paving was completed.

Mixing Plant Type (Item 4): The type of mixing plant used. Codes are provided on the data sheet.

Mixing Plant Name (Item 5): Name of the mix plant.

Type of Materials Transfer Equipment Used (Item 6): A code to indicate the type of materials transfer equipment used. Space is also provided to describe some other type of equipment used if none of those for which codes are provided are used. Additionally, there is a space provided to list the brand name of the equipment used.

Tack Coat (Y/N) (Item 7): A yes or no field indicating whether a tack coat was applied.

Tack Coat Type (Item 8): The type of tack coat that was applied. The codes appear in table A.16. Space is provided on the data sheet for identifying another type of tack coat if the types identified in table A.16 are not applicable.

Tack Coat Dilution (Item 9): The dilution of the tack coat in percent asphalt as part of the total

Application Rate (Item 10): The number to record the gallons per square yard (gal/yd^2) of the application rate.

Haul Distance and Time (Item 11): The distance from the plant to the site in miles, and the time from the plant to site in minutes.

Single Pass Laydown Width (Item 12): With of pavement (in feet) the paver lays down in a single pass.

Transverse Joint Location (Item 13): Location in meters from the start of the section to a transverse paving joint.

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

Longitudinal Joint Offset (Item 15): Location (in feet) of the longitudinal joint from the outside shoulder.

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

PMA Construction (Continued) (Sheet 18*)*

The data on this data sheet is a continuation of the data from Maintenance/Rehabilitation Data Sheet 17.

Individual data elements are as follows.

Layer Number (Item 1): The number of the layer for which the data on this data sheet is being provided (from Maintenance/Rehabilitation Data 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.

Plant Exhaust Temperature (Item 3): The plant exhaust temperature in degrees Fahrenheit.

Mean Delivery Temperature (Item 4): The average temperature of mixture during delivery to the site in degrees Fahrenheit.

Laydown Temperatures (Item 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 6-22): 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 23-31): Spaces are provided to enter the compaction data up to four lifts.

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

Air Temperature (Item 29): The ambient temperature measured in 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 the layer is opened to traffic.

Heater Scarification Recycled Asphalt Pavement (Sheet 19)

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 Maintenance/Rehabilitation Data Sheet 2).

Date Scarification Began (Item 2): The month, day and year the heater/scarification operation began.

Date Scarification Complete (Item 3): The month, day and year the heater/scarification operation was completed. Do not include following surface treatment if any.

Type of Heater Scarification (Item 4): A code to indicate what type of heater scarification was employed. Codes appear on the data sheet.

Depth of Scarification (Item 5): 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 Rejuvenating Agent (Item 6): 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 7): 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.

Type of Surface Treatment (Item 8): 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.

Roller Data (Items 9-17): 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 (Items 18 -20): 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 21): The number of days between scarification/re-compaction and addition of surface treatment.

Length of Time Between Surfacing and Opening Road to Traffic (Item 22): The number of days between surface treatment and opening the surface to traffic.

AC Shoulder Restoration (Sheet 20)

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.

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

Date Work Complete (Item 2): The month, day, and year the maintenance activity was completed.

Shoulder Restored (Item 3): A code, provided on the data sheet, to indicate whether the data applies to the inside or outside shoulder.

Total Width (Item 4): The total (paved and unpaved) width of the restored shoulder to the nearest whole number of feet.

Paved Width (Item 5): The total paved width of the restored shoulder to the nearest whole number of feet.

Surface Type (Item 6): The type of restored shoulder surface (See table A.5 of appendix A for codes). A space is also provided for surface types other than that those included in the list.

Surface Thickness (Item 7): The average thickness of the restored shoulder surface at the lane-shoulder edge to the nearest tenth of an inch (0.1 in).

Shoulder Base Type (Item 8): The type of base material used in the restored shoulder (See table A.6, appendix A for codes).

Base Thickness (Item 9): The average thickness of the restored shoulder base at the lane-shoulder edge to the nearest tenth of an inch (0.1 in).

Type of Shoulder Restoration (Item 10): A code to identify the procedure used to restore the shoulder. Codes are provided on the data sheet.

Type of AC Materials (Item 11): The type of AC materials used in the shoulder restoration. Codes are provided on the data sheet.

Thickness of AC Material Removed by Milling (Item 12): If milling was used, the thickness of the AC removal on the shoulder, to the nearest tenth of an inch (0.1 in).

AC Overlay Thickness (Item 13): If an AC overlay was placed on the shoulder, the thickness of the overlay to the nearest tenth of an inch (0.1 in).

Lane/Shoulder Joint Sealant (Item 14): The method used to seal the joint separating the shoulder and traffic lane. Codes are provided on the data sheet.

Type of Joint Sealant (Item 15): A code to indicate whether the sealant used in the longitudinal joint between the shoulder and the traffic lane was poured (molded in place) or preformed (compression-type). Codes are provided on the data sheet.

Lane/Shoulder Joint Sealant Reservoir (Item 16): 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.

Subdrainage Retrofit (Sheet 21)

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.

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

Date Work Complete (Item 2): The month, day, and year the maintenance activity was completed.

Type of Subdrains (Item 3): 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 4): A code to indicate whether the drains are evenly spaced, or localized. Codes are provided on the data sheet.

Primary Purpose of Subdrainage Installation (Item 5): 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.

Type of Drainage Pipe (Item 6): 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 7): 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 8): 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 9): 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 10): 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 11): 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 12): 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 13): 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 14): 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 15): The approximate average distance in feet between adjacent subdrainage outlets.

PCC Aggregate Properties (Sheet 22)

This data sheet provides information regarding PCC aggregate properties. This data is to be filled out to the extent possible for all new PCC layers

Individual data elements are as follows:

Layer Number (Item 1): The number of the layer for which the data on this sheet is being provided (from Maintenance/Rehabilitation Data 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.

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

Aggregate Durability Test Results (Items 11-13): 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 11, 12, and 13) and one (Item 14) for the combination of coarse and fine aggregates. The durability test type codes appear in table A.13 of appendix A.

Bulk Specific Gravities (Items 14 and 15): The bulk specific gravities (to the nearest thousandth (0.001)) for coarse aggregate (Item 14) and fine aggregate (Item 15). 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 using figure 2.

Gradation of Aggregates (Items 16 and 17): 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.

PCC Mix Design (Sheet 23)

This data sheet provides information regarding the mix proportions used for each new PCC layer mixture.

Individual data elements are as follows.

Layer Number (Item 1): The number of the layer for which the data on this sheet is being provided (from Maintenance/Rehabilitation Data 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.

PCC Strength (Sheet 24)

This data sheet is used to provide PCC 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 layer for which the data on this sheet is being provided (from Maintenance/Rehabilitation Data Sheet 4).

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:

$$E_c = 57{,}000\sqrt{f_c}$$

Figure 9. Equation. Modulus of Elasticity.

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.

PCC Construction (Sheet 25)

This data sheet includes information regarding the construction of any new PCC 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 Maintenance/Rehabilitation Data Sheet 2).

Date Paving Began (Item 2): The date the paving operation was started.

Date Paving Complete (Item 3): The date the paving operation was ended

Type of Paver Used (Item 4): 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).

Paver Manufacturer/Model (Item 5): Enter the manufacturer of the paver and the manufacturer's model designation.

Air Temperatures During Placement (Items 6, 7, and 8): 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 9): The number of days the concrete was allowed to cure before opening the pavement to traffic (including construction traffic).

Time Before Sawing Joints (Item 10): The number of hours between the time the concrete was placed and the joints were sawed.

Consolidation of Materials (Item 11): The method used to consolidate the concrete. Space is provided for identifying another method if none of those with codes was used.

Finishing (Item 12): The method used to finish the concrete. Space is provided for identifying another method if none of those with codes was used.

Method Used to Cure Concrete (Item 13): 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 14): The method used to provide texture to the concrete surface. Codes are provided on the data sheet.

PCC Construction - Overlay (Sheet 26)

This data sheet provides basic construction information for PCC overlay events.

Individual data elements are as follows.

Layer Number (Item 1): The number of the PCC overlay layer to be described on this sheet (from Maintenance/Rehabilitation Data 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.

PCC Joint Data (Sheet 27)

Maintenance/Rehabilitation Data Sheets 25 and 26 provide information on the joints used in any newly placed PCC 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 Maintenance/Rehabilitation Data 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.

PCC Joint Data (Continued) (Sheet 28)

This data sheet is a continuation of the data provided on Sheet 26.

Individual data elements are as follows.

Layer Number (Item 1): The number of the PCC overlay for which a description is being provided (from Maintenance/Rehabilitation Data 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.

PCC Reinforcing Steel Data (Sheet 29)

This data sheet provides information regarding the reinforcement used in a newly placed PCC 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 Maintenance/Rehabilitation Data 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.

PCC Shoulder Restoration (Sheet 30)

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.

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

Date Work Complete (Item 2): The month, day, and year the maintenance activity was completed.

Shoulder Restored (Item 3): A code, provided on the data sheet, to indicate whether the data applies to the inside or outside shoulder.

Type of Shoulder System (Item 4): A code to indicate whether the 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.

Total Width (Item 5): The total (paved and unpaved) width of the restored shoulder to the nearest whole number of feet.

Paved Width (Item 6): The total paved width of the restored shoulder to the nearest whole number of feet.

Surface Type (Item 7): The type of restored shoulder surface (See table A.5 of appendix A for codes). A space is also provided for surface types other than that those included in the list.

Surface Thickness (Item 8): The average thickness of the restored shoulder surface at the lane-shoulder edge to the nearest tenth of an inch (0.1 in).

Shoulder Base Type (Item 9): The type of base material used in the restored shoulder (See table A.6, appendix A for codes).

Base Thickness (Item 10): The average thickness of the restored shoulder base at the lane-shoulder edge to the nearest tenth of an inch (0.1 in).

Note that Data Items 11-13 pertain only to JPCP and JRCP shoulders.

Average Joint Spacing (Item 11): Average joint spacing for JPCP or JRCP shoulders to the nearest whole foot.

Skewness of Joints (Item 12): 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 13): Code, provided on the data sheet, to indicate whether the joints in the restored shoulder were constructed to match the joint spacing in the adjacent pavement slab.

Type of Lane/Shoulder Joint (Item 14): A code to identify the type of longitudinal joint present between the travel lane and the shoulder. Codes are provided on the data sheet.

Lane/Shoulder Joint Tie System (Items 15 thru 18): 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 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 shoulder and the traffic lane.

Lane/Shoulder Joint Sealant (Item 19): The method used to seal the joint separating the 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 20): The average Width and Depth of the as-built joint sealant reservoir between the restored shoulder and traffic lane. If butt or keyed joints were used without a sealant reservoir, enter "0.0" in both of the spaces provided.

Type of Joint Sealant (Item 21): A code to indicate whether the sealant used in the longitudinal joint between the 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 22): A code to indicate the type of blocking material used (placed prior to the joint sealant) in the longitudinal joint between the shoulder and the travel lane.

Joint Sealant Backer Dimension (Item 23): If the joint sealant backer material type used in the longitudinal joint between the 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).

Subsealing PCC Pavement (Sheet 31)

This data on Maintenance/Rehabilitation Data Sheet 31 and 32 provide information regarding subsealing operations on PCC pavements.

Individual data elements are as follows.

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

Date Work Complete (Item 2): The month, day, and year the maintenance activity was completed.

Layer Number of PCC Pavement (Item 3): The number of the PCC layer under which subsealing is being performed (from Maintenance/Rehabilitation Data Sheet 2).

Type of Mixture Used in Subsealing (Item 4): 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.

Determination of Area to be Subsealed (Item 5): A code to record the means for determining the required areal extent of the subsealing efforts. Codes are provided on the data sheet.

Asphalt Cement Data (Items 6, 7, and 8): These items are only used when asphalt cement is used for subsealing.

AC Grade (Item 6): A code for the grade of the asphalt cement used. Codes are provided in table A.16 of appendix A.

Penetration at 77F (Item 7): The penetration value for the asphalt cement in tenths of a mm by Test Method AASHTO T49 (ASTM D5).

Ring and Ball Softening Point (Item 7): The ring and ball softening point of the asphalt cement to the nearest degree by Test Method AASHTO T53 (ASTM D36).

Portland Cement Grout Data (Items 9-16): These items are only used when Portland Cement grout is used for subsealing.

Cement Type (Item 9): A code for the type of cement used in the grout. Codes are provided in table A.11 of appendix A.

Cement to Sand Ratio (Item 10): The ratio of cement to sand by weight, to the nearest tenth.

Water Cement Ratio (Item 11): The water to cement by weight, to the nearest hundredth.

Additive Type (Item 12): A code for any additives used in the grout. Codes are provided in table A.12 of appendix A.

Additive Amount (Item 13): The amount of the additive, in percent by weight of the cement, to the nearest percent.

Fluidity of Portland Cement Grout (Item 14): 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 15): The compressive strength measured by Test Method AASHTO T106 (ASTM C109) in psi.

Curing Period for Portland Cement Grout (Item 16): Number of days the grout cube was cured before compressive strength testing by Test Method AASHTO T106 (ASTM C109).

Subsealing PCC Pavement (Continued) (Sheet 32)

This data sheet is for continuation of the data recorded on Sheet 31.

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 Maintenance/Rehabilitation Data 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.

Load Transfer Restoration (Sheet 33)

Maintenance/Rehabilitation Data Sheets 33 and 34 are for describing work to restore load transfer across joints in an existing jointed concrete pavement.

Individual data elements are as follows.

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

Date Work Complete (Item 2): The month, day, and year the maintenance activity was completed.

Layer Number (Item 3): The number of the PCC layer in which load transfer was restored (from Maintenance/Rehabilitation Data Sheet 2).

Type of Load Transfer Restoration (Item 4): 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 5): 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 6): The number of load restoration devices installed per joint.

Location of Dowels or Shear Devices (Item 7): 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 8): 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 9): 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 (Continued) (Sheet 34)

This data sheet is a continuation of the data provided on Maintenance/Rehabilitation Data Sheet 33.

Individual data elements are as follows.

Layer Number (Item 1): The number of the PCC layer in which load transfer was restored (from Maintenance/Rehabilitation Data 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 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:

$$LTE = \frac{d_{j2}\, x\, 100}{d_{j1}}\, x\, \frac{d_{c1}}{d_{c2}}$$

Figure 10. Equation. Load transfer efficiency.

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 when tests were conducted, before and after the load restoration.

Crack and Seat PCC Pavement (Sheet 35)

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).

Date Began (Item 2): The month, day and year the maintenance operation began.

Date Complete (Item 3): The month, day and year the maintenance operation was completed.

Average PCC Breakage Size (Item 4): The estimated average length and width of the broken PCC pieces to the nearest inch.

Pavement Breaker Passes/Lane (Item 5): The number of pavement breaker passes per lane.

Pavement Breaker Type (Item 6): 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 7): The type of the proof roller used after breaking the pavement. Codes are provided on the data sheet.

Proof Roller Weight (Item 8): The weight of the proof roller (to the nearest ton) used after breaking the pavement.

Broken Pavement Exposure to Traffic (Item 9): The approximate length of time for which the pavement was exposed to traffic after cracking, in days.

Deflection Measurements Taken (Item 10): A Yes/No code 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.

Deflection Measurement Device Used (Item 11): 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 12): The magnitude of the load produced by the deflection testing device in pounds.

Loading Frequency (Item 13): 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 14): Codes to identify the means of surface preparation used prior to surface overlay or other treatment. Codes are provided on the data sheet.

Seal Coat Application Data (Sheet 36)

Maintenance/Rehabilitation Data Sheets 36, 37, and 38 are for recording data on seal coat applications. This includes data specific to the design and construction of the layer. The forms are built to be used for all seal coat types, and therefore contain many items that may not be applicable to the specific seal coat placed.

Individual data elements are as follows.

Layer Number (Item 1): The number of the layer for which the data on this data sheet is being provided (from Maintenance/Rehabilitation Data Sheet 2).

Date Sealing Began (Item 2): The month, day and year the maintenance operation began.

Date Sealing Complete (Item 3): The month, day and year the maintenance operation was completed.

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 data sheet. If multiple coats are applied, repeat Data Sheets 3 and 4 for each seal.

Primary Reason for Seal Coat (Item 5): 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.

Condition of Existing Pavement Surface (Item 6): A code entered to indicate the general condition of the surface prior to application of the treatment. The codes appear on the data sheet.

Initial Preparation of Existing Pavement Surface (Item 7): 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 8): A code entered to record the final surface preparation used on the existing AC surface prior to seal coat application. The codes for various surface preparation methods appear on the data sheet.

Surface Cleanliness Prior to Placement (Item 9): A code entered to indicate whether the surface of the existing pavement was clean, moderately clean, or dirty when the seal coat was placed.

Surface Moisture at Placement (Item 10): A code entered to indicate whether the surface of the existing pavement was wet or dry when the seal coat was placed.

Air Temperature (Item 11): The ambient temperature measured in degrees Fahrenheit while the seal coat was placed.

Surface Temperature (Item 12): The temperature of the existing pavement surface measured in degrees Fahrenheit just prior to the seal coat placement.

Relative Humidity (Item 13): The relative humidity, in percent, at the time of seal coat placement.

Cloud Cover (Item 14): The approximate cloud coverage, in percent, at the time of seal coat placement.

Wind Speed (Item 15): The approximate typical wind speed, in miles per hour, at the time of seal coat placement.

Seal Coat Application Data, Continued (Sheet 37)

This data sheet is a continuation of the seal coat data recorded on Maintenance/Rehabilitation Data Sheet 36.

Individual data elements are as follows.

Layer Number (Item 1): The number of the layer for which the data on this data sheet is being provided (from Maintenance/Rehabilitation Data Sheet 2).

Application Rate for Bituminous Material (Item 2): The design amount of bituminous material, to the nearest hundredth of a gallon, to be placed per square yard (0.01 gal/yd^2) of pavement.

Application Temperature for Bituminous Material (Item 3): The design application temperature of the bituminous material in degrees Fahrenheit

Application Rate for Aggregate (Item 4): The design amount by weight of aggregate, to the nearest tenth of a pound (0.1 lb.), to be placed per square yard of pavement (0.1 lb/yd^2).

Application Rate for Mineral Filler (Item 5): The design amount by weight of filler, to the nearest tenth of a pound (0.1 lb.), to be placed per square yard of pavement (0.1 lb/yd^2).

Application Rate for Slurry Mixture (Item 6): The design amount by weight of slurry mixture, to the nearest tenth of a pound (0.1 lb.), to be placed per square yard of pavement (0.1 lb/yd^2).

Residual Asphalt Content (Item 7): The design amount by weight of residual asphalt, to the nearest tenth of a pound (0.1 lb.), per square yard of pavement (0.1 lb/yd^2).

Wear Value (WTAT Loss) (Item 8): The design wear value in grams per square foot (g/ft^2). This value is also known as abrasion loss or WTAT (Wet Track Abrasion Test) loss.

Design Embedment Depth (Item 9): The designed depth of aggregate embedment, to the nearest hundredth of an inch (0.01 in)

Vialet Test Lab Results (Item 10): The percent of aggregate retained, to the nearest one percent, as determined by the Vialet test using lab prepared samples.

Asphalt Distributor Manufacturer/Model (Item 11): The manufacturer name and the manufacturer model designation for the asphalt distribution vehicle.

Nozzle Angle (Item 12): The angle, in degrees from vertical, of the spray bar nozzles on the asphalt distribution vehicle.

Spray Bar Height (Item 13): The height, in inches, of the spray bar from the pavement surface, to the nearest tenth of an inch (0.1 in)

Nozzle Spacing (Item 14): The distance, in inches, between the spray bar nozzles, to the nearest tenth of an inch (0.1 in)

Nozzle Brand/Model (Item 15): The brand and model number of the spray bar nozzles.

Aggregate Distributor Manufacturer/Model (Item 16): The manufacturer name and the manufacturer model designation for the aggregate distribution equipment.

Slurry Mixer/Distributor Manufacturer/Model (Item 17): The manufacturer name and the manufacturer model designation for the slurry mixer/distributor vehicle.

Spreader Box Width (Item 18): The width of the spreader box, to the nearest inch.

Type of Drag Used (Item 19): A code indicating what type of drag, if any, was used. Codes are provided on the form.

Roller Data (Items 20-24): Codes appear on the data sheet for pneumatic-tired rollers, and also for a different roller type if necessary. Spaces are provided to describe significant characteristics for up to five different rollers. Rollers are described by their gross weight in tons, tire pressure in psi, and roller speed in miles per hour to the nearest tenth (0.1 mph). Space is also provided for the coverage information. A "coverage" in this case is defined as one trip of the roller across the pavement.

Seal Coat Application Data, Continued (Sheet 38)

This data sheet is a continuation of the seal coat data recorded on Maintenance/Rehabilitation Data Sheets 36 and 37.

Individual data elements are as follows.

Layer Number (Item 1): The number of the layer for which the data on this data sheet is being provided (from Maintenance/Rehabilitation Data Sheet 2).

Percent of Test Section Sealed (Item 2): 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.

Tack Coat Used (Item 3): A Y/N code entered to indicate whether or not a tack coat was applied prior to application of the seal coat.

Tack Coat Material (Item 4): A code used to indicate the material used for the tack coat applied prior to application of the micro-surfacing. The codes are available in table A.16. A space is provided to indicate the type of material used if other than those provided.

Tack Coat Application Rate (Item 5): The amount of bituminous material, to the nearest hundredth of a gallon, placed per square yard (0.01 gal/yd^2) of pavement.

Bituminous Material Application Rate (Item 6): The amount of bituminous material, to the nearest hundredth of a gallon, placed per square yard (0.01 gal/yd^2) of pavement (water added to emulsified asphalt is included).

Bituminous Material Application Temperature (Item 7): The temperature of the bituminous material, as applied, in degrees Fahrenheit.

Appearance of Non-Uniform Bituminous Material Application (Item 8): The length of the section, in feet, that received non-uniform (streaking or areas not adequately covered) transverse application of bituminous material.

Aggregate Precoated (Item 9): A Y/N code entered to indicate whether or not the aggregate used in the seal coat was coated with bituminous material prior to placement.

Aggregate Application Rate (Item 10): 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).

Appearance of Non-Uniform Aggregate Application (Item 11): The length of the section, in feet, that received non-uniform transverse application of bituminous material

Mineral Filler Application Rate (Item 12): The amount by weight of mineral filler, to the nearest tenth of a pound (0.1 lb.), placed per square yard of pavement (0.1 lb/yd^2).

Water Added to Mix (Item 13): The amount of bituminous water, to the nearest hundredth of a gallon, placed per square yard (0.01 gal/yd^2) of pavement.

Micro-surfacing Application Rate (Item 14): The amount by weight of slurry seal or micro-surfacing, to the nearest tenth of a pound (0.1 lb.), placed per square yard of pavement (0.1 lb/yd^2).

Wear Value (WTAT Loss) – As Placed (Item 15): The wear value in grams per square foot (g/ft^2) of the as placed micro-surfacing or slurry seal mixture. This value is also known as abrasion loss or WTAT (Wet Track Abrasion Test) loss.

Aggregate Cleanliness (Item 16): A code entered to indicate the general level of cleanliness of the applied aggregate. Codes are supplied on the data sheet.

Aggregate Wetness (Item 17): A code entered to indicate the general level of wetness of the applied aggregate. Codes are supplied on the data sheet.

Aggregate Moisture Content (Item 18): The moisture content of the applied aggregate, in percent by weight of the aggregate.

Estimated Time Between Spreading and Foot Traffic (Item 19): The approximate length of time, in hours, between the completion of spreading of the surface and opening the section to foot traffic.

Estimated Time Between Spreading and Vehicle Traffic (Item 20): The approximate length of time, in hours, between the completion of spreading of the surface and opening the section to vehicular traffic.

Approximate Finished Surface Treatment Thickness (Item 21): The approximate thickness of the applied seal coat, to the nearest tenth of an inch (0.1 in).

Measured Embedment Depth (Item 22): The depth of aggregate embedment measured in the finished layer, to the nearest hundredth of an inch (0.01 in)

Vialet Test Field Results (Item 23): The percent of aggregate retained as determined by the Vialet test using field collected samples to the nearest one percent.

Surface Texture Provided (Item 24): A code entered to record the texture of the finished slurry seal or micro-surfacing layer. The codes appear on the data sheet

Does Brooming Dislodge Surface (Item 25): A Y/N code indicating whether the finished slurry seal or micro-surfacing is easily dislodged by a broom or not.

Milled Sections (Sheet 39)

This data sheet provides information on milling events typically used for removal of some or all of the surface layers prior to overlay. For treatments used without an accompanying overlay or surface treatment, it may be more reasonable to use Maintenance/Rehabilitation Data Sheet 42 for grinding. Ultimately, the decision is best based on the type of equipment used. Material removal with a milling machine should use Sheet 39, and material removal with a diamond grinder should use Sheet 42.

Individual data elements are as follows:

Date of Milling (Item 2): The month, day and year of the milling operation.

Design Milling Depth (Item 2): The intended depth of milling.in inches.

Manufacturer of Milling Machine (Item 3): Indicate the manufacturer of the milling machine.

Milling Machine Model Designation (Item 4): Indicate the model number and designation of the milling machine.

Width of Cutting Head (Item 5): Enter the width of the cutting head employed on the milling machine, to the nearest 0.1 inch.

Air Temperature (Item 6): The ambient temperature measured in degrees Fahrenheit while the milling was performed.

Surface Temperature (Item 7): The temperature of the existing pavement surface measured in degrees Fahrenheit just prior to the milling.

Relative Humidity (Item 8): The relative humidity, in percent, at the time of milling.

Cloud Cover (Item 9): The approximate cloud coverage, in percent, at the time of milling.

Wind Speed (Item 10): The approximate typical wind speed, in miles per hour, at the time of milling.

Extent of Milling (Item 11): A code entered to indicate whether the milling was partial over individual joint, over patches only, or complete over the section. Codes are provided on the data form, and space is provided to describe a different extent where necessary.

Were Patches Placed after Milling (Item 12): Enter a yes or no to indicate whether patches were placed after the milling was completed.

Length of Time Milled Surface Was Opened to Traffic (Item 13): If the milled pavement surface was opened to traffic prior to placement of the replacement material layer, enter the length of time, in hours, it was opened to general traffic. If the milled surface was not opened to traffic, enter a 0.

Was Adjacent Travel Lane Milled to Same Depth as Test Lane (Item 14): This field indicates if the adjacent travel lane was eventually milled to the same depth as the test section lane. If the lane next to the test section was not milled or not milled to the same depth as the travel lane, then indicate no and record the total width of pavement that was milled to the same depth as the travel lane, to the nearest 0.1 foot.

General Construction Comments (Item 15): Provide any general comments pertaining to the milling operation, which may be useful in interpreting the subsequent performance of the overlay, such as unusual events, equipment problems and climatic events.

Milled Depth (Item 16): Enter the measured average final milled depth to the neared 0.1 inch. The milled depth should be measured at the outside (adjacent to the shoulder) and the inside edge (along center line or adjacent lane) of the milled area every 25 feet. Measurements should be made from the surface of the pavement adjacent to the milled surface. For surfaces with significant macro texture, the measurement should be made to the nominal bottom milled surface (bottom of valleys between peaks in the macrotexture). Enter the number of measurements, maximum, minimum and standard deviation of the measurements in the spaces provided.

Macro-Texture (Item 17): Indicate the general roughness of the surface as defined by the macro texture. Fine macro-texture designates a surface with an average or typical peak height (distance between values and peaks).

Estimate of Extent of Test Section Delaminated (Item 18): This data item refers to de-laminations in the milled surface due to chipping of two square inch or greater size chunks from the surface. This may occur when material separates from an interface between pavement layers and becomes dislodged. Estimate the extent of delamination due to milling as a percentage of the delaminated surface area in the study lane. If the extent of de-laminations is large (> 30%) or is localized, provide a sketch of the milled surface using SPS-10 Data Sheet 30.

Height of Ridge Between Parallel Passes (Item 19): If the width of the cutting head is less than the full lane width, indicate the height of any longitudinal ridge remaining between parallel passes of the milling machine in the study lane, to the nearest 0.1 inch. If a distinguishable ridge does not exist, enter 0.

Other Comments about the newly milled surface (Item 20): Use this section to indicate any comments regarding the finished surface, such as irregularities or inconsistencies.

Patching AC Surfaces (Sheet 40)

The information on this data sheet applies to asphalt concrete patches placed on AC surfaced sections. The information on this data sheet provides a summary of the patching operations on a test section.

Date Patching Operation Began (Item 1): This is the date the patching operation on the test section began.

Date Patching Operation Complete (Item 2): This is the date the patching operation on the test section began.

Primary Distress Occurrence Patched (Item 3): Indicate the code number from table A.22 for the primary, i.e., most prevalent, distress occurrence patched. If the code descriptions provided in table A.22 do not adequately describe the primary distress, describe the distress or occurrence being patched in the space provided. The distress terminology and definitions contained in the LTPP Distress Identification Manual should be used as a guide to distress interpretations. [(2)]

Secondary Distress Occurrence Patched (Item 4): Indicate the code number from table A.22 for the second most prevalent distress occurrence patched. If the code descriptions provided in table A.22 do not adequately describe the primary distress, describe the distress or occurrence being patched in the space provided. The distress terminology and definitions contained in the LTPP Distress Identification Manual should be used as a guide to distress interpretations. [(2)]

Summary of Patching (Item 5): Summarize the number of patches placed and the area of patching by type of patch. This should include only those patches placed in the test sections.

Method Used to Determine Location and Sizes of Patches (Item 6): Enter the code number corresponding to the primary method used to determine the location and extent of patches. Codes are provided on SPS-10 Data Sheet 34.

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

Compaction Equipment (Item 8): Enter the code numbers for the type of equipment used to compact the patches. Space is provided for two responses if more than one type of compaction equipment was used.

Patch Material (Item 9): Enter the code corresponding to the general classification of material used in the surface of the patches. Codes are provided on the data sheet.

Minimum Time from Material Placement to Opening to Traffic (Item 10): Indicate the minimum time, to the nearest hour, from completion of placement of the patch to opening to traffic.

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

Air Temperature During Placement Operations (Item 11): Enter the highest and lowest air temperature, in degrees Fahrenheit, during the patching operations.

Predominant Road Surface Moisture Condition During Placement Operations (Item 13): Indicate the predominant moisture condition of the pavement surface during patching operations. Moist is considered as some moisture visible on the pavement surface, but the entire surface of the pavement is not wet and no standing water is present.

Crack Sealing AC Surfaces (Sheet 41)

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

Individual data elements are as follows.

Date Sealing Began (Item 1): This is the date the patching operation on the test section began.

Date Sealing Complete (Item 2): This is the date the patching operation on the test section began.

Average Crack Severity Level (Item 3): The average severity level of the cracks in the test section. Codes are provided on the data sheet. The LTPP Distress Identification Manual should be used to determine the definition of the various severity levels. [2]

Primary Type of Cracks (Item 4): A code entered to describe the primary type of cracking prevalent over the monitored test section and evaluated in item 2 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 LTPP Distress Identification Manual.[2]

Type of Material Used to Seal Cracks (Item 5): A code entered to record the type of material used to seal the cracks in the pavement surface. Codes are provided on 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 6): 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 7): The approximate total linear feet of individual cracks sealed within the test section to the nearest foot.

Method Used to Clean Cracks Prior to Sealing (Item 8): A code entered to record the procedure used to clean the debris from cracks prior to sealing. Codes are provided on SPS-10 Data Sheet 35.

Diamond Grinding (Sheet 42)

Maintenance/Rehabilitation Data Sheet 42 is for recording data from diamond grinding events. It includes information on the design and application of the grinding, as well as the equipment used. This data sheet provides information on grinding events typically used to enhance the smoothness of a section or provide a textural benefit. For treatments used for removal of some or all of the surface layers prior to overlay, use Maintenance/Rehabilitation Data Sheet 39 for milling. Ultimately, the decision is best based on the type of equipment used. Material removal with a milling machine should use Sheet 38, and material removal with a diamond grinder should use Sheet 42.

Individual data elements are as follows.

Date of Grinding (Item 1): The month, day and year the grinding was performed.

Reason for Grinding (Item 2): The primary reason for grinding the pavement section. Codes are provided on the data form. Space is provided to indicate another reason, where a code has not been provided.

Design Grinding Depth (Item 3): The design grinding depth, in inches.

Design Lateral Spacing (Item 4): The design lateral spacing, in inches.

Manufacturer/Model (Item 5): The manufacturer name and the manufacturer model designation for the grinding machine.

Cutting Head Width (Item6): The width of the cutting head, in inches

Average Spacing Between Blades (Item 7): The average spacing between the cutting blades, in inches.

Existing Pavement Surface Finish (Item 8): A code entered to indicate the surface finish of the existing pavement surface. The codes appear on the data sheet.

Existing Surface Mean Texture Depth (Item 9): The texture depth, in inches, of the existing surface using the sand patch test (ASTM E965).

Hardness of Existing Pavement Surface (Item10): The hardness of the pavement surface using the Moh's hardness scale.

Air Temperature (Item 11): The ambient temperature measured in degrees Fahrenheit while the grinding was performed.

Surface Temperature (Item 12): The temperature of the existing pavement surface measured in degrees Fahrenheit just prior to the grinding.

Relative Humidity (Item 13): The relative humidity, in percent, at the time of grinding.

Cloud Cover (Item 14): The approximate cloud coverage, in percent, at the time of grinding.

Wind Speed (Item 15): The approximate typical wind speed, in miles per hour, at the time of grinding.

Extent of Milling (Item 16): A code entered to indicate whether the milling was partial over individual joint, over patches only, or complete over the section. Codes are provided on the data form, and space is provided to describe a different extent where necessary.

Is Concrete Slurry Adequately Removed? (Item 17): A yes/no code to indicate whether the grinding slurry was adequately vacuumed and removed.

Mean Texture Depth (Item 18): The texture depth, in inches, of the surface after grinding is performed using the sand patch test (ASTM E965).

Transverse Slope (Item 19): The deviation from flat in the transverse direction between adjacent passes.

Average Depth of Cut (Item 20): The average depth of cut, in inches, from the grinding operation

Average Groove Width (Item 21): The average groove width, in inches.

Patching PCC Surfaces (Sheet 43)

Maintenance/Rehabilitation Data Sheets 43, 44, 45, and 46 include information for partial depth patching, and 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.

Date Work Complete (Item 2): The month, day, and year the maintenance activity was completed.

Type of Patches (Item 3): A code indicating the type of patches for which the data is applicable. The types are differentiated by depth of material replaced, whether only the slab has been replaced, or both the slab and the base. Codes are supplied on the data sheet.

Patch Material Used (Item 4): A code indicating the general type of material used for the patches. Codes are supplied on the data sheet.

Primary Reason for Patches (Item 5): 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. [(2)]

Secondary Reason for Patches (Item 6): A code entered for indicating a second type of distress requiring patching or slab replacement, using codes as discussed above.

Number of Patches (Item 7): The number of patches placed.

Area of Patches (Item 8): The area of patches placed, to the nearest square foot.

Method used to Determine Size and Location of Patches Required (Item 9): 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.

Base Replaced By (Item 10): 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.

Air Temperature (Item 11): The ambient temperature measured in degrees Fahrenheit while the seal coat was placed.

Surface Temperature (Item 12): The temperature of the existing pavement surface measured in degrees Fahrenheit just prior to the seal coat placement.

Relative Humidity (Item 13): The relative humidity, in percent, at the time of seal coat placement.

Cloud Cover (Item 14): The approximate cloud coverage, in percent, at the time of seal coat placement.

Wind Speed (Item 15): The approximate typical wind speed, in miles per hour, at the time of seal coat placement.

Surface Moisture at Placement (Item 16): A code entered to indicate whether the surface of the existing pavement was wet or dry when the seal coat was placed.

Patching PCC Surfaces (Continued) (Sheet 44)

This data sheet is a continuation of the patching data for PCC pavements recorded on Sheet 43.

Individual data elements are as follows.

Method Used to Cut Boundaries (Item 1): 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.

Number of Saw Cuts Per Patch (Item 2): The number of saw cuts required per patch, if any.

Depth of Typical Boundary Saw Cut (Item 3): The depth, to the nearest tenth of an inch (0.1 in), of the average boundary saw cut.

Method Used to Break-up Deteriorated Concrete (Item 4): 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 5): A code entered to indicate the method of material removal from the area patched. Codes are provided on the data sheet.

Method Used for Final Cleaning of Patch Area (Item 6): A code entered to indicate the method used to clean the area to be patched. Codes are provided on the data sheet.

Patch Material (Item 7): Used only for AC patches, this item indicates the general type of asphalt patch material used. Codes are provided on the data sheet.

Compaction Equipment (Item 8): A code entered to indicate the means of compacting the patch materials into the area patched. Codes are provided on the data form.

Maximum Material Temp for Traffic Opening (Item 9): The maximum allowable temperature for the patch material to be opened for traffic, if defined.

Approximate Time Between Patching and Opening to Traffic (Item 10): The approximate time in hours from placement of materials until traffic was allowed on the patch surface.

Patching PCC Surfaces (Continued) (Sheet 45)

This data sheet is a continuation of the patching data for PCC pavements recorded on Sheets 43 and 44.

Individual data elements are as follows.

Mixture Design for Patch Material (Item 1): 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

Type Cement Used (Item 2): 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 3): 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 4): 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 5): 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.

Maximum Size of Coarse Aggregate (Item 6): The maximum size of the coarse aggregate in the patch material to the nearest tenth of an inch (0.1 in).

Compressive Strength (Item 7): The mean compressive strength of the PCC mix used in the patch in pounds per square inch, and the number of days the beam was cured before testing. If compressive tests have not been performed and some other strength test (such as flexural 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.

Type of Joint Load Transfer System Used for Repaired Areas (Item 8): 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.

Dowel Coatings (Item 9): 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.

Securing Load Transfer Devices (Item 10): 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.

Patching PCC Surfaces (Continued) (Sheet 46)

This data sheet is a continuation of the full depth repair data for PCC pavements recorded on Sheets 43, 44, and 45.

Individual data elements are as follows.

Reinforcing Steel Placed in Patch (Item 1): A code entered to indicate whether the patched area contains reinforcing steel or not. Codes are provided on the data form.

Placement Method (Item 2): 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.

Bar Diameters (Item 3): 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 4): The lengths of longitudinal and transverse bars or wire mesh, to the nearest tenth of an inch (0.1 in).

Bar Spacings (Item 5): The approximate center-to-center spacing of adjacent longitudinal and transverse bars or wire mesh, to the nearest tenth of an inch (0.1 in).

Joint Forming Method (Item 6): 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 7): 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 8): 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.

Consolidation of Materials (Item 9): 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 10): 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 11): 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 12): 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.

Approximate Time Between Patching and Opening to Traffic (Item 13): The approximate time in hours from placement of materials until traffic was allowed on the patch surface.

Joint Sealant Application Data (Sheet 47)

Maintenance/Rehabilitation Data Sheets 47 and 48 are for recording data from joint sealant application. This includes data specific to the material as well as the joint preparation and placement.

Individual data elements are as follows.

Date Sealing Began (Item 1): The month, day and year the operation began, including any surface preparation.

Date Sealing Complete (Item 2): The month, day and year the sealing was completed.

Joints Previously Sealed? (Item 3): A Y/N code indicating whether the joints were previously sealed or not.

Condition of Existing Sealant (Item 4): Space is provided for the estimation of the percent of existing sealant affected by the presence of: extrusion, hardening, adhesive failure, cohesive failure, sealant loss, foreign material intrusion, and weed growth. When the distress is no present, the value should be zero. It is possible for sealant to exhibit more than one type of failure.

Air Temperature (Item 5): The ambient temperature measured in degrees Fahrenheit while the sealant was placed.

Surface Temperature (Item 6): The temperature of the existing pavement surface measured in degrees Fahrenheit just prior to the sealant placement.

Relative Humidity (Item 7): The relative humidity, in percent, at the time of sealant placement.

Cloud Cover (Item 8): The approximate cloud coverage, in percent, at the time of sealant placement.

Wind Speed (Item 9): The approximate typical wind speed, in miles per hour, at the time of sealant placement.

Method of Removing Old Sealant (Item 10): A code entered to identify the method used for removing any old or existing joint sealant. Codes are provided on the data form.

Were Jointed Sidewalls Refaced? (Item 11): 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 12): A code entered to specify the means of cleaning the sidewalls prior to resealing. Codes are provided on the data form.

Width (Item 13): The width of the sealant reservoir to the nearest tenth of an inch (0.1 in).

Depth (Item 14): The depth of the sealant reservoir to the nearest tenth of an inch (0.1 in).

Cleanliness (Item 15): A code entered to indicate the general level of cleanliness of the reservoir prior to sealant application. Codes are supplied on the data sheet.

Wetness (Item 16): A code entered to indicate the general level of moisture in the reservoir prior to sealant application. Codes are supplied on the data sheet.

Joint Sealant Application Data, Continued (Sheet 48)

This data sheet is a continuation of the joint sealant application information recorded on Sheet 47.

Individual data elements are as follows.

Type of 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.

Manufacturer Name (Item 2): The manufacturer of the sealant

Manufacturer Sealant Name (Item 3): The manufacturer’s name for the sealant

Type of 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

Bond Breaker Size (Item 5): The size of the bond breaker used, to the nearest tenth of an inch (0.1 in).

Depth from Surface to Top of Bond Breaker (Item 6): The depth from the surface of the pavement to the top of the bond breaker, to the nearest tenth of an inch (0.1 in).

Sealant Application Temperature (Item 7): The temperature of the sealant as placed. For sealants that are not heated, no value should be entered.

Sealant Application Rate (Item 8): The design amount of bituminous material, to the nearest hundredth of a pound, to be placed per linear ft (0.01 pounds/ft) of pavement.

Depth of Top of Sealant (Item 9): 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. If the sealant is above the surface of the pavement, the value should be negative.

Estimated Time Between Surface Preparation and Sealing (Item 10): The number of days between the completion of surface prep and the application of the sealant. If both are performed on the same day, enter zero.

Estimated Time Between Sealing and Vehicle Traffic (Item 11): The approximate length of time, in hours, between the completion of sealing and opening the section to vehicular traffic.

Length of Transverse Joints Sealed (Item 12): The total length of transverse joints receiving new sealant, in feet

Length of Longitudinal Joints Sealed (Item 13): The total length of transverse joints receiving new sealant, in feet

Penetrating Sealant Application Data (Sheet 49)

Maintenance/Rehabilitation Data Sheet 49 is used for recording data from the application of penetrating sealants. This includes data specific to the condition prior to placement, the sealant properties, and the preparation and placement.

Individual data elements are as follows.

Date Sealing Began (Item 1): The month, day and year the operation began, including any surface preparation.

Date Sealing Complete (Item 2): The month, day and year the sealing was completed.

Joints Previously Sealed? (Item 3): A Y/N code indicating whether the joints were previously sealed or not.

Air Temperature (Item 4): The ambient temperature measured in degrees Fahrenheit while the sealant was placed.

Surface Temperature (Item 5): The temperature of the existing pavement surface measured in degrees Fahrenheit just prior to the sealant placement.

Relative Humidity (Item 6): The relative humidity, in percent, at the time of sealant placement.

Cloud Cover (Item 7): The approximate cloud coverage, in percent, at the time of sealant placement.

Wind Speed (Item 8): The approximate typical wind speed, in miles per hour, at the time of sealant placement.

Preparation of Existing Pavement Surface (Item 9): 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.

Cleanliness (Item 10): A code entered to indicate the general level of cleanliness of the pavement surface prior to sealant application. Codes are supplied on the data sheet.

Wetness (Item 11): A code entered to indicate the general level of surface moisture prior to sealant application. Codes are supplied on the data sheet.

Type of Sealer (Item 12): A code entered to indicate the general type of sealer used. Codes are supplied on the data sheet.

Manufacturer Name (Item 13): The manufacturer of the sealant

Manufacturer Sealant Name (Item 14): The manufacturer's name for the sealant

Sealant Application Rate (Item 15): The rate of application of the sealant, in gallons per square yard.

Width of Sealant Application (Item 16): The distance between the joint and the edge of the applied sealant, in inches.

Depth of Penetration (Item 17): Depth of penetration of the sealant, in inches.

PCC Crack Sealing (Sheet 50)

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 this sheet for each type.

Individual data elements are as follows:

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

Date Work Complete (Item 2): This is the date on which crack sealing operations began.

New Sealant Reservoir Dimensions (Item 3): The width and depth of 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 identify other materials, if used.

Cleaning of Cracks (Item 5): A code to specify the means of cleaning the cracks prior to sealing. Codes are provided on the data form.

Type of Sealant (Item 6): 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 7): 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 8): The total linear feet to the nearest tenth of a foot (0.1 ft) of cracks sealed on the test section.

LTPP MAINTENANCE/REHABILITATION DATA **SHEET 1** **IMPROVEMENT LISTING**	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. DATE COMPLETE (dd/mmm/yyyy)	2. WORK TYPE CODE (Table A.17)	3. WORK QUANTITY (units from Table A.17)	4. THICKNESS (inches)
[__ __/__ __ __ /__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]
[__ __/__ __ __ /__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]
[__ __/__ __ __ /__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]
[__ __/__ __ __ /__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]
[__ __/__ __ __ /__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]
[__ __/__ __ __ /__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]
[__ __/__ __ __ /__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]
[__ __/__ __ __ /__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]
[__ __/__ __ __ /__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]
[__ __/__ __ __ /__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]
[__ __/__ __ __ /__ __ __ __]	[__ __]	[__ __ __.__]	[__ __.__]

PREPARER___________________ EMPLOYER_____________________DATE_______________

LTPP MAINTENANCE/REHABILITATION DATA **SHEET 2** **LAYER**	STATE CODE [__ __] SHRP ID [__ __ __ __]

LAYER DESCRIPTIONS

LAYER NUMBER[1]	LAYER DESCRIPTION[2]	MATERIAL TYPE[3]	LAYER THICKNESSES[4] (**inch**)			
			MEAN	MIN.	MAX.	STD. DEV.
1	SUBGRADE(7)	[__ __]				
2	[__ __]	[__ __]	[_ _ _._]	[_ _ _._]	[_ _ _._]	[_ _ _._]
3	[__ __]	[__ __]	[_ _ _._]	[_ _ _._]	[_ _ _._]	[_ _ _._]
4	[__ __]	[__ __]	[_ _ _._]	[_ _ _._]	[_ _ _._]	[_ _ _._]
5	[__ __]	[__ __]	[_ _ _._]	[_ _ _._]	[_ _ _._]	[_ _ _._]
6	[__ __]	[__ __]	[_ _ _._]	[_ _ _._]	[_ _ _._]	[_ _ _._]
7	[__ __]	[__ __]	[_ _ _._]	[_ _ _._]	[_ _ _._]	[_ _ _._]
8	[__ __]	[__ __]	[_ _ _._]	[_ _ _._]	[_ _ _._]	[_ _ _._]
9	[__ __]	[__ __]	[_ _ _._]	[_ _ _._]	[_ _ _._]	[_ _ _._]
10	[__ __]	[__ __]	[_ _ _._]	[_ _ _._]	[_ _ _._]	[_ _ _._]
11	[__ __]	[__ __]	[_ _ _._]	[_ _ _._]	[_ _ _._]	[_ _ _._]
12	[__ __]	[__ __]	[_ _ _._]	[_ _ _._]	[_ _ _._]	[_ _ _._]
13	[__ __]	[__ __]	[_ _ _._]	[_ _ _._]	[_ _ _._]	[_ _ _._]
14	[__ __]	[__ __]	[_ _ _._]	[_ _ _._]	[_ _ _._]	[_ _ _._]
15	[__ __]	[__ __]	[_ _ _._]	[_ _ _._]	[_ _ _._]	[_ _ _._]

5. DEPTH BELOW SURFACE TO 'RIGID' LAYER (**ft**) [__ __.__]
(Rock, Stone, Dense Shale)

NOTES:

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

2. Layer description codes:

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

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

PREPARER_____EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA **SHEET 3** **FIELD THICKNESS**	STATE CODE [__ __] SHRP ID [__ __ __ __]

LAYER THICKNESS MEASUREMENTS (Inches) SHEET __ OF __

		LAYER NUMBER (From LTPP Data Sheet 4)			
STATION NUMBER	OFFSET (Inches)	[__ __]	[__ __]	[__ __]	[__ __]
[__+__ __]	[__ __ __] [__ __ __] [__ __ __] [__ __ __] [__ __ __]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]
[__+__ __]	[__ __ __] [__ __ __] [__ __ __] [__ __ __] [__ __ __]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]
[__+__ __]	[__ __ __] [__ __ __] [__ __ __] [__ __ __] [__ __ __]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]
[__+__ __]	[__ __ __] [__ __ __] [__ __ __] [__ __ __] [__ __ __]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]
[__+__ __]	[__ __ __] [__ __ __] [__ __ __] [__ __ __] [__ __ __]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]
[__+__ __]	[__ __ __] [__ __ __] [__ __ __] [__ __ __] [__ __ __]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]
[__+__ __]	[__ __ __] [__ __ __] [__ __ __] [__ __ __] [__ __ __]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]	[__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__] [__ __ __.__]

PREPARER____________________ EMPLOYER______________________DATE________________

LTPP MAINTENANCE/REHABILITATION DATA SHEET 4 QC MEASUREMENTS	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. NUCLEAR DENSITY MEASUREMENTS

Layer Type	Binder Course	Surface Course
Measurement Method (A, B, C)[1]	[__]	[__]
Number of Measurements	[__ __]	[__ __]
Average (pcf)	[__ __ __ __.__]	[__ __ __ __.__]
Maximum (pcf)	[__ __ __ __.__]	[__ __ __ __.__]
Minimum (pcf)	[__ __ __ __.__]	[__ __ __ __.__]
Standard Deviation (pcf)	[__ __ __ __.__]	[__ __ __ __.__]
Layer Number (From Data Sheet 2)	[__ __]	[__ __]

[1]Measurement Method Backscatter.. A Direct Transmission.. B Air Gap.. C

2. MANUFACTURER OF NUCLEAR DENSITY GAUGE [_____]

3. NUCLEAR DENSITY GAUGE MODEL NUMBER [_____]

4. NUCLEAR DENSITY GAUGE IDENTIFICATION NUMBER [_____]

5. NUCLEAR GAUGE COUNT RATE FOR STANDARDIZATION [__ __ __ __ __]

6. PROFILOGRAPH MEASUREMENTS

Measured Layer Number [__ __]
Profilograph Type California..... 1 Rainhard..... 2 [__]
Profile Index (Inches/Mile) [__ __ __.__]
Interpretation Method Manual.. 1 Mechanical.. 2 Computer.. 3 [__]
Height of Blanking Band (Inches) [__.__ __]
Cutoff Height (Inches) [__.__ __]

7. SURFACE PROFILE USED AS BASIS OF INCENTIVE PAYMENT (Y/N) [__]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 5 AC AGGREGATE PROPERTIES	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__ __]

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

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

Crushed Stone... 1 Crushed Slag..... 4
Gravel..... 2 Manufactured Lightweight... 5
Crushed Gravel.. 3
Other (Specify)[_____]6

	TYPE	PERCENT
3.	[__]	[__ __ __]
4.	[__]	[__ __ __]
5.	[__]	[__ __ __]

6. GEOLOGIC CLASSIFICATION OF COARSE AGGREGATE [__ __]
   (See Geologic Classification Codes, Table A.9)

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

Natural Sand..... 1
Manufactured Sand (From Crushed Gravel or Stone)..... 2
Recycled Concrete..... 3
Other (Specify)[_____]4

	TYPE	PERCENT
7.	[__]	[__ __ __]
8.	[__]	[__ __ __]
9.	[__]	[__ __ __]

10. TYPE OF MINERAL FILLER [__]
    Stone Dust..... 1 Portland Cement..... 3
    Hydrated Lime.. 2 Fly Ash..... 4
    None..... 5
    Other (Specify)[_____]6

AGGREGATE DURABILITY TEST RESULTS (Items 13 through 16)
(See Durability Test Type Codes, Table A.13)

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

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 6 AC AGGREGATE PROPERTIES (Continued)	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__ __]
2. TYPE OF AGGREGATE [__]
   Untreated..... 1 RAP..... 2
   RAS..... 3 Combined..... 4
3. POLISH VALUE OF COARSE AGGREGATES [__ __]
   (Surface Layer Only) (AASHTO T279, ASTM D3319)
4. ANGULARITY COARSE ONE FACE [__ __ __.__]
5. ANGULARITY COARSE TWO FACES [__ __ __.__]
6. ANGULARITY FINE [__ __ __.__]
7. SOUNDNESS COARSE [__ __ __.__]
8. SOUNDNESS FINE [__ __ __.__]
9. COARSE AGGREGATE TOUGHNESS [__ __ __.__]
10. DELETERIOUS MATERIALS [__ __ __.__]
11. CLAY CONTENT [__ __ __.__]
12. THIN ELONGATED PARTICLES [__ __.__]
13. GRADATION OF COMBINED AGGREGATES

Sieve Size or No.	% 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.....	[__ __]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 7 AC AGGREGATE PROPERTIES (Continued)	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__ __]
2. TYPE OF AGGREGATE [__]
   Untreated..... 1 RAP..... 2
   RAS..... 3 Combined..... 4

ABSORPTION OF AGGREGATE (Items 2 and 3)

3. COARSE AGGREGATE (AASHTO T85 OR ASTM C127) [__.__ __ __]

4. FINE AGGREGATE (AASHTO T84 OR ASTM C128) [__.__ __ __]

BULK SPECIFIC GRAVITIES (Items 4 through 7)

5. COARSE AGGREGATE (AASHTO T85 OR ASTM C127) [__.__ __ __]

6. FINE AGGREGATE (AASHTO T84 OR ASTM C127) [__.__ __ __]

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

8. AGGREGATE COMBINATION (Calculated - EQ. 1) [__.__ __ __]

9. EFFECTIVE SPECIFIC GRAVITY OF AGGREGATE COMBINATION (Calculated - EQ. 2) [__.__ __ __]

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

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 8 AC BINDER	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__ __]

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

3. ASPHALT GRADE (Specify Design SUPERPave PG Grading) PG[__ __]-[__ __]

4. ASPHALT GRADE (If not PG grade)
   (See Asphalt Code Sheet, Table A.16, Appendix A) [__ __]
   Other (Specify) [_____]

5. SOURCE (See Supply Code Sheet, Table A.14, Appendix A) [__ __]
   Other (Specify) [_____]

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

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

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

9. 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 11 and 12)

	TYPE	QUANTITY(%)
10. MODIFIER #1	[__ __]	[__ __.__]
11. MODIFIER #2	[__ __]	[__ __.__]
Other (Specify) [_____]		

12. DUCTILITY AT 77°F (cm) [__ __ __]
    (AASHTO T51, ASTM D113

13. DUCTILITY AT 39.2°F (cm) [__ __ __]
(AASHTO T51, ASTM D113

14. TEST RATE FOR DUCTILITY MEASUREMENT AT 39.2°F (cm/min) [__ __ __]

15. PENETRATION AT 39.2°F, 200 g, 60 sec. (tenths of a mm) [__ __ __]
    (AASHTO T49, ASTM D5)

16. RING AND BALL SOFTENING POINT (°F) [__ __ __]
    (AASHTO T53, ASTM D36)

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 9 AC DSR, BBR, DIRECT TENSION	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__]

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

3. DYNAMIC SHEAR RHEOMETER COMPLEX MODULUS AND PHASE ANGLE (kPa, deg)
   (Tank Asphalt) (AASHTO TP5) [__ __ __ __.__ __] [__ __]

4. DYNAMIC SHEAR RHEOMETER COMPLEX MODULUS AND PHASE ANGLE (kPa, deg)
   (RTFO Asphalt) (AASHTO TP5) [__ __ __ __.__ __] [__ __]

5. DYNAMIC SHEAR RHEOMETER COMPLEX MODULUS AND PHASE ANGLE (kPa, deg)
   (PAV Asphalt)(AASHTO TP5) [__ __ __ __ __.__ __] [__ __]

6. BENDING BEAM RHEOMETER STIFFNESS MODULUS AND SLOPE (MPa, ratio)
   (PAV Asphalt)(AASHTO TP5) [__ __ __ __] [__ __ __ __.__ __ __]

7. DIRECT TENSION TENSILE STRENGTH AND TENSILE STRAIN (kPa, ratio)
   (PAV Asphalt)(AASHTO TP5) [__ __ __ __ __.__] [__ __ __.__ __]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 10 RAP	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__ __]

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

RAP

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

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

RAS

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

BOTH

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

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

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

   Provide type of additive [_____]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 11 PMA LABORATORY MIX DESIGN	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__ __]

2. MAXIMUM SPECIFIC GRAVITY (No Air Voids) [__.__ __ __]

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

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

5. PERCENT AIR VOIDS [__ __ __.__]

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)

11. VOIDS IN MINERAL AGGREGATE (%) (Fig. 5) [__ __.__]

12. EFFECTIVE ASPHALT CONTENT (%) (Fig. 6) [__ __.__]

13. SUPERPAVE GYRATORY COMPACTION N_{DESIGN} [__ __ __]

14. GYRATION RATIO [__.__ __]

15. ASPHALT GRADE (Specify Design SUPERPave PG Grading) PG[__ __]-[__ __]
    Other (Specify)[_____]

HAMBURG WHEEL TRACKING TEST

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

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

18. TEST TEMPERATURE [__ __.__]

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

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 12 PMA LABORATORY MIX DESIGN (Continued)	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__ __]

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

3. FLOW NUMBER TEMPERATURE [__ __ __]

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

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

RECYCLED DESIGN INFORMATION

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

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

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

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

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

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

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

	TYPE	QUANTITY(%)
13. RECYCLING AGENT (See Type Code, Table A.20)	[__ __]	[__ __]
Other (Specify)	[_____]	

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

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 13 **PMA LABORATORY MIX DESIGN - WARM MIX**	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__ __]

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

   Name Brand (Specify)[_____]

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

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

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

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA **SHEET 14** **PMA MIX PROP**	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data 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) [__.__ __ __]

4. BULK SPECIFIC GRAVITY (ASTM D1188)
   MEAN [__.__ __ __] NUMBER OF TESTS [__ __]
   MINIMUM [__.__ __ __] MAXIMUM [__.__ __ __]
   STD. DEV. [__.__ __ __]

5. ASPHALT CONTENT (% by weight of total mix)
   (AASHTO T164, ASTM D2172)
   MEAN [__ __.__] NUMBER OF TESTS [__ __]
   MINIMUM [__ __.__] MAXIMUM [__ __.__]
   STD. DEV. [__ __.__]

6. PERCENT AIR VOIDS
   MEAN [__ __.__] NUMBER OF TESTS [__ __]
   MINIMUM [__ __.__] MAXIMUM [__ __.__]
   STD. DEV. [__ __.__]

7. VOIDS IN MINERAL AGGREGATE (%)
   MEAN [__ __.__] NUMBER OF TESTS [__ __]
   MINIMUM [__ __.__] MAXIMUM [__ __.__]
   STD. DEV. [__ __.__]

8. EFFECTIVE ASPHALT CONTENT (%)
   MEAN [__ __.__] NUMBER OF TESTS [__ __]
   MINIMUM [__ __.__] MAXIMUM [__ __.__]
   STD. DEV. [__ __.__]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 15 PMA MIX PROP (Continued)	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__ __]

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

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

4. TYPE OF ANTISTRIPPING AGENT (See Type Codes, Table A.21) [__ __]
   Other (Specify) [_____]

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

6. AMOUNT OF ANTI-STRIPPING AGENT [__ __ __.__]
   (If liquid, enter amount as percent of asphalt cement weight. If solid, enter amount as percent of aggregate weight.)

7. 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

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

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 16 SUPERPAVE MIXTURE PROPERTIES	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data 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	[__ __ __]	[__ __ __]	[__ __ __]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 17 PMA CONSTRUCTION	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__]

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

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

EQUIPMENT

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

5. MIXING PLANT NAME [_____]

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

TACK COAT

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

8. TACK COAT TYPE (See Table A.16) [__ __]
   Other (Specify) [_____]

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

10. APPLICATION RATE (gal/yd^2) [__.__ __]

PLACEMENT INFO

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

12. SINGLE PASS LAYDOWN WIDTH (ft) [__ __.__]

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

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

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

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

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA **SHEET 18** **PMA CONSTRUCTION (Continued)**	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__]

TEMPERATURE DATA (Items 2. to 5.)

2. MIXING TEMPERATURE (°F) [__ __ __]
3. PLANT EXHAUST TEMPERATURE (°F) [__ __ __]
4. MEAN DELIVERY TEMPERATURE (°F) [__ __ __]
5. LAYDOWN TEMPERATURES (°F)

MEAN	[__ __ __]	NUMBER OF TESTS	[__ __ __]
MINIMUM	[__ __ __]	MAXIMUM	[__ __ __]
STD. DEV.	[__ __ __. __]		

ROLLER DATA (Items 6. to 22.)

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

COMPACTION DATA (Items 23. to 31.)

	FIRST LIFT	SECOND LIFT	THIRD LIFT	FOURTH LIFT
BREAKDOWN:				
23. ROLLER CODE # (A-Q)	[__]	[__]	[__]	[__]
24. COVERAGES	[__ __]	[__ __]	[__ __]	[__ __]
INTERMEDIATE:				
25. ROLLER CODE # (A-Q)	[__]	[__]	[__]	[__]
26. COVERAGES	[__ __]	[__ __]	[__ __]	[__ __]
FINAL:				
27. ROLLER CODE # (A-Q)	[__]	[__]	[__]	[__]
28. COVERAGES	[__ __]	[__ __]	[__ __]	[__ __]
29.AIR TEMPERATURE (°F)	[__ __ __]	[__ __ __]	[__ __ __]	[__ __ __]
30.COMPACTED THICKNESS (in	[__.__]	[__.__]	[__.__]	[__.__]
31.CURING PERIOD (days)	[__ __]	[__ __]	[__ __]	[__ __]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA **SHEET 19** **HEATER SCARIFICATION SURFACE** **RECYCLED ASPHALT PAVEMENT**	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__]

2. DATE SCARIFICATION BEGAN (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]
3. DATE SCARIFICATION COMPLETE (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]

4. TYPE OF HEATER SCARIFICATION [__]
   Multiple Unit Process... 1 Single Unit Process 2

5. DEPTH OF SCARIFICATION (inches) [__.__]

6. TYPE OF REJUVENATING AGENT (Codes - Table A.20) [__ __]

7. AMOUNT OF REJUVENATING AGENT (gal/sq. yard) [__ __.__]

8. TYPE OF SURFACE TREATMENT [__]
   None..... 1 Slurry Seal 4
   Aggregate Seal..... 2 Sand Seal 5
   Fog Seal..... 3 HMAC Overlay 6
   Other (Specify)[_____].7

ROLLER DATA (Items 9. to 17.)

	ROLLER CODE	ROLLER DESCRIPTION	GROSS WGT (tons)	TIRE PRES. (psi)	FREQ. (vibr/min)	AMPLITUDE (in)	SPEED (mph)
9.	A	STEEL-WHL TANDEM	__ __.__				
10.	B	STEEL-WHL TANDEM	__ __.__				
11.	E	PNEUMATIC-TIRED	__ __.__	__ __ __.			
12.	F	PNEUMATIC-TIRED	__ __.__	__ __ __.			
13.	I	SINGLE-DRUM VIBR.	__ __.__		__ __ __ __.	.__ __ __	__ __.__
14.	J	SINGLE-DRUM VIBR.	__ __.__		__ __ __ __.	.__ __ __	__ __.__
15.	M	DOUBLE-DRUM VIBR.	__ __.__		__ __ __ __.	.__ __ __	__ __.__
16.	N	DOUBLE-DRUM VIBR.	__ __.__		__ __ __ __.	.__ __ __	__ __.__
17.	Q	OTHER _____					

COMPACTION DATA

		ROLLER CODE	COVERAGES
18.	BREAKDOWN	[__]	[__ __]
19.	INTERMEDIATE	[__]	[__ __]
20.	FINAL	[__]	[__ __]

21. LENGTH OF TIME BETWEEN HEATER SCARIFICATION AND ADDITION OF SURFACE TREATMENT (days) [__ __]

22. LENGTH OF TIME BETWEEN SURFACING AND OPENING TO TRAFFIC (days) [__ __]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA **SHEET 20** **AC SHOULDER RESTORATION**	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. DATE WORK BEGAN (dd/mmm/yyyy) [__ __ /__ __ __ /__ __ __ __]
2. DATE WORK COMPLETE (dd/mmm/yyyy) [__ __ /__ __ __ /__ __ __ __]

3. SHOULDER RESTORED Outside.....1 Inside.....2 [__]

SHOULDER PROPERTIES (After Restoration)

4. TOTAL WIDTH (feet) [__ __]
5. PAVED WIDTH (feet) [__ __]
6. SURFACE TYPE (See Codes, Table A.5) [__]
   Other (Specify)[_____]
7. SURFACE THICKNESS (inches) [__ __.__]
8. SHOULDER BASE TYPE (See Codes, Table A.6) [__ __]
9. BASE THICKNESS (inches) [__ __.__]

RESTORATION DETAILS

10. TYPE OF SHOULDER RESTORATION [__]
    - AC Overlay Without Removal of Existing AC 1
    - Milling and AC Overlay 2
    - Complete Shoulder Removal and Replacement 3
    - In-place Recycling and Overlay 4
    - Other (Specify)[_____] 5

11. TYPE OF AC MATERIALS USED [__]
    - New Materials 1
    - Hot Recycled Materials 2
    - Cold Recycled Materials 3
    - Other (Specify)[_____] 4

12. THICKNESS OF AC MATERIAL REMOVED BY MILLING (inches) [__.__]

13. AC OVERLAY THICKNESS (inches) [__.__]

14. LANE/SHOULDER JOINT SEALANT [__]
    - None 1
    - Sealed Without Providing Reservoir 2
    - Saw Reservoir and Seal 3
    - Other (Specify)[_____] 4

15. TYPE OF JOINT SEALANT [__]
    - Poured 1
    - Preformed 2

16. LANE/SHOULDER JOINT SEALANT RESERVOIR (inches)
    - WIDTH [__.__]
    - DEPTH [__.__]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA **SHEET 21** **SUBDRAINAGE RETROFIT**	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. DATE WORK BEGAN (dd/mmm/yyyy) [__ __ /__ __ __ /__ __ __ __]
2. DATE WORK COMPLETE (dd/mmm/yyyy) [__ __ /__ __ __ /__ __ __ __]

3. TYPE OF SUBDRAINS [__]
   - Transverse 1
   - Longitudinal 2

4. EXTENT OF SUBDRAINS [__]
   - Continuous 1
   - Intermittent 2
   - Adjacent to Full Depth Repairs 3

5. 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

6. TYPE OF DRAINAGE PIPE [__]
   - Clay Tile 1
   - Concrete Tile 2
   - Vitrified Clay 3
   - Perforated Plastic Bituminous Fiber 4
   - Perforated Corrugated Metal 5
   - Corrugated Plastic Tubing 6
   - Drainage Mat 7
   - Other (Specify) [_____] 8

7. DIAMETER OF PIPE (inches) [__ __.__]
8. DEPTH OF PIPE BELOW TOP OF PAVEMENT SURFACE (inches) [__ __.__]
9. HORIZONTAL PLACEMENT OF PIPE FROM OUTER EDGE OF PAVEMENT (in.) [__ __.__]

10. TYPE OF PRIMARY FILTER USED [__]
    - Graded Aggregate 1
    - Uniformly Graded Aggregate (One Size) .. 2
    - Woven Fabric 3
    - Other (Specify) [_____] 7
    - Non-Woven Fabric 4
    - Porous PCC 5
    - Porous Bituminous Concrete 6

11. MAXIMUM PARTICLE SIZE OF PRIMARY FILTER MATERIAL (inches) [__.__]

12. GRADATION OF PRIMARY FILTER MATERIAL (percent passing)
    - # 4 SIEVE [__ __.__]
    - #10 SIEVE [__ __.__]
    - # 40 SIEVE [__ __.__]
    - #100 SIEVE [__ __.__]

13. PERMEABILITY OF PRIMARY FILTER MATERIAL (ft/day) [__ __.__ __]

14. TYPE AND LOCATION OF SECONDARY FILTER MATERIAL [__]
    - Fabric Encapsulating the Primary Filter Material 1
    - Fabric Encapsulating the Drainage Pipe 2
    - Other (Specify) [_____] 3

15. AVERAGE OUTLET INTERVAL (feet) [__ __ __]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 22 PCC AGGREGATE PROPERTIES	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__ __]

COMPOSITION OF COARSE AGGREGATE (Items 2, 3, and 4)

			TYPE	PERCENT
Crushed Stone... 1	Crushed Slag..... 4	2.	[__]	[__ __ __]
Gravel..... 2	Manufactured Lightweight... 5	3.	[__]	[__ __ __]
Crushed Gravel.. 3		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. INSOLUBLE RESIDUE (ASTM D3042)(percent) [__ __ __]

AGGREGATE DURABILITY TEST RESULTS (Items 10 through 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	[__ __]	[__ __ __.__ __ __]

BULK SPECIFIC GRAVITIES (Items 14 and 15)

14. COARSE AGGREGATE (AASHTO T85 OR ASTM C127) [__.__ __ __]
15. FINE AGGREGATE (AASHTO T84 OR ASTM C127) [__.__ __ __]

GRADATION OF AGGREGATES

16. COARSE AGGREGATE		17. FINE AGGREGATE	
Sieve Size or No.	% Passing	Sieve Size or No.	% Passing
2”.....	[__ __ __]	No. 8.....	[__ __ __]
1 1/2”.....	[__ __ __]	No. 10.....	[__ __ __]
1”.....	[__ __ __]	No. 16.....	[__ __ __]
7/8”.....	[__ __ __]	No. 30.....	[__ __ __]
3/4”.....	[__ __ __]	No. 40.....	[__ __ __]
5/8”.....	[__ __ __]	No. 50.....	[__ __ __]
1/2”.....	[__ __ __]	No. 80.....	[__ __ __]
3/8”.....	[__ __ __]	No. 100.....	[__ __ __]
No. 4.....	[__ __ __]	No. 200.....	[__ __ __]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 23 PCC MIX DESIGN	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__]

MIX DESIGN

2. COARSE AGGREGATE (lb./cu.yd. - Oven Dried Weight) [__ __ __ __]
3. FINE AGGREGATE (lb./cu.yd. - Oven Dried Weight) [__ __ __ __]
4. CEMENT (lb./cu.yd. - Oven Dried Weight) [__ __ __ __]
5. WATER (lb./cu.yd) [__ __ __ __]

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 (AASHTO T121, T152, or T196)

8. MEAN (percent) [__.__]
9. MINIMUM (percent) [__.__]
10. MAXIMUM (percent) [__.__]

ADMIXTURES (See PCC Admixture Codes, Table A.12) (percent by weight of cement)

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

Other (Specify)[_____]

SLUMP (AASHTO T119 or ASTM C143)

14. MEAN (inches) [__.__]
15. MINIMUM (inches) [__.__]
16. MAXIMUM (inches) [__.__]
17. STANDARD DEVIATION (inches) [__.__]
18. NUMBER OF TESTS [__ __ __]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA **SHEET 24** **PCC STRENGTH**	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data 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

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 25 PCC CONSTRUCTION	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__]

2. DATE PAVING BEGAN (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]
3. DATE PAVING COMPLETE (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]

4. TYPE OF PAVER USED [__]
   - Slip-Form Paver 1
   - Side-Form 2
   - Other (Specify)[_____] 3

5. PAVER MANUFACTURER/MODEL [_____]

AIR TEMPERATURES DURING PLACEMENT

6. MEAN (°F) [__ __ __]
7. MINIMUM (°F) [__ __ __]
8. MAXIMUM (°F) [__ __ __]

9. CURING PERIOD BEFORE OPENING TO ANY TRAFFIC (days) [__ __]
10. TIME BEFORE SAWING JOINTS (hours) [__ __]

11. CONSOLIDATION OF MATERIALS [__]
    - Internal Vibrators 1
    - Vibrating Screeds 2
    - Troweling 3
    - Rolling 4
    - Tamping 5
    - Other (Specify)[_____] 6

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

13. METHOD USED TO CURE CONCRETE [__]
    - Membrane Curing Compound ... 1
    - Burlap Curing Blankets 2
    - Waterproof Paper Blankets .. 3
    - White Polyethylene Sheeting 4
    - Burlap-Polyethylene Blanket .. 5
    - Cotton Mat Curing 6
    - Hay 7
    - Other (Specify)[_____] 8

14. METHOD USED TO TEXTURE CONCRETE [__]
    - Tine 1
    - Broom 2
    - Burlap Drag 3
    - Grooved Float 4
    - Astro Turf 5
    - None 6
    - Other (Specify)[_____] 7

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 26 PCC CONSTRUCTION - OVERLAY	STATE CODE [__ __] SHRP ID [__ __ __ __]

*1. LAYER NUMBER (From Data 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

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA **SHEET 27** **PCC JOINT DATA**	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data 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

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 28 PCC JOINT DATA (Continued)	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__]

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

3. TYPE OF LONGITUDINAL JOINT (Between Lanes) [__]
   - Butt 1
   - Keyed 2
   - Sawed Weakened Plane 3
   - Insert Weakened Plane ... 4
   - Other (Specify) [_____] 5

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

5. TRANSVERSE JOINT SEALANT TYPE (As Built) [__]
   - Preformed (Open Web) 1
   - Asphalt 2
   - Rubberized Asphalt 3
   - Low-Modulus Silicone 4
   - Other (Specify) [_____] 5

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) [__ __]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 29 PCC REINFORCING STEEL DATA	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data 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

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA **SHEET 30** **PCC SHOULDER RESTORATION**	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. DATE WORK BEGAN (dd/mmm/yyyy) [__ __ /__ __ __ /__ __ __ __]
2. DATE WORK COMPLETE (dd/mmm /yyyy) [__ __ /__ __ __ /__ __ __ __]

3. SHOULDER RESTORED Outside.....1 Inside.....2 [__]

SHOULDER PROPERTIES (After Restoration)

4. TYPE OF SHOULDER SYSTEM [__]
   - JPCP Shoulder 1
   - JRCP Shoulder 2
   - CRCP Shoulder 3
   - Other Specify)[_____] 4
5. TOTAL WIDTH (feet) [__ __]
6. PAVED WIDTH (feet) [__ __]
7. SURFACE TYPE (See Codes, Table A.5) [__]
   - Other (Specify)[_____]
8. SURFACE THICKNESS (inches) [__ __.__]
9. SHOULDER BASE TYPE (See Codes, Table A.6) [__ __]
10. BASE THICKNESS (inches) [__ __.__]

11. AVERAGE JOINT SPACING (feet) [__ __ __]
12. SKEWNESS OF JOINTS (feet) [__.__]
13. JOINTS MATCH PAVEMENT JOINTS? (Y/N) [__]
14. TYPE OF LANE/SHOULDER JOINT [__]
    - Tied 1
    - Butt 2
    - Keyed 3
    - Other (Specify)[_____] 4
15. LANE/SHOULDER JOINT TIE SYSTEM TYPE [__]
    - None 1
    - Deformed Bars 2
    - Hook Bolts 3
    - Other (Specify)[_____] 4
16. BAR DIAMETER (inches) [__.__ __]
17. BAR LENGTH (inches) [__ __]
18. BAR SPACING (inches) [__ __]

19. LANE/SHOULDER JOINT SEALANT [__]
    - None..... 1
    - Sealed Without Providing Reservoir 2
    - Saw Reservoir and Seal 3
    - Other (Specify)_____ 4
20. LANE/SHOULDER JOINT SEALANT RESERVOIR (inches)
    - WIDTH[__.__]
    - DEPTH[__.__]
21. TYPE OF JOINT SEALANT Poured.....1 Preformed.....2 [__]
22. JOINT SEALANT BACKER MATERIAL TYPE [__]
    - Foam Backer Rod 1
    - Tape 2
    - Rope 3
    - None 4
    - Other (Specify)[_____] 5
23. JOINT SEALANT BACKER DIMENSION (inches) [__.__]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 31 SUBSEALING PCC PAVEMENT	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. DATE WORK BEGAN (dd/mmm /yyyy) [__ __ /__ __ __ /__ __ __ __]
2. DATE WORK COMPLETE (dd/mmm/yyyy) [__ __ /__ __ __ /__ __ __ __]

3. LAYER NUMBER OF PCC PAVEMENT (From Sheet 2) [__]

4. 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

5. DETERMINATION OF AREA TO BE UNDERSEALED [__]
   - Blanket Coverage 1
   - Deflection Data 2
   - Visual Signs of Pumping 3
   - Other (Specify)[_____] 4

ASPHALT CEMENT DATA

6. AC GRADE (See Codes, Table A.16) [__ __]
7. PENETRATION AT 77°F, 100 g, 5 sec. (tenths of a mm) [__ __ __]
   (AASHTO T49, ASTM D5)
8. RING AND BALL SOFTENING POINT (°F) (AASHTO T53, ASTM D36) [__ __ __]

PORTLAND CEMENT GROUT DATA

9. CEMENT TYPE (See Cement Type Codes, Table A.11) [__ __]
10. CEMENT TO SAND RATIO (by weight) [__.__]
11. WATER/CEMENT RATIO (by weight) [__.__ __]
12. ADDITIVE TYPE (See Table A.12) [__ __]
13. AMOUNT OF ADDITIVE (by percent of cement weight) [__ __ __]

14. FLUIDITY OF PORTLAND CEMENT GROUT [__ __.__]
    (Flow Cone Method ASTM C939) (sec.)

15. CUBE COMPRESSIVE STRENGTH OF PORTLAND CEMENT GROUT (psi) [__ __ __]
    (AASHTO T106, ASTM C109)

16. CURING PERIOD FOR PORTLAND CEMENT GROUT (days) [__ __]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 32 SUBSEALING PCC PAVEMENT (Continued)	STATE CODE [__ __] SHRP ID [__ __ __ __]

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? (Y/N)
    BEFORE SUBSEALING [__]
    AFTER SUBSEALING [__]

13. TIME OF DAY THAT DEFLECTION MEASUREMENTS WERE CONDUCTED (hours)

	STARTING TIME	ENDING TIME
BEFORE SUBSEALING	[__ __ __ __]	[__ __ __ __]
AFTER SUBSEALING	[__ __ __ __]	[__ __ __ __]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA **SHEET 33** **LOAD TRANSFER RESTORATION**	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. DATE WORK BEGAN (dd/mmm/yyyy) [__ __ /__ __ __ /__ __ __ __]
2. DATE WORK COMPLETE (dd/mmm/yyyy) [__ __ /__ __ __ /__ __ __ __]

3. LAYER NUMBER (From Sheet 2) [__]

4. 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

5. 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

6. NUMBER OF DEVICES PER JOINT [__ __]

7. 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 [__ __ __]

8. DIAMETER OF RETROFIT DOWEL BARS (inches) [__.__ __]

9. LENGTH OF RETROFIT DOWEL BARS (inches) [__ __.__]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 34 LOAD TRANSFER RESTORATION (Continued)	STATE CODE [__ __] SHRP ID [__ __ __ __]

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 (dd/mmm/yyyy)

   BEFORE RESTORATION [__ __ /__ __ __ /__ __ __ __]
   AFTER RESTORATION [__ __ /__ __ __ /__ __ __ __]

PREPARER___________________ EMPLOYER_____________________DATE______________

LTPP MAINTENANCE/REHABILITATION DATA SHEET 35 CRACK AND SEAT PCC PAVEMENT	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Sheet 2) [__]

2. DATE WORK BEGAN (dd/mmm/yyyy) [__ __ /__ __ __ /__ __ __ __]
3. DATE WORK COMPLETE (dd/mmm/yyyy) [__ __ /__ __ __ /__ __ __ __]

4. AVERAGE PCC BREAKAGE SIZE (inches) WIDTH [__.__]
LENGTH [__.__]

5. PAVEMENT BREAKER PASSES PER LANE [__]

6. 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		

7. PROOF ROLLER TYPE [__]

Steel Wheeled	1	Pneumatic	2

8. PROOF ROLLER WEIGHT (tons) [__.__]

9. BROKEN PAVEMENT EXPOSURE TO TRAFFIC (days) [__ __ __]

10. DEFLECTION MEASUREMENTS TAKEN (Y/N)

BEFORE BREAKING	[__]
AFTER BREAKING (Prior to Seating)	[__]
AFTER SEATING (Prior to Overlay)	[__]
AFTER OVERLAY	[__]

11. DEFLECTION MEASUREMNT DEVICE USED [__]

FWD	1	Road Rater	3
Benkelman Beam	2	Dynaflect	4
Other (Specify)[_____]	5		

12. MAGNITUDE OF LOAD USED FOR DEFLECTION TEST (pounds) [__ __ __ __ __]

13. LOADING FREQUENCY (hertz)(Cyclic loading devices only) [__ __]

14. BROKEN PAVEMENT SURFACE PREPARATION [__]

None	1	Tack Coat	3
Sweeping	2	Leveling Course	4
Full Depth Repair of Failed Areas	5		
Other (Specify)[_____]	6		

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA **SHEET 36** **SEAL COAT APPLICATION DATA**	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__]

2. DATE SEALING BEGAN (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]
3. DATE SEALING COMPLETE (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]

4. TYPE OF SEAL COAT [__]
   - Fog Seal..... 1
   - Slurry Seal..... 2
   - Aggregate Seal..... 3
   - Other (Specify)[_____] 6
   - Sand Seal.....4
   - Cape Seal.....5

5. PRIMARY REASON FOR SEAL COAT [__]
   - Seal Cracks..... 1
   - Improve Skid Resistance. 2
   - Bleeding..... 3
   - Other (Specify)[_____] 6
   - Raveling.....4
   - Unknown.....5

GENERAL CONDITION INFORMATION

6. CONDITION OF EXISTING PAVEMENT SURFACE [__]
   - Flushed-bleeding..... 1
   - Smooth, non-porous..... 2
   - Slightly porous, slightly oxidized 3
   - Slightly pocked, porous, oxidized 4
   - Badly pocked, porous, oxidized 5

7. INITIAL PREPARATION OF EXISTING PAVEMENT SURFACE [__]
   - None..... 1
   - Sweep Clean Only..... 2
   - Other (Specify)[_____] 5
   - Cold Mill 3
   - Shot Blast 4

8. 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

9. SURFACE CLEANLINESS PRIOR TO PLACEMENT
   Clean....1 Moderately Clean....2 Dirty....3 [__]

10. SURFACE MOISTURE AT PLACEMENT - Dry.....1 Wet.....2 [__]

AMBIENT CONDITIONS AT TIME SEAL COAT APPLIED

11. AIR TEMPERATURE (°F) [__ __ __]
12. SURFACE TEMPERATURE (°F) [__ __ __]
13. RELATIVE HUMIDITY (percent) [__ __ __]
14. CLOUD COVER (percent) [__ __ __]
15. WIND SPEED (mph) [__ __ __]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 37 SEAL COAT APPLICATION DATA (Continued)	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Data Sheet 2) [__]

DESIGN INFORMATION

2. APPLICATION RATE FOR BITUMINOUS MATERIAL (gallons/sq. yard) [__.__ __]
3. APPLICATION TEMPERATURE FOR BITUMINOUS MATERIAL (°F) [__ __ __]
4. APPLICATION RATE FOR AGGREGATE (pounds/sq. yard) [__ __.__]

SLURRY SEAL/MICRO-SURFACING DESIGN

5. APPLICATION RATE FOR MINERAL FILLER (pounds/sq. yard) [__ __.__]
6. APPLICATION RATE FOR SLURRY MIXTURE (pounds/sq. yard) [__ __.__]
7. RESIDUAL ASPHALT CONTENT (pounds /sq. yard) [__.__ __]
8. WEAR VALUE (WTAT loss) (g/sq. ft) (ASTM D3910) [__ __ __]

CHIP SEAL DESIGN

9. DESIGN EMBEDMENT DEPTH (inches) [__.__ __]
10. VIALET TEST LAB RESULTS (percent retained) [__ __ __]

EQUIPMENT INFORMATION

ASPHALT DISTRIBUTOR

11. MANUFACTURER/MODEL [_____]
12. NOZZLE ANGLE (degrees) [__ __]
13. SPRAY BAR HEIGHT (inches) [__ __.__]
14. NOZZLE SPACING (inches) [__ __.__]
15. NOZZLE BRAND/MODEL [_____]

AGGREGATE DISTRIBUTOR

16. MANUFACTURER/MODEL [_____]

SLURRY MIXING MACHINE

17. MANUFACTURER/MODEL [_____]
18. SPREADER BOX WIDTH (inches) [__ __ __]
19. TYPE OF DRAG USED [__]

None..... 1 Burlap 2
Other (Specify)[_____] 3

ROLLERS

	ROLLER CODE	ROLLER DESCRIPTION	GROSS WGT (tons)	TIRE PRES. (psi)	SPEED (mph)	COVERAGES (number of passes)
20.	E	PNEUMATIC-TIRED	__ __.__	__ __ __	__ __.__	__ __
21.	F	PNEUMATIC-TIRED	__ __.__	__ __ __	__ __.__	__ __
22.	G	PNEUMATIC-TIRED	__ __.__	__ __ __	__ __.__	__ __
23.	H	PNEUMATIC-TIRED	__ __.__	__ __ __	__ __.__	__ __
24.	Q	OTHER _____			__ __.__	__ __

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 38 SEAL COAT APPLICATION DATA (Continued)	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. LAYER NUMBER (From Sheet 2) [__]

CONSTRUCTION INFORMATION

2. PERCENT OF TEST SECTION SEALED [__ __ __]
3. TACK COAT USED (Y/N) [__]
4 TACK COAT MATERIAL (See Table A.16) [__ __]
   Other (Specify)[_____]
5. TACK COAT APPLICATION RATE (gallons/sq. yard) [__.__]
6. BITUMINOUS MATERIAL APPLICATION RATE (gallons/sq. yard) [__.__]
7. BITUMINOUS MATERIAL APPLICATION TEMPERATURE (°F) [__ __ __]
8. APPEARANCE OF NON-UNIFORM BITUMINOUS MATERIAL APPLICATION (ft) [__ __ __]
9. AGGREGATE PRECOATED? (Y/N) [__]
10. AGGREGATE APPLICATION RATE (pounds/sq. yard) [__ __.__]
11. APPEARANCE OF NON-UNIFORM AGGREAGATE APPLICATION (ft) [__ __ __]

SLURRY SEAL/MICRO-SURFACING SURFACE

12. MINERAL FILLER APPLICATION RATE (pounds/sq. yard) [__ __.__]
13. WATER ADDED TO MIX (gallons/sq. yard) [__.__ __]
14. MICRO-SURFACING APPLICATION RATE (pounds/sq. yard) [__ __.__]
15. WEAR VALUE (WTAT loss) – AS PLACED (g/sq. ft) (ASTM D3910) [__ __ __]

AGGREGATE CONDITION PRIOR TO USE

16. CLEANLINESS - Clean...1 Moderately Clean...2 Dirty...3 [__]
17. WETNESS – Very Dry..1 Only Slightly Damp..3 Slightly Wet..5 [__]
    Dry.....2 Somewhat Damp.....4 Wet.....6
18. MOISTURE CONTENT (percent by weight) [__ __.__]

19. ESTIMATED TIME BETWEEN SPREADING AND FOOT TRAFFIC (hours) [__.__]
20. ESTIMATED TIME BETWEEN SPREADING AND VEHICLE TRAFFIC (hours) [__ __.__]

FINISHED SURFACE INFORMATION

21. APPROXIMATE FINISHED SURFACE TREATMENT THICKNESS (inches) [__.__]

CHIP SEAL SURFACE

22. MEASURED EMBEDMENT DEPTH (inches) [__.__ __]
23. VIALET TEST FIELD RESULTS (percent retained) [__ __ __]

SLURRY SEAL/MICRO-SURFACING SURFACE

24. SURFACE TEXTURE PROVIDED [__]
    Rough and Open..... 1 Somewhat Smooth and Tight 3
    Somewhat Rough and Open.. 2 Smooth and Tight 4

25. DOES BROOMING DISLODGE SURFACE (Y/N) [__]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 39 MILLED SECTIONS	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. DATE OF MILLING (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]

DESIGN INFORMATION

2. DESIGN MILLING DEPTH (inches) [__ __.__]

EQUIPMENT INFORMATION

3. MANUFACTURER OF MILLING MACHINE [_____]
4. MILLING MACHINE MODEL DESIGNATION [_____]
5. WIDTH OF CUTTING HEAD (Inches) [__ __ __ __.__]

AMBIENT CONDITIONS AT TIME OF MILLING

6. AIR TEMPERATURE (°F) [__ __ __]
7. SURFACE TEMPERATURE (°F) [__ __ __]
8. RELATIVE HUMIDITY (percent) [__ __ __]
9. CLOUD COVER (percent) [__ __ __]
10. WIND SPEED (mph) [__ __ __]

CONSTRUCTION INFORMATION

11. EXTENT OF MILLING [__]
    Entire Section..... 1 Joints/Cracks 2
    Patches..... 3
    Other (Specify)[_____].4

12. WERE PATCHES PLACED AFTER MILLING? (Y/N) [__]
13. LENGTH OF TIME MILLED SURFACE WAS OPEN TO TRAFFIC (Hours) [__ __ __ __]
14. WAS ADJACENT TRAVEL LANE MILLED TO SAME DEPTH AS TEST LANE? [__]
    If no, width milled same depth as test lane (Feet) [__ __.__]
15. GENERAL CONSTURCTION COMMENTS _____
    _____
    _____

MILLED SURFACE CHARACTERISTICS

16. TOTAL MILLED DEPTH (Inches)

Location	Measurements	Maximum	Minimum	STD. DEV.	Average
Inside Edge	[__ __]	[__ __.__]	[__ __.__]	[__.__]	[__ __.__]
Outside Edge	[__ __]	[__ __.__]	[__ __.__]	[__.__]	[__ __.__]

17. Macro Texture Fine (≤ ¼ inch).. 1 Coarse (> ¼ inch).. 2 [__]
18. Estimate of Extent of Test Section Surface Delaminated (%) [__ __ __]
18. Height of Ridge Between Parallel Passes (Inches) [__ __.__]
20. Other Comments about the newly milled surface _____
    _____

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA **SHEET 40** **PATCHING AC SURFACES**	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. DATE PATCHING BEGAN (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]
2. DATE PATCHING COMPLETE (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]

3. PRIMARY DISTRESS OCCURRENCE PATCHED (Table A.22) [__ __]
   Other (Specify)_____
   _____

4. SECONDARY DISTRESS OCCURRENCE PATCHED (Table A.22) [__ __]
   Other (Specify)_____
   _____

5. SUMMARY OF PATCHING

	NUMBER	TOTAL AREA (sq. ft.)
Surface Only	[__ __]	[__ __ __ __]
Surface and partial base replacement	[__ __]	[__ __ __ __]
Full Depth	[__ __]	[__ __ __ __]

6. METHOD USED TO DETERMINE LOCATION AND SIZES OF PATCHES [__]
   Deflection... 1 Coring... 2 Visual... 3
   Other…..4 (Specify)_____

7. METHOD USED TO FORM PATCH BOUNDARIES [__]
   None.... 1 Saw Cut... 2 Air Hammer... 3 Cold Milling... 4
   Other... 5 (Specify)_____

8. COMPACTION EQUIPMENT [__] [__]
   None..... 1 Pneumatic Roller... 2 Vibratory Plate Compactor. 3
   Vibratory Roller. 4 Steel Wheel Roller. 5 Truck Tire..... 6
   Hand Tools..... 7 Other..... 8(Specify) _____

9. PATCH MATERIAL [__]
   Hot Mix Asphalt Concrete..... 1
   Plant Mix with Cutback Asphalt, Cold Laid..... 2
   Plant Mix with Emulsified Asphalt, Cold Laid..... 3
   Road Mix with Cutback Asphalt..... 4
   Road Mix with Emulsified Asphalt..... 5
   Portland Cement Concrete..... 6
   Other(Specify) _____ 7

10. MINIMUM TIME FROM PLACEMENT TO OPENING TO TRAFFIC (Hours) [__ __]

11. MAXIMUM MATERIAL TEMP FOR TRAFFIC OPENING (IF USED) (°F) [___ __ __]

12. AIR TEMPERATURE DURING PLACEMENT OPERATIONS
    High Temperature (°F) [__ __ __]
    Low Temperature (°F) [__ __ __]

13. PREDOMINANT ROAD SURFACE MOISTURE CONDITION DURING PLACEMENT OPERATIONS
    Dry... 1 Moist... 2 Wet... 3 [__]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA **SHEET 41** **CRACK SEALING AC SURFACES**	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. DATE CRACK SEALING BEGAN (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]
2. DATE CRACK SEALING COMPLETE (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]

3. AVERAGE CRACK SEVERITY LEVEL (See Distress Identification Manual) [__]
   Low...1 Moderate...2 High...3

4. PRIMARY TYPE OF CRACKS (See Table A.22 for Type Codes) [__ __]
   (See Distress Identification Manual for Description)

5. 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

   IF 6 OR 7 ABOVE, COMPLETE FOLLOWING:
   MANUFACTURER NAME [_____]
   MANUFACTURER SEALANT NAME [_____]

6. AMBIENT CONDITIONS AT TIME OF CRACK SEALING
   AIR TEMPERATURES (°F) LOW [__ __ __]
   HIGH [__ __ __]

   SURFACE MOISTURE - Dry... 1 Wet... 2 [__]

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

8. METHOD USED TO CLEAN CRACKS PRIOR TO SEALING [__]

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

   Other (Specify) [_____]7

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 42 DIAMOND GRINDING	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. DATE OF GRINDING (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]

DESIGN INFORMATION

2. REASON FOR GRINDING [__]
   - Faulting 1
   - Slab Warping 2
   - Skid Resistance 3
   - Trans. Slope Restoration . 4
   - Other (Specify)[_____] 5

3. DESIGN GRINDING DEPTH (inches) [__.__ __]
4. DESIGN LATERAL SPACING (inches) [__ __ __]

EQUIPMENT INFORMATION

5. MANUFACTURER/MODEL [_____]
6. CUTTING HEAD WIDTH (inches) [__ __ __.__]
7 AVERAGE SPACING BETWEEN BLADES (inches) [__.__]

GENERAL CONDITION INFORMATION

8. EXISTING PAVEMENT SURFACE FINISH [__]
   - Longitudinal Tining 1
   - Transverse Tining 2
   - Broomed Finish 3
   - Other (Specify)[_____] 4

9. EXISTING SURFACE MEAN TEXTURE DEPTH (ASTM E965)(inches) [__.__ __ __]
10. HARDNESS OF EXISTING PAVEMENT SURFACE (MOHS SCALE) [__.__]

AMBIENT CONDITIONS AT TIME OF GRINDING

11. AIR TEMPERATURE (°F) [__ __ __]
12. SURFACE TEMPERATURE (°F) [__ __ __]
13. RELATIVE HUMIDITY (percent) [__ __ __]
14. CLOUD COVER (percent) [__ __ __]
15. WIND SPEED (mph) [__ __ __]

CONSTRUCTION INFORMATION

16. EXTENT OF GRINDING [__]
   - Entire Section..... 1
   - Joints/Cracks 2
   - Patches..... 3
   - Other (Specify)[_____].4

17. IS CONCRETE SLURRY ADEQUATELY REMOVED? (Y/N) [__]

FINISHED SURFACE INFORMATION

18. MEAN TEXTURE DEPTH (ASTM E965)(inches) [__.__ __ __]
19. TRANSVERSE SLOPE (inches) [__.__ __]
20. AVERAGE DEPTH OF CUT (inches) [__.__ __]
21. AVERAGE GROOVE WIDTH (inches) [__.__]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 43 PATCHING PCC SURFACES	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. DATE WORK BEGAN (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]
2. DATE WORK COMPLETE (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]

GENERAL INFORMATION

3. TYPE OF PATCHES [__]
   - Full Depth – Partial Slab Only 1
   - Full Depth – Partial Slab and Base 2
   - Full Depth – Full Slab Replacement 3
   - Full Depth – Full Slab and Base Replacement 4
   - Partial Depth..... 5

4. PATCH MATERIAL USED [__]
   - Portland Cement Concrete.. 1
   - Polymer Concrete..... 2
   - Other (Specify)[_____] 5
   - Asphalt Concrete 3
   - Epoxy Mortar 4

5. PRIMARY REASON FOR PATCHES (See Table A.22) [__ __]
   Other (Specify) [_____]

6. SECONDARY REASON FOR PATCHES (See Table A.22 [__ __]
   Other (Specify) [_____]

7. NUMBER OF PATCHES [__ __]

8. AREA OF PATCHES (sq. feet) [__ __ __]

9. METHOD USED TO DETERMINE SIZE AND LOCATION OF PATCHES REQUIRED [__]
   - Visual..... 1
   - Coring..... 2
   - Other (Specify)[_____] 5
   - Deflection 3
   - State Standard/Spec 4

10. BASE REPLACED BY (Blank if No Base is Replaced) [__]
    - Similar Material..... 1
    - Asphalt Concrete..... 2
    - Portland Cement Concrete.. 3
    - Other (Specify)[_____] 4

AMBIENT CONDITIONS AT TIME OF PATCHING

11. AIR TEMPERATURE (°F) LOW [__ __ __] HIGH[__ __ __]
12. SURFACE TEMPERATURE (°F) [__ __ __]
13. RELATIVE HUMIDITY (percent) [__ __ __]
14. CLOUD COVER (percent) [__ __ __]
15. WIND SPEED (mph) [__ __ __]

16. PREDOMINANT ROAD SURFACE MOISTURE CONDITION DURING PLACEMENT OPERATIONS
    Dry... 1 Moist... 2 Wet... 3 [__]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 44 PATCHING PCC SURFACES (Continued)	STATE CODE [__ __] SHRP ID [__ __ __ __]

SITE PREPARATION INFO

1. METHOD USED TO CUT PATCH BOUNDARIES [__]
   - Diamond Blade Saw..... 1
   - Carbide Blade Saw..... 2
   - Other (Specify)[_____] 5
   - Wheel Saw 3
   - Air Hammer 4

2. NUMBER OF SAW CUTS PER PATCH (If Sawed) [__ __]
3. DEPTH OF TYPICAL BOUNDARY SAW CUT (inches) [__ __.__]

4. METHOD USED TO BREAK UP DETERIORATED CONCRETE [__]
   - None..... 1
   - Pneumatic Air Hammer.... 2
   - Other (Specify)[_____] 5
   - Gravity Drop Hammer 3
   - Sawing 4

5. REMOVAL OF CONCRETE [__]
   - Concrete Breakup and Cleanout 1
   - Lift out Intact Slab Section..... 2
   - Other (Specify)[_____] 3

6. METHOD USED FOR FINAL CLEANING OF PATCH AREA [__]
   - None..... 1
   - Sandblasting..... 2
   - Other (Specify)[_____] 5
   - WaterBlasting 3
   - Sawing 4

ASPHALT PATCHING INFORMATION (use only for AC patches)

7. PATCH MATERIAL [__]
   - Hot Mix Asphalt Concrete 1
   - Plant Mix with Cutback Asphalt, Cold Laid..... 2
   - Plant Mix with Emulsified Asphalt, Cold Laid..... 3
   - Road Mix with Cutback Asphalt 4
   - Road Mix with Emulsified Asphalt 5
   - Other(Specify) 7

8. COMPACTION EQUIPMENT [__] [__]
   - None..... 1
   - Vibratory Roller. 4
   - Hand Tools..... 7
   - Pneumatic Roller... 2
   - Steel Wheel Roller. 5
   - Other(Speficy)[_____] 8
   - Vibratory Plate Compactor. 3
   - Truck Tire..... 6

9. MAXIMUM MATERIAL TEMP FOR TRAFFIC OPENING (IF USED) (°F) [___ __ __]

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

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 45 PATCHING PCC SURFACES (Continued)	STATE CODE [__ __] SHRP ID [__ __ __ __]

PCC PATCHING INFORMATION

1 MIXTURE DESIGN FOR PATCH MATERIAL
- COARSE AGGREGATE (lbs./cubic yd.) [__ __ __ __]
- FINE AGGREGATE (lbs./cubic yd.) [__ __ __ __]
- CEMENT (lbs./cubic yd.) [__ __ __ __]
- WATER (gallons/cubic yd.) [__ __ __ __]

2. TYPE CEMENT USED (See Type Codes, Tables A.11 and A.16) [__ __]

3. AIR CONTENT (percent by volume)
- MEAN [__ __.__]
- RANGE [__ __.__ to __ __.__]

4. ADMIXTURES (See Cement Additive Codes, Table A.12) [__ __] , [__ __]

5. SLUMP (inches)
- MEAN [__.__]
- RANGE [__.__ to __.__]

6. MAXIMUM SIZE OF COARSE AGGREGATE (inches) [__.__]

7. COMPRESSIVE STRENGTH (psi) [__ __ __ __]
CURING TIME (days) [__ __]
- If Unavailable, And other Strength Test Conducted,
- ENTER ALTERNATE TEST [_____]
- TYPE OF LOADING [_____]
- AGE (days) [__ __]; STRENGTH (psi) [__ __ __ __]

8. TYPE OF JOINT LOAD TRANSFER SYSTEM — TRANSVERSE [__ __] LONGITUDINAL [__ __]

None	1	Undercutting	4
Dowel Bars	2	Aggregate Interlock	5
Tie Bars	3		
Other (Specify) [_____]	6		

9. DOWEL COATINGS — TRANSVERSE [__] LONGITUDINAL [__]

None	1	Monel	4
Paint and/or Grease	2	Stainless Steel	5
Plastic	3	Epoxy	6
Other (Specify) [_____]	7		

10. SECURING LOAD TRANSFER DEVICES [__]

None	1	Epoxy Filler	3
Grout Filler	2		
Other (Specify) [_____]	4		

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 46 PATCHING PCC SURFACES (Continued)	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. REINFORCING STEEL PLACED IN PATCH (Y/N) [__]
2. PLACEMENT METHOD Chairs . 1 Between PCC layers .. 2 [__]

	TRANSVERSE	LONGITUDINAL
3. BAR DIAMETERS (rebar number)	[__ __]	[__ __]
4. BAR LENGTHS (inches)	[__ __ __.__]	[__ __ __.__]
5. BAR SPACING (inches)	[__ __.__]	[__ __.__]

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		

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

Yes	1	No	2

8. 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 Sheeting	5		
Other (Specify)[_____]	10		

9. CONSOLIDATION OF MATERIALS[1] [__]

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

10. FINISHING [__]

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

11. TYPE OF TRANSVERSE JOINTS IN PATCHES [__]

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

12. WERE OLD JOINTS MATCHED? [__]

Yes	1	No	2

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

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 47 PCC JOINT SEALANT APPLICATION DATA	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. DATE SEALING BEGAN (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]
2. DATE SEALING COMPLETE (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]

EXISTING CONDITION INFORMATION

3. JOINTS PREVIOUSLY SEALED? (Y/N) [__]
4. CONDITION OF EXISITNG SEALANT – APPROX % OF SEALANT LENGTH WITH
   - EXTRUSION [__ __ __]
   - HARDENING [__ __ __]
   - ADHESIVE FAILURE [__ __ __]
   - COHESIVE FAILURE [__ __ __]
   - SEALANT LOSS [__ __ __]
   - FOREIGN MATERIAL INTRUSION [__ __ __]
   - WEED GROWTH [__ __ __]

AMBIENT CONDITIONS AT TIME SEAL COAT APPLIED

5. AIR TEMPERATURE (°F) [__ __ __]
6. SURFACE TEMPERATURE (°F) [__ __ __]
7. RELATIVE HUMIDITY (percent) [__ __ __]
8. CLOUD COVER (percent) [__ __ __]
9. WIND SPEED (mph) [__ __ __]

SURFACE PREPARATION

10. METHOD OF REMOVING OLD SEALANT [__]

Not Removed.....1	Joint Plow - V-Shaped . 2
Joint Plow – Rectangular.3	Water Blasting 4
Diamond Blade Saw.....5	Carbide Blade Saw 6
Pull-Out Old Sealant.....7	Not Previously Sealed . 8
Other (Specify)[_____] 9	

11. WERE JOINT SIDEWALLS REFACED? [__]

No..... 1
Yes -- One-Blade..... 2
Yes -- Two-Blade..... 3
Other (Specify) [_____]4

12. CLEANING OF SIDEWALLS [__]

None..... 1
Sandblasting..... 2
Pressure Washing..... 3
Other (Specify) [_____]4

RESERVIOR INFORMATION (Prior to Sealing)

13. WIDTH (inches) [__.__]
14. DEPTH (inches) [__ __.__]
15. CLEANLINESS - Clean...1 Moderately Clean...2 Dirty...3 [__]
16. WETNESS – Very Dry..1 Only Slightly Damp..3 Slightly Wet..5 [__]
    Dry.....2 Somewhat Damp.....4 Wet.....6

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 48 PCC JOINT SEALANT APPLICATION DATA (Continued)	STATE CODE [__ __] SHRP ID [__ __ __ __]

SEALANT INFORMATION

1. TYPE OF 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

2. MANUFACTURER NAME [_____]
3. MANUFACTURER SEALANT NAME [_____]

BOND BREAKER

4. TYPE OF BOND BREAKER UNDER SEALANT [__]

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

5. BOND BREAKER SIZE (inches) [__.__]
6. DEPTH FROM SURFACE TO TOP OF BOND BREAKER (inches) [__.__]

SEALING INFORMATION

7. SEALANT APPLICATION TEMPERATURE (°F) [__ __ __]
8. SEALANT APPLICATION RATE (pounds/linear foot) [__.__ __]
9. DEPTH OF TOP OF SEALANT (Below Pavement Surface) (inches) [__.__]
10. ESTIMATED TIME BETWEEN SURFACE PREPARATION AND SEALING (days) [__]
11. ESTIMATED TIME BETWEEN SEALING AND VEHICLE TRAFFIC (hours) [__ __.__]
12. LENGTH OF TRANSVERSE JOINTS SEALED (linear feet) [__ __ __ __.__]
13. LENGTH OF LONGITUDINAL JOINTS SEALED (linear feet) [__ __ __ __.__]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 49 PCC PENETRATING SEALER APPLICATION DATA	STATE CODE [__ __] SHRP ID [__ __ __ __]

1. DATE SEALING BEGAN (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]
2. DATE SEALING COMPLETE (dd/mmm/yyyy) [__ __/__ __ __/__ __ __ __]

EXISTING CONDITION INFORMATION

3. JOINTS PREVIOUSLY SEALED? (Y/N) [__]

AMBIENT CONDITIONS AT TIME SEALER APPLIED

4. AIR TEMPERATURE (°F) [__ __ __]
5. SURFACE TEMPERATURE (°F) [__ __ __]
6. RELATIVE HUMIDITY (percent) [__ __ __]
7. CLOUD COVER (percent) [__ __ __]
8. WIND SPEED (mph) [__ __ __]

SURFACE PREPARATION

9. WAS JOINT PRESSURE WASHED PRIOR TO APPLICATION (Y/N) [__]

10. OTHER SURFACE PREPERATION [_____]

11. CLEANLINESS - Clean...1 Moderately Clean...2 Dirty...3 [__]

12. WETNESS – Very Dry..1 Only Slightly Damp..3 Slightly Wet..5 [__]
Dry.....2 Somewhat Damp.....4 Wet.....6

SEALANT INFORMATION

13. MANUFACTURER NAME [_____]
14. MANUFACTURER SEALANT NAME [_____]

APPLICATION

15. SEALER APPLICATION RATE (gal/square yard) [__.__ __]
16. WIDTH OF APPLICATION (inches) [__ __.__]
17. DEPTH OF PENETRATION (inches) [__.__ __]

PREPARER_____ EMPLOYER_____DATE_____

LTPP MAINTENANCE/REHABILITATION DATA SHEET 50 CRACK SEALING PCC SURFACES	STATE CODE [__ __] SHRP ID [__ __ __ __]

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

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

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

5. METHOD USED TO CLEAN CRACKS PRIOR TO SEALING [__]
   None..... 1 Steel Wire Brush..... 4
   Compressed Air..... 2 Brooming..... 5
   Routing..... 3 Hot Air Lance..... 6
   Other (Specify) [_____]7

6. 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 [_____]

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

8. TOTAL LINEAR FEET OF CRACKS SEALED [__ __ __ __.__]

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

PREPARER_____ EMPLOYER_____DATE_____

REFERENCES

1. "Strategic Highway Research Program, Research Plans, Final Report," Transportation Research Board, National Research Council, National Cooperative Highway Research Program, May 1986.
2. Miller, J.S. and Bellinger, W.Y., *Distress Identification Manual for the Long-Term Pavement Performance Program (Fifth Revised Edition)*, Report No. FHWA-RD-13-092, McLean, Virginia, May 2014.

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).

The 6W designates WMA mixtures as follows:

Chemical Additives are defined as water-free (non-aqueous) chemistry packages that modify the AC binder properties to enhance coating, adhesion, and workability at reduced temperatures. This includes surfactants, fatty-acid chemical additives, cationic surface-active agents, and rheology modifiers.

Organic Additives are plant-based, wax-based, or sulfur-extended materials designed to provide viscosity reduction, aid in asphaltenes dispersion, and act as a lubricant at mixing temperatures below that of standard HMA.

Table A.3 – Experiment Type Definitions (Continued)

Foaming Additives are defined as water-containing materials added to the mixture to foam the asphalt. The most common foaming additive is synthetic zeolite. Zeolite contains 20-30% water that is released at temperatures above the boiling point of water. The water from the zeolite foams the asphalt binder.

The ***Foaming Process*** category includes all WMA types that utilize assemblies/modifications to the plant to foam AC binder without additives. This includes foaming nozzles, expansion chambers, vortex mixers, and shearing devices. While the other categories may be added to the mix using some type of nozzle or other addition, the key distinction between the Foaming Process category and others is the absence of additives. WMA technologies that fall into the Foaming Process category only utilize water.

(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.)

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).

The 6W designates WMA mixtures as follows:

Chemical Additives are defined as water-free (non-aqueous) chemistry packages that modify the AC binder properties to enhance coating, adhesion, and workability at reduced temperatures. This includes surfactants, fatty-acid chemical additives, cationic surface-active agents, and rheology modifiers.

Table A.3 – Experiment Type Definitions (Continued)

Organic Additives are plant-based, wax-based, or sulfur-extended materials designed to provide viscosity reduction, aid in asphaltenes dispersion, and act as a lubricant at mixing temperatures below that of standard HMA.

Foaming Additives are defined as water-containing materials added to the mixture to foam the asphalt. The most common foaming additive is synthetic zeolite. Zeolite contains 20-30% water that is released at temperatures above the boiling point of water. The water from the zeolite foams the asphalt binder.

The ***Foaming Process*** category includes all WMA types that utilize assemblies/modifications to the plant to foam AC binder without additives. This includes foaming nozzles, expansion chambers, vortex mixers, and shearing devices. While the other categories may be added to the mix using some type of nozzle or other addition, the key distinction between the Foaming Process category and others is the absence of additives. WMA technologies that fall into the Foaming Process category only utilize water.

(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.

Table A.3 – Experiment Type Definitions (Continued)

(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 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.

(10) Warm Mix Asphalt (WMA)

The experiment on WMA was designed to study the effects of warm mix asphalt layers on existing and newly constructed pavements. The experiment design includes all four climatic regions. The experiment design stipulates a mixture produced at or below 275^{o}F or a mixture produced at temperatures at least 30^{o}F below the production temperature of the HMA control. The WMA mixture is as follows:

Chemical Additives are defined as water-free (non-aqueous) chemistry packages that modify the AC binder properties to enhance coating, adhesion, and workability at reduced temperatures. This includes surfactants, fatty-acid chemical additives, cationic surface-active agents, and rheology modifiers.

Organic Additives are plant-based, wax-based, or sulfur-extended materials designed to provide viscosity reduction, aid in asphaltenes dispersion, and act as a lubricant at mixing temperatures below that of standard HMA.

Foaming Additives are defined as water-containing materials added to the mixture to foam the asphalt. The most common foaming additive is synthetic zeolite. Zeolite contains 20-30% water that is released at temperatures above the boiling point of water. The water from the zeolite foams the asphalt binder.

The ***Foaming Process*** category includes all WMA types that utilize assemblies/modifications to the plant to foam AC binder without additives. This includes foaming nozzles, expansion chambers, vortex mixers, and shearing devices. While the other categories may be added to the mix using some type of nozzle or other addition, the key distinction between the Foaming Process category and others is the absence of additives. WMA technologies that fall into the Foaming Process category only utilize water.

(11) AC Preservation

The SPS-11 experiment examines the effectiveness of a single application of an AC preservation treatment as a function of pavement condition and time through application of the same preservation treatment, at different times, on the same pavement structure. Three different treatments are part of the experiment, each with a different designation. SPS-11T is used for thin AC overlays, SPS-11C for chip seals, and SPS-11M for micro-surfacing. The treatments should be applied to roadways with a recent (<4 years) overlay, with no visible distress and a smooth (IRI<80) surface.

(12) PCC Preservation

The SPS-12 experiment examines the effectiveness of a single application of a PCC preservation treatment as a function of pavement condition and time through application of the same preservation treatment, at different times, on the same pavement structure. Three different treatments are part of the experiment, each with a different designation. SPS-12G is used for diamond grinding, SPS-12S for joint sealing, and SPS-12P for penetrating sealers. The treatments should be applied to recently constructed (<4 years for sealers, <10 years for grinding), dowelled JPCC surfaces in good condition.

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
Warm Mix Dense Graded	91
Warm Mix Open Graded	92
Warm Mix Gap Graded	93

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
Micro-surfacing	87
Plain Portland Cement Concrete (only used for SPS-7)	90

Table A.9 – Geologic Classification Codes

	Code
Igneous	
Granite	01
Syenite	02
Diorite	03
Gabbro	04
Peridotite	05
Felsite	06
Basalt	07
Diabase	08
Sedimentary	
Limestone	09
Dolomite	10
Shale	11
Sandstone	12
Chert	13
Conglomerate	14
Breccia	15
Metamorphic	
Gneiss	16
Schist	17
Amphibolite	18
Slate	19
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	**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, Arizona	05
Cross Oil and Refining Company, Smackover, Arizona	06
Lion Oil Company, El Dorado, Arizona	07
McMillan Ring, Free Oil Cl., Norphlet, Arizona	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., Oildate, 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., Martinez, 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	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
Alon Israel Oil Company LTD – Bakersfield, Californa	94
Alon Israel Oil Company LTD – Krotz Springs, Lousiana	95
Alon Israel Oil Company LTD – Big Spring, Texas	96
American Refining Group Inc. – Bradford, Pennsylvania	97
FJ Management Inc. – North Salt Lake, Utah	98
BP PLC – Prudhoe Bay, Alaska	99
BP PLC – Whiting, Indiana	100
BP PLC – Texas City, Texas	101
BP PLC – Los Angeles, California	102
BP PLC – Ferndale, Washington	103
BP Husky Refining LLC, Toledo, Ohio	104
Transworld Oil USA, Inc. – Lake Charles, Louisana	105
Calumet Lubricants, Co – Cotton Valley, Louisiana	106
Calumet Lubricants, Co – Princeton, Louisiana	107
Calumet Lubricants, Co – Superior, Wisconsin	108
Calumet Lubricants, Co - Shreveport, Louisiana	109
CHS, Inc. – Laurel, Montana	110
Chalmette Refining LLC = Chalmette, Louisiana	111
Chevron Corp – El Segundo, Californa	112
Chevron Corp – Honolulu, Hawaii	113
Chevron Corp – Salt Lake City, Utah	114
PDV America Inc. – Lake Charles, Louisiana	115
PDV American Inc. – Corpus Christi, Texas	116
CVR Energy – Coffeyville, Kansas	117
ConocoPhillips – Prudhoe Bay, Alaska	118
ConocoPhillips – Rodeo, California	119
ConocoPhillips – Wilmington, California	120
ConocoPhillips – Belle Chasse, Louisiana	121

Table A.14 – Codes for Asphalt Refiners and Processors in the United States* (Continued)

	Code
ConocoPhillips – Westlake, Louisiana	122
ConocoPhillips – Linden, New Jersey	123
ConocoPhillips – Ponca City, Oklahoma	124
ConocoPhillips – Sweeny, Texas	125
ConocoPhillips – Ferndale, Washington	126
Continental Refining Co. LLC – Somerset, Kentucky	127
Countrymark Coop Inc. – Mount Vernon, Indiana	128
Deer Park Refining LTD PTNRSHP – Delaware City, Delaware	129
Delek Group LTD – Tyler, Texas	130
Access Industries - Channelview, Texas	131
Ergon Inc. – Newell, West Virginia	132
Excel Paralubes – Westlake, Louisiana	133
Exxon Mobil Corp – Torrance, California	134
Exxon Mobil Corp – Joliet, Illinois	135
Exxon Mobil Corp – Beaumont, Texas	136
Koch Industries Inc. – North Pole, Alaska	137
Koch Industries Inc. – Saint Paul, Minnesota	138
Koch Industries Inc. – Corpus Christi, Texas	139
Foreland Refining Corp – Ely, Nevada	140
Hollyfrontier Corp – El Dorado, Kansas	141
Hollyfrontier Corp – Woods Cross, Utah	142
Access Industries – Houston, Texas	143
Hovensa LLC – Kingshill, Virgin Islands	144
Hunt Consld Inc. – Tuscaloosa, Alabama	145
Hunt Consld Inc. – Sandersville, Mississippi	146
Kern Oil & Refining Co. – Bakersfield, California	147
Blue Dolphin Energy Co – Nixon, Texas	148
Husky Energy Inc. – Lima, Ohio	149
Delek Group LTD – El Dorado, Arkansas	150
Sinclair Oil Corp – Evansville, Wyoming	151
World Oil Co – South Gate, California	152
Marathon Petroleum Corp – Robinson, Illinois	153
Marathon Petroleum Corp – Catlettsburg, Kentucky	154
Marathon Petroleum Corp – Canton, Ohio	155
Marathon Petroleum Corp – Texas City, Texas	156
Martin Reseource Management Grp – Smackover, Arkansas	156
Connacher Oil & Gas LTD – Great Falls, Montana	157
Motiva Enterprises LLC – Convent, Louisiana	158
Motiva Enterprises LLC – Norco, Louisiana	159
Motiva Enterprises LLC – Port Arthur, Texas	160
Hollyfrontier Corp – Artesia, New Mexico	161

Table A.14 – Codes for Asphalt Refiners and Processors in the United States* (Continued)

	Code
CHS Inc. – McPherson, Kansas	162
Nustar Energy LP – Savanna, Georgia	163
Nustar Energy LP – Paulsboro, New Jersey	164
Nustar Energy LP – San Antonio, Texas	165
Alon Israel Oil Company LTD – Paramount, California	166
Petroleo Brasileiro SA – Pasadena, California	167
PBF Energy Co LLC – Paulsboro, New Jersey	168
PDV American Inc. – Lemont, Illinois	169
Pelican Refining Co. LLC – Lake Charles, Louisiana	170
Arctic Slope regional Corp – North Pole, Alaska	171
Arctic Slope regional Corp – Valdez, Alaska	172
Placid Oil Co – Port Allen, Louisiana	173
Vallero Energy Corp – Memphis, Tennessee	174
Vallero Energy Corp – Port Arthur, Texas	175
Greka Energy – Santa Maria, California	176
Royal Dutch/Shell Group – Saraland, Alabama	177
Royal Dutch/Shell Group – Martinez, Californa	178
Royal Dutch/Shell Group – Saint Rose, Louisiana	179
Royal Dutch/Shell Group – Anacortes, Washington	180
Silver Eagle Refining Inc. – Woods Cross, Utah	181
Silver Eagle Refining Inc. – Evanston,Wyoming	182
Texas Oil & Chemical Co. –Silsbee, Texas	183
Northern Tier Energy LLC – Saint Paul, Minnesota	184
Suncor Energy Inc. – Commerce City East, Colorado	185
Sunoco Inc. – Philadelphia, Pennsylvania	186
Tesoro Corp – Kenai, Alaska	187
Tesoro Corp – Ewa Beach, Hawaii	188
Tesoro Corp – Martinez, California	189
Tesoro Corp – Wilmington, California	190
Tesoro Corp – Mandan, North Dakota	191
Tesoro Corp – Salt Lake City, Utah	192
Tesoro Corp – Anacortes, Washington	193
PBF Energy Co. LLC – Toledo, Ohio	194
Total SA – Port Arthur, Texas	195
BTB Refining LLC – Corpus Christi, Texas	196
Compagnie Nationale A Portefeuilli – Tacoma, Washington	197
Valero Energy Corp – Meraux, Louisiana	198
Valero Energy Corp – Sunray, Texas	199
Valero Energy Corp – Three Rivers, Texas	200
Valero Energy Corp – Benicia, California	201
Valero Energy Corp – Wilmington Asphalt Plant, California	202

Table A.14 – Codes for Asphalt Refiners and Processors in the United States* (Continued)

Code

Valero Energy Corp – Wilmington Refinery, Califorina.....203
Valero Energy Corp – Ardmore, Oklahoma.....204
Valero Energy Corp – Houston, Texas.....205
Valero Energy Corp – Texas City, Texas.....206
Valero Energy Corp – Norco, Louisiana.....207
Ventura Refining and Transmission LLC – Thomas, Oklahoma.....208
Western Refining Inc. – El Paso, Texas.....209
Western Refining Inc. – Bloomfield, New Mexico.....210
Western Refining Inc. – Gallup, New Mexico.....211
WRB Refining LP – Wood River, Illinois.....212
WRB Refining LP – Borger, Texas.....213
CVR Energy – Wynnewood, Oklahoma.....214
Black Elk Refining LLC – New Castle, Wyoming.....215

* Codes 1-93 Originally taken from Oil and Gas Journal, March 20, 1989, pp. 72-89 and updated October 1993. Codes 94-215 taken from Energy Information Administration (EIA), Form EIA-820, "Annual Refinery Report" as of January 1, 2012.

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

Table A.16 – Grades of Asphalt, Emulsified Asphalt, and Cutback Asphalt Codes (Continued)

	Code
70	37
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

Table A.17 – Maintenance and Rehabilitation Work Type Codes (Continued)

Codes

Dust Layering (sq. yards) 37
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
Mill Existing Pavement and Overlay with Warm Mix AC (sq. yards) 58
Warm Mix AC Overlay (sq. yards) 59
Warm Mix AC Overlay with RAP and/or RAS (sq. yards) 60
Mill Existing Pavement and Overlay with Warm Mix Recycled AC (sq. yards) 61
Micro-surfacing (sq. yards) 62
PCC Penetrating Sealant (sq. yards) 63

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

Table A.23 – Route Signing Codes

	Code
Not Signed	1
Interstate	2
U.S.	3
State	4
Off-Interstate Business Marker	5
County	6
Township	7
Municipal	8
Parkway Marker or Forest Route Marker	9
None of the Above	10
Provincial	11

Table A.24 – Ownership Codes

	Code
State Highway Agency	1
County Highway Agency	2
Town or Township Highway Agency	3
City or Municipal Highway Agency	4
State Park, Forest, or Reservation Agency	11
Local Park, Forest or Reservation Agency	12
Other State Agency	21
Other Local Agency	25
Private (other than Railroad)	26
Railroad	27
State Toll Road	31
Local Toll Authority	32
Other Public Instrumentality (i.e., Airport)	40
Indian Tribe Nation	50
Other Federal Agency	60
Bureau of Indian Affairs	62
Bureau of Fish and Wildlife	63
U.S. Forest Service	64
National Park Service	66
Tennessee Valley Authority	67
Bureau of Land Management	68
Bureau of Reclamation	69
Corps of Engineers	70
Air Force	72
Navy/Marines	73
Army	74
Other	80

Table A.25 – Turn Lane Codes

	Code
No intersection where a right turning movement is permitted exists on the section	1
Turns permitted; multiple exclusive right turning lanes exist. Through movements are prohibited in these lanes. Multiple turning lanes allow for simultaneous turns from all turning lanes	2
Turns permitted; a continuous exclusive right turning lane exists from intersection to intersection. Through movements are prohibited in this lane	3
Turns permitted; a single exclusive right turning lane exists	4
Turns permitted; no exclusive right turning lanes exist	5
No right turns are permitted during the peak period	6

Table A.26 – Widening Obstacles Codes

	Code
No obstacles	X
Dense development	A
Major transportation facilities	B
Other public facilities	C
Terrain restrictions	D
Historic and archaeological sites	E
Environmentally sensitive areas	F
Parkland	G

No obstacles - No obstacles to widening.

Dense development - Refers to the density and size of buildings to be acquired, the number of people that would need to be relocated, and the number of businesses that would need to be acquired. (Realizing dense development may be higher in urban areas; this should not be used as on obstacle for all urban areas and should be evaluated relative to the conditions in the area where the section is located).

Major transportation facilities - Includes major rail lines, canals, airports, major natural gas and oil pipe lines whose location relative to the roadway section would limit expansion of the existing roadway.

Other public facilities - Includes hospitals, museums, libraries, major public office buildings, schools, and universities.

Terrain restrictions - Relates to geographic features that would make it very difficult to add lanes, requiring significant excavation, fill, or tunneling. This applies to both horizontal and vertical terrain restrictions.

Historic and archaeological sites - Includes such things as historic buildings, historic land, large monuments, cemeteries, and known archaeological sites.

Environmentally sensitive areas - Includes such areas as scenic landmarks, wetlands, bodies of water, areas inhabited or used by protected species. Scenic routes and byways are included in the category and are those national and State routes that have been identified and listed as official designations.

Parkland - Includes National, State, and local parks.