

**MISSISSIPPI SPR-1(98), PART II**

**QUARTERLY PROGRESS REPORT**

**PERIOD: OCTOBER/NOVEMBER/DECEMBER 2015**

**FEDERAL FY2016 1ST QUARTER**

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## **State Study No. 184--Long-Term Field Monitoring and Performance of Paving Fabric Interlayer Systems to Reduce Reflective Cracking**

**Principal Investigator:** Farshad Amini

<b>Funds Allocated:</b>	\$218,224.00	<b>Date Started:</b>	October 1, 2005
<b>Expended to Date:</b>	\$145,141.76	<b>Completion Date:</b>	June 30, 2016
<b>Current Work Program:</b>	\$ 25,319.46	<b>Time Remaining:</b>	6 months
<b>Current Work Program Expenditures:</b>	\$0		

**Research Agency:** Jackson State University

### **Objective:**

The formation of reflective cracking of pavement overlays has confronted highway engineers for many years. Stress-relieving interlayers, such as paving fabrics, have been used in an attempt to reduce or delay reflective cracking. The primary objective of this project is to conduct a long-term monitoring of the paving fabric interlayer systems to evaluate its effectiveness and performance. A comprehensive testing, monitoring, and analysis program is planned, where twelve 500-ft pavement sections of a two-lane highway are constructed, and then monitored for seven years. Particular attention is directed towards investigating the influence of overlay thickness on long-term performance. A comparison between the performance of paving fabric treatment systems for milled and non-milled surfaces, as well as a comparison between the performance of paving fabrics on sealed and non-sealed surfaces are reported. In addition, a cost-benefit analysis is performed to develop total life cycle costs for each section.

### **Progress:**

During the last quarter, a final cost analysis including life cycle costs were completed. Final relationships including the development of reflection crack over time, as well as the effects various variables on the crack growth were developed. Effects of overlay thickness, milling and sealing were determined. Comparison between milling and non milling, sealing and non sealing were made. The equivalency between overlay thickness and paving fabrics was also developed.

### **Plans for Next Quarter:**

During the next quarter, the preliminary final report will be prepared.

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**EEO and Title VI Information:  
Employment Data for Research Staff**

Total Staff	Male					Female			
	White	Black	Hispanic	Asian	Native Am	White	Black	Hispanic	Asian
2	1								1

## **State Study No. 185--In-House Support To State Study No. 184 - Long-Term Field Monitoring And Performance Of Paving Fabric Interlayer Systems To Reduce Reflective Cracking**

**Principal Investigator:** Cindy Smith, P.E.

<b>Funds Allocated:</b>	\$ 30,000.00	<b>Date Started:</b>	October 1, 2005
<b>Expended to Date:</b>	\$ 16,086.88	<b>Completion Date:</b>	June 30, 2016
<b>Current Work Program:</b>	\$ 2,000.00	<b>Time Remaining:</b>	6 months
<b>Current Work Program Expenditures:</b>	\$0		

**Research Agency:** Research Division, Mississippi Department of Transportation

### **Objective:**

This study will be conducted to support the proposed study “Long-Term Field Monitoring and Performance of Paving Fabric Interlayer Systems to Reduce Reflective Cracking.”

The required tasks include:

- FWD field testing and evaluation of requisite overlay of proposed pavement for inclusion in Phase II study.
- Operation of the MDOT profiler to obtain video images of the pavement surface one time prior to construction of the twelve test sections and nine times subsequent to construction.
- Mapping of cracks on the video logs for submission to Jackson State University.
- Traffic control will be required to facilitate FWD testing by MDOT and pavement coring operations by Burns, Cooley, & Dennis, Inc.
- Review of one construction report, three progress reports, and one final report.

### **Progress:**

No work was performed this quarter.

### **Plans for Next Quarter:**

Perform final distress survey of pavement control and test sections.

## State Study No. 186--Consultant Support To State Study No. 184 – Long – Term Field Monitoring And Performance Of Paving Fabric Interlayer Systems To Reduce Reflective Cracking

**Principal Investigator:** Randy Ahlrich, P.E.

**MDOT Project Monitor:** Cindy Smith, P.E.

<b>Funds Allocated:</b>	\$ 20,400.00	<b>Date Started:</b>	October 1, 2005
<b>Expended to date:</b>	\$ 15,900.00	<b>Completion Date:</b>	June 30, 2016
<b>Current Work Program:</b>	\$2,000	<b>Time Remaining:</b>	6 months
<b>Current Work Program Expenditures:</b>	\$0		

**Research Agencies:** Burns, Cooley & Dennis, Inc.  
Research Division, Mississippi Department of Transportation

### Objective:

This project will provide consultant support to the proposed study “Long-Term Field Monitoring and Performance of Paving Fabric Interlayer Systems to Reduce Reflective Cracking.” The required tasks include:

- Provide guidance on selection of paving fabric.
- Provide guidance regarding paving fabric construction for inclusion in construction bid documents.
- Monitor construction of test sections.
- Perform requisite coring of pavement test sections.
- Review the construction report, three progress reports and the final report.

### Progress:

Consultant performed final coring of field test sections.

### Plans for Next Quarter:

No work planned.

### EEO and Title VI Information:

Employment Data for Burns Cooley & Dennis, Inc. Research Staff

Total	Male					Female				
Staff	White	Black	Hispanic	Asian	Native Am	White	Black	Hispanic	Asian	NativeAm
1	1									

## State Study No. 250— Full Depth Reclamation for High Traffic Applications

**Principal Investigator:** Isaac Howard  
**MDOT Project Monitor:** James C. Watkins

**Funds Allocated:** \$ 291,975.80      **Start Date:** January 17, 2012  
**Expended to Date:** \$ 114,659.90      **Completion Date:** December 31, 2015  
**Current Work Program:** \$ 2,000.00      **Time Remaining:** Time expired  
**Current Work Program Expenditures:** \$2,000

**Research Agencies:** Mississippi State University

### Objective:

The proposed study will characterize properties of FDR that are important to design, construction and performance in high traffic applications. Historically FDR has been more commonly used in lower traffic applications and a study of the nature proposed could not be identified with materials similar to those native to Mississippi. The proposed study is aimed at providing design, construction, and performance guidance for FDR layers in high traffic applications, which have different behavioral conditions than low traffic applications.

### Progress:

Project was completed.

### Plans for Next Quarter:

None. Project has been completed.

### EEO and Title VI Information:

#### Employment Data for Mississippi State University Research Staff

Total Staff	Male					Female				
	White	Black	Hispanic	Asian	Native Am	White	Black	Hispanic	Asian	NativeAm
17	16					1				

## State Study No. 251— In-House Support to Full-Depth Reclamation for High-Traffic Applications

**Principal Investigator:** William Barstis

**Funds Allocated:** \$ 11,000.00      **Start Date:** January 17, 2012  
**Expended to Date:** \$ 6,388.49      **Completion Date:** December 31, 2015  
**Current Work Program:** \$2,500.00      **Time Remaining:** Time expired  
**Current Work Program Expenditures:** \$0

**Research Agencies:** MDOT

### Objective:

This study will provide in-house support to the Full-Depth Reclamation for High-Traffic Applications. This item will fund traffic control and MDOT staff time for the study.

### Progress:

No work was performed this quarter.

### Plans for Next Quarter:

Any follow-up activities at the request of MSU.

### EEO and Title VI Information:

#### Employment Data for Mississippi State University Research Staff

Total Staff	Male					Female				
	White	Black	Hispanic	Asian	Native Am	White	Black	Hispanic	Asian	NativeAm
0										

## State Study No. 262— Evaluation of the WatchDog Weather Station to Reduce Drift from MDOT Spray Trucks

**Principal Investigator:** John Byrd  
**MDOT Project Monitor:** Cindy Smith, P.E.

**Funds Allocated:** \$77,748.00      **Start Date:** September 23, 2013  
**Expended to Date:** \$ 23,146.07      **Completion Date:** December 31, 2015  
**Current Work Program:** \$33392.98      **Time Remaining:** Time expired  
**Current Work Program Expenditures:** \$0.00

**Research Agencies:** Mississippi State University

### Objective:

Weather conditions that cause right of way herbicide drift onto sensitive adjacent crops can be avoided if wind speed and direction relative to the spray truck can be accurately monitored during applications.

### Progress:

Project ended.

### EEO and Title VI Information:

#### Employment Data for Mississippi State University Research Staff

Total Staff	Male					Female				
<u>White</u>	<u>Black</u>	<u>Hispanic</u>	<u>Asian</u>	<u>Native Am</u>	<u>White</u>	<u>Black</u>	<u>Hispanic</u>	<u>Asian</u>	<u>NativeAm</u>	

## State Study No. 263— Collection and Evaluation of Core Data for the MEPDG for Overlaid and New Pavements

**Principal Investigator:** Allen Cooley  
**MDOT Project Monitor:** William Barstis

<b>Funds Allocated:</b>	\$350,000.00	<b>Start Date:</b>	Awaiting NTP
<b>Expended to Date:</b>	\$0	<b>Completion Date:</b>	Awaiting NTP
<b>Current Work Program:</b>	\$250,000.00	<b>Time Remaining:</b>	Awaiting NTP
<b>Current Work Program Expenditures:</b>	\$0		

**Research Agencies:** Burns, Cooley, and Dennis

### Objective:

The Mechanistic-Empirical Pavement Design Guide (MEPDG) method for designing pavement structures utilizes mechanistic materials properties combined with other inputs to predict pavement performance using user inputs. Pavement performance models are used for this prediction of pavement performance. The pavement performance models are based upon national predictive models that are likely not applicable to Mississippi. This research project is designed to provide the required information for the calibration of these performance models for Mississippi materials and conditions. A number of test pavement sections will be visited, evaluated, sampled, and tested. Following these activities site reports will be prepared for each individual site that provides the information required for this calibration of the pavement performance models to local conditions.

## **State Study No. 264— District Traffic Control Support to Collection and Evaluation of Core Data for the MEPDG for Overlaid and New Pavements**

**Principal Investigator:** William Barstis

<b>Funds Allocated:</b>	\$50,000.00	<b>Start Date:</b>	Awaiting NTP
<b>Expended to Date:</b>	\$0	<b>Completion Date:</b>	Awaiting NTP
<b>Current Work Program:</b>	\$20,000.00	<b>Time Remaining:</b>	Awaiting NTP
<b>Current Work Program Expenditures:</b>	\$0		

**Research Agencies:** MDOT

### **Objective:**

The District in-house support to State Study 263 will cover traffic control and other District personnel field work and charges in support of the main study.

## **State Study No. 265— Research Division Support to Collection and Evaluation of Core Data for the MEPDG for Overlaid and New Pavements**

**Principal Investigator:** William Barstis

<b>Funds Allocated:</b>	\$200,000.00	<b>Start Date:</b>	Awaiting NTP
<b>Expended to Date:</b>	\$0	<b>Completion Date:</b>	Awaiting NTP
<b>Current Work Program:</b>	\$100,000.00	<b>Time Remaining:</b>	Awaiting NTP
<b>Current Work Program Expenditures:</b>	\$0		

**Research Agencies:** MDOT

### **Objective:**

The Research Division in-house support to State Study (SS) 263 will provide falling weight deflectometer (FWD) field testing and FWD data analysis to characterize in-situ moduli of pavement layers at each project site used for local calibration of MEPDG performance models. Extensive coordination between principal investigator of SS No. 263 and MDOT District traffic control personnel will be performed via this support study as well as review of site reports generated as a deliverable of SS 263.

## State Study No. 266— Field Aging Effects on Asphalt Mixed at Different Temperatures and Hauled Different Distances

**Principal Investigator:** Isaac L. Howard

**MDOT Project Monitor:** Alex Middleton

**Funds Allocated:** \$150,000.00

**Start Date:** March 1, 2014

**Expended to Date:** \$12,966.91

**Completion Date:** December 31, 2017

**Current Work Program:** \$50,000.00

**Time Remaining:** 27 months

**Current Work Program Expenditures:** \$12,966.91

**Research Agencies:** Mississippi State University

### Objective:

With all the options available to produce and place asphalt pavement in present day, a study into the field aging of these materials needs to be performed. Field aging has always been one of the biggest uncertainties in asphalt pavement performance, and with the widespread use of warm mix technologies, there are more aging questions than ever. This study is very timely, and if performed now can be conducted for less cost by leveraging the investment of a previous study.

### Progress:

Progress was made on four tasks. Task 1 began the quarter 0% complete and ended the quarter 25% complete due to literature review. Task 2 began the quarter 40% complete and ended the quarter 80% complete due to lab testing. Task 3 began the quarter 39.74627% complete and ended the quarter 67.045057% complete due to field aging investigation. Task 5 began the quarter 0% complete and ended the quarter 16% complete due to progress reports and management.

### Plans for Next Quarter:

Plans for the next quarter are to work on tasks 1 to 3 (literature review, laboratory testing, and/or field testing)

### EEO and Title VI Information:

#### Employment Data for Mississippi State University Research Staff

Total Staff	Male						Female				
	White	Black	Hispanic	Asian	Native Am	Arabic	White	Black	Hispanic	Asian	NativeAm
8	7					1					

## **State Study No. 268— Development of a Data Quality Management Plan for Pavement Management System (PMS) Data**

**Principal Investigator:** Greg Duncan

**MDOT Project Monitor:** Cindy Smith

**Funds Allocated:** \$121,436.16

**Start Date:** Awaiting NTP

**Expended to Date:** \$0

**Completion Date:** Awaiting NTP

**Current Work Program:** \$75,000.00

**Time Remaining:** Awaiting NTP

**Current Work Program Expenditures:** \$0

**Research Agencies:** Applied Pavement Technology, Inc

### **Objective:**

With movement toward transportation asset management, pavement management system (PMS) data quality is more important than ever. MDOT seeks to consolidate existing PMS documentation, review existing practices, and get recommendations for quality improvement.

## **State Study No. 269— Development of a Setup Prediction Method and Implementation into LRFD Driven Pile Design in Mississippi soils**

**Principal Investigator:** Eric J. Steward  
**MDOT Project Monitor:** Alex Middleton

**Funds Allocated:** \$202,000.00      **Start Date:** Awaiting NTP  
**Expended to Date:** \$0      **Completion Date:** Awaiting NTP  
**Current Work Program:** \$50,000.00      **Time Remaining:** Awaiting NTP  
**Current Work Program Expenditures:** \$0

**Research Agencies:** University of South Alabama

### **Objective:**

Geotechnical engineering, and pile driving in particular, contains a significant amount of uncertainties in the design process. At this point in time, a pile foundations' increase in strength or bearing capacity, over time cannot be quantified. Determination of this long-term bearing capacity can influence both the required pile size and embedment depth and, in turn, would lower project costs considerably. This study intends to develop a pile loading database for MDOT as well as calibrate regionally specific resistance factors required for LRFD (Load Resistance Factor Design) for MDOT projects.

## **State Study No. 270— Continuation of Field Aging Effects on Asphalt Mixed at Different Temperatures and Hauled Different Distances Phase III**

**Principal Investigator:** Isaac Howard  
**MDOT Project Monitor:** Alex Middleton

**Funds Allocated:** \$155,000.00      **Start Date:** Awaiting NTP  
**Expended to Date:** \$0      **Completion Date:** Awaiting NTP  
**Current Work Program:** \$60,000.00      **Time Remaining:** Awaiting NTP  
**Current Work Program Expenditures:** \$0

**Research Agencies:** Mississippi State University

### **Objective:**

With all the options available to produce and place asphalt pavement in present day, a study into the field aging of these materials needs to be performed. Field aging has always been one of the biggest uncertainties in asphalt pavement performance, and with the widespread use of warm mix technologies, there are more aging questions than ever. This study is very timely, and if performed now can be conducted for less cost by leveraging the investment of a previous study.

## State Study No. 271— Knowledge of Effects of Different Mississippi Soil Deposits on Pavement Performance

**Principal Investigator:** Richard Sheffield

**MDOT Project Monitor:** William Barstis

**Funds Allocated:** \$100,000.00

**Start Date:** Awaiting NTP

**Expended to Date:** \$0

**Completion Date:** Awaiting NTP

**Current Work Program:** \$50,000.00

**Time Remaining:** Awaiting NTP

**Current Work Program Expenditures:** \$0

**Research Agencies:** Thompson Engineering

### Objective:

MDOT S.O.P. TMD-20-14-00-000, "Centerline Soil Profiles and Standard Design Procedures for Construction of Roadways Through High Volume Change Soils," specifies use of the Mississippi Office of Geology's Geologic Map of Mississippi to identify the boundaries/areal extent of geologic units of various soil types distributed across the state. This S.O.P. references eight geologic units that include active clays requiring either replacement or treatment with lime. The MDOT Assistant Chief Engineer – Operations advised that MDOT does not construct rigid pavements within the "Loess" geologic unit due to the erodibility of this type soil. These examples demonstrate that given soil deposits impact selection of pavement type or construction practice.

Mississippi DOT is in the process of implementing the Mechanistic-Empirical Pavement Design procedure for designing rigid and flexible pavements. This effort includes providing the agency with a manual, "Mississippi DOT Pavement ME Design User Input Guide." The current draft manual needs to be enhanced with the addition of a chapter focused on the various soil deposits located throughout the state.

This chapter will capture available institutional knowledge on the general properties of each geological unit of soil deposit and their effects on the performance of pavements constructed thereon. Given geological units requiring special pavement design or pavement foundation considerations will be addressed. This chapter will also list the geologic units that preclude construction of rigid pavements. It is envisioned that the Mississippi Office of Geology's Geologic Map of Mississippi will be used as the basis for this chapter with accompanying discussion of each geologic unit and corresponding impact on pavement performance.

## State Study No. 272— MDOT Specific Design Procedure for Chip Seals

**Principal Investigator:** Isaac Howard  
**MDOT Project Monitor:** Alex Middleton

**Funds Allocated:** \$200,000.00      **Start Date:** Awaiting NTP  
**Expended to Date:** \$0      **Completion Date:** Awaiting NTP  
**Current Work Program:** \$80,000.00      **Time Remaining:** Awaiting NTP  
**Current Work Program Expenditures:** \$0

**Research Agencies:** Mississippi State University

### Objective:

Historically, the Department has used chip seals as a preventative maintenance treatment on low traffic rural routes. Developing a methodology to design and evaluate the performance of the design is important to produce a cost effective and long lasting product. Currently, the Department sets target application rates for the binder and aggregate based on general material properties. In addition, the current specifications do not make allowance for the condition of the roadway at the time of placement of the chip seal. Basic chip seal design procedures are needed to establish the binder and aggregate application rates considering the actual component materials, environmental factors, traffic, and existing roadway surface condition. As a part of the design procedure, a test method or methods are needed to evaluate the chip seal design to help ensure the durability of the chip seal and help establish construction criteria for rolling, sweeping, and opening to traffic.

## **State Study No. 273— Update and Documentation of MDOT Warranty Process and Distress Thresholds**

**Principal Investigator:** Feng Wang  
**MDOT Project Monitor:** Alex Collum

**Funds Allocated:** \$155,000.00      **Start Date:** Awaiting NTP  
**Expended to Date:** \$0      **Completion Date:** Awaiting NTP  
**Current Work Program:** \$60,000.00      **Time Remaining:** Awaiting NTP  
**Current Work Program Expenditures:** \$0

**Research Agencies:** Jackson State University

### **Objective:**

MDOT implemented warranty specifications in the late 1990s as an option on construction/overlay projects. The specification included distress thresholds which, if exceeded, result in the contractor having to take action, from repair to remove and replace. MDOT seeks to do the following: (1) Document the existing warranty process; (2) Revisit the warranty thresholds to see if they need adjustment; and (3) Quantify the distress thresholds in terms of distress quantities and severities rather than deduct points.