February 13, 2007

Mr. Andrew H. Hughes  
Division Administrator  
Federal Highway Administration  
666 North Street, Suite 105  
Jackson, Mississippi 39202  

Dear Mr. Hughes:  

Subject: Mississippi SPR-1(49), Part II, Quarterly Progress Reports  

Attached are the Quarterly Progress Reports for the first quarter of FY 2007, period ending December 31, 2006.  

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198 Quality Verification of PQI 301 Asphalt Density Device
199 Port Sedimentation Solutions – Gulf Coast
If you have any questions, or if we can be of further assistance, please advise.

Sincerely,

Randy Battey, P.E.
State Research Engineer

Attachment
pc: Central File (96-20)
    Linda Harrell (62-03)
    Progress Report File
MDOT RESEARCH WORK PROGRAM
SPR-1(49), PART II L56

QUARTERLY PROGRESS REPORTS

1st QUARTER FY 2007
(October 1, 2006 to December 31, 2006)
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QUARTERLY PROGRESS REPORT
Period: October, November & December 2006

RESIN MODIFIED PAVEMENT DEMONSTRATION PROJECT

Funds Allocated: $90,242.00 Date Started: October 1, 1999
Expended to Date: $74,757.85 Completion Date: March 31, 2007
Current Work Program: $10,000.00 Time Remaining: 3 months
Current Work Program Expenditures: $539.46

Research Agency: Research Division, Mississippi Department of Transportation

Objective:
The objective of this project is to construct a demonstration Resin Modified Pavement (RMP) highway project and compare its performance with ultra-thin white topping (Portland cement concrete inlay) and polymer modified asphalt (PG 82-22) for a period of five years. The proposed study will be constructed at an intersection with a Hot Mix Asphalt (HMA) pavement with a history of rutting and a high traffic loading. Two intersections on US 72 in Corinth, Mississippi have been chosen for this project.

Progress:
The process of writing the final report began.

Plans for Next Quarter:
The final report will be completed and made available to interested agencies.
Objective:
The current roughness specification utilized by the MDOT was developed over 10 years ago and there have been no significant changes since. The specification was developed based on the manual profilograph, which has since been replaced by the automatic unit. Also, unlike 10 years ago, industry is now utilizing high frequency rollers to compact their hot mix asphalt pavements. These rollers have a propensity for creating small scallops in the pavement surface, which due to blanking band requirements in most agency roughness specifications, are not taken into account when computing a profile index. However, these scallops are certainly felt by the traveling public and create a rougher ride quality. Based on this type of specification, industry is not being penalized for a rough ride quality and in some instances contractors are being rewarded with incentive pays for a rough final ride surface. Most states, including MDOT, have removed the blanking band from their roughness specification for this very reason. Many of the states have gone to the lightweight profiler for their QC/QA of ride quality. MDOT intends on utilizing the lightweight profiler, which instead of producing a profile index value measures the International Roughness Index (IRI). This transition will take some time with undoubtedly a period of time where a dual specification (lightweight profiler and profilograph) is in place. If MDOT is to ever successfully make this transition, the current profilograph specification must be “tightened up” and data must be gathered comparing profile index values to IRI for Mississippi pavements.

Another task is to produce a method to determine areas of “localized roughness” utilizing inertial profilers.


State Study No. 144 (Continued)

**Progress:**

During this quarter, data was analyzed with the latest version of. Correspondence with The Transtec Group has been ongoing to answer questions concerning ProVAL software capabilities. Time was spent consulting with other DOT agencies concerning smoothness specifications and equipment/operator certification programs. Proposals for operator and equipment certifications were submitted to the State Research Engineer for review. A draft smoothness specification was submitted to the State Research Engineer for review. A testing protocol was submitted for approval.

**Plans for Next Quarter:**

During the next quarter, upon approval by the State Research Engineer, the testing protocol will be implemented and the results will be analyzed.
Objective:

Knowledge of magnitude and frequency of floods is essential to the design of bridges, highway embankments, culverts, levees, dams, and other structures near streams. Effective flood-plain management and determination of flood insurance rates require accurate information on magnitude and frequency of floods.

The statewide flood-frequency reports by Landers and Wilson (1991) and Wilson and Landers (1991) provided estimates of magnitude and frequency of floods at gaging stations and provided techniques for estimating magnitudes and frequency of floods at ungaged sites in Mississippi. Observed annual peak-flow data collected through 1988 at 358 gaging stations were used in the analyses. Since the 1991 statewide flood-frequency reports, an additional 11 years of observed annual peak-flow data has become available and data have been collected on several large floods. Also, the 1991 regional flood-frequency equations were developed using generalized least-squares (GLS) regression (Stedinger and Tasker, 1985; and Tasker and Stedinger, 1989). GLS regression had and still has advantages over the ordinary least-squares and weighted least-squares regression, but since the 1991 reports, Tasker and Slade (1994) demonstrated that GLS regression coupled with a site-specific approach [referred to as “interactive” by Tasker and Slade (1994) and as “region-of-influence” by Hodge and Tasker (1995)] had smaller root-mean-square errors than the traditional geographic regional approach. Analyses of flood frequency using these additional data with a site-specific approach may substantially change and improve the accuracy of techniques for estimating magnitudes and frequencies of floods in Mississippi.
State Study No. 146 (Continued)

**Progress:**

Work was performed to finalize basin delineations for use with GIS tools to determine basin characteristics and for use in StreamStats. The Big Black River Basin was used to test processing procedures and automated delineation of subbasins using the results.

**Plans for Next Quarter:**

Work will continue on basin delineations for use with GIS tools to determine basin characteristics. Work will be continued with log-Pearson Type III analyses of the peak-flow data through 2006 and regional regression analyses.
Objective:
The Yazoo Clay is notorious as a problem in Central Mississippi and in particular the Greater Jackson area. Its high-volume-change properties can have a devastating effect on roads, buildings, bridges, and embankments. The Yazoo Clay has never been studied systematically to determine what controls its properties and the distribution of these properties. All efforts have been local in nature and problem oriented. This study will seek to define the areal limits and stratigraphic units of the Yazoo Clay deposit based on engineering properties. These units can then be mapped showing the distribution of these engineering properties. A map showing this distribution will serve as a basis for designing solutions for projects located in a given unit. Also included in the study will be an analysis of how effective the current MDOT design policies with regards to Yazoo Clay have been and recommendations will be made as to any changes to the current policy that could be made.

Progress:
New location and lab data was added to the database.

Plans for Next Quarter:
A major drilling project in the Yazoo Clay is taking place in Madison County along I-55. This information, which could come from as many as 50 holes, is being added to the database.
EVALUATION OF DRM™ SYSTEM

Funds Allocated: $150,000.00  Date Started: March 1, 2002
Expended to Date: $112,237.54  Completion Date: March 31, 2007
Current Work Program: $ 10,000.00  Time Remaining: 3 months
Current Work Program Expenditures: $0

Research Agency: Research Division, Mississippi Department of Transportation

Objective:

Reflective cracking in flexible pavements is a primary form of distress found in Mississippi highway pavements. To date, few if any, fail safe preventative measures to prevent this distress have been discovered.

The objective of this project is to evaluate an interlayer system, DRM™ (Distress Resistant Membrane), as a preventative treatment for reflective cracking in HMA pavements. (More information on the DRM™ system can be found at http://www.highwaypreservation.com) A seven mile long project on MS4 near the community of Galena in Marshall County will be utilized for the evaluation. MS4 near Galena was originally constructed in 1981 and is comprised of 6" of asphalt pavement on top of a soil cement base. Reflective cracking from the soil cement base has caused the pavement condition to become unacceptable.

The study will compare 3½ miles of DRM™ with a subsequent 4" overlay to 3½ miles of no DRM™ with a 4" overlay. A comparison will be made between the amount of reflective cracking in the new 4" overlay between the sections with and without the DRM™ system.

Progress:

The process of writing the final report began.

Plans for Next Quarter:

The final report will be completed and made available to interested agencies.
HOT MIX ASPHALT (HMA) CHARACTERIZATION FOR THE AASHTO 2002 DESIGN GUIDE

Funds Allocated: $115,089.00  Date Started: October 1, 2002
Expended to Date: $106,293.00  Completion Date: December 31, 2007
Current Work Program: $ 29,583.00  Time Remaining: 12 months
Current Work Program Expenditures: $2,709.00

Research Agencies:
Department of Civil Engineering, Mississippi
State University and Research Division,
Mississippi Department of Transportation

Objective:
MDOT currently uses the AASHTO Guide for the Design of Pavement Structures for structural pavement design. This guide is empirically based and utilizes the concept of structural numbers (SN) to determine the overall required thickness of varying pavement layers. These structural numbers were determined from the AASHTO road test in the 1950's.

Currently the AASHTO 2002 Guide for Design of New and Rehabilitated Pavement Structures is being developed. This guide will have three design levels (Level 1, 2 and 3) all based on mechanistic-empirical design principles and will potentially replace the existing guide as the structural design guide for MDOT.

The researchers working on the flexible pavement component of the 2002 guide have evaluated many test methods to determine the best relationship between observed HMA mix lab performance and field performance with respect to rutting, fatigue cracking, etc. Currently, the dynamic modulus test will be used to characterize HMA mixes for input into the 2002 design guide. The test is run in accordance with ASTM D 3497 Standard Test Method for Dynamic Modulus of Asphalt Concrete Mixtures.

Mississippi HMA mixes need to be characterized using dynamic modulus testing in preparation for the future implementation of the 2002 design guide. In this study a range of HMA mixes will be characterized using the dynamic modulus testing. Any proposed evaluation will initially be focused on materials and mixes that are currently being used in the state.
State Study No. 166 (Continued)

Selected mixes will also be evaluated using the asphalt pavement analyzer (APA) and confined repeated deformation testing for comparison purposes.

MDOT has performed APA testing on many mixes and a side-by-side comparison of the dynamic modulus and the APA would be very useful.

Progress:

- All study mixtures were tested for Dynamic Modulus. In conducting the tests, several mixtures failed at the highest temperature and stress level used at lower temperatures. As a result, these mixtures are scheduled for retesting at a lower stress level.
- MDOT requested a new mixture be added to the testing program. That mixture was identified and extension and expansion was request and approved. The extension is until December 31, 2007.

Plans for Next Quarter:

- The additional study mixture will be designed.
- Specimens for APA tests will be prepared and all tests completed for all study mixtures. Any new specimens for high temperature dynamic modulus determination will be prepared and tested.
- Data reduction will proceed and results formatted for reporting

MDOT requested the study be expanded to include an additional HMA mix. This mix is a 19 mm, all gravel aggregate with a minimum of 80 percent one-fractured face. $5,089 additional funding was granted to the study to cover the testing costs of this additional HMA mix.

EEO and Title VI Information:

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<tbody>
<tr>
<td>Total Staff</td>
</tr>
<tr>
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</table>
Objective:

ERES Consultants Division of Applied Research Associates, Inc. is finalizing the development of the 2002 Guide for Design of New and Rehabilitated Structures through NCHRP Project 1-37A. The 2002 Guide incorporates mechanistic-empirical pavement design principles and allows highway agencies to develop cost-effective and reliable designs by systematically considering climate, material properties, construction variability, and traffic to predict pavement performance. This design process is a total departure from the process utilized in the current AASHTO design procedure, requiring the designer to make trial selection of materials and layer thicknesses and evaluating their performance under projected loadings over the design life of the pavement.

The objective of this study is to implement the 2002 Design Guide for Mississippi DOT. The following issues will be addressed in this study:

- Provide for training of Design Guide users and other stakeholders
- Develop and execute a plan for securing the appropriate design input data on material and traffic characterization, and other design inputs
- Conduct sensitivity analyses and make comparisons of 2002 designs with current procedure
- Develop and execute a plan for calibration of Guide performance and distress models
Progress:

- Project staff met with MDOT this quarter to discuss pavement performance data needs and calibration efforts to date. We received performance data on 61 analysis sections monitored by TMIS; the data were in Adobe PDF format. We manually entered data for each sample unit for nine analysis sections into Microsoft Excel® to model pavement deterioration over time.

- Analysis sections 256, 865, 1903, and 2625 were analyzed in detail to establish procedures to check validity of performance data. Time progressions of performance data for each sample unit were plotted using the following combinations:
  - Individual distresses by severity (e.g. low-severity fatigue cracking, medium-severity alligator cracking, etc.)
  - Total of individual distresses; severities combined using TMIS deduct values (e.g., low-, medium-, and high-severity transverse cracking [TC] combined to generate total TC in terms of low severity, $TC_{\text{Total}} = TC_{\text{Low}} + 1.639 \cdot TC_{\text{Medium}} + 2.035 \cdot TC_{\text{High}}$)
  - Total alligator and longitudinal cracking; longitudinal cracking was considered over 1-inch wide area to convert to area distress.

Combining distress data by severity levels appears to produce the best time progressions.

- We developed a procedure to determine the best combination of time progressions that had the maximum number of distress observations increasing with time. The performance data for each analysis section were categorized as:
  - Excellent (if $\geq 91\%$ of total distress observed over all survey years and all sample units increased with time)
  - Very Good (76% - 90%)
  - Good (61% - 75%)
  - Fair (45% - 60%)
  - Poor ($\leq 44\%$)

Performance data rated good and higher will be the first choice for use in calibration and validation of performance models. In case such data is not available, we will consider using performance data rated as fair (for a limited number of sections).

The above ratings for each analysis section were further refined by reviewing if the overall rating could be improved by not considering data
State Study No. 170 (Continued)

for any given year. This procedure was automated as a Microsoft Excel® macro; the results for the analyzed analysis sections are shown below:

<table>
<thead>
<tr>
<th>Year Removed</th>
<th>TMIS Analysis Sections – Percent Data with Distresses Increasing with Time</th>
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<tbody>
<tr>
<td></td>
<td>256</td>
</tr>
<tr>
<td>None</td>
<td>33% Poor</td>
</tr>
<tr>
<td>1997</td>
<td>48% Fair</td>
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<tr>
<td>2000</td>
<td>48% Fair</td>
</tr>
<tr>
<td>2002</td>
<td>45% Fair</td>
</tr>
<tr>
<td>2004</td>
<td>40% Poor</td>
</tr>
<tr>
<td>2006</td>
<td>38% Poor</td>
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</table>

Note: Analysis sections with usable data are indicated in bold.

- We continued to coordinate and acquire pavement inventory and performance data this quarter. Information on each proposed analysis section (from Mississippi DOT TMIS) will be reviewed for conformity and entered into the ME pavement design guide software to ensure that all necessary information is available.

- Note that work directly related to ME PDG distress models has been suspended/slowed at Mississippi DOT’s request to ensure incorporation of NCHRP 1-40 results. NCHRP 1-40 is reviewing results of NCHRP 1-37A.

Plans for Next Quarter:

- A meeting is planned for January 3, 2007 with the pavement management group of Mississippi DOT to discuss TMIS performance related data for calibration and validation of ME PDG performance models. The data requirements and results on analyses conducted during the last quarter are on the meeting agenda. Specially, we will request:
  
  - Performance data on 61 analysis sections in Microsoft Excel® format
  - Performance data using TMIS deduct value for further time-progression analysis

- We will continue to coordinate with Mississippi DOT to acquire pavement inventory and performance data. We have requested pavement section information on the aforementioned analysis sections (256, 865, 1903, and 2625) to review for conformity. This data will be entered into the ME PDG software to ensure that all necessary data are available.

- A database will be set up to house pavement data for calibration and validation of ME PDG as pavement inventory and performance data requirements are finalized.

- We will make plans for resilient modulus testing of base/subbase materials.
State Study No. 170 (Continued)

**EEO and Title VI Information:**

Employment Data for ARA Research Staff

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Mississippi SPR-1(46), Part II  
State Study No. 171  
William Barstis, P.E. – Principal Investigator

QUARTERLY PROGRESS REPORT  
Period: October, November & December 2006

IN-HOUSE SUPPORT TO STATE STUDY NO. 170 - IMPLEMENT THE 2002 DESIGN GUIDE FOR MDOT (PHASE II)

Funds Allocated: $200,000.00  Date Started: October 1, 2003  
Expended to Date: $ 74,159.21  Completion Date: March 01, 2008  
Current Work Program: $ 75,000.00  Time Remaining: 14 months  
Current Work Program Expenditures: $7,225.51

Research Agency: Research Division, Mississippi Department of Transportation

Objective:

This study will be conducted to support the proposed study “Implement the 2002 Design Guide for Mississippi DOT.” The construction, traffic and materials data will be obtained for approximately 132 existing pavement sections. In addition to this data, pavement coring and FWD testing will be required for 24 of these pavement sections. Coordination between the six District Materials Engineers, the MDOT Central Laboratory and the private testing firm will be required to ensure that the requisite materials testing is conducted on representative samples of subgrade soils, crushed rock base course materials and chemically stabilized soil materials. Review the input/output data related to the customized 2002 Design Guide software as well as the developed training materials including courses, seminars and manuals that will be delivered to MDOT as a result of the referenced study.

Progress:

Continued to collect requisite data for calibration/validation of performance models.

Plans for Next Quarter:

Continue collecting requisite MDOT data for calibration of performance models.
Objective:
Preventive maintenance is the planned treatment of pavements which provides protection, decreases the rate of deterioration and adds 5 to 10 years to the service life of the pavement. Agencies must determine which of the many treatments that are available provides the most benefit for the various stages of a pavements life. In this study an evaluation will be performed of two seal treatments to provide cost/benefit data and assist in the updating of Mississippi DOT’s “decision trees” that are utilized to determine which preventive maintenance treatment provides the most benefit for each pavement condition.

A one mile scrub seal test section was constructed on Mississippi 35 in Tallasahatchie County (log mile 18.673-19.673) in March of 2005. The scrub seal was applied over two MDOT Pavement Management Analysis sections to facilitate “decision tree” development.

A second evaluation has been added to the evaluation. A micro surfacing treatment will be compared to a 1-inch conventional HMA overlay on US 61 in Tunica county. The two treatments will be evaluated over time to determine which approach yields the superior performance.

Progress:
The PASS (CMS-1P (CR)) emulsion was utilized in a chip seal application on MS 47 in Clay County. The application was placed with MDOT forces. An additional section of CRS-1P chip seal was constructed to serve as a control section for this experiment.

Plans for Next Quarter:
There is currently no planned activity for the upcoming reporting period.
EFFECTIVENESS OF INCREASED HIGHWAY PATROL SURVEILLANCE ON WORK ZONE SAFETY IN MISSISSIPPI

Funds Allocated: $92,222.00 Date Started: October 1, 2004
Expended to Date: $15,050.00 Completion Date: July 31, 2007
Current Work Program: $88,797.00 Time Remaining: 7 months
Current Work Program Expenditures: $0

Research Agencies: The University of Southern Mississippi and Traffic Engineering Division, Mississippi Department of Transportation

Objective:

Among the MDOT work zone safety initiatives, MDOT has established an agreement with the Mississippi Highway Patrol (MHP). As part of the agreement, MDOT has provided funds to the MHP to increase surveillance in high profile work zones. The objective of this project is to evaluate the safety impact of this increased surveillance. This will be achieved by the following means:

- Collecting historical and field data from selected Mississippi work zones before, during and after the increased highway patrol surveillance
- Reviewing nationwide literature of increased highway patrol surveillance in work zones
- Analyzing the compiled Mississippi data and the nationwide literature search findings

The data collection in Mississippi work zones will begin by consolidating MDOT and other government entities historical data. The data consolidation will include:

- Characteristics of work zones (i.e. locations, safety programs, conditions before, during and after construction)
- Traffic parameters (such as traffic volume before, after and during construction)
- Accident information (location, time, severity and cause of accident)

Once the historical consolidation has been performed, similar information will be gathered on projects currently under construction.
State Study No. 175 (Continued)

Ultimately correlations will be established to relate traffic parameters such as volume and speed to accidents in work zones. A second correlation between increased highway patrol surveillance, traffic parameters and accident rate will be established. Using these correlations the impact of increased highway patrol surveillance on accident reduction will be identified.

Progress:


2. Held progress report meeting on October 24, 2006 focused on the outline of the final report and the section mentioned in item 1.

3. Interacted with MDOT and seek verification of completeness and accuracy of the documents presented and requested final comments.

4. Presented in the Mississippi Transportation Institute 2006 Conference Program the results of the “Effectiveness of Increased Law Enforcement Surveillance on Work Zone Safety in Mississippi” Study.

5. Attended the MDOT Transportation Research Workshop and participate in the Traffic/ITS/Safety group on December 6-7, 2006

Plans for Next Quarter:

1. Interact with MDOT Traffic Engineering to obtain the final comments to include in the final report

2. Work on the final report based on comments from MDOT

EEO and Title VI Information:

Employment Data for The University of Southern Mississippi Research Staff

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Objective:

MDOT is implementing the mechanistic-empirical pavement design methodology developed under NCHRP 1-37A. This pavement design method characterizes the pavement materials by fundamental properties such as modulus and Poisson’s Ratio. For rigid pavement design the Portland Cement Concrete (PCC) is characterized by:

- Modulus of Rupture
- Compressive Strength
- Modulus of Elasticity
- Tensile Strength
- Coefficient of Thermal Expansion
- Concrete Shrinkage
- Unit Weight
- Poisson’s Ratio

In this study PCC mixes encompassing a range of aggregate types with various blends of Type I cement, Class F or C fly ash and slag that are typically encountered in Mississippi will be evaluated for these parameters.
State Study No. 177 (Continued)

Progress:

- Check the collected data so far and repeat preparation and testing of specimens that gave non logical results.
- Continue collecting data from the shrinkage / expansion test
- Continue collecting data from the CTE tests using AASHTO- TP60
- Continue collecting data for strength and modulus of all 20 mixes.
- Start writing final report

Plans for next quarter

- Continue collecting data
- Start preparing the final report

EEO and Title VI Information:

Employment Data for University of Mississippi Research Staff

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Objective:

MDOT is faced with the control and management of a very aggressive grass known as Cogongrass (*Imperata cylindrica*). Cogongrass is an invasive weed which continues to spread along MDOT right of ways, as well as to adjacent properties. Because it is so hardy, it colonizes on a site and quickly becomes the dominant vegetation. No other plant species can compete with the extensive root system. It is a threat to both the local plant community and the native wildlife because it displaces all native plant materials, resulting in a near sterile monoculture. Neither wild nor domestic animals can digest the leaf tissue because of the high silica content.

The proposed research will be a three-phase approach. A comprehensive inventory will be completed which identifies colony locations on a regional and then state wide basis. This inventory will also identify adjacent land uses and the level of threat the Cogongrass poses to particular areas. From this information, a priority system will be developed which identifies the areas most in need of treatment. This treatment may be one of two types, management or eradication. Due to the extensive spread of this plant in south Mississippi, it will have to be managed in some areas while eradication efforts are conducted in the high need areas.

Progress:

Graduate student, Zach Chesser has started to analyze imagery to determine accuracy of analysis of cogongrass patches (separation of cogongrass from other vegetation species) and patch size accuracy. Several issues complicated the analysis of the imagery we received. This was partly due to our lack of experience with the type data file sent, but that issue is being resolved by Mark Carruth, who supplied the data, sending mosaic images. Once the mosaic
State Study No. 178 (Continued)

images are received, they will be analyzed using normalized difference vegetation indexes, a standard procedure for remote image analysis. Although the mosaics were requested in late November, they have not yet been sent. With the two week closing of MSU for the Christmas holiday and longer holiday schedule for 9 month faculty, we have not yet been able to schedule a meeting with Dr. Bruce to test her automated detection methods. This will be top priority for next quarter.

**Plans for Next Quarter:**

Compare accuracy of NDVI versus other imagery analysis method for detecting cogongrass.

**EEO and Title VI Information:**

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</table>
EVALUATION OF PAVEMENT MARKING MATERIALS

Funds Allocated: $90,000.00  Date Started: October 1, 2005
Expended to Date: $17,768.00  Completion Date: September 30, 2008
Current Work Program: $30,000.00  Time Remaining: 21 months
Current Work Program Expenditures: $5,361.81

Research Agency: Research Division, Mississippi Department of Transportation

Objective:

Current MDOT policy requires that products to be used on construction and maintenance projects come from the Departmental “Approved Products List”. Additionally in order for the Department to obtain Federal participation on projects, all products must have an approved equal (i.e. no sole source products).

Safety has long been a priority for MDOT and with that in mind the Department is constantly exploring methods and products that will improve visibility for motorists both at night and during wet conditions. In order to evaluate new striping materials, MDOT has received formal experimental feature approval (in accordance with 23 CFR 635.411(a)(3)) from the Mississippi Division Office of FHWA on the following four projects to date:

1. MS 304 from US 61 to I-55 and Spur (MS 713), Desoto & Tunica Counties
2. US 49 from US 98 South to Black Creek, Forrest County
3. Interchange at US 61 and Liberty Road, Adams County
4. I-55 from Pearl Street to I-220, Hinds & Madison Counties

The performance of each of the experimental features incorporated in these projects (and any future approved pavement marking evaluations) will be separately documented and reported to interested agencies as well as the AASHTO Product Evaluation Listing (APEL) through technology transfer procedures already in place within MDOT’s Research Division. This study will fund the collection and dissemination of data resulting from these evaluations. Additionally should these evaluations prove to be successful it will enable the approval of more products for the Departmental “Approved Product List” and enable Federal participation on more projects utilizing these products.
State Study No. 180 (Continued)

**Progress:**

The MS 304 and MS 713 project had the 3M Wet Reflective pavement marking tape applied during this reporting quarter along with the two experimental sections of Thermoplastic and High Performance Cold Plastic pavement markings. MDOT Research documented the application of this tape and began monitoring the retroreflectivity and durability of the tape.

Testing was completed for the temporary tape placed at the interchange of US 61 and Liberty Road in Adams County.

Testing was completed for the Gulfline inverted profile striping.

**Plans for Next Quarter:**

MDOT Research will continue to monitor the Desoto-Tunica and Forrest county projects. MDOT will also begin monitoring the Hinds county experimental feature project if the pavement markings are installed in the upcoming quarter.
Objective:

Asphalt Drainage Courses (ADCs) are generally required under all 4-lane facility flexible pavements in Mississippi. Within typical pavement sections, ADCs are placed over a stabilized granular soil base layer. MDOT is currently funding studies to implement the new Mechanistic-Empirical Pavement Design Guide (MEPDG). Within this new design guide all layers of the pavement structure are evaluated for fundamental engineering properties such as modulus and Poisson’s Ratio. The proposed study includes three objectives:

1. Properly characterize the stiffness (modulus) of ADC materials.

2. Develop appropriate transfer functions for ADC materials. MDOT uses the Falling Weight Deflectometer (FWD) to characterize the structural capacity of in-place pavements that are scheduled for overlay. Data developed from FWD testing is input into ELMOD 5 for evaluating determining required thickness of overlay. To facilitate analysis using ELMOD 5 typical moduli values of ADC materials (objective 1) are required along with appropriate transfer functions.

3. The current MDOT flexible pavement design procedure does not assign a structural value (layer coefficient) to ADCs. The new MEPDG allows the contribution of the 4 inches of asphalt binder stabilized aggregates to the overall structural integrity of the pavement. Possible elimination of the underlying chemically stabilized soil base course could be realized if the drainage layer is shown to be structurally equivalent to the stabilized base layer, leading to a savings in pavement construction. The results from the first two objectives will be used in the MEPDG to perform this evaluation.
State Study No. 181 (Continued)

Progress:
During the last quarter, work continued on identifying the best method for characterizing the stiffness of asphalt drainage courses. To date, this effort has mainly entailed a literature search. The question that must be answered is whether an asphalt drainage course is an aggregate material or a hot mix asphalt material. Current techniques for characterizing the stiffness of aggregate materials is to use the resilient modulus test, while for hot mix asphalt materials the common method for measuring stiffness is dynamic modulus. The primary difference between the two stiffness measuring techniques is that the aggregate materials are tested with a confining pressure while the hot mix asphalt materials are not. The question arises from the relatively small amounts of asphalt binder that are added to the asphalt drainage courses. With the small asphalt binder amounts, it is unclear whether there is enough cohesion within the mixture to withstand compressive forces to measure stiffness. The researchers did not contact any acknowledged experts last quarter as intended; however, experts in this area will be contacted for opinions and experiences on the best method for measuring the stiffness of asphalt drainage courses.

Work also continued for identifying materials to be used within this study. One source of limestone aggregate was obtained along with a loose sample of ADC that was being placed in South Mississippi. Six inch cores were also obtained from the in place ADC to determine an approximate target density for laboratory compacted samples. An average of about 35% air voids was determined from the field samples, which was expected based on some of the literature.

Plans for Next Quarter:
During the next quarter, it is anticipated that work will continue towards identifying the best method(s) for characterizing the stiffness (modulus) of asphalt drainage courses. Work will also continue toward identifying and obtaining the remaining aggregates needed to comprise the asphalt drainage courses. Also, the researchers plan to locate another on going project to obtain field cores and loose material from. Once aggregates are obtained, mix designs will be conducted. These mix designs should help identify whether asphalt drainage courses should be considered aggregates or hot mix asphalt. Work should also begin for identifying the appropriate inputs needed for ADCs when included within the new M-E pavement design guide.

EEO and Title VI Information:

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Objective:
Jackson State University (JSU) has established an initiative entitled the University and Urban Mobility Initiatives to continuously assess mobility in the Greater Capitol Region and design and implement strategies to better ensure ease of movement throughout the metro area. This program will identify the regions strengths and shortcomings in the areas of transportation and mobility with the goals of continuing to maintain residents and viable commercial entities. The proposal provides for joint funding by JSU, MDOT and the City of Jackson to accomplish these goals. A budget of $205,630 is proposed for the first year with JSU providing 42%, and MDOT and the City of Jackson (or other entity) respectively providing 29 percent of the cost of the program.

Progress:
1. Drafted Materials for the Pre-summit Mailouts
2. Continued the Identification of Prospective Summit Attendees
3. Continued Discussions with Area Officials on Summit Topical Areas
4. Refined the Agenda and Began Identification of Summit Moderators, Speakers and Presenters
5. Continued the Development of the Summit Budget
6. Refined Logistical and Support Plans to Convene the Summit
7. Continued the Development of Agreements Required for Summit Support
8. Completed a Review of the Capital Region Transportation Planning and Development Initiatives
9. Continued Summit Discussions with Capital Region’s Elected Officials, Transportation Directors and Planners, Business Leaders and Community Leaders
State Study No. 183 (Continued)

10. Participated in MDOT Initiative to Identify Statewide Transportation and Mobility Issues

Plans for Next Quarter:

1. Conduct all Pre-Summit Mailouts
2. Formally Invite All Speakers, Moderators and Presenters
3. Conduct Pre-Summit Marketing and Promotion
4. Finalize All Discussions of Potential Regional Mobility Issues with Mississippi Capital Region Elected Officials, Transportation Directors, Business Leaders and Community Representatives
5. Increase Communications with Summit Partners
6. Complete Negotiations with Summit Venue Manager (Mississippi e-Center)
7. Post and Disseminate List of Summit Participants. Established goal of 200-250 Attendees. Maximum: 300 Summit Attendees
8. Draft Resolution for Post-Summit Activities
9. Continue to Review and Remain Abreast of Regional Transportation and Development Plans

EEO and Title VI Information:

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LONG-TERM FIELD MONITORING AND PERFORMANCE OF PAVING FABRIC INTERLAYER SYSTEMS TO REDUCE REFLECTIVE CRACKING

Funds Allocated: $218,224.00 Date Started: October 1, 2005
Expended to Date: $ 12,036.47 Completion Date: September 30, 2014
Current Work Program: $ 33,027.00 Time Remaining: 93 months
Current Work Program Expenditures: $292.47

Research Agencies: Department of Civil Engineering, Jackson State University and Research Division, Mississippi Department of Transportation

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, the literature related to the performance of paving fabric systems was reviewed. In addition, the previously developed paving fabric installation specification was re-examined. It is expected that the test sections be located in Highway 80 in Brandon/Pearl. The exact locations of the twelve 500 ft sections will have to be selected. In addition, a paper on the “Applications of Paving Fabric Systems to Reduce Reflective Cracking” was presented at the Mississippi Transportation Institute Conference in October 2006.
State Study No. 184 (Continued)

**Plans for Next Quarter:**

- Plan and finalize the test locations.
- Finalize the construction specifications document.

**EEO and Title VI Information:**

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State Study No. 185  
Milady Howard, P.E. – Principal Investigator

QUARTERLY PROGRESS REPORT  
Period: October, November & December 2006

IN-HOUSE SUPPORT TO STATE STUDY NO. 184 - LONG-TERM FIELD MONITORING AND PERFORMANCE OF PAVING FABRIC INTERLAYER SYSTEMS TO REDUCE REFLECTIVE CRACKING

Funds Allocated: $30,000.00  Date Started: October 1, 2005  
Expended to Date: $1,178.44  Completion Date: September 30, 2014  
Current Work Program: $9,000.00  Time Remaining: 93 months  
Current Work Program Expenditures: $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:

1. FWD field testing and evaluation of requisite overlay of proposed pavement for inclusion in Phase II study.
2. 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.
3. Mapping of cracks on the video logs for submission to Jackson State University.
4. 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:

Complete crack mapping.

Plans for Next Quarter:

Finalize construction documents and select limits of construction.
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:

1. Provide guidance on selection of paving fabric.
4. Perform requisite coring of pavement test sections.

Review the construction report, three progress reports and the final report.

Progress:
No work performed during this quarter.

Plans for Next Quarter:
Construction documents to be prepared by February. Test locations will be located. Pavement cracks will be mapped.
**EEO and Title VI Information:**

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

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EFFECTS OF MOISTURE CONTENT ON THE THERMAL COEFFICIENT OF EXPANSION OF CONCRETE

Objective:
Portland cement concrete experiences a change in volume due to a change in temperature, and this dependency is described in terms of coefficient of thermal expansion (CTE). A test method to test the CTE of concrete was recently developed by AASHTO as test number TP60-00, “Standard Test Method for the Coefficient of Thermal Expansion of Hydraulic Cement Concrete.” This method has been recommended and adopted by FHWA as an input in the new Mechanistic-Empirical Pavement Design Guide. However, the method suggests that the concrete is fully saturated in all occasions which is, generally speaking, not true. In this study the effect of moisture content on the CTE of concrete will be evaluated and the results correlated to the type of aggregate used in the mix.

Progress:
1- Finished measurement of CTE using AASHTO TP 60-00 for the cases of ~0% and 100% moisture content
2- Started measurement of CTE using strain gage technique for the cases of ~0% and 100% moisture content
3- Repaired Humidity chamber and calibrated it.
4- Started casting concrete prisms of dimensions 100 mm x 100 mm x 400 mm which will be used for measuring CTE according to the Danish standard.
State Study No. 187 (Continued)

5- Ordered the following equipment and materials for the Danish standard experiment:
   a. 200 mm Standard DEMEC Mechanical Strain gage
   b. 6.3 mm diameter Stainless Steel Locating Disks
   c. Water paths with controlled temperature between 5°C and 30°C.

Plans for next quarter:

1- Continue obtaining CTE of samples manufactured from all 20 mixes for the cases of moisture content of 25%, 50% and 75% using AASHTO TP60-00.
2- Continue obtaining CTE of samples manufactured from all 20 mixes for cases of moisture content of 25%, 50% and 75% using strain gage technique.
3- Start the Danish standard experiment.

EEO and Title VI Information:

Employment Data for University of Mississippi Research Staff

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Objective:
The current MDOT flexible pavement design method utilizes 4 input values: AADT, % Trucks, ESALS for 10 or 20 year, and Flexible factor. The new Mechanistic-Empirical Pavement Design Guide utilizes a significant amount of additional traffic information in the form of load spectra to support a given pavement design. SS No. 165 “Traffic Load Spectra Development for the 2002 AASHTO Design Guide” included the following recommendation:

“Use of automated software that processes, checks, analyzes and prepares traffic data in the format required for input into the design guide would greatly reduce time and result in more accurate and efficient use of the guide. Manual processing of the large volume of traffic data can be accomplished, but will be labor intensive and subject to increased mistakes.”

The objective of the current proposed study is to utilize the existing ATLAS prototype software to develop and implement an automated custom software system for processing and analysis of MDOT traffic data in support of the MEPDG implementation effort. In addition to the software, ARA will provide support in the form of technical documentation, user’s guide, on-site software installation, and training.

Progress:
Tasks 1 and 2 are complete; work continued on Tasks 3 through 6.

ATLAS customization work under Task 2 was completed during this quarter. A new module was added to generate traffic data files in the format required by the August 2006 release of the ME PDG software.
State Study No. 188 (Continued)

Under Task 3, work continued to modify the MS-ATLAS program to incorporate the Mississippi DOT traffic monitoring data quality control/quality assurance (QC/QA) rules. The research team reviewed the “Planning Division Mississippi Department of Transportation Traffic Monitoring and Data Procedures” (PDTM), and is incorporating relevant QC/QA rules and data processing procedures into the program.

For Task 4, the research team incorporated the results of SS 165 to enhance MS-ATLAS capabilities. This included analyzing and incorporating truck load spectra developed for specific truck traffic classifications (TTC) groups. The SS165 staff developed TTCs using LTPP traffic monitoring data to classify Mississippi highways.

Under Task 5, the research team is incorporating TTCs developed under SS 165 into MS-ATLAS; provisions will be made to allow incorporation of TWRGs based on future availability.

The research team received the geographic information system (GIS) shape files of the Mississippi roadways from Mississippi DOT Planning Division during this quarter. These shape files are being incorporated into the MS-ATLAS program under Task 6 to provide a graphical user interface to select a particular traffic data collection site to generate traffic data for a particular design problem.

**Plans for Next Quarter:**

Tasks 1 and 2 are complete; we will continue on Tasks 3 through 6.

The project team will complete Tasks 3 through 6 during the next quarter. This will include further customization of the MS-ATLAS software, traffic data library, and GIS maps. Based on the new file formats in the latest ME PDG software, necessary revisions will continue being made to the MS-ATLAS software to accommodate processing of the MDOT traffic data for the ME-PDG analysis.

**EEO and Title VI Information:**

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EVALUATION OF THE EFFECTIVENESS OF DRAINAGE LAYERS

Funds Allocated: $24,287.00  Date Started: October 1, 2005
Expended to Date: $13,174.00  Completion Date: September 30, 2007
Current Work Program: $24,287.00  Time Remaining: 9 months
Current Work Program Expenditures: $0

Research Agencies: Mississippi State University and Research Division, Mississippi Department of Transportation

Objective:

MDOT currently is sponsoring a graduate student, Jordan Whittington, at Mississippi State University. In order to meet the thesis requirements for his Masters degree, Mr. Whittington will examine the effectiveness of and “value” that MDOT is realizing from providing positive drainage in pavement structures. Critics of the drainage layer claim that when not maintained the layers actually are a detriment to the pavement structure and due to this lack of maintenance, MDOT would be wise to omit the drainage layer in our new pavement designs. This project will support Mr. Whittington’s research.

Progress:

Work was completed on building enclosures for all of the instrumentation and all dataloggers were programmed to be ready for data collection. An 800 foot drainage section for the concrete pavement was instrumented for measurement of rainfall and outflow. With an outlet spacing of 200 feet throughout each 800 foot drainage section, four sets of instrumentation were used leaving the “vent” on the uphill end of the drainage section open. Data for significant rainfall events was collected and analyzed.

Plans for Next Quarter:

All enclosures and instrumentation will be removed from the concrete drainage section and taken into the shop for service. Routine maintenance will be conducted and modifications will be made as deemed necessary from the first setup on the concrete drainage section. Once all maintenance is complete, the equipment will be taken to the field to measure rainfall and outflow on an 800 foot drainage section for asphalt pavement. Data for significant rainfall events will be collected and analyzed.
Objective:

The State Planning and Research Program Administration regulations (23 CFR Part 420) became effective on August 22, 1994. Subpart B requires the States to conduct a peer exchange of their research and technology (R & T) management process on a periodic basis. Mississippi’s first round peer exchange was held in June of 1998 and the second was held in September of 2002. The program is designed to send an outside team of invited top level managers to meet with the host agency to discuss and review its RD&T management processes. Information on the host agency and team members’ RD&T policies and procedures are exchanged with the intent to improve the overall RD&T management process. Peer exchanges provide an opportunity for participants to share best practices and management innovations with each other. The information gathered from the exchange is presented to agency management.

An in-state University to be determined later will provide assistance to MDOT in conducting this required peer exchange program. Specifically, the University will be reimbursed for the following functions related to this line item:

- Organizing the Event
- Reimbursing the Peer Exchange Participants Travel Cost
- Providing Lodging, Meals and Meeting Space for the Participants
- Preparing and Distributing a Final Report
- Providing Ground Transportation for Participants
State Study No. 190 (Continued)

**Progress:**

MDOT Research hosted the “Research Needs Workshop”. The experience will be evaluated at the next Research Peer Exchange.

**Plans for Next Quarter:**

No activity planned for the upcoming quarter.
Objective:

The purpose of SS# 191 is to investigate options for replacing TMIS (Transportation Management Information System) pavement management system (PMS) software with up-to-date software. TMIS was custom-designed for MDOT beginning in 1996, and as such, much of the underlying technology is no longer supported, out of date, and/or cumbersome to use. Also, many capabilities which were once only available in custom-designed packages are now available in cost-effective off-the-shelf PMS software. New software capabilities will include more user-friendly maintenance of construction history data, incorporation of condition survey data, and network optimization, including pavement performance models and cost/benefit scenario analysis. The study will consist of a needs assessment phase, followed by an investigation of available software, then finally software selection.

Progress:

Initial meetings were held at MDOT Nov. 28-30. These meetings included Ms. Katie Zimmerman, her associate Ilya Yut, the pavement management staff, and MDOT personnel from districts and upper management. Numerous discussions of PMS software needs took place. Also, APT extensively interviewed PMS staff to ascertain what capabilities the existing software, TMIS and PAP, currently provide.
State Study No. 191 (Continued)

**Plans for Next Quarter:**

Cindy Drake and James Watkins came up with a list of questions for vendors. James and APT will meet with these PMS software vendors during the TRB conference in January to see what each software can provide. Katie and Ilya are currently analyzing documentation of TMIS and PAP sent to them, as well as the results of the kickoff meetings.

**EEO and Title VI Information:**

Employment Data for Applied Pavement Technology, Inc. Research Staff

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Objective:

Hurricane Katrina struck the Mississippi Gulf Coast in August 2005 resulting in extensive damage to Mississippi’s coastal infrastructure. Based on past experience with hurricane Camille, it is anticipated that erosion of the pavement foundation occurred under U.S. Hwy 90 resulting in the development of voids under the pavement structure. This study employs the services of two consulting firms in conjunction with the Mississippi Department of Transportation to locate and evaluate the impact of any pavement foundation problems existing under 116 lane miles of the referenced highway. Electronic Pavement and Infrastructure Charting (EPIC), Inc. will utilize its Hyper Optics Pavement Analysis System to scan the asphalt overlaid concrete jointed pavement and provide Pavement Void Analysis (PVA), Pavement Thickness Analysis (PTA) and water content of the base utilizing Pavement Composition Analysis (PCA).

Fugro BRE, Inc. will employ the company’s Falling Weight Deflectometer (FWD) to perform in-situ testing of the pavement structure and provide analyses of the resulting test data to ascertain the in-situ engineering properties of the given pavement structure. Fugro BRE, Inc. will provide lane closure services to facilitate the FWD test efforts.

The Mississippi Department of Transportation (MDOT) is responsible for coring the pavement and then providing, in electronic format, both the core logs and pavement layer thickness data, to both EPIC and Fugro BRE. Traffic control for these coring operations will be the responsibility of MDOT.
State Study No. 192 (Continued)

**Progress:**
The contract documents were prepared and executed. The work on US 90 in Harrison County was performed.

**Plans for Next Quarter:**
The consultants will provide MDOT with their report.

**EEO and Title VI Information:**

**Employment Data for Fugro BRE, Inc. Research Staff**

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**EEO and Title VI Information:**

**Employment Data for Electronic Pavement and Infrastructure Charting, Inc. Research Staff**

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Objective:
Proper compaction of hot mix asphalt (HMA) mixtures is vital to ensuring that a stable and durable pavement is constructed. There are many factors that can affect the compaction of HMA. One of these factors is lift thickness. Previous work by the Florida DOT and the National Center of Asphalt Technology showed that for a given compactive effort, an increase in lift thickness results in an increase in compacted density.

MDOT’s current lift thickness requirements for a single lift of HMA is based on nominal maximum aggregate size (NMAS), with maximum lift thickness limited to generally 4 times the NMAS. Most current gravel sources in Mississippi are producing particle sizes that are in the range of 1 ½ to 2 inches. Once crushed to provide the needed particle angularity for HMA, most of the aggregate particles are less than ½ inch in diameter. This means that the most rut resistant mixes (mixtures containing the most angular aggregates) have a relatively small NMAS. Under the current Mississippi aggregate requirements, the highest quality HMA mix used in Mississippi, a 9.5 mm NMAS, can not be used in 2 inch mill and fill overlay projects, and a high quality 12.5 mm NMAS mix cannot be utilized in a 2 ½ or 3 inch upper binder layer.

The proposed research evaluates the use of 9.5 mm NMAS aggregate HMA in a 2-inch maximum lift thickness and a 12.5 mm NMAS aggregate HMA in a 3-inch maximum lift thickness in a total of 12 field projects. For each of these projects the compaction process will be monitored for roller types and pavement temperature and pavement density between roller passes. The collected data will be used to estimate the relative ability to compact the lift and provide information on whether the thicker lifts result in better density using a typical compactive effort. Uniformity of compaction throughout the depth of the
State Study No. 193 (Continued)

compacted layer and the permeability of the layer will also be addressed. Based upon the research findings, MDOT would be provided with the requisite information to modify the current allowable lift thickness for HMA.

**Progress:**

Work began on preparing the contract documents necessary to begin the project.

**Plans for Next Quarter:**

The contract will be executed and the project will begin.

**EEO and Title VI Information:**

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

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CONTROLLING SULFATE ATTACK IN MDOT STRUCTURES

Funds Allocated: $100,000.00  Date Started: October 1, 2006
Expended to date: $  87.33  Completion Date: December 31, 2008
Current Work Program: $ 50,000.00  Time Remaining: 24 months
Current Work Program Expenditures: $ 87.33

Research Agencies: Engineering Research & Development Center and Materials Division, Mississippi Department of Transportation

Objective:

Due to what has historically been considered relatively low concentrations of sulfate in Mississippi, sulfate attack on concrete structures has not been of significant concern in the concrete industry. The Mississippi Department of Transportation (MDOT) has historically required the use of ASTM C150 Type II cement and determined this measure to provide adequate control of concrete deterioration from any sulfates that might be present. However, two events have occurred that have created a need to re-examine this problem:

1. One of the principal portland cement producers used by MDOT has ceased production of ASTM C150 type II cement
2. Evidence has recently been discovered that indicates higher concentrations of sulfates may be present at depth in some areas of Mississippi. This creates concern for the long-term durability of concrete pilings.

The following research is proposed to evaluate and suggest solutions for this issue:

- Review MDOT's available data documenting damage ascribed to sulfate attack
- Determine the level of protection that is needed for concrete elements
- Perform literature review
- Assess the potential for sulfate attack of Portland cements available in Mississippi
State Study No. 194 (Continued)

- Make preliminary recommendations for prevention of sulfate attack based upon currently available data
- Conduct laboratory research

**Progress:**
Work began on preparing the contract documents necessary to begin the project.

**Plans for Next Quarter:**
The contract will be executed and the project will begin.

**EEO and Title VI Information:**

| Employment Data for Engineering Research & Development Center Research Staff |
|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| Total                                          | Male                                            | Female                                          |
| Staff                                          | White Black Hispanic Asian Native Am           | White Black Hispanic Asian Native Am           |
| Staff                                          | White Black Hispanic Asian Native Am           | White Black Hispanic Asian Native Am           |
EVALUATION OF LOAD-DEFLECTION BEHAVIOR IN DRILLED, CAST-IN-PLACE CONCRETE SHAFTS IN MISSISSIPPI

Funds Allocated: $171,000.00 Date Started: October 1, 2006
Expended to Date: $ 0 Completion Date: December 31, 2009
Current Work Program: $ 67,980.00 Time Remaining: 36 months
Current Work Program Expenditures: $0

Research Agencies:
Department of Civil Engineering, Mississippi
State University and Materials Division,
Mississippi Department of Transportation

Objective:
Over the past decade, the Mississippi Department of Transportation (MDOT) has performed approximately sixty load tests on straight-sided, drilled, cast-in-place concrete shafts (drilled shafts). Each of these load tests was well instrumented and included an Osterberg load cell and several strain gauges at critical locations along the shaft length.

Data in the MDOT drilled shaft load test database is currently employed in a qualitative form to support engineering judgment of the behavior of new shafts being completed in proximity to a project where an instrumented load test exists. To date, however, the data has not been integrated into a quantitative procedure that could readily be employed in design. The objective of this study is to develop the necessary correlations between design strength parameters and model soil response using the existing MDOT database of load tests on drilled shafts. These correlations would form the basis of a new method of design of drilled shafts for locations other than those constructed to date, reduce the amount of conservatism relative to that employed in the current design method, and result in a reduction of construction costs.

Progress:
Work began on preparing the contract documents necessary to begin the project.

Plans for Next Quarter:
The contract will be executed and the project will begin.
EEO and Title VI Information:

Employment Data for Mississippi State University Research Staff

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Mississippi SPR-1(49), Part II  
State Study No. 196  
Tulio Sulbaran – Co-Principal Investigator  
David Marchman – Co-Principal Investigator  
Jim Willis Jr. – MDOT Project Monitor  

QUARTERLY PROGRESS REPORT  
Period: October, November & December 2006  

EFFECTIVENESS OF RUMBLE STRIPES ON ROADWAY SAFETY IN MISSISSIPPI  

Funds Allocated: $158,954.00 Date Started: October 1, 2006  
Expended to Date: $ 0 Completion Date: December 31, 2008  
Current Work Program: $ 65,238.00 Time Remaining: 24 months  
Current Work Program Expenditures: $0  

Research Agencies: The University of Southern Mississippi and Traffic Engineering Division, Mississippi Department of Transportation  

Objective:  
Although traffic deaths are caused by an array of factors, in the United States more than half of all roadway fatalities are caused by roadway departures. The Mississippi Department of Transportation (MDOT) has invested valuable resources to implement a series of safety improvement programs. One of these programs is entitled “Rumble Stripes.” The current research will quantify the effectiveness of this program by:  
- Collecting historical and field data from selected Mississippi roadways, before and after the construction of “Rumble Stripes.”  
- Reviewing nationwide literature on “Rumble Stripes” effectiveness  
- Analyzing the compiled Mississippi data and the nationwide literature findings  

This research will also provide a framework for assessing other safety programs implemented by MDOT.  

Progress:  
Work began on preparing the contract documents necessary to begin the project.  

Plans for Next Quarter:  
The contract will be executed and the project will begin.
State Study No. 196 (Continued)

**EEO and Title VI Information:**
Employment Data for The University of Southern Mississippi Research Staff

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DEVELOPMENT OF A TRANSPORTATION MODEL FOR NINTH GRADE STUDENTS

Funds Allocated: $60,000.00  Date Started: October 1, 2006
Expended to Date: $0  Completion Date: December 31, 2007
Current Work Program: $60,000.00  Time Remaining: 12 months
Current Work Program Expenditures: $0

Research Agencies:
Research Curriculum Unit, Mississippi State University and Outreach Division, Mississippi Department of Transportation

Objective:
Employment in the transportation industry is expected to increase by 914,000 jobs from 2002 to 2012. In order to keep pace with the workforce demands, the U.S. Department of Labor has developed the report “Innovative Workforce Solutions to Help the Transportation Industry Address Hiring, Training, and Retention Challenges.” In this report, the workforce solution, based on the transportation industry’s priorities, lists “Helping high school, technical school, and community college graduates successfully enter the transportation industry.”

Utilizing ideas from this Department of Labor report, this research encompasses the following:

- Develop a model program to introduce ninth grade students to the careers available in the transportation industry
- Develop a training program for ninth grade students which teaches them to utilize GPS, GIS, and remote sensing through real world activities based on the MDOT in-the-field research.
- Align all activities with the state framework and national standards in math, science and technology.
- Develop a teachers’ guide with sample lesson plans which have the core objectives listed at the top for easy referral.
- Develop a transportation model kit which includes GIS, GPS, and remote sensing equipment and activities based on the use of this equipment at MDOT.
- Produce a video which features MDOT workers using the referenced technology
State Study No. 197 (Continued)

**Progress:**
Work began on preparing the contract documents necessary to begin the project.

**Plans for Next Quarter:**
The contract will be executed and the project will begin.

**EEO and Title VI Information:**

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Objective:
Nuclear density gages are currently used by the Mississippi Department of Transportation (MDOT) to determine the in-situ density of hot mix asphalt (HMA) layers. These devices include radioactive sources which require:

- MDOT must have a special license and follow regulatory controls
- Each user must be specially trained and certified
- Each user must wear a badge which is periodically tested to ensure that the employee has not been exposed to an excessive amount of radiation
- Designated special storage areas

The 6th District will purchase a PQI 301 Pavement Quality Indicator. This device is advertised to provide accurate density measurements of HMA while eliminating every negative aspect of the use of the nuclear density gage. The Gulfport Project Office will use this device in conjunction with the nuclear density gage on upcoming projects to provide comparison test results. These results will be evaluated to determine if the PQI 301 can be used in lieu of the nuclear density gage.

Progress:
No work performed this quarter.

Plans for Next Quarter:
A PQI 301 Pavement Quality Indicator will be lent to the Department by the manufacturer to gain familiarity with the device. NCHRP 10-65, “Nondestructive Testing Technology for Quality Control and Acceptance of Flexible Pavement Construction”, will be reviewed for developing a test plan for MDOT evaluation of the device.
Public ports on the Mississippi Gulf coast suffer sedimentation problems that limit ship access or draft. Port sedimentation causes two major problems—the expense of dredging and disposing of sediment, and friction with shippers, who cannot transit and/or berth vessels in areas where sedimentation has reduced the depth available for navigation and loading/unloading. These sedimentation problems can be reduced or eliminated via the use of designs and procedures that keep sediment out, keep sediment moving, or remove sediment that deposits in navigation facilities.

The proposed research will identify engineered solutions to reduce or eliminate the need for maintenance dredging at public ports on the Mississippi Gulf coast. This will be accomplished with site visits and inspections of each port, compilation of data and analysis of this data.

**Progress:**

Work began on preparing the contract documents necessary to begin the project.

**Plans for Next Quarter:**

The contract will be executed and the project will begin.
EEO and Title VI Information:
Employment Data for Mississippi State University Research Staff

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