

MISSISSIPPI SPR-1(37), PART II

GENERAL COMMENTS ON RESEARCH WORK PROGRAM
FOR FISCAL YEAR 2001

The expected SPR research work program allocation for FY 2000 totals \$1,632,728 and includes a National Cooperative Highway Research Program (NCHRP) contribution of \$359,200 for FY 2001, and pooled-fund studies totaling \$272,146 for FY 2001 as detailed in the program tabulation and narrative included in this document. The NCHRP funding is 5.5% of the total SPR allocation (Parts I and II). This work program tabulation also includes renewal statements for all on-going line items. The renewal statements for state studies contain financial information including total study budget, total expenditures to date, and cost estimates for fiscal year 2001. Also included in the renewal statements for state studies are narrative descriptions of study objectives, accomplishments of the past year, and work planned for fiscal year 2001. Beginning and completion dates are shown for each state study. Line items other than state studies have narrative descriptions of scope, objectives and anticipated activities along with a cost estimate. These tabulations and renewal statements constitute the FY 2001 research work program.

The pooled fund studies, Mississippi's second round of peer exchange and NCHRP are funded with 100% SPR Part II funds (no state match). The twenty-four line items in the tabulation mentioned above includes only those items for which there is a state match in the funding.

State study numbers in this work program are the same as those currently being used, and they will remain the same in all correspondence. Study proposals for future submissions will be numbered sequentially.

The SPR allocation for FY 2001 is planned to be 20 percent greater than the allocation for FY 2000; however, to be on the conservative side, an allocation in the same amount as last year is being used. This would amount to \$1,632,728 and the state match would be \$250,346.

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LINE ITEM 1

Research Administration

This line item covers those direct costs chargeable for administration which, due to their nature, are difficult to apportion to the separate studies. Chargeable categories include preparation of contracts and proposals, collection of background information on individual studies, acquisition of basic reference materials and bibliographies, determining the qualifications of institutions and other groups for performing studies, providing for report review, and miscellaneous implementation of research products not specially accounted for elsewhere. Routine surveillance and support of contracted research studies, where not provided for elsewhere, are also included in this item. Overhead items such as housekeeping, accounting, and office rental will be included in these charges.

COST ESTIMATE FOR FISCAL YEAR 2001

Salaries (Regular Employees)	\$171,632
Employee Benefits	\$48,368
Materials, Supplies, and Services	15,000
Travel and Sustenance	<u>10,000</u>
Total	\$245,000

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LINE ITEM 2

Transportation Research Board Correlation Service

This line item provides for subscription to a "Research Correlation Service" from the Transportation Research Board, a service established and operated in accordance with the recommendation of the Executive Committee of AASHTO. The activities supported by this subscription include the collection of available information concerning past, current and proposed research related to transportation from all sources including federal, state and other government agencies, colleges and universities, research and planning organizations, transport operators and industry, as well as the TRB Annual Meeting and conference programs; the study and correlation of this information through the work of the committees of the Board and dissemination of the useful findings of research and other information by all feasible means including the several TRB publication series, the output of the Transportation Information Services, and through personal contacts during scheduled field visits by the TRB professional staff. The current annual subscription cost for Mississippi is \$84,625, however TRB increased the subscription cost from \$71,805 to \$84,625 in FY 2000. That increase left the FY 2000 Work Program with a \$13,077 shortfall since \$71,805 was budgeted for FY 2000. Therefore the FY 2001 TRB Correlation Service line item is funded at a level of \$97,702 to account for the previous year shortfall in addition to the current subscription cost.

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LINE ITEM 3

Long-Term Pavement Performance

This line item is for support of the Long-Term Pavement Performance (LTPP) program begun under the Strategic Highway Research Program (SHRP) and now a part of the Federal Highway Administration (FHWA). Activities covered include site nomination, site verification, historic data searches, support for material sampling and field-testing, construction supervision, and technology transfer activities associated with LTPP and SHRP product implementation.

Activities conducted in FY 2000 included:

- implementation of LTPP products
- marking and signing of LTPP sites
- coordinating material testing activities for SPS experiments
- support for field data collection

Activities planned for FY 2001 include:

- continued coordination of material testing activities
- maintaining signage for existing LTPP sites
- support for all LTPP activities

COST ESTIMATE FOR FISCAL YEAR 2001

Salaries (Regular Employees)	\$11,826
Employee Benefit	3,311
Materials, Supplies, and Services	4,363
Travel and Sustenance	<u>500</u>
Total	\$20,000

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LINE ITEM 4

Implementation of Research Projects

This line item funds Research Division activities relating to implementation of research studies.

Implementation Activities consist of field and office activities that apply research results to the solution of operational problems in the transportation area. Examples of these activities are:

1. Applying new products and/or procedures in the field to specific field problems.
2. Short-term field and/or office technical support in trouble-shooting and design.
3. Assistance in development of specifications and tests to implement new products or procedures.
4. Identifying areas in which research is required.
5. Initial preparation costs associated with proposed research.

Research information for implementation may originate from MDOT's Research Program (in-house and Contract), including both completed and ongoing studies; from other state transportation agencies' experiences and research; from national and international sources, from the FHWA; and from major research sources such as NCHRP, Corps of Engineers, etc.

COST ESTIMATE FOR FISCAL YEAR 2001

Salaries (Regular Employees)	\$172,000
Employee Benefits	48,160
Materials, Supplies, and Services	9,840
Travel and Sustenance	<u>10,000</u>
Total	\$240,000

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LINE ITEM 5

Technology Transfer

This activity funds Research Division activities relating to the distribution of information about transportation technologies to any of MDOT Research Division's transportation customers. These are not new activities but have been on going for many years. This line item is included to facilitate better documentation of technology transfer activities.

There are many similarities between items falling under the categories **Technology Transfer** and **Implementation** of this work program. For the purposes of this work program, a distinction will be made that **Implementation** will be concerned with actively putting research results into practice while **Technology Transfer** will refer to efforts to disseminate information. One noteworthy example of work in this area is technology exchange relating to implementing of Superpave. Other examples of technology transfer are:

- making presentations of research results to various groups such as universities and technical societies
- participation in seminars and training courses
- distribution of research results
- inputting research and research-in-progress results into the Transportation Research Information Service (TRIS)

The SPR WORK PROGRAM-PART I, Technology Transfer, provides direct support to the Center for Technology Transfer (T²) at Jackson State University, and those activities and funds are not included in the above line item, Technology Transfer.

COST ESTIMATE FOR FISCAL YEAR 2001

Salaries (Regular Employees)	\$12,000
Employee Benefits	3,360
Materials, Supplies, and Services	640
Travel and Sustenance	<u>4,000</u>
Total	\$20,000

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LINE ITEM 6

PAVEMENT MANAGEMENT

PAVEMENT MANAGEMENT / PMS STAFF

This item covers the activities of the Research Division relating to the development, implementation, and operation of the Department's Pavement Management System.

Activities include awareness of national pavement management state-of-the-art and practice, administration of field data collection and statewide database development, administration of pavement condition survey contracts, quality assurance for condition surveys, in-house software development, administration of contract software development, planning and conducting in-house training, administration of contract pavement management research, and implementation of pavement management research.

COST ESTIMATE FOR FISCAL YEAR 2001

Salaries (Regular Employees)	\$178,125
Employee Benefits	49,875
Materials, Supplies, and Services	2,000
Travel and Subsistence	<u>10,000</u>
Total	\$240,000

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LINE ITEM NO. 7	STATE STUDY NO. 127
TOTAL STUDY BUDGET: \$175,000	TOTAL STUDY COST TO DATE: \$134,584
DATE STARTED: 10/01/97	COMPLETION DATE: 04/30/01
STUDY TITLE:	Hot Mix Asphalt Quality Management Implementation
RESEARCH AGENCY:	Chicago Testing Laboratory and Materials Division, Mississippi Department of Transportation
PRINCIPAL INVESTIGATOR:	Richard Root, P. E. Richard Sheffield

Objectives:

1. Conduct Certification Training.
2. Develop a Field Procedures Manual
3. Provide on the job support to the QC/QA teams on specific projects.
4. Participate in the MDOT HMA Quality Circle composed of District and Central Office representatives.
5. Develop recommended changes in the mixture and QMP specifications, and related Standard Operating Procedures.
6. Identify and recommend changes to resolve HMA pavement performance problems.

Progress:

Work accomplished for FY 2000 included completing Objectives 3, 4, 5, and 6. There was participation in the MDOT HMA Quality Circle and observations and recommendations made. Changes to resolve HMA pavement performance problems were identified and recommendations made. A summary of these various efforts will be contained in a final report.

Plans for FY 2001:

It is planned to continue this study for another 10 months. Tasks for FY 2001 will include the finalization of the field procedures manual and conducting certification training.

COST ESTIMATE FOR FY 2001

\$40,416

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LINE ITEM NO. 8	STATE STUDY NO. 129
TOTAL STUDY BUDGET: \$81,700	TOTAL STUDY COST TO DATE: \$76,655
DATE STARTED: 10/01/97	COMPLETION DATE: 12/31/00
STUDY TITLE:	Structural Parameters of Lime Treated Subgrades and Lime-Fly Ash-Aggregate Base Courses
RESEARCH AGENCY:	Mississippi Department of Transportation and Chemical Lime Company
PRINCIPAL INVESTIGATORS:	Randy L. Battey, Kevin D. Ingram, and Dallas N. Little

Objectives:

Primary objectives of this study are as follows:

- determine reasons for recent failures of relatively new pavements having LFA base courses; one of these is located on US 98 in Perry and Green Counties and one is located on SR 6 in Pontotoc County;
- ascertain modulus of lime treated subgrades and relate this to pavement structural contribution for a range of Mississippi soils that have been modified with lime over the past 30 years; this will involve deflection bases layer analysis and a laboratory validation;
- critically examine existing specifications and pavement structural and mixture design procedures for ways to improve performance of LFA base courses and lime treated subgrades.

Progress:

Preparations were made for a demonstration project, which will be designed to utilize the information gained from the soil tests, GPR and DCP tests and will provide the basis for design recommendations. A rough draft of the testing procedure for lime soil designs has been prepared. Additional soil samples were obtained and analyzed to fill in some of the gaps in the data. Due to the necessity of obtaining and analyzing additional samples to achieve a complete data set, the completion date was extended to December 31, 2000.

Plans for FY 2001:

A finalized testing procedure and report will be prepared by Dr. Dallas Little which will include recommendations for the structural number of subgrades to design Mississippi pavements. The finalized report will be made available to interested agencies.

Cost Estimate for FY 2001: \$5,045 (includes salary, benefits, and travel)

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LINE ITEM NO. 9	STATE STUDY NO. 131
TOTAL STUDY BUDGET: \$259,292	TOTAL STUDY COST TO DATE: \$170,091
DATE STARTED: 01/26/99	COMPLETION DATE: 12/31/00
STUDY TITLE:	Subgrade Characterization for Highway Pavement Design
RESEARCH AGENCY:	University of Mississippi
PRINCIPAL INVESTIGATORS:	K. P. George and W. Uddin Mississippi Department of Transportation

Objectives:

In this study, the Dynamic Cone Penetrometer (DCP), originally introduced in South Africa, and recently automated, is investigated as an alternative for characterizing roadbed soils and unbound pavement materials. DCP testing in soils has produced useful correlation with CBR and strength parameters. The primary objective of this study is to establish a reliable correlation between the DCP index and resilient modulus of unbound materials.

The following tasks will be conducted to satisfy the objectives:

- Acquisition of automated DCP equipment.
- Review of research and theory of lab resilient modulus and DCP tests.
- Laboratory testing
- Field testing of DCP and FWD.
- Back calculation of FWD moduli.
- Finite element simulation models
- Subgrade characterization model.
- Final report.

Progress:

- A second and third cycle of FWD and ADCP testing was performed on the Monroe County and Rankin County sections.
- 70 shelly tube samples were tested for resilient modulus and were grouped and classification tests were performed on one sample from each group.
- Comparisons of ADCP and manual DCP data correlation was presented to the MDOT research committee.
- A new ADCP software code, DCPAN for subgrade characterization was developed using the FWD backcalculated moduli. DCPAN was utilized to predict in-situ subgrade resilient modulus directly from ADCP data files.
- FWDSOIL computer program was finalized for unpaved highway and subgrade soils. It uses MDOT FWD time files and layering information from the ADCP plots to backcalculate subgrade moduli.

Plans for FY 2001:

- Finalize modifications to FWDSOIL & DCPAN software.
- Prepare final report for publication and distribution to interested agencies.
- Present findings and demonstrate software to MDOT research committee.

It should be noted that due to the delay in acquisition of the Automated Dynamic Cone Penetrometer at the inception of the study, it became necessary to utilize the Manual Dynamic Cone Penetrometer for the first round of testing at some of the sites. This made further study necessary to develop a correlation between Automated and Manual DCP data, which was not envisioned when the study was proposed. Also it became necessary to purchase a “rugged” laptop computer as part of the study for the Automated DCP which was not planned at the inception of the study. With these reasons in mind, the Department granted the University of Mississippi an extension of 3 months for project completion and an increase in funding of \$14,952.

Cost Estimate for FY 2001 \$59,200

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LINE ITEM NO. 10	STATE STUDY NO. 132
TOTAL STUDY BUDGET: \$70,000	TOTAL STUDY COST TO DATE: \$4,909
DATE STARTED: 01/01/99	COMPLETION DATE: 09/30/01
STUDY TITLE:	Performance and Evaluation of Median Barrier Curbs and Traffic History Devices at Highway Railroad Grade Crossings in Mississippi
RESEARCH AGENCY:	Mississippi Department of Transportation
PRINCIPAL INVESTIGATORS:	John W. Avent and Randy L. Battey

Objective:

The objective of this study is to determine if median barrier curbs with delineator panels will reduce the risk of collisions at highway-rail grade crossing both in urban and rural areas, and if so, to determine the optimal length of an effective installation. A second objective is to determine if the installation of video cameras along with signs so stating that these devices are monitoring the grade crossings will also reduce the drive-arounds.

Five different tasks will be undertaken to satisfy the objectives:

- Selection of Highway-Rail Crossings.
- Procurement of Equipment.
- Installation of Equipment.
- Data Collection.
- Reporting and Implementation Plan.

This study is being conducted jointly by the Research Division, Rails Division, and Traffic Engineering Division.

Progress:

The cameras and mounting equipment has been procured and two of the sites have had cameras installed for testing purposes. Agreements with each local government are in place. Attempts have been made to obtain agreements with the railroads to tie into their system. This is critical since the cameras need to only be activated when a train is in the vicinity of the crossing. This would minimize the amount of film that would be generated. Currently the necessary agreements have stalled within the legal divisions of the department and the railroads.

Plans for FY 2001:

Obtain an agreement with the railroads to tie into their system. Install the cameras and curbs at all sites. This study will monitor the traffic for a period that is long enough to determine that the devices are working and to what amount.

Cost Estimate for FY 2001: \$40,000 (includes salaries, benefits, and travel)

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LINE ITEM NO. 11	STATE STUDY NO. 133
TOTAL STUDY BUDGET: \$97,276	TOTAL STUDY COST TO DATE: \$1,011
DATE STARTED: 10/01/99	COMPLETION DATE: 09/30/04
STUDY TITLE:	Soil Stabilization Field Trial
RESEARCH AGENCY:	University of Mississippi (This study will be conducted jointly with the Portland Cement Association sharing costs)
PRINCIPAL INVESTIGATOR:	K.P. George

Objective:

A field trial is proposed to investigate the effectiveness of fly ash or other methods such as pre-cutting the base at regular intervals or pre-cracking in mitigating the shrinkage-cracking problem in soil-cement. The Department has been using lime-fly ash (LFA) for stabilization of bases, and this field study will compare the performance of cement sections with LFA included in the program.

The research study is proposed to have a field trial incorporating one section of cement, another of reduced cement and fly-ash, a third section with pre-cut cement layer, a fourth section with induced pre-cracking, a fifth section incorporating lime and fly-ash, and the last section with ground granulated blast furnace slag as an additive.

Progress:

A literature review has been performed to review any previous research that would relate to the study. A location has been identified for the test on MS 302 in Marshall County. Samples of the select material from the project location have been obtained and laboratory tests were performed. Mix designs for each test section were composed based on the laboratory test results.

Plans for FY 2001:

The six test sections will be constructed and a preliminary evaluation of the test sections will be performed. An interim report will be published documenting the construction and the initial evaluation of the sections. Long term monitoring of the sections will begin.

<u>Cost Estimate for FY 2001</u>	\$60,000
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The PCA and the University of Mississippi are providing funds to supplement this effort.

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LINE ITEM NO. 12	STATE STUDY NO. 134
TOTAL STUDY BUDGET: \$10,000	TOTAL STUDY COST TO DATE: \$22,628
DATE STARTED: 05/01/99	COMPLETION DATE: 12/31/00
STUDY TITLE:	Applicability of Automated Dynamic Cone Penetrometer
RESEARCH AGENCY:	Mississippi Department of Transportation
PRINCIPAL INVESTIGATOR:	William F. Barstis

Objective:

This study is being conducted to support State Study No. 131 "Subgrade Characterization for Highway Pavement Design" which is the contract underway with the Department of Civil Engineering at the University of Mississippi (UM). Most of the laboratory and field testing to support the contract study will be conducted by this in-house study. In addition, this study will provide the test data to correlate the Dynamic Cone Penetrometer (DCP) to the Automated DCP.

Progress:

Progress of field construction activities related to State Study No. 131 was monitored. Support was provided as required to the principal investigators of State Study No. 131.

Plans for FY 2001:

Continue to provide support to the principal investigators of State Study No. 131. Monitor the progress of the DCPAN software and review the draft of the manual supporting this software.

Cost Estimate for FY 2001 \$10,000 (includes salaries, benefits, and travel)

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LINE ITEM NO. 13	STATE STUDY NO. 136
TOTAL STUDY BUDGET: \$200,000	TOTAL STUDY COST TO DATE: \$67,021
DATE STARTED: 04/06/99	COMPLETION DATE: 12/31/02
STUDY TITLE:	Master Testing Agreement
RESEARCH AGENCY:	Fugro-BRE, Inc., Reed and Graham, Inc. and Burns, Cooley and Dennis, Inc.
PRINCIPAL INVESTIGATOR:	John W. Avent and Randy L. Battey

Objective:

The objective of this study is to provide engineering services for laboratory tests and analysis of samples and materials generated from projects and research studies. These services will provide for testing and characterization of hot mix asphalt mixture and binder, portland cement concrete, bound and unbound granular materials and soils in accordance with testing and reporting protocols of designated tests promulgated by the Strategic Highway Research Program Long-Term Pavement (SHRP-LTPP).

Progress:

The results of the first round of testing were received and forwarded to SHRP-LTPP for their data set. A third laboratory, Burns, Cooley & Dennis, Inc., was added to the study for the second round of testing. Material samples for the second round of testing were sent to each of the three participating laboratories for their testing protocol. The results of the second round of testing were received and forwarded to SHRP-LTPP.

Plans for FY 2001:

A third round of material tests will be performed by the participating laboratories

Cost Estimate for FY 2001 The third round of tests will cost \$77,862.

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LINE ITEM NO. 14	STATE STUDY NO: 138
TOTAL STUDY BUDGET: \$75,000	TOTAL STUDY COST TO DATE: \$4,326
DATE STARTED: 10/01/99	COMPLETION DATE: 09/30/04
STUDY TITLE:	In-house Study to Support Field Sampling for State Study No. 133 – Soil Stabilization Field Trial
RESEARCH AGENCY:	Mississippi Department of Transportation Research Division
PRINCIPAL INVESTIGATOR:	William F. Barstis

OBJECTIVE: This study will be conducted to support State Study No. 133 “Soil Stabilization Field Trial” which is a proposed contract with the Department of Civil Engineering at the University of Mississippi. The field site location, layout, and sampling to support the contract study will be conducted by this in-house study.

Progress:

Federal Aid Project No. NH-0021-01(104)PH2 was selected as the project for the current study test sections. The project site is located on MS 302 between the Desoto/Marshall County line and US 72 in Marshall County. Meetings were conducted with the principal investigator of State Study No. 133, the Contractor/Subcontractors and MDOT personnel to ensure that the objectives of State Study No. 133 and the field methodologies utilized to meet these objectives were understood by all parties involved in the study. Samples of the select material from the project were obtained and submitted to the University of Mississippi for the required laboratory testing.

Plans for FY 2001:

Six test sections, each 1,000 feet in length, will receive treatments of cement alone, cement treatment with vibratory roller, cement and fly-ash, lime fly-ash, ground granulated blast furnace slag, and precutting the base at 10-foot intervals. All of this construction will be coordinated by MDOT with various data collected during construction of the test sections. Utilization of the Departments Falling Weight Deflectometer (FWD) will be made before and after construction. At various times loose samples of materials and cores will be obtained and sent to the University for testing purposes. Any additional support required by the principal investigators of State Study No. 133 will be performed.

Cost Estimate for FY 2001 \$40,000 (including salaries, benefits & travel)

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LINE ITEM NO. 15	STATE STUDY NO: 140
TOTAL STUDY BUDGET: \$24,500	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/99	COMPLETION DATE: 09/30/01
STUDY TITLE:	Evaluation of E-Krete for Rut Filling
RESEARCH AGENCY:	Polycon, Inc. and Research Division, Mississippi Department of Transportation
PRINCIPAL INVESTIGATOR:	Randy L. Battey

BACKGROUND: Rutting of asphalt pavements presents a serious problem for highway agencies worldwide. There are several ways to rehabilitate rutted asphalt pavement, including milling by itself, milling and overlay, overlay without milling, and rut filling. Rut filling with various materials, primarily asphalt based, has been done for several years.

A new material E-Krete, manufactured by a Mississippi Corporation, Polycon, Inc., is under evaluation as bridge deck surface treatment and for spall repair on concrete pavement and structures. E-Krete is a Portland cement based material that has excellent adhesion properties. A 375-foot test section of E-Krete was installed, at Polycon's expense, in a severely rutted section of the outside lane of the northbound lanes of I-55 in August 1999. This problem statement is for a more carefully engineered evaluation of E-Krete for rut filling.

Progress:

A rutted 2000-foot length of U.S. Highway 49 Southbound in Madison County between the two southern-most relief bridges of the Big Black River was selected for this study. 4 – 500 foot test sections, in the outside travel lane only, were constructed and received the following treatments:

- **Section One** - Mill the existing top lift of rutted asphalt pavement and replace with a well-compacted lift of HMA. This section will serve as the control for this experiment and give us data how the E-Krete method of filling ruts compares with the current strategy of "mill & fill" currently employed by the department.
- **Section Two** - Clean & degrease the existing ruts. Prime the inside of the rut with Polycon's binder material. In the ruts only, layer 1st coat of E-Krete with aggregate both mixed in and broadcast on top of the 1st coat. Once the 1st coat has cured and hardened, apply a 2nd layer of E-Krete, similar to the 1st coat, to the rut area. Once the 2nd coat has cured and hardened, apply thin tan-colored E-Krete overlay across the entire 12-foot width of the travel lane.

- **Section Three** - Construct exactly as Section Two, except a layer of reinforced glass grid shall be embedded into the wet E-Krete which comprises the 1st coat in the rut area.
- **Section Four** – Clean & degrease the existing ruts. Prime the inside of the rut with Polycon's binder material. Mix large aggregate into the E-Krete and fill the rut with one single application. Once the single application has cured and hardened, overlay entire 12 foot width of travel lane with tan-colored E-Krete

Plans for FY 2001:

Monitoring and documentation of the test sections will be performed. Friction testing will be performed on the test sections for inclusion in the documentation. A report will be generated and distributed to various interested agencies.

Cost Estimate for FY 2001 \$10,000 (includes salaries, benefits & travel)

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LINE ITEM NO. 16	STATE STUDY NO. 141
TOTAL STUDY BUDGET: \$44,000	TOTAL STUDY COST TO DATE: \$3,658
DATE STARTED: 05/01/00	COMPLETION DATE: 12/31/02
STUDY TITLE:	Performance of Polymer Modified Hot Mix Asphalt Pavements – An Extended Evaluation
RESEARCH AGENCY:	Ergon Technical Development and Mississippi Department of Transportation
PRINCIPAL INVESTIGATOR:	Mike Hemsley and Randy L. Battey

Objective:

The objective of this research project is to continue observation and evaluation of the Polymer Modified Pavement Field Trial sections, located on I-55 northbound near Grenada, MS, for an additional 3 years in order to study any additional or new pavement distresses. This study will evaluate the modifiers in each of the sections, which include five different polymer sections, two crumb rubber sections, a gelled asphalt section and a section with no modifier to serve as the control section. Information gained from this research in using polymers and modifiers to overcome premature rutting and other distresses will continue to set Mississippi as one of the leaders in this field of study. It should be noted that Ergon Technical Development will provide all laboratory testing at no cost to the Mississippi Department of Transportation.

Progress:

Field operations began in May 2000 and comprised of cutting 152 – 6” cores, performing 90 sand patch tests, gathering rut data, performing friction testing and mapping the distresses in the test sections. All 152 cores were delivered to Ergon Technical development for testing.

Plans for FY 2001:

Ergon Technical Development will complete their testing protocol on the 152 cores that were gathered in the 1st phase of field operations and report their test results to the MDOT. A second round of field operations will be performed in the Spring of 2001.

Cost Estimate for FY 2001 \$15,000 (includes salaries, benefits & travel).

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LINE ITEM NO. 17	STATE STUDY NO. 142
TOTAL STUDY BUDGET: \$34,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 05/01/00	COMPLETION DATE: 12/31/02
STUDY TITLE:	Evaluation of Crumb Rubber Modified Hot Mix Asphalt on a County Road
RESEARCH AGENCY:	Mississippi Department of Transportation, Hinds County Public Works Department and Mississippi Department of Environmental Quality
PRINCIPAL INVESTIGATOR:	William F. Barstis

Objective:

The abundant surplus of vehicle tires still presents a problem for Mississippi, as well as other states. The Hinds County Department of Public Works recently recognized this problem and approached the Mississippi Department of Environmental Quality (DEQ) concerning a joint venture to construct a crumb rubber modified hot mix asphalt overlay of a county road. The intent is to use available research funds from DEQ in support of Hinds County Public Works road program to construct the project. PolyVulc, a Vicksburg, MS company who processes waste tires into crumb rubber for various uses, was selected to provide the crumb rubber. The MDOT Research Division was requested by both financial supporters, as well as the crumb rubber supplier, to facilitate the design, oversee the construction and to evaluate the performance.

The objective of this research project is to evaluate the performance of a crumb rubber modified hot mix asphalt overlay on a low volume two-lane road. The purpose is for the crumb rubber modifier to enhance the pavement's ability to resist distresses resulting from environmental factors. This project will use the wet process for incorporating the crumb rubber modifier into the hot mix asphalt.

Progress:

The route chosen for this project is the connector between Clinton, MS and Raymond, MS, which is 4.5 miles in length and comprised of two 10-foot lanes. Prior to constructing the test sections the department performed rut measurements and a distress survey on the existing surface. Three 1-mile test sections were constructed with varied amounts of crumb rubber modifier. Between each test section is a one-half mile control section containing no crumb rubber.

The following table describes the section layout:

<u>Distance</u>	<u>Section</u>
0 – 1 mile	3% CRM
1 – 1½ mile	Control
1½ - 2½ miles	5% CRM
2½ - 3 miles	Control
3 – 4 miles	7% CRM
4 – 4½ miles	Control

The overlay was 2 inches in thickness and the Hinds County road crew performed the construction.

Plans for FY 2001:

The MDOT will continue to monitor and document the condition of the test sections. Rut measurements, distress surveys and skid friction testing will be performed periodically.

Cost Estimate for FY 2001 \$10,000 (includes salaries, benefits & travel).

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LINE ITEM NO. 18	STATE STUDY NO. 143
TOTAL STUDY BUDGET: \$120,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/00	COMPLETION DATE: 12/31/01
STUDY TITLE:	In-House Support to State Study No. 137 (Construction of Resin Modified Pavement Project)
RESEARCH AGENCY:	Mississippi Department of Transportation
PRINCIPAL INVESTIGATOR:	Randy L. Battey

Objective:

Due to financial constraints within the Department of Transportation, District Seven in McComb has notified the Research Division that they will be unable to fund the construction State Study No. 137 – Resin Modified Pavement Demonstration Project. Therefore it is necessary that the Research Division fund the construction of the project with SPR funds. The Research Division has requested FHWA to grant an extension of one year, to enable the Research Division to budget for the cost of construction in their upcoming FY 2001 Work Program. Should FHWA grant this request, construction will be scheduled for Spring of 2001 and will be paid for with this line item.

Plans for FY 2001:

Let the necessary contracts to build State Study No. 137 – Resin Modified Pavement Demonstration Project. The construction contracts will be paid for out of this line item.

Cost Estimate for FY 2001 \$120,000 (construction costs only)

MISSISSIPPI SPR-1(37)
PART II

LINE ITEM NO. 19	STATE STUDY NO. 144
TOTAL STUDY BUDGET: \$50,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/00	COMPLETION DATE: 09/30/01
STUDY TITLE:	Profilograph Specification Study
RESEARCH AGENCY:	Mississippi Department of Transportation
PRINCIPAL INVESTIGATOR:	Randy L. Battey

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 the blanking band requirement in the current roughness specification 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 the current 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 have removed the blanking band from their roughness specification for this very reason. Many of the states have gone to the light weight profiler for their QC/QA of ride quality. The MDOT intends on utilizing the light weight 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 (light weight profiler and profilograph) is in place. If the 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.

Plans for FY 2001:

Roughness data will be gathered from approximately forty (40) projects utilizing the profilograph, South Dakota type road profiler and the walking profiler. This information will allow the department to revise the current roughness (profilograph) specification and to have data for the future transition to the light weight profiler. Phase I of this study will be to revise the current specification and will be completed in FY 2001.

Cost Estimate for FY 2001 \$50,000

MISSISSIPPI SPR-1(37)
PART II

LINE ITEM NO. 20	STATE STUDY NO. 145
TOTAL STUDY BUDGET: \$86,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/00	COMPLETION DATE: 03/31/02
STUDY TITLE:	The Effect of End-Point Compaction on Superpave Mix Designs
RESEARCH AGENCY:	Mississippi State University
PRINCIPAL INVESTIGATOR:	Tom White

Objective:

With fixed contact pressure and gyration angle, Superpave compaction effort is controlled by number of gyrations. Traffic level determines the desired initial (N_{ini}), design (N_{des}) and maximum (N_{max}) number of gyrations. Design asphalt content is selected at N_{des} . The initial Superpave protocol specified that specimens are compacted to N_{max} and the bulk density at N_{des} is interpolated based on specimen change in height. This approach is reasonable for some mixtures, however the change in height may not be linear for other mixtures, which could lead to an error in volumetric determinations. There is thought of changing the protocol to call for specimens to be compacted to N_{des} for selecting design asphalt content. After the design asphalt content is selected then the mixtures are compacted to N_{max} , to confirm air voids will be adequate through the mixture service life. There is industry concern about the effect of this change on design asphalt contents.

Plans for FY 2001:

This study will quantify the effect on Superpave design asphalt content resulting from the change of N_{max} to N_{des} as the end-point of compaction for mix designs. A laboratory study is proposed in which the factors would include aggregate type, maximum aggregate size, aggregate gradation and N_{des} . Appropriate levels of each factor will be included in the study. Mix designs will be conducted at N_{des} . Additional specimens will be compacted to N_{max} . An analysis of design asphalt contents will be made and the differences will be quantified.

Cost Estimate for FY 2001 \$54,531

MISSISSIPPI SPR-1(37)
PART II

LINE ITEM NO. 21	STATE STUDY NO. 146
TOTAL STUDY BUDGET: \$80,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/00	COMPLETION DATE: 09/30/03
STUDY TITLE:	Updating Mississippi Flood Frequency Reports
RESEARCH AGENCY:	United States Geological Survey
PRINCIPAL INVESTIGATOR:	K. Van Wilson

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.

Plans for FY 2001-FY 2003:

The objectives of this project are to prepare an updated version of the flood-frequency reports that would:

- Document the maximum known flood at gaged sites in Mississippi and compare with a previously published envelope curve;
- Document flood data and flood-frequency estimates at gaging stations in Mississippi; and
- Present methods for estimating the magnitude and frequency of floods in Mississippi having recurrence intervals ranging from 2 to 500 years.

Tidal record data along the Mississippi Gulf Coast will also be included. See the following web address for examples of data: <http://wtsodin.er.usgs.gov/camille/>

Estimated Costs:

The project will be done in cooperation with the MDOT, Research Division. The 3-year project will begin October 1, 2000, and will end September 30, 2003. It is anticipated that the results of this project will be reviewed and discussions toward renewal after 2003 will be made to include additional GIS work on automated basin delineation, which is currently in the development stages. The total estimated cost of the project is \$160,000 distributed over three Federal Fiscal years (October 1 to September 30) as follows:

	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>Total</u>
MDOT	\$ 20,000	\$ 30,000	\$ 30,000	\$ 80,000
USGS	\$ <u>20,000</u>	\$ <u>30,000</u>	\$ <u>30,000</u>	\$ <u>80,000</u>
Total	\$ 40,000	\$ 60,000	\$ 60,000	\$ 160,000

The availability of Federal matching funds is difficult to predict, but we will make every effort to secure funds to match all or part of the State funds. If Federal matching funds vary from those shown for each year, then the MDOT and USGS can discuss alternatives, such as, reducing scope or extending the time of the project.

Products:

Reports will be published that contain maximum known flood data, annual peak-flow data, flood-frequency estimated at gaging stations, and equations and (or) computer programs for estimating the magnitude and frequency of annual floods in Mississippi.

The reports will be provided in paper form (with a diskette or CD) and will also be made available in digital form on the Internet.

Cost Estimate for FY 2001 \$20,000

MISSISSIPPI SPR-1(37)
PART II

LINE ITEM NO. 22	STATE STUDY NO: 147
TOTAL STUDY BUDGET: \$20,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/00	COMPLETION DATE: 09/30/01
STUDY TITLE:	Long Term Effect of Lime Fly Ash Treated Soils
RESEARCH AGENCY:	Mississippi Department of Transportation Research Division
PRINCIPAL INVESTIGATOR:	William F. Barstis

Objective:

For approximately 20 years, the Mississippi Department of Transportation has been utilizing lime fly ash in base course construction. Recently questions as to the long-term effect lime fly ash has on soil strength and stability have been raised. This study intends on answering those questions by performing the following two tasks:

- A thorough literature search will be performed to determine what other agencies have discovered based on their experiences with lime fly ash treated bases that are over 10 years in age.
- Mississippi constructed several of their early lime fly ash treated bases as part of "Demonstration" or Research projects. These projects were well documented and the strength of the bases at the time of construction is known. As part of this project these early sites will be revisited and core samples will be taken. A comparison of the present day core properties will be made to the earlier data.

Upon completion of these two tasks, a comprehensive report will be generated detailing the findings of the study. It is estimated that it will take approximately one year to complete this research.

Cost Estimate for FY 2001 \$20,000

MISSISSIPPI SPR-1(37)
PART II

LINE ITEM NO. 23	STATE STUDY NO: 148
TOTAL STUDY BUDGET: \$250,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/00	COMPLETION DATE: 09/30/02
STUDY TITLE:	Crash Testing Mississippi's Temporary Barrier Systems
RESEARCH AGENCY:	Mississippi Department of Transportation Research Division
PRINCIPAL INVESTIGATOR:	Randy L. Battey

Objective:

The Federal Highway Administration (FHWA) is requiring all states to have all traffic control devices utilized in a work zone to be crashworthy according to the testing and acceptance guidelines of the National Cooperative Highway Research Program (NCHRP) Report 350. As part of this mandate, all temporary barrier systems must meet the requirements of NCHRP 350 by October 1, 2002. Mississippi has not crash tested it's current precast temporary barrier system to determine if it is in compliance with NCHRP 350. The main component in question is our current "pin and loop" connection between adjacent barrier units. This study will determine, based on crash testing, if modifications to Mississippi's current standard temporary barriers are necessary for compliance with NCHRP 350.

Cost Estimate for FY 2001 \$100,000

MISSISSIPPI SPR-1(37)
PART II

LINE ITEM NO. 24	STATE STUDY NO: N/A
TOTAL STUDY BUDGET: \$25,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/00	COMPLETION DATE: 09/30/01
STUDY TITLE:	Minor Research Studies
RESEARCH AGENCY:	Mississippi Department of Transportation Research Division
PRINCIPAL INVESTIGATOR:	Joy F. Portera

Low cost/short duration projects may be done without being put into a process of clearances and competing with other programs. An example of such a project is an experimental feature evaluation.

The Research Advisory Committee will establish a resource threshold to be met before requiring any project be put into a centralized clearinghouse/priority setting process. Current operating procedures are to conduct research projects where the expenditure ceiling is expected to be under \$10,000 and the project duration is expected to be one year or less.

These are based on selection and approval by the Research Engineer, following an appropriate review of District needs and literature review.

These research projects are short-term, and will employ only MDOT personnel in the research project. Brief, concise work plans will be developed for each of these projects.

Cost Estimate for FY 2001 \$25,000

MISSISSIPPI SPR-1(37)
PART II

MISSISSIPPI PARTICIPATION IN NCHRP

The Mississippi Department of Transportation contributes to the National Cooperative Highway Research Program (NCHRP). NCHRP is a special-purpose program administered by the Transportation Research Board (TRB) under a three-way agreement among the National Academy of Sciences, AASHTO, and the FHWA. Funding is provided by state highway and transportation agencies at a rate of 5.5% of the agencies' SPR funds. Funds for this participation are 100% Federal and thus contain no state match. These pooled funds are used to fund research aimed at solving national or regional problems and can only be spent on problems approved by at least two-thirds of the states. Formal solicitations are made from the states, AASHTO committees, TRB committees and FHWA to develop problem statements. Estimated contribution for FY 2000 is **\$359,200**.

MISSISSIPPI SPR-1(37)
PART II

MISSISSIPPI'S SECOND ROUND OF PEER EXCHANGE

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 review (exchange) of their research and technology (R & T) management process on a periodic basis; "periodic basis" has been interpreted in previous correspondence to be a 3-year cycle. Mississippi's first round peer exchange was held in June of 1998, therefore Mississippi's second round peer exchange will be held in FY 2001.

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.

This line item shall fund the following aspects related to Mississippi's FY 2001 Peer Exchange:

- 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

Cost Estimate for FY 2001 \$10,000

POOLED FUND STUDIES

Pooled Fund Study: ***Auburn University Accelerated Pavement Test Facility***

Host Agency - Alabama Department of Transportation

The objective of this pooled-fund study is to construct, operate, and analyze the data from a full size test track to be constructed near Auburn, Alabama. Seven states (Alabama, Florida, Georgia, Indiana, Mississippi, South Carolina, and Tennessee) are currently committed to participate in this study that will evaluate hot mix asphalt pavement under a traffic loading of 10 million equivalent single axle load (ESALs) over a two year period. Each participating state will be responsible for the pavement design for their test sections. The National Center for Asphalt Technology (NCAT) will be responsible for monitoring the experiment to include periodic data collection and data analysis. The MDOT has committed to the first phase of test section construction, trafficking and analysis. This commitment will be for fiscal years 1999 through 2001 in the following amounts:

FY 1999	\$268,000
FY 2000	\$200,000
FY 2001	\$27,000

Pooled Fund Study: ***Traffic Signal Load Switches***

Host Agency - Ohio Department of Transportation

This pooled fund is in support of the MDOT Traffic Engineering Division and will be evaluating a new type of load switch that is designed to significantly increase the life of signal lamps.

FY 1999	\$55,000
FY 2000	\$40,000
FY 2001	\$16,497

Pooled Fund Study: ***Wind Induced Vibration of Stay Cables***

Host Agency – Missouri Department of Transportation

This pooled fund is in support of the MDOT Bridge Division and will address concerns about wind-induced vibration of stay cables on long-span bridges and will develop guidelines for wind-resistant design of new cable systems and countermeasures to stabilize in-service cables.

FY 2000 - \$35,000	FY 2001 - \$32,000
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Pooled Fund Study: ***Southeast SUPERPAVE Center***

Host Agency - Alabama Department of Transportation

The objective of this pooled-fund study will be to support the implementation of the products of the SHRP research effort within the state DOTs through the ***Southeast SUPERPAVE Center***. Each state can select from a list of services that will best satisfy their needs. The list includes:

- Develop and provide, for the DOTs and Industry, training on the volumetric analysis of HMA pavements using the Superpave Gyratory Compactor.
- Conduct at least 1 (more if needed) four day Superpave binder school at NCAT.
- Provide troubleshooting expertise to the states on the development of Superpave designs - both over the phone and as required by visits to the DOT laboratory and/or project site.
- Provide support for implementation of Superpave by conducting round robin studies to evaluate the accuracy of laboratories within the region.

If additional work is needed, each state can determine from the list of services the cost for performing this additional work.

FY 2001 - \$20,000

Pooled Fund Study: ***Evaluation of Pavement Permeability in Mississippi***

Host Agency - Alabama Department of Transportation

During the last several years, all of the states within the Southeast have placed Superpave designed mixes. Most of these mixes have been on the coarse side of the restricted zone. Several states, including Mississippi, have expressed concerns that the Superpave designed mixes are more permeable than pavements previously designed with the Marshall hammer.

During 1998, the National Center for Asphalt Technology, through the Southeastern Superpave Center, performed a pool fund study to evaluate four field permeameters. The study involved taking the four field devices to hot mix asphalt (HMA) construction projects and performing field permeability tests. At the conclusion of the study, one of the field devices was selected based upon correlation with laboratory permeability results (using the standard Florida Department of Transportation method), repeatability, and ease of use.

In FY 2000 eight different projects were evaluated using the selected field permeameter. The intent is to add six more projects to the existing data set in FY 2001 with the ultimate objective being to use the data to develop a permeability specification for Mississippi's hot mix asphalt pavements

FY 2000 - \$28,300

FY 2001 - \$14,300

Pooled Fund Study: ***Evaluation of Using Stone Matrix Asphalt (SMA) in Mississippi***

Host Agency -Alabama Department of Transportation

Stone matrix asphalt (SMA) has been used in Europe for over 30 years. Due to the success of SMA in Europe, five agencies within the U.S. constructed SMA pavements during the early 1990's. An evaluation of those pavements has shown excellent rut resistance and performance. Because of the good performance of SMA within the U.S., a study is needed to evaluate the potential of using SMA within Mississippi using aggregate commonly found in Mississippi hot mix asphalt pavements. Two nominal maximum aggregate sizes (NMASs) will be included in this study: 9.5 mm and 4.75 mm. A NMAS of 9.5 mm has been used in the U.S. with success. The NMAS of 4.75 mm has not been used to date but has been successfully evaluated in the laboratory by NCAT. A 4.75 mm NMAS is proposed because this type of mix would be ideal for maintenance overlays.

There will be a total of 16 different designed mixes, which will be subjected to rut testing utilizing the Asphalt Pavement Analyzer (APA). This testing will be conducted to verify that rut resistant SMA mixes were achieved for each mix design

FY 2001 - \$59,200

Pooled Fund Study: ***Compatibility of Liquid Asphalts with Different Aggregate Used in Mississippi Related to Stripping Susceptibility***

Host Agency -Alabama Department of Transportation

As a standard practice, the MDOT requires the use of lime in hot mix asphalt mixtures to combat moisture induced damage. However, even with the use of lime, some pavements have still had premature distressing (stripping) due to moisture damage. A potential cause of this premature stripping is an incompatibility between some asphalt binder-aggregate combinations. A total of 60 mixtures will be evaluated for this study. A full factorial experiment including five aggregates (2 variations of native chert gravel, limestone, sandstone and granite), three asphalt binders (2-PG 67-22 binders and a polymer modified PG 76-22), two nominal maximum aggregate sizes (12.5mm and 19mm) and two gradation shapes (above & below the maximum density line). The total estimated cost is \$143,298 over a two-year period.

FY 2001 - \$71,649 FY 2002 - \$71,649

Pooled Fund Study: ***LTPP SPS8 WIM Calibration and Data Processing***

Host Agency - FHWA

The Long Term Pavement Performance (LTPP) Program was initiated as a part of the Strategic Highway Research Program in 1987. The intent was a 20-year study of pavements that would provide the highway community with the information it needed to design, build and maintain cost-effective and long lived pavements. Mississippi is one of 37 states and provinces participating in the LTPP Specific Pavement Studies (SPS). A core objective of these studies is to quantify relationships between pavement performance, truck volumes and axle loading. It is essential to quantify these relationships if we are to make progress in improving our ability to predict the long-term performance of our Interstates and other major highways. Unfortunately, the states and provinces have fallen behind in collecting the required traffic data and successful achievement of this goal is in serious jeopardy. The Transportation Research Board's LTPP Committee, which oversees the program on behalf of the states and provinces, has concluded that the current traffic data collection provided by the states and provinces is proving inadequate to maintain effective SPS experiments. The recommendations by the LTPP Committee propose major changes in the SPS traffic data collection effort. These changes will require uniform national standards for the acquisition, installation, calibration and operation of WIM/AVC equipment, as well as the timely processing of the resulting data. The total estimated cost of implementing the recommendations through FY 2003 nationally is \$10 million, however Mississippi's cost for their SPS sites in FY 2001-FY 2003 is \$19,000.

FY 2001 - \$9,000

FY 2002 - \$5,000

FY 2003 - \$5,000

Pooled Fund Study: ***Non-Nuclear Testing of Soils and Granular Bases Using the GeoGauge***

Host Agency - FHWA

The Soil Stiffness Gauge, GeoGauge, is a non-nuclear, non-destructive testing device that directly and rapidly measures the stiffness of soils and soil-aggregate mixtures. This stiffness can be used to directly determine Young's and shear modulus and can be used in conjunction with a moisture measurement to determine density. Users of the GeoGauge have reported the following benefits:

- Relatively simple to use with minimal training required;
- Eliminates licensing/interstate issues related to nuclear-based devices;
- Relatively low price compared to nuclear gauge;
- Has the ability to measure a key, albeit elusive, engineering property;
- Allows an increase in lot sample size, thereby quantifying material and evaluating subgrade and base course variability.

A pool fund study has been established to conduct a national evaluation of the GeoGauge.

FY 2001 - \$12,500

FY 2002 - \$12,500

PROJECTS FUNDED BY FHWA

TECHNICAL AND EVALUATION PROJECT NO. TE-030
HIGH PERFORMANCE CONCRETE PAVEMENT
WORK ORDER NO. DTFH71-99-TE030-MS-12
(State Study No. 137)

TOTAL STUDY BUDGET: \$90,242 TOTAL STUDY COST TO DATE: \$6,590
DATE STARTED: 08/09/99 COMPLETION DATE: 09/30/06
STUDY TITLE: Resin Modified Pavement Demonstration
Project
RESEARCH AGENCY: Mississippi Department of Transportation
PRINCIPAL INVESTIGATORS: John W. Avent and Randy L. Battey

Background:

Resin Modified Pavement (RMP) is a new composite paving material consisting of a thin layer (2 inches) of open graded hot mix asphalt (HMA) whose internal voids (approximately 30% voids) are filled with a latex rubber-modified portland cement grout. Some of the objectives that the RMP material was developed to address are:

- resist damage from rutting
- resist damage from fuel spillage
- easily to construct with conventional construction equipment
- require no joints
- have comparable life cycle costs with other rehabilitation methods.

Objective:

The objective of this project is to construct a demonstration RMP highway project and compare its performance with ultra-thin whitetopping (Portland cement concrete inlay) and polymer modified asphalt, for a period of five years. The proposed study will be constructed in an intersection with a HMA pavement with a history of rutting and a high traffic loading.

Plans for FY 2001:

Design procedures for the open graded HMA will be based on procedures adopted by the Corps of Engineers and modified to use Superpave technology. Air void content in the open graded HMA will be in the range of 25-35%. Resin modified grout design will follow procedures adopted by the Corps also.

The intersection chosen will allow research sections to be constructed in four directions; i.e. a resin modified pavement will be constructed in two directions, an ultra-thin whitetopping pavement will be constructed in one direction and a polymer modified hot-mix asphalt in one direction. Each test section will be approximately 500 foot in length. Together, these different pavements will allow the evaluation of the latest high-performance pavement types. This particular intersection is to be under construction in the FY 2001 construction season and it is planned to let the contractor build the test sections.

The tasks to be conducted during this study are as follows:

- Planning and partnerships.
- Design of mixes.
- Construction.
- Documentation during construction.
- Periodic monitoring.
- Reporting.

Cost Estimate for FY 2001:

Partnerships and site investigation	Sep 1999-Oct 2000	\$9,500
Design	Nov-Dec 2000	\$5,000
Construction plans	Jan-Feb 2000	\$8,000
Documentation of construction	Mar-May 2000	\$25,000
Construction report	Jun-Sep 2000	\$10,000
Periodic monitoring	Jun-Sep 2000	\$2000
	Total	\$59,500
Periodic monitoring/ Final report	Oct 2001 – Sep 2006	<u>\$30,742</u>
	Grand Total	\$90,242

**Mississippi
Department of Transportation**

**RESEARCH WORK PROGRAM
SPR-1(37), Part II
Q56**

**For the Fiscal Period
October 1, 2000 to September 30, 2001**



**Prepared by the
Mississippi Department of Transportation
*RESEARCH DIVISION***

**In Cooperation with the
U.S. Department of Transportation
Federal Highway Administration**

**Mississippi
Department of Transportation**

**RESEARCH WORK PROGRAM
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Q56**

**For the Fiscal Period
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