**TRANSPORTATION POOLED FUND PROGRAM**

**QUARTERLY PROGRESS REPORT**

Lead Agency (FHWA or State DOT): \_FHWA\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**INSTRUCTIONS:**

*Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.*

|  |  |  |  |
| --- | --- | --- | --- |
| **Transportation Pooled Fund Program Project #**  *TPF-5(019) & SPR-2(174)*  *Full-Scale Accelerated Performance Testing for Superpave*  *and Structural Validation & Accelerated Pavement*  *Testing of Crumb Rubber Modified Asphalt Pavements* | | **Transportation Pooled Fund Program - Report Period:**  □Quarter 1 (January 1 – March 31)  ●Quarter 2 (April 1 – June 30)  □Quarter 3 (July 1 – September 30)  □Quarter 4 (October 4 – December 31) | |
| **Project Title:**  TPF-5(019)  SPR-2(174) | | | |
| **Project Manager: Phone: E-mail:**  Nelson Gibson 202-493-3073 nelson.gibson@dot.gov | | | |
| **Project Investigator: Phone: E-mail:**  Nelson Gibson 202-493-3073 nelson.gibson@dot.gov | | | |
| **Lead Agency Project ID:**  - | **Other Project ID (i.e., contract #):**  **-** | | **Project Start Date:**  January 2002 |
| **Original Project End Date:**  **-** | **Current Project End Date:**  December 2008 | | **Number of Extensions:**  **-** |

Project schedule status:

□ On schedule □ On revised schedule □ Ahead of schedule ● Behind schedule

Overall Project Statistics:

|  |  |  |
| --- | --- | --- |
| **Total Project Budget** | **Total Cost to Date for Project** | **Total Percentage of Work**  **Completed** |
| $983,697.52 TPF-5(019)  + $500,000.00 SPR-2(174)  $1,483,697.52 | $928,480.10 TPF-5(019)  + $470,972.58 SPR-2(174)  $1,399,452.68 | 100% |

***Quarterly*** Project Statistics:

|  |  |  |
| --- | --- | --- |
| **Total Project Expenses**  **This Quarter** | **Total Amount of Funds**  **Expended This Quarter** | **Percentage of Work Completed**  **This Quarter** |
| $0 | $0 | 0 |

**Project Description:**

(Abstract from Draft Final Report)

The primary objective of this full scale accelerated pavement testing was to evaluate the performance of unmodified and polymer modified asphalt binders and to recommend improved specification tests over existing Superpave Performance Grading methodologies. Candidate replacement tests were evaluated via their ability to discern fatigue cracking resistance and rutting. Two fatigue cracking specification tests were identified as being more capable than others; binder yield energy and critical tip opening displacement. Two rutting specification tests that quantify irrecoverable deformations exhibited the best strength to capture rutting; Multiple Stress Creep and Recovery and oscillatory based non recoverable stiffness.

Based on the full scale performance and laboratory tests, crumb rubber (recycled tires) modified asphalt (Arizona wet process) was shown to significantly slow or stop the growth of fatigue cracks in a composite asphalt pavement structure. A hybrid technique to modify asphalt with a combination of crumb rubber and conventional polymers (terminally blended) exhibited good fatigue cracking resistance relative to the control binder, without any special handling procedures needed for some crumb rubber modified asphalts. Also, a simple addition of polyester fibers to asphalt mix was shown to have high resistance to fatigue cracking without the use of polymer modification.

The research study also quantified the capabilities of NCHRP mechanistic-empirical pavement design and analysis methodologies to predict rutting and fatigue cracking of modified asphalts that were not captured in the calibration data from the Long Term Pavement Performance Program. Falling Weight Deflectometer, multi depth deflectometer and strain gauge instrumentation were used to measure pavement response. The results illustrated that the globally-calibrated mechanistic-empirical performance models could differentiate between structural asphalt thickness but had difficulty differentiating the modified from the unmodified asphalt binder performance. Nonetheless, the mechanistic-empirical performance ranking and predictions were enhanced and improved using mixture-specific performance tests currently being implemented using the Asphalt Mix Performance Tester.

**Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**

* Staff reviewed the editorial (non technical) comments received from the editor and made corresponding changes.
* Internal resources were utilized for the final report publication rather than pooled funds because release of agency remaining pooled funds from the CFO for the purposes of report editing and publication would have taken too long to move forward. This means there will be more reaming funds at the end of the project once all is closed out.
* The draft test method for Double Edge Notch Tension (DENT) for calculated critical tip opening displacement (CTOD) was finalized and agenda time was secured at the Fall FHWA Asphalt Expert Task Groups.
* The written test method specification was added as an appendix to the final report.
* It appears that the first close out webinar slides from 2010 are periodically removed from the FTP site due to space constraints. It is being considered whether those slides should or could be posted at the pooled fund website

**Anticipated work / close-out activities for next quarter:**

* Present the draft DENT CTOD test method at the Fall FWHA Asphalt Expert Task Group
* Submit the accelerated aged ALF performance and extracted binder test results for peer review
* Complete the mailing package containing (1) flexible silicone DENT CTOD molds + metal specimen tabs, (2) test method protocol for review and (3) DVD containing the audio and video of the first technical close out webinar.
* Gather and address the technical comments from the participants on the draft final report.
* Develop a schedule for second final close out technical webinar which will allow for sufficient planning and final review of draft report by participants.
* Receive all necessary approvals from FHWA CFO for financial close out.

**Significant Results:**

* The ALF binders were characterized using several standard ductility tests as a requested action item from Texas during first technical close out webinar. Testing is complete and data has been analyzed for comparison to DENT CTOD.

The test results are as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Test Method | DENT CTOD | Elastic Recovery | Ductility | | Force Ductility |
| Specification | Proposed from  ALF research | AASHTO T301 | ASTM D113 | | AASHTO T300 |
| Material Tested | Bituminous binder | Bituminous binder | Bituminous binder | | Emulsion residues |
| Specimen Shape | Sharp notches of  different ligament  lengths | Straight dog-bone | Gentle notch | | Straight dog-bone |
| Temperature | 25C | 25C  but at times 15C | 25C but at times 15C | | 4C |
| Aging condition | PAV | RTFO  *\*but ALF materials*  *were PAV aged here* | RTFO  *\*but ALF materials were PAV aged here* | | Residues |
| Extension Rate | 100mm/min | 50mm/min | 50mm/min | | 50mm/min |
|  | | | | | |
| ALF Material Results | CTOD, mm  (Rank) | % Recovery  (Rank) | Elongation, mm  (Rank) | Energy to fail, J  (Rank) | This test was not  Ran on the ALF  Binders |
| Lane 2  Control PG70-22 | 7.5 (#4) | 9.4 (#3) | 87.4 (#4) | 1.158 (#4) |
| Lane 3  Air Blown | 6.8 (#5) | 8.1 (#4) | 61.3 (#5) | 0.934 (#5) |
| Lane 4  SBS-LG | 24.0 (#1) | 14.0 (#1) | 408.2 (#1) | 3.621 (#1) |
| Lane 5  CR-TB | 8.5 (#3) | 6.0 (#5) | 122.4 (#3) | 1.748 (#3) |
| Lane 6  Terpolymer | 15.7 (#2) | 10.5 (#2) | 372.9 (#2) | 3.234 (#2) |

Analysis indicates that Elastic Recovery does not provide the same ranking as CTOD. The Ductility test results for both elongation and energy to fail do follow the same rank order. The relative magnitudes of elongation between the binders is very widespread but the energy to failure not only has the same rank order but similar relative variation in magnitude

**Circumstance affecting project or budget (Describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope, and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).**