TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): Virginia Department of Transportation

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 # *(i.e, SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX))*	**Transportation Pooled Fund Program - Report Period:**
TPF-5(229)	☐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: Characterization of Drainage Layer Properties for MEPDG		
Name of Project Manager(s): Brain K. Diefenderfer	**Phone Number:** (434)293-1944	**E-Mail** Brain.Diefenderfer@VDOT.Virginia.gov
Lead Agency Project ID:	**Other Project ID (i.e., contract #):** VTRC-MOA-11-005(98289)	**Project Start Date:** September 1, 2010
Original Project End Date: August 31,2013	**Current Project End Date:** August 31, 2013	**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	Percentage of Work Completed to Date
270,000.00	46.47%	50%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
$123,373/3%	8,100.00	70%

Project Description:

The objectives of this pooled fund study are to develop methods for characterizing the elastic modulus and strength of pavement drainage layers for the Mechanistic-Empirical Pavement Design Guide (MEPDG), to perform analysis of the stability and failure of the drainage layer in the pavement structure, and to develop specifications for required minimum porosity for effective drainage.

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

1. Compacting specimens for Oklahoma

Thirty specimens were compacted using the asphalt stabilized open graded aggregates which were collected from Oklahoma. The theoretical maximum specific gravity of the mixture obtained last quarter was used to calculate the amount of mixture needed to get desired air void content of the specimens. By trial and error method the amount of mixture was adjusted to achieve more accurate air void content of these laboratory compacted specimens.

2. Determining the air void content of Oklahoma's specimens

The air void content, which is also known as the void in total mixture (VTM) was determined for Oklahoma's specimens by three methods. The dimensional method, Parafilm method and vacuum sealing method were conducted to determine the VTM of each specimen. The testing results of the three methods were analyzed and compared. For specimens with comparatively low air void content about 20%, the difference between the results of the three methods was not notable. However, the vacuum sealing method is believed to be more reliable for the very porous specimens with up to 30% air void content. The difference between the air void content before and after coring and cutting was also investigated for the specimens made of asphalt stabilized open graded aggregates.

The effective air void content of these specimens was determined following ASTM D7063 Standard Test Method for Effective Porosity and Effective Air Voids of Compacted Bituminous Paving Mixture Samples. The relationship between the permeability and VTM, and the relationship between the permeability and effective air voids were investigated.

3. Determining the permeability of Oklahoma's specimens

The permeability of the Oklahoma's specimens was determined by following the Oklahoma testing standard OHD L-44 which is a flexible wall falling head method. The relationship between the permeability and air voids was obtained.

4. Prepare for the dynamic modulus test

The equipment for dynamic modulus testing was fixed and calibrated. The gauge points were glued to the specimens' surfaces for attaching the linear variable differential transformers (LVDT). All the specimens will be tested under the temperature of 40F, 70F, 100F, 130F and at the frequency of 0.1, 0.5, 1, 5, 10, 25. The master curve will be constructed for the specimens with different air void content.

Anticipated work next quarter:

More specimens with air void content ranging from 20% to 30% will be compacted using the materials collected from Oklahoma. Specimens of the cement treated permeable aggregates will also be made with the loose aggregates from Oklahoma.

The VTM of the compacted specimens for Oklahoma will be determined by the dimensional method, parafilm method and vacuum sealing method and the testing results will be analyzed and compared. The effective air void content will also be determined and related to the permeability.

The flexible wall falling head method will be conducted to determine the permeability of the specimens for Oklahoma. The relationship between the permeability and the VTM, the permeability and effective air voids will be investigated, by testing series of specimens made of mixtures typically used for drainage layer with different air void content.

The dynamic modulus test will be conducted on the laboratory compacted specimens for both Virginia and Oklahoma. The master curve will be constructed for the mixtures collected from Virginia and Oklahoma with different air void content.

The resilient modulus test and IDT static compliance test will be conducted for Oklahoma's specimens and the results will be analyzed. The testing data will be input into FEM simulation for further study.

Significant Results:

1. The air void content (VTM) and effective air voids were determined for the laboratory compacted specimens. The difference of the air voids obtained from the three methods (Dimensional, Parafilm and Vacuum sealing) was investigated for specimens with high air void content up to 30%. The difference between the air void content before and after coring and cuttingwas found to be 1% to 4% for specimens compacted with the drainage layer materials.

2. The permeability of specimens made of mixtures adopted by Oklahoma for the drainage layer was determined following the Oklahoma testing standard OHD L-44. The relationship between the permeability and VTM, the permeability and effective air voids were investigated. The permeability results for Oklahoma's specimens follow the similar tendency as that of Virginia's specimens.

3. The equipment was fixed and calibrated and the specimens were ready for the dynamic modulus testing. The temperature and frequency for the dynamic modulus testing were determined

Circumstance affecting project or budget. (Please 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).

No problems have been encountered this quarter.

Potential Implementation: