TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): ____IOWA DOT_____

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(300)*	**Transportation Pooled Fund Program - Report Period:** X Quarter 1 (January 1 – March 31, 2014) Quarter 2 (April 1 – June 30, 2014) Quarter 3 (July 1 – September 30, 2014) Quarter 4 (October 1 – December 31, 2014)

Project Title: Performance and Load Response of Rigid Pavement Systems		
Project Manager: Francis Todey	**Phone:**	**E-mail:** francis.todey@dot.iowa.gov
Project Investigator: Tom Cackler	**Phone:** 294-3532	**E-mail:** tcackler@iastate.edu

Lead Agency Project ID:	**Other Project ID (i.e., contract #):** Addendum 504	**Project Start Date:** 5/29/14
Original Project End Date: 5/31/2017	**5/31/2019**	**Number of Extensions:**

Project schedule status:

X 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
$1,520,000	55,183.27	27%

Quarterly Project Statistics:

Total Project Expenses This Quarter	Total Amount of Funds Expended This Quarter	Percentage of Work Completed This Quarter
55,183.27	N/A	15%

Project Description:

The modern approach to highway design is embodied in the Mechanistic-Empirical Pavement Design Guide (MEPDG), which incorporates models embedded in dedicated software, such as AASHTOWare Pavement ME Design, to predict pavement performance in greater detail than before. Full implementation of the MEPDG by state departments of transportation requires customizing or calibrating the software to state and local conditions, which in turn requires collecting data on climate, material properties, load response, and pavement performance.

The MEPDG software uses these data inputs to more accurately simulate the load response of pavements and long-term pavement performance. Local calibration of the software involves comparing long-term performance simulation results to actual performance data at local sites if possible or from matching pavements in the LTPP database. New York is one of the states that have previously instrumented test pavement sections to acquire local data to improve calibration of the MEPDG software. The installed sensors are still functioning to an extent that permits collection of additional useful data. This project has these objectives:

- Collecting load response and performance data and environmental monitoring at selected test pavements in New York for four years.
- Installing new instrumented sections as needed for a better understanding of rigid pavement response, including monitoring for the duration of the project.
- Determining the impact of a base on long-term performance of rigid pavement utilizing the data acquired in fulfilling the first two objectives and other nationally available data on the topic.

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

NYSDOT priority task list:

- Task 1. Develop relationships between PCC slab thickness and pavement performance
- Task 2. FWD Analysis Procedures

January:

- Following the global calibration for the state of New York using the material properties, weather, traffic and distress surveys for the state, we performed local calibration runs for PCC pavement sections in Region 5 and Region 8 using the AASHTOWare Pavement ME software. The pavement thickness data, assuming a 10 ft. (3 m) deep water table and subgrade modulus of 5000 psi (34.5 MPa) were provided for review, and are attached to this email in the Excel file entitled PCC Thickness, in Sheets “Region 5” and “Region 8”. We will continue with our local calibration and conduct runs for Region 7 and Region 1 on the northeastern corner of the state. We have extracted the annual weather data for each weather station in those regions and will proceed with creating the thickness design tables for the regions.
- In addition we plotted the variation of PCC thickness versus mean annual air temperature, mean annual precipitation and average annual freeze/thaw cycles. The plot presented in the “Climate” sheet of the same Excel file generally shows that the PCC thickness follows the annual freeze/thaw cycles.
- We will continue with calibrating the remaining regions in NY and provide the data for further analysis.
- For the NYDOT priority list given below for work on Task 1 we will start putting together a list of available sections from the LTPP data base that are in NY. We will compile the list and then

conduct a parametric study to find a relationship between pavement performance and PCC slab thickness.

- For Task 2 we would like a little more explanation on what analysis procedures and goals the NYDOT is looking for. As you know, FWD data can be used for many applications, for rigid pavement the load transfer efficiencies or deflection basins can be calculated and for flexible pavement, the pavement material properties can be calculated, in addition the base and subgrade modulus can be also calculated. Once we determine what exactly the goals are, we will conduct a search of available software that might assist with the task and/or create a suitable template that can be used by the NYDOT regions.

February:

- As requested by the New York State Department of Transportation, a preliminary study was conducted to determine an optimum Portland Cement Concrete (PCC) pavement thickness. In order to conduct this study, data from PCC pavement performance in the LTPP Infopave database (http://www.infopave.com/) was collected for the State of New York and surrounding states. The initial query for the state of New York resulted in 26 sections. 5 of those sections on State 947A and State 49 East and I 481 South had an Asphalt overlay which made them unsuitable for the study. 19 of the sections were on 2 lane road with asphalt overlays which again we deemed unsuitable for the study. 2 sections one on State 17 west bound and I-88 east bound remained as suitable sections for this study. Unfortunately this was not enough to conduct a parametric study so we expanded the search to include the neighboring states to NY. The query criteria would include 2 lanes per direction highway with concrete pavement that did not have an overlay and had adequate data in the data base to be able to conduct an adequate study. After conducting the database query, 18 sections had adequate data to be used for this analysis, 2 road sections in New York, one in New Jersey, one in Connecticut and 14 sections in Pennsylvania. Pertinent information about these sections was shared with NYSDOT.
- From the InfoPave data base, the pavement thickness (PCC and Base) as well as the AADT and AADTT, IRI, number of spalled transverse joints, number of transverse cracks and number of corner breaks was aggregated. Unfortunately the joint spacing and lane width and type of pavement were not part of the available online data, so an additional information request had to be sent to acquire the additional data required for the analysis. Most of these pavements had long joint spacing due to the fact that they are jointed reinforced concrete pavements. In addition, PA-1598 and PA-5020 were continuously reinforced concrete sections. The common practice these days is the use of Jointed Plain Concrete Pavement (JPCP).
- For the initial analysis stage, the 18 pavement sections were grouped in terms of PCC thickness. The database reports actual pavement thickness. PCC thicknesses reported between 8.8 to 9.4 inches were averaged as one group, PCC thickness reported between 9.5 inches and 10.4 inches were averaged as the second group, and anything larger than 10.5 inches was averaged as the third group. One section PA-3044 reported a PCC thickness of 12.7 inches, which was separated as its own group. Data used in the initial analysis and from the forensic investigation were shared with NYSDOT.
- The relationship between AADT and IRI versus pavement thickness and distress was plotted and shared with NYSDOT. It is clear from the type of pavements in this study, 9 inches of concrete has the highest value for distress and 10.5 inches has the lowest. It is important to

note that the performance of concrete pavement is not only controlled by the PCC thickness but also with the interaction between the PCC and the base, construction and joint spacing, all of which need to be accounted for.

- Our next step is to look further into more sections and try to account for base type and joint spacing to further study and research the thickness optimization of the PCC.

March:

1. Work is continuing on the calibration of the MEPDG catalog. To date we have completed Regions 5, 7 and 8. We will calibrate regions 1, 10 and 11 next. Calibration data from Regions 5, 7 and 8 were shared with NYSDOT. The goal is to complete the catalog and meet with DOT personnel to discuss the next steps.
2. Work on Priority Task 1 is almost completed. In a previous detailed report, data was accumulated from the LTPP data base and used to get an optimum PCC thickness. From the data collected and analyzed, with figures attached, a thickness of 10.25 inches (260 mm) seems to have lower distress occurrence.
3. Work on Priority Task 2 continues. A suitable Excel Add-in was identified, and currently the program has been modified to include all New York state regions and counties. The next step is to test the program to see if it is compatible with the Falling Weight Data collected in New York. We are requesting sample FWD data from NYSDOT so we can use it to test the program and validate it.
4. We did not receive any communications from New York City DOT concerning the RT9A project.
5. We will be scheduling FWD and site trips to the NY projects as soon as weather permits and in coordination with NYSDOT personnel.

Preliminary results have been shared with NYSDOT.

Anticipated work next quarter:

- Continue calibration of other regions
- Install new cabinet on the RT9A project site when requested.
  NYSDOT priority task list:
- Task 1. Develop relationships between PCC slab thickness and pavement performance: has been nearly completed
- Task 2. FWD Analysis Procedures: will continue

Significant Results:

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).

- A 2-year extension has been granted to allow for additional data collection and other additional tasks, including evaluation of pre-cast concrete slabs for pavement.
- *Tom Cackler will retire from Iowa State University in April, and Dr. Peter Taylor will become the director of the National CP Tech Center and assume Mr. Cackler's duties. A letter requesting the Principal Investigator for this project be Dr. Peter Taylor, will be sent after Mr. Cackler retires.*