

**The Pennsylvania State University Master Agreement
Contract No. 4400008014
FINAL UNIVERSITY RESPONSE**

Agency and Project Name:

Pennsylvania Department of Transportation
Best Practices for the Design, Evaluation, and Quality Control of High Percentage RAP Mixes
Work Order 10

Scope of Work: *(Attach the final statement of work)*

Using reclaimed asphalt pavement (RAP) in construction of new pavements has been a practice for decades. Federal Highway Administration (FHWA) and many state highway agencies have been pursuing usage of high percentage RAP content in asphalt mixes. Within the last decade, there has been a good amount of research and development on high percentage RAP asphalt mixes in terms of design, construction, and performance. The work proposed in this document includes investigating NCHRP Report 752 and its accompanying appendix on high percentage RAP mixes as well as other pertinent established documents on the usage of such mixes, and incorporating the results of such investigation into pertinent PennDOT documents. The work also includes investigating the work that has been conducted by the FHWA expert task group on evaluating high percentage RAP mixes regarding mix design, performance, and best management practices. The PennDOT documents that will be affected by these practices, at a minimum, include Publication 27, Publication 408, and Publication 2.

Project Objective:

The overall goal of the project is the adaptation and implementation of accepted best practices for mix design procedures and performance evaluation for higher percentage RAP mixes. The main objective of this work is to make necessary changes to PennDOT publications that will be affected by recently proposed practices by NCHRP Report 752 and its accompanying appendix on best RAP management practices.

Overall Performance Time Frame:

The project will be completed within 12 months from the notice-to-proceed date which includes the period for Clearance Transmittal reflecting recommended changes to publications, circulation for comments, and addressing the comments by the research team for two rounds of circulation.

Tasks:

Task 1: Review Current PennDOT Practices and Specification of RAP Usage

The research team will determine, with the collaboration of the PennDOT technical advisor, the PennDOT publications that will be affected by the recent practices on RAP mixes. For each PennDOT publication, the sections that currently contain information on RAP will be identified and highlighted. At a minimum, this review will cover PennDOT Bulletin 27, Specification 408,

and Publication 2. A list will be provided to PennDOT indicating all page numbers, sections, and the technical aspect of RAP usage addressed in each document.

The review will also include documenting existing quality control (QC) measures utilized by producers in managing the RAP along with currently minimum QC requirements that the producer must follow.

Deliverable: A report summarizing existing PennDOT documents containing RAP usage and design and documentation of existing QC control measures will be submitted to PennDOT within two months of the notice-to-proceed date.

Task 2: Review and Select Nationally Developed Practices for High Percentage RAP

Parallel to Task 1, a review will be made of NCHRP Report 752, "Improved Mix Design, Evaluation, and Materials Management Practices for Hot Mix Asphalt with High Reclaimed Asphalt Pavement Content," and its accompanying appendix, "Best RAP Management Practices". Simultaneously, contact will be made with the FHWA expert task group (ETG) working on high percentage RAP mixes to determine the most recent changes, recommendations, and advances in using such mixes developed by ETG. The principal investigator will conduct one trip to attend a RAP ETG meeting to discuss and gather relevant information. Mr. Gerry Huber, associate director, Heritage Research Group, who was the chair of the RAP/RAS expert task group, will provide feedback to the principal investigator on the most important items to be considered for high percentage RAP mix design and construction. Upon completion of the review, a point-by-point analysis of the best management practices will be conducted, and a list of important items affecting PennDOT publications will be developed based on the reviewed documents and with input from the PennDOT technical advisor.

Deliverable: A summary report of important recommendations and developments on high percentage RAP mixes, selected from reviewed documents, will be provided to PennDOT within three months of the notice-to-proceed date.

Task 3: Incorporate the Changes into PennDOT Publications and Minimum QC Requirements.

PennDOT publications that were reviewed under Task 1 will be revisited for any changes needed based on findings from Task 2. The list of items affecting the publications, as developed under Task 2, will be the basis for making any recommended changes. The magnitude of changes depends on how close the existing PennDOT publications on RAP are to findings from Task 2. In some cases, a total rewriting of the pertinent section might be necessary. It is also anticipated that some of the recommended changes, for both hot mix and warm mix asphalt, will have a significant impact on the PennDOT publications and best management practices for RAP, while some others will have a slight or moderate impact. In developing such a list, assistance will be sought of Mr. Huber. The list of recommended changes will be prioritized in this regard to indicate the level of importance and effectiveness of the change on the best practices for high percentage RAP mixes. PennDOT will provide the research team with an editable version of each publication reviewed under Task 1 so that the changes can be tracked in the document.

Recommendations will be provided regarding possible changes to the producer minimum quality control requirements for RAP management, depending on Task 2 findings.

Deliverable: A tracked version of pertinent PennDOT publications reflecting the proposed changes will be delivered to PennDOT within nine months of the notice-to-proceed date.

Task 4: Finalize the Changes in PennDOT Publications

There will be two rounds of comments from PennDOT and industry review on the proposed changes. After each round of comments, revised changes will be made to the publications and sent back to PennDOT. Initial submission of changes and revised submission of changes will be circulated by PennDOT in a clearance transmittal package. The time between submission of changes and receiving the comments back is not expected to exceed three weeks. This time interval should be applicable to both the initial submission and the revised submission. The comments received from PennDOT on the draft changes will also be consulted with Mr. Huber in developing the final changes to the publications.

Deliverable: A revised version of PennDOT publications with the final changes incorporated will be submitted to PennDOT within 11 months of the notice-to-proceed date.

Task 5: Develop an Implementation Plan

Upon finalizing the changes in PennDOT publications, the research team will work with the project technical liaison and project manager to develop an implementation plan and a roadmap to guide the implementation. The principal investigator will also have Mr. Huber's assistance in developing such a plan. The idea behind development of such a plan is to ensure a smooth transition of the changes to mix designers, asphalt producers, and contractors. For example, the plan could include working with a few selected designers and contractors in implementing the changes.

Deliverable: An implementation plan will be submitted to PennDOT within 11 months of the notice-to-proceed date.

Task 6: Develop and Submit Draft Final Report

Upon completion of this work, a draft final report will be generated that summarizes the research steps and the findings from the project.

Deliverable: A draft final report will be prepared for review by PennDOT and will be submitted within 11 months of the notice-to-proceed date.

Task 7: Final Report

Two electronic copies of the final report on CDs and/or USB drives and three bound and two unbound hard copies of the final report will be provided to PennDOT, taking into consideration comments that were received from PennDOT on the draft final report.

Deliverable: The final report will be submitted to PennDOT within 12 months of the notice-to-proceed date.

Deliverable Schedule:

Task/ Deliverable	Description	Month Due from Notice to Proceed Date
Task 1	Review current PennDOT practices and specification of RAP usage	2
Task 2	Review/select nationally developed practices for high percentage RAP	3
Task 3	Incorporate the changes into PennDOT publications	9
Task 4	Finalize the changes in PennDOT publications	11
Task 5	Develop an Implementation Plan	11
Task 6	Draft final report	11
Task 7	Final report	12

Cost Information:

The total cost of this project is \$55,694. The University's budget by task and deliverable is presented below and in an accompanying Excel spreadsheet.

DELIVERABLE	ESTIMATED ANNUAL UNITS	UNIT PRICE	TOTAL
Task 1: Summary report of existing PennDOT documents containing RAP usage and design.	1	\$3,305	\$3,053
Task 2: Summary report on important recommendations and developments on high percentage RAP mixes.	1	\$10,401	\$10,401
Task 3: Tracked version of pertinent PennDOT publications reflecting the proposed changes.	1	\$17,456	\$17,456
Task 4: Final version of PennDOT revised publications.	1	\$8,013	\$8,013
Task 5: Implementation plan.	1	\$7,632	\$7,632
Task 6: Draft final report.	1	\$5,668	\$5,668
Task 7: Final report.	1	\$3,417	\$3,471
GRAND TOTAL			\$55,694

Management Plan and Staffing: *(List Key Personnel)*

"Key Personnel" are defined as individuals who contribute to the scientific development or execution of a project in a substantive way. The Principal Investigator (PI) and Co-PI are always considered key personnel; students and wage payroll employees are not key personnel. If other key personnel are needed later in the project, the PI will notify the PennDOT Program Manager

Attachment 3

in writing to identify them prior to their addition to the team and prior to charging their time to the project.

Proposed Person-hours by Task:

Team Member	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	TOTAL
Key Project Team Members, Estimated Hours* per Task								
Mansour Solaimanian, PI	8.0	40.0	80.3	32.0	40.0	32.0	24.0	256.3
Scott Milander	8.0	24.0	32.0	0.0	0.0	16.0	8.0	88.0
Other Project Team Members, Estimated Hours* per Task								
Gerry Huber	0.0	4.0	8.0	8.0	8.0	2.0	0.0	30.0
Wage Payroll (student)	40.0	40.0	40.0	24.0	0.0	0.0	0.0	144.0
Wage Payroll (student)	10.0	10.0	10.0	24.0	0.0	0.0	0.0	54.0
Totals	66.0	118.0	170.3	88.0	48.0	50.0	32.0	572.3

* The estimate of person-hours is furnished solely for the purpose of this proposal. It is understood that the University will not be required to maintain a record by person-hours under any resultant contract.

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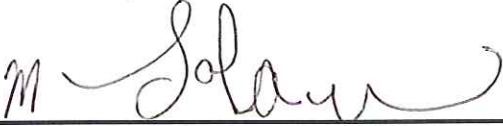
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Approvals:

The Pennsylvania State University

The Pennsylvania State University Principal Investigator:

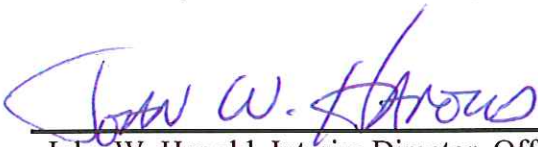


Mansour Solaimanian, Senior Research Associate

5/7/14

Date

The Pennsylvania State University Authorized Official:



John W. Hanold, Interim Director, Office of Sponsored Programs

5/7/14

Date

Pennsylvania Department of Transportation

Deputy Secretary for Planning

Date