



Reclaimed Asphalt Pavement Optimization Study

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Bureau of Maintenance and Operations



PennDOT Pavement Advisory Group

- PAG formed by DS Highway Administration 2015
- Members – PAPA, APC, PACA, ACPA, FHWA, ACEC, PTC, PennDOT
- PAG Picked “Top 10” Pavement Initiatives
- PAPA had 4 initiatives in “Top 10”
 - Long Life Asphalt Pavement
 - Reduced # of Asphalt Job Mix Formulas
 - Asphalt Pavement PWL Spec
 - Recycled Asphalt Pavement Issues

PennDOT Pavement Advisory Group

- Recycled Asphalt Pavement Issues
 - Perform a study to ascertain “What is the Highest and Best Use of RAP and Develop a Policy on Usage Priorities”
 - PAPA drafted Research Proposal “Optimizing the Utilization of Reclaimed Asphalt Pavements”– gave to PennDOT

PennDOT RAP Study

- PennDOT RAP Study:
 - Consultant selected and study underway
 - Study - Policy to recycle RAP (highest and best use)
 - Six month study with monthly status meetings
- Statewide RAP Study:
 - Research other State DOT's laws, policies, and procedures
 - Develop "Best Practices" document
 - Study Potential for Transport (economically feasible and practical)
 - Develop Final Report and Update/Implement Policies (as needed)

PennDOT Current RAP Policy

- SOL 495-17-02 "Milled Asphalt Pavement Material: Retainage, Plan and Use" January 26, 2017
 - Retainage – PennDOT Owns material
 - PennDOT may offer RAP to contractors
 - PennDOT must track all RAP
 - SRL & Stockpile Management



RAP SOL Retainage & Use

- “SOL 495-17-04 “Milled Material Retainage and Use” March 10, 2017
 - Contractor Retainage – Minimum, 15% of millings*
 - Contractor Retainage – <200 tons millings generated
- * SOL States – District should consider > 15% if higher RAP mix proposed by contractor



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Prepared for
Pennsylvania Department of Transportation
Bureau of Maintenance and Operations



➤ Purpose and Background

- RAP stockpile surpluses
- Goals:
 - Research Best Practices
 - Research Transportation
 - Implementation Strategies

➤ Approach

- Technical Steering Committee
 - PennDOT BOMO
 - PennDOT BOPD
 - PennDOT Executive Office
 - PennDOT Materials personnel
 - PennDOT District 1-0
 - PennDOT District 6-0
 - PennDOT District 10-0
 - PennDOT District 11-0
- Monthly Steering Committee Meetings
- Questionnaires
- Interviews
- Literature

➤ District RAP Use – Current and Future

- Average RAP Usage
- Cold recycling
- Full Depth Pavement & Shoulders
- Shoulder backup
- Other potential uses include:
 - Trench backfill
 - Pothole patching
 - Vegetation management
 - Rock lining
 - Stockpile site enhancements
 - Seal coating (#8 aggregate)
 - Slide/sink hole restoration

➤ District RAP Use – Current and Future

- Transportation
- Future projections
- Strategies identified for future RAP usage
- Environmental Concerns

➤ Other State DOTs RAP Use

- Questionnaires
- RAP Percentages
- Environmental Concerns

➤ Academic Literature Review

- Studies Reviewed
- Study Finding Summary
- Penn State Study – *Best Practices for the Design, Evaluation and Quality Control of High Percentage RAP Mixes*

➤ International RAP Information

- Studies Reviewed
- Study Finding Summary

➤ Coordination with Municipalities

- Statewide Practices
- Municipal RAP usage:
- Roadblocks to PennDOT/municipal coordination:

➤ Asphalt Producers

- Transport
- % RAP in new pavement
- RAP Stockpiles
- Roadblocks to Higher Percentage RAP Usage
- Performance Testing

➤ Potential RAP Uses

- Uses other than in new pavement mixtures:
- 1st use should be new pavement mixtures
- All other uses are acceptable secondary uses, particularly in times of excess

➤ Short-term Recommendations

1. Implement recommendations of the Penn State Study (RBR ratio tier system)
2. Use RAP as a material extender while maintaining the hierarchy of use (RAP in new pavements 1st use, other uses 2nd)
3. Maximize the use of cold recycling (in-place and central plant)
4. Utilize RAP in thin mix overlays for the secondary roadway network
5. Each District should determine primary RAP use and if segregation for those uses is beneficial. Consider segregating millings by type (PG 64 & PG 58) and SRL.
6. Implement the following best practices:
 - Require fractionation for high RAP use
 - Require covered RAP stockpiles and processing to minimize moisture
 - Require longer mixing times
 - Use rejuvenators, softening binders, etc. to facilitate high RAP mixtures
 - Change production processes - longer virgin aggregate and RAP mix times, high shear mixing, and storage time
7. Develop inter-District coordination to maximize RAP use.
8. Use in-line roller crushers or reduced speed impact crushers to avoid changing RAP gradation when breaking up clumps of RAP. Screen material before it's crushed to avoid putting anything through the crusher that isn't necessary.

➤ Long-term Recommendations

1. Each District should develop a 3 year (minimum), 5 year preferred, overall plan to coordinate mill/overlay projects to minimize transport, minimize storage time, efficiently schedule maintenance force, and match high SRL millings with high SRL overlays.
2. Develop and implement performance testing requirements to replace RBR ratio tier system.
3. Develop coordination programs between the Department, contractors, producers, and local municipalities and counties to identify needs and share materials and services. Develop educational opportunities about RAP for municipalities.
4. Develop less strict material and service sharing requirements between all entities. May require legislative changes to maximize sharing of material.



Questions & Comments

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