



Ohio's Research Initiative for Locals

Request for Proposals

RFP Solicitation Number: 2020-ORIL2

Research Title: Design of Micro-Surfacing and Chip Sealing Mixes with RAP for Local Roadway Applications

Problem Statement

Different pavement preservation treatments have been used by local public agencies to enhance the quality of pavement condition and extend pavement service life. Micro-surfacing is one of the common pavement preservation treatments that is used. Micro-surfacing is a cold-laid, polymer-modified asphalt mix containing crushed aggregate, asphalt emulsion, water, polymer additives, and mineral filler to fill ruts and improve surface friction. It can be used as a leveling course or a surface course for existing pavements. Micro-surfacing has been found to be effective in slowing raveling and oxidation, sealing cracks, enhancing skid resistance, and generally improving the longevity of a pavement structure. Chip seal is also widely used as an effective, low-cost preventative maintenance treatment for low-volume roads across Ohio and around the country.

Over the past four decades, there has been growing interest to increase the amounts of Reclaimed Asphalt Pavement (RAP) in construction of pavement structures. The use of RAP not only reduces the construction cost, but also conserves non-renewable natural resources, such as the aggregates and bitumen. RAP has been successfully used in new asphalt mixes, but it has not been utilized in micro-surfacing or chip sealing mixes. Some studies showed that it is possible to prepare micro-surfacing mixes with 100% RAP while meeting all performance specifications; however, these results were not validated in the field. Research is needed to evaluate the effects of using RAP on the properties and the performance of micro-surfacing and chip sealing mixtures that are typically used on local roadways.

Goals and Objectives

The goal of this research is to develop a method to design cost-effective, well-performing, and durable micro-surfacing or chip sealing mixtures with various RAP contents to be used on local roadways in Ohio. The objectives are to assess the availability and feasibility of using RAP for these types of applications and develop field evaluations to test the proposed applications.

Proposed Research

This research is expected to include (at a minimum) the activities listed below. Additional activities may be included at the researcher's discretion to achieve the stated goals and objectives of the study. This research will be performed in two phases. Researchers are expected to submit proposals inclusive of both phases.

Phase 1 is to be comprised of a feasibility study on the use of RAP in micro-surfacing and chip seal applications on local roadways considering material availability, suitability, and cost. The analysis should focus on the use of RAP for micro-surfacing and chip seal aggregates in low-volume, arterial and residential roads in both urban and rural settings.

- A comprehensive literature search of active and completed research on the use of RAP in transportation construction applications related to this topic.
- Assess the current state of the supply of RAP in Ohio. Determine whether or not adequate supply exists to support an ongoing use in pavement preservation applications, e.g.,: micro-surfacing and/or chip seal. This evaluation should include but is not limited to: availability of product both in quantity and geographic distribution, general gradation and suitability for these uses, and likely cost as compared to virgin materials. The assessment should identify any unique conditions that would be placed on producers/suppliers to make this product readily available. Within four (4) months of the project start date, results from the literature search and supply assessment should be presented. If it is determined that adequate supply does not exist to support the use of this product for pavement preservation applications within Ohio, the research study might be concluded at this point. If this occurs, the researcher will be instructed to submit a draft final report based on the work done to date.
- Evaluate the mechanical properties of RAP for use in a micro-surfacing mix or as a chip-seal aggregate in local roadway construction. The researcher is to recommend the appropriate criteria and testing protocol

for use in lab testing (AASHTO, ASTM, ODOT, ISSA, etc.) for the incorporation of RAP into preventative maintenance applications. Items to be considered during this analysis generally include: durability, gradation, blending ratios, particle size, and uniformity requirements.

- Determine the cost effectiveness of using RAP in preventative maintenance applications.
- Develop a study for an in-field evaluation of RAP in preventative maintenance applications in local roadway construction to occur during Phase 2. The study should include recommendations for quality control methods during construction.

An interim report based on Phase 1 analysis will be submitted within **12 months** of the project start-date. The interim report will be a comprehensive accounting of all research activities to date and include the recommendations for an in-field evaluation. Based on a review of the findings, the TAC will make a recommendation on whether or not to pursue Phase 2. If Phase 2 is not authorized, the interim report will be treated as the draft final report and the project finalized. The researcher will receive instructions concerning the delivery of all other pertinent deliverables. If Phase 2 is authorized, the interim report will serve as the basis for the final report to be presented at the conclusion of Phase 2. Note that Phase 2 is also contingent upon securing a suitable local site for field testing.

Phase 2 will be comprised of field evaluations of RAP micro-surfacing mixes and/or as a chip seal aggregate in local roadway construction. Potential locations of field testing will be determined at a later date. The researcher may be required to coordinate with local agency personnel and construction contractors to provide clarification and oversight in the design and building of the test sections. The researcher will observe and document the process to ensure adherence to recommendations as appropriate. *(Note: the researcher will not be required to construct the physical test section, as this will be handled by the selected local agency.)*

The researcher will develop a methodology for ongoing data collection and testing to confirm/validate the performance of the materials/mix application(s). This methodology is expected to be performed by local agency personnel; therefore, the researcher should take into consideration available resources during the design of the methodology. The methodology should include a recommended timeline for data collection and testing, as well as a process for performing a life-cycle cost analysis of the test section(s). The researcher must provide training to local agency personnel on the methodology.

The researcher will be expected to perform baseline testing of the test section on behalf of the local agency.

The researcher will prepare a final report on all aspects of Phase 1 and Phase 2.

Requirements of the Research Team:

Due to the nature of this study, the proposed research team must include individuals with experience in construction and asphalt pavement performance testing, specifically related to binder and mixture testing. Previous work experience with or knowledge of micro-surfacing and chip seal mix design is also required. The proposal must demonstrate that these requirements have been met in the "Qualifications of the Research Team" section, as well as in attached resumes. Contracting requirements of the State of Ohio require the inclusion of an Ohio-based entity on the research team.

Assistance from Locals

During this research, the researcher can expect to receive the following assistance from the Technical Advisory Committee:

- Technical direction
- Review of reports
- Participation in meetings
- Site selection for Phase 2 (if authorized)
- Assistance with coordination efforts with construction contractor for Phase 2 (if authorized)
- Coordination of staff for training in Phase 2 (if authorized)

Project Specific Deliverables

The researcher must provide the following deliverables (electronically) for **Phase 1** within 12 months of the contract start date:

- 1) Assessment of current state of supply of RAP for preventative maintenance applications, due within four (4) months of the project state date.

- 2) Interim report documenting findings from the feasibility study.
- 3) A cost analysis of using RAP.
- 4) Draft recommendations for utilization of RAP in preventative maintenance applications in local roadway construction.
- 5) Recommendations for quality control methods.
- 6) Testing protocol for Phase 2.

The researcher must provide the following deliverables for **Phase 2** by the completion date of the project:

- 1) Methodology for ongoing data collection and testing.
- 2) Training of local personnel.
- 3) Baseline data.

Research Contract Deliverables

In addition to the project specific deliverables, the researcher must also provide the following standard deliverables by the completion date of the project:

1. Quarterly progress reports (provided electronically).
2. Electronic copies of the draft final report and draft executive summary shall be submitted 120 days prior to the contract completion date.
3. A PDF and MS DOC version of the final report and fact sheet shall be submitted by the contract completion date.
4. Article for the Research newsletter (to be provided upon request).
5. Participation in the following meetings: project start-up, monthly project status conference calls, research review session (1 per year), and research results presentation.

Benefits

The results of this research will provide local officials with enhanced knowledge of RAP and its potential for use in local transportation projects. The findings of this research will either validate or disprove the perception that utilizing RAP as part of a micro-surfacing mix or chip seal aggregate is feasible in local roadway construction and can lead to cost savings while providing similar performance. The results of this research may also produce environmental benefits by increasing the use of recyclable materials and conserving non-renewable natural resources, such as aggregates.

Potential Application of Research Results

The findings of this research will be of interest to municipalities, townships, and counties within Ohio, as well as other states and localities nationwide. Actual implementation of findings will be at the discretion of each Local Public Agency. The successful development of recommendations for incorporation of RAP may result in specialized technology transfer, i.e., training, by the ORIL program in collaboration with the Ohio LTAP Center.

Preliminary Literature Search Results

A preliminary literature search identified various publications pertaining to this topic. Researchers are expected to perform a more in-depth literature search to ensure this research does not duplicate existing efforts.

Laboratory and Field Evaluation of Cold-in-Place RAP Recycling

Marcandali da Silva, Amanda Helena; Vasconcelos, Kamilla L; Aranha, Ana Luisa; Bernucci, Liedi Bariani; Chaves, José Mario
 TRB Annual Meeting 2013
<https://trid.trb.org/view/1242429>

State-of-the-Practice in Chip Seal, Slurry Seal, Micro Surfacing, and Thin Lift Asphalt Overlay Construction Quality Assurance

Elie Y. Hajj, Lauren Graham, Michael A. Heitzman, Adam J.T. Hand, Dean Weitzel, and Nam H. Tran
 University of Nevada
 June 2018 Report No.: 715-15-050
<https://www.nevadadot.com/home/showdocument?id=14560>

Development of Pavement Performance Prediction Models for Preservation Treatments: Volume 2

Hasan Ozer, Mojtaba Ziyadi, Ahmed Faheem
 Illinois Center for Transportation
 April 2018 Report No.: FHAW-ICT-18-003

<https://apps.ict.illinois.edu/projects/getfile.asp?id=7486>

Abundance of RAP Spurs New Uses in Preservation Treatments (article)

Erik Updyke, Dennis Ruh

Pavement Preservation Journal

Winter 2016, Pages 24-29

<http://www.nxtbook.com/naylor/FPPQ/FPPQ0416/index.php?startid=25>

Performance Assessment of Micro surfacing with Reclaimed Asphalt Pavement

Delfosse, F.; Urbain, J-E

24th World Road Congress September 2011

<https://trid.trb.org/view/1299468>

Experimental Study on Cold Micro-Surfacing with Crumb Rubber

Canestrari, F; Pasquini, E; Ferrotti, G; Riviera, Pier Paolo

Sixth International Conference on Maintenance and Rehabilitation of Pavements and Technological Control

July 2009

<https://trid.trb.org/view/899353>

Eight-Year Performance of a Recycled Freeway Surface in Ontario

Marks, Pamela; Lane, Becca; Kazmierowski, Thomas J

Proceedings of the 52nd Annual Conference of the Canadian Technical Asphalt Association

November 2007

<https://trid.trb.org/Results?txtKeywords=Eight-Year+Performance+of+a+Recycled+Freeway+Surface+in+Ontario+#/View/877837>

Duration

Total duration of the project is **24** months. A Phase 1 analysis and report must be completed with **12 months** of the project start date, with the current state of supply assessment provided within **four (4)** months of the project state date. The draft final report for Phase 2, if authorized, will be due within **20 months** of the contract start date.

Specific Assurances with Respect to Federally-Assisted Projects

The Ohio Department of Transportation in accordance with Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, all bidders including disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, national origin, sex, age, disability, low-income status, or limited English proficiency in consideration for an award.