



WHRP

Wisconsin Department of Transportation Wisconsin Highway Research Program

Request for Proposal

Evaluation of Recycled Base Aggregates

Questions submitted to research@dot.wi.gov regarding the content of this RFP are due no later than **4:30 PM (CST) on December 7, 2015**

Responses to questions will be posted to the WisDOT Research and Library website <http://wisdotresearch.wi.gov/rfps-and-proposals> by **4:30 PM (CST) on December 14, 2015**

Proposers must submit a PDF version of their proposal by **4:30 PM (CST) on January 22, 2016**
to: research@dot.wi.gov

Proposers will be notified by May 1, 2016

For more information regarding this RFP contact the WisDOT Research Program at: research@dot.wi.gov. This RFP is posted to the Internet at: <http://wisdotresearch.wi.gov/rfps-and-proposals>.



**Wisconsin Highway Research Program
Request for Proposals
Geotech Technical Oversight Committee**

Evaluation of Recycled Base Aggregates

I. Background and Problem Statement

There has been great interest in recent years in using Recycled Asphalt Pavement (RAP) and Recycled Concrete Aggregate (RCA) as base course in Wisconsin and elsewhere for the economic and environmental benefits offered by such practice. Recent examples include the I-94 corridor reconstruction in Kenosha, Racine and Milwaukee Counties, and the Beltline reconstruction in Dane County.

Laboratory studies showed that RAP and RCA have resilient modulus values equal to or higher than typical natural aggregates and also generally higher durability, in particular to freeze-thaw cycles. However, it is also recognized that RAP exhibits temperature sensitivity and larger permanent deformations than natural aggregates and RCA exhibits tufa formation and potentially lower drainability than natural aggregates.

How these characteristics manifest themselves in the field, especially in northern climates, can only be assessed by long-term observation of field performance. For this purpose, Minnesota Department of Transportation (MnDOT) constructed and monitored test sections at the MNROAD facility through a pooled fund, in which Wisconsin Department of Transportation (WisDOT) was a member. These test sections showed comparable performance to the control section of natural aggregate 2009-2013. However, there are reports now that rutting and cracking are being observed.

WisDOT has been using RAP and RCA as base course for over thirty years. The qualitative assessment of WisDOT roads constructed with RAP and RCA is that they are performing adequately. This anecdotal impression needs to be verified quantitatively if the use of RAP and RCA in base aggregates is to continue. A quantitative review of WisDOT experience through collection and comparison of pavement distress surveys of roadways using RAP and RCA as base course compared to those using natural mineral aggregates is needed.

II. Goal and Objectives

The intended outcome of this study is to meet the following objectives:

- Conduct new surveys to collect and analyze pavement distress for Hot Mix Asphalt (HMA) roadways constructed in Wisconsin using RAP and RCA as base course aggregate and compare with similar roadways constructed with natural aggregates to verify the performance of roadways constructed with recycled base aggregates.
- If any negative attributes regarding the use of RAP and RCA exist, the researcher shall



determine if there are any techniques that can be used, such as blending of recycled aggregates with natural aggregates, which would produce satisfactory results using recycled aggregates.

- Depending on the outcome of the research, develop specification language and construction guidance regarding the use of recycled aggregates as base course.

III. Scope of Work

Task 1: Literature Review and Summary of Current Practice

Conduct a literature review and assessment of current practices at various other state DOTs. There will be some lessons learned that will help the researcher organize the work plan. Lessons learned from other states will be used to help the researcher and Project Oversight Committee (POC) monitor and make modifications to the work plan.

Task 2: Existing pavement condition assessment

The researcher will need to perform a comprehensive analysis of existing WisDOT roadways that used recycled aggregates as dense graded base course.

- A. Identify 10 HMA roadway sites that utilized dense graded base course. Five consisting of recycled HMA aggregates and five consisting of recycled Portland Concrete Cement (PCC) aggregates. An additional five sites should be analyzed where natural aggregates were used as base course for comparison.
- B. WisDOT will perform non-destructive testing consisting of Falling Weight Deflectometer (FWD) and Ground Penetrating Radar (GPR) testing to determine the strength characteristics and thicknesses of underlying pavement layers. WisDOT will conduct this testing for one lane mile per the 15 projects selected.
- C. Perform a visual assessment of roadways.
- D. Obtain Pavement Condition Index (PCI), International Roughness Index (IRI), Pavement Distress Index (PDI) and Pavement Serviceability Index (PSI) from WisDOT, Central Office, Meta-manager database.

Task 3: Data Analysis

Based on the data collected in Task 2 conduct a detailed analysis of pavements constructed over dense graded aggregates using recycled aggregates.

Task 4: Final Report

Report the results of the study to the Technical Oversight Committee (TOC) in a written final report and an in-person presentation.



IV. WisDOT/TOC Contribution

- A. FWD and GPR testing – WisDOT will conduct this testing on each of the 15 selected projects. WisDOT will perform this testing for one lane mile per each of the 15 selected sites. If WisDOT or another entity donates other equipment, a letter of commitment must be included in the proposal.
- B. Expected level by staff/TOC members: Maximum of 40 hours. Project Oversight Committee (POC) members will consult with research team in selection of project sites.
- C. This project will require travel for a meeting to finalize the work plan with the POC, and travel to Madison is required to report the results of the study to the Geotech TOC in Task 4. Other interim reporting is also expected.
- D. If field work on or around inservice facilities is anticipated by the research, the proposal will need to discuss the nature and extent of needed traffic control and support assistance that will be requested from the WisDOT. The researcher will need to closely coordinate with WisDOT regional personnel and possibly the county personnel where project fieldwork is being conducted. For WisDOT planning purposes, the Principal Investigator shall specify in his or her proposal, as practical, what specific traffic control will be required for this project, such as traffic flagging, signage, barricades, etc., as well as the duration needed (hours/day/location).

V. Required Travel

This project will require travel for a meeting to finalize the work plan with the POC, for the researcher's fieldwork, and to deliver a final presentation to the TOC.

VI. Deliverables

- A. Submittal and reporting of progress as required by the WHRP and WisDOT.
- B. Reporting Requirements. Seven (7) hard copies and an electronic copy of the final report delivered to WisDOT by contract end date.
- C. Presentation Requirements. All projects require the Principal Investigator to give a closeout presentation after submittal of the draft final report.

VII. Schedule and Budget

A. **Project Duration**

- i. The total duration of the project is **24 months** with an anticipated start date of October 1, 2016.
- ii. The researcher is expected to submit the draft report with quality technical writing and proper grammar. It is acceptable to include a technical editor on the research team to ensure these requirements are met.



iii. Contract is considered closed upon satisfactory completion of the project scope, including submission of electronic and hard copies of the final report.

B. Project Budget

- i. The project budget shall not exceed **\$100,000** and shall include any costs associated with performing tests, analyzing data, and preparing the draft and final reports.
- ii. Matching funds will not be considered in the proposal evaluation process.

VIII. Implementation

The results of this study will be used to validate the practice of using recycled aggregates in WisDOT base course layers beneath pavements. If the use of recycled aggregates appears to have a negative effect on WisDOT pavements, then changes to the Standard Specifications, Construction Materials Manual (CMM) and Facilities Development Manual (FDM) will be warranted.

Such changes may consist of the following:

- Restricting the use of recycled aggregates in the base course layers beneath HMA pavements.
- Modifying the composition of recycled aggregates allowed in base courses.
- Increased frequency of testing of the physical properties of recycled aggregates.
- Modifying the strength parameters assigned to recycled aggregates during the pavement design.