



# WHRP

**Wisconsin Department of Transportation**

**Wisconsin Highway Research Program**

Request for Proposal

## **Quality Testing of Wisconsin Aggregates**

Questions submitted to [research@dot.wi.gov](mailto:research@dot.wi.gov) regarding the content of this RFP are due by **4:30 PM (CST) on January 4, 2019.**

Responses to questions will be posted to the WisDOT Research and Library website (<https://wisconsindot.gov/Pages/about-wisdot/research/researchers.aspx>) by **4:30 PM (CST) on January 11, 2019.**

Proposers must submit a PDF version of their proposal to [research@dot.wi.gov](mailto:research@dot.wi.gov) by **4:30 PM (CST) on February 6, 2019.**

Proposers will be notified of the proposal review decision by **May 1, 2019.**

This RFP is posted on the WisDOT Research and Library website (<https://wisconsindot.gov/Pages/about-wisdot/research/researchers.aspx>). For more information, contact the WisDOT Research Program at [research@dot.wi.gov](mailto:research@dot.wi.gov).

**Wisconsin Highway Research Program (WHRP)  
Request for Proposals (RFP)  
Flexible Pavement Technical Oversight Committee (TOC)**

***Quality Testing of Wisconsin Aggregates***

**I. Background and Problem Statement**

At a minimum, WisDOT requires sodium sulfate soundness testing (AASHTO T104) and Los Angeles wear (AASHTO T96) aggregate quality testing be completed once every three years for quarried aggregate sources and once every five years for pit aggregate sources.

Aggregate sources located in the Sippewee geological group, generally in the southwest part of Wisconsin, require an additional freeze-thaw test (AASHTO T103) on a three-year or five-year testing cycle.

An internal audit of WisDOT specifications concluded that the frequency of testing for quality is lacking relative to surrounding states. Reduced testing frequencies is due, in part, to the higher level of aggregate quality available to paving contractors in Wisconsin.

Despite the inventory of high-quality construction aggregates, localized pavement performance issues have raised concerns about the effectiveness of the current quality testing program.

Recent changes to the standard specifications have partially addressed concerns regarding the minimal quality testing frequencies, but there is a need to revisit quality thresholds and accuracy of current testing methods to represent aggregate durability.

Wisconsin Department of Transportation (WisDOT) engineers have been tasked with improving specifications for aggregate quality. Based on internal research, WisDOT representatives have concluded that AASHTO T103 may be a more accurate representation of aggregate soundness and could replace AASHTO T104 entirely.

**II. Research Objectives**

Before statewide implementation of AASHTO T103, new limitations need to be selected for each aggregate application: base course, Hot Mix Asphalt (HMA) pavement and Portland Cement Concrete (PCC) pavement.

The objective of this research is to:

- Investigate the feasibility of implementing statewide freeze-thaw testing.
- Understand the accuracy of the existing soundness procedures (AASHTO T103/T104).
- Recommend thresholds for Wisconsin aggregates used in base course, HMA pavement and PCC pavement regarding freeze-thaw durability.

The research team is expected to use historical data and pavement condition surveys in conjunction with a laboratory testing program to recommend new testing protocols and quality thresholds.

Researchers are expected to determine appropriate application limitations. Criteria for selection of limitations should be based on a literature review, historical aggregate quality measurements, application specific freeze-thaw testing and historical project performance. Alternatively, researchers may conclude the Sodium Sulfate Soundness is a valuable test method that should remain in the standard specification.

### **III. Scope of Work**

#### **Task 1 – Literature Review**

Conduct literature review of soundness testing protocols and rank each procedure based on accuracy to represent pavement durability. Also review agency specifications in regions/states with similar climates, including Canada. Provide a summary of the most common thresholds for quality and most frequently used testing procedures. Include a review of agency specifications where freeze-thaw is a concern; specifically, New England, Midwest, Mountain west and Canadian regions. Also, summarize the repeatability and reproducibility of the different test methods.

#### **Task 2 – Investigate PCC and HMA Freeze-Thaw Testing Procedures**

Propose PCC and HMA laboratory testing procedures that replicate distresses caused by freezing and thawing of aggregates in the field to the Project Oversight Committee (POC) for approval. Although standardized procedures are preferred, they are not required. Test results are expected to support recommended thresholds for the statewide AASHTO T103 implementation based on application (Base, PCC and HMA).

#### **Task 3 – Laboratory Testing**

Work with WisDOT's aggregate laboratory to collect low, moderate and high AASHTO T103 freeze-thaw durability aggregates. WisDOT will share aggregate samples and available pavement condition survey data for projects with pavements containing sampled aggregates. A minimum of six aggregate sources must be included in the laboratory testing portion of the research: two low, two mediocre and two high-soundness sources. Selection of aggregate sources will be based on performance and geology. Propose and conduct a laboratory testing program to validate potential specification limits with PCC and HMA testing protocols.

HMA and PCC samples, composed of aggregates tested for AASHTO T-103, should also be tested with the methods proposed in Task 2 in developing thresholds for durability for aggregates used in HMA and PCC pavement. All freeze-thaw testing should be carried out for as many freeze-thaw cycles as necessary to capture complete failure of the samples to conduct the necessary analysis.

#### **Task 4 – Data Analysis**

Analyze the relationship between freeze-thaw data, literature review, HMA/PCC testing and pavement survey data. Use the analysis to recommend statewide freeze-thaw durability standard specifications for aggregate quality. Researchers are expected to recommend thresholds for quality based on application. Existing thresholds for aggregate quality can be found in

aggregate base, PCC and HMA sections of the WisDOT standard specification. Application categories should be designated by material type and desired level of quality.

#### Task 5 – Close-Out Reports

The Before Close-Out Presentation (BCOP) report summarizes the literature review and analysis and is due three months before the project end date. Please refer to WHP technical report instructions to ensure the BCOP report is concise and targets the proper audience (WisDOT engineers). The publication-ready, After Close-Out Presentation (ACOP) report is due on the project end date.

#### **IV. WisDOT/TOC Contribution**

- A. Expected level by staff/TOC members: Maximum of 40 hours over the duration of the project. WisDOT officials and POC members will select the project sites.
- B. The research team will not assume the availability of other WisDOT staff or additional equipment in the proposal. If WisDOT or another entity donates additional equipment, a letter of commitment must be included in the proposal.
- C. If field work on or around in-service facilities is required 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 TOC will provide contact information for the relevant WisDOT regional personnel and possibly the county personnel such that the researcher will be able to closely coordinate 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 to the project sites across Wisconsin for documentation, measurement, and information collection. It is expected the PI will deliver the final presentation in-person in Madison, Wisconsin.

#### **VI. Deliverables**

- A. Reporting Requirements: An electronic copy of the final report delivered to WisDOT by the contract end date. This includes the report, special provisions, and pavement details. Please refer to the Implementation section for further details.
- B. The researcher is expected to submit the After-Close-Out Presentation (ACOP) report with quality technical writing and proper grammar. It is acceptable to include a technical editor in the research team to ensure these requirements are met.
- C. Matching funds will not be considered in the proposal evaluation process.
- D. Presentation Requirements: The researcher is required to give an in-person Close-Out presentation to the TOC.
- E. Policy recommendations for Construction Manual, draft Specification and Special Provisions (SPV) related to implementation of the results of this project.

## **VII. Budget and Schedule**

- F. Project Budget shall not exceed **\$175,000**.
- G. Proposed project duration is **24 months** starting around **October 1, 2019**.
- H. Deadline for submittal of Before Close-Out presentation (BCOP) report is three months before the contract end date to allow for report review activities.
- A. Deadline for research Close-Out presentation is six to eight weeks before the contract end date.
- B. Deadline for submittal of the publication-ready version of the After Close-Out Presentation (ACOP) report is the contract end date.

## **VIII. Implementation**

Successful implementation of this research will be achieved through the development of the following items:

- A. Final report detailing the results of the research project and following the report preparation instructions: [Researcher Report Preparation](#).
  - 1. The final report should be a maximum of 50 pages (plus supporting appendices) and be as concise as possible.
  - 2. The research team should format the report such that significant findings are provided at the beginning (e.g., in an extended executive summary).
- B. Determining the most accurate quality testing method (AASHTO T-103 or T-104) to determine aggregate soundness.
- C. Determining thresholds for base course, HMA pavement and PCC pavement regarding freeze-thaw durability.
- D. Updating WisDOT Specifications and Manual to reflect the outcomes of the research.