



WHRP

Wisconsin Department of Transportation Wisconsin Highway Research Program

Request for Proposals

Balanced Mixture Design Pilot and Field Test Sections

Questions submitted to research@dot.wi.gov regarding the content of this RFP are due no later than 04:30 PM (CST) on January 4, 2021

Responses to questions will be posted to the WisDOT Research and Library website <https://wisconsin.gov/Pages/about-wisdot/research/researchers.aspx> by 04:30 PM (CST) on January 15, 2021

Proposers must submit a PDF version of their proposal by 4:30 PM (CST) on February 5, 2021 to research@dot.wi.gov.

Proposal Preparation Guidelines can be found at:
[Proposal Preparation Guidelines](#)

Researchers will be notified of the proposal review decision by April 30, 2021

For more information regarding this RFP contact the WisDOT Research Program at:
research@dot.wi.gov.

This RFP has been posted to the Internet at: <https://wisconsin.gov/Pages/about-wisdot/research/researchers.aspx>



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

Balanced Mixture Design Pilot and Field Test Sections

I. Background and Problem Statement

The implementation of performance testing using the balanced mixture design (BMD) concept is a challenging, multi-step process that requires sponsorship and collaboration by and among multiple nation and state agencies, academia and industry. For example, the National Cooperative Highway Research Program (NCHRP) project 20-07's report concisely summarizes the steps required for a successful implementation, including:

1. Develop draft test method and prototype equipment (Academia & AASTHO/ASTM Committees)
2. Evaluate sensitivity to materials (WHRP Projects 14-06, 15-04, 17-04)
3. Establish preliminary field performance relationship (NCAT-MnRoad Pooled Fund & NCHRP 09-57)
4. Conduct ruggedness experiment to refine its critical aspects (NCHRP 09-57)
5. Develop commercial equipment specification and pooled fund purchasing (AASHTO/ASTM committees)
6. Conduct round-robin testing to establish precision and bias information (AASHTO resource and independent round robins)
7. Conduct robust validation of the test to set criteria for specifications (WHRP 20-04, DOT/Industry testing on projects)
8. Conduct training and certification
9. Implement into engineering practice

This Request for Proposal (RFP) will focus on step 7 of this list: *Conduct robust validation of test to set criteria for specifications*. One of the expected outcomes from the on-going WHRP project 20-04 is the recommendation of preliminary thresholds for acceptance of surface mixtures in the BMD process. Once these thresholds are established, there will be a need to test the proposed material acceptance framework on paving projects. However, WisDOT does not have a quality assurance protocol for balanced mixture designs, and it is not clear how changes during hot mix asphalt (HMA) production would affect performance testing results.

This is not only a Wisconsin problem, there is also a need for more field test sections to validate that an increase balanced mixture design quality is related to an increase in pavement longevity. Ongoing research studies through Pooled Funds and NCHRP are establishing relationships between performance testing and field cracking, but each of these efforts must be replicated locally. Wisconsin test sections will complement national studies and will provide insight into local considerations for interpretation of test results while increasing the sample population of test sections across the country.



II. Research Objectives

Objectives for this research project are twofold:

- 1) to statistically analyze the variance of performance test data during construction, and
- 2) to assess the long-term field performance of balanced mix design pavements.

This project is not intended to compare the efficacy of alternative test methods; WisDOT has selected the IDEAL CT (ASTM D8225) and Hamburg Wheel Tracking (AASHTO T324) as balanced mixture design performance tests. Rather, researchers should focus on data analysis of production test results and on the design and monitoring of instrumented test sections.

III. Scope of Work

Task 1: Extensive Literature Review and State of Practice

The research team will review and summarize:

- best practices for the design and test of field pavement sections, and
- strategies to measure production variability using new quality assurance test methods.

The research team should focus their search on successful research projects that have impacted agency specifications for HMA material quality. This task should also include a commentary on how lessons learned from past and current projects might influence the development of the work plan in Task 2.

Task 2: Design of Test Sections

The research team will propose the design of test section(s) and develop an instrumentation plan for the long-term performance validation of BMD pavements. The WHRP Project Oversight Committee (POC) will review, revise and approve of proposed design and plan before they are implemented.

There will only be one construction project included in this research. All work plans should include: field tests sections, definitions for each field section (e.g., mixture design differences), number of samples needed within each test section, type of sensors to be installed, sampling methods, description of performance tests and expected level of assistance required from POC. Each test section should be instrumented with sensors to measure long-term stress/strain and moisture within the pavement. The workplan should also specify the minimum number of samples required to capture production variability and any supplemental testing necessary to measure composition differences between samples.

Note - the research team will not have control over the location of the construction project. WisDOT staff will have a project selected for the research team prior to the research start date. However, the content of the awarded proposal will be considered by WisDOT staff during the project selection process.



Task 3: Sampling, Instrumentation, and Testing

Carryout field sampling, instrumentation and laboratory testing plan. All sampling of materials, instrumentation of field test sections and testing is the responsibility of the research team. Arrangements should be made for traveling to project location, communicating with contractor(s), communicating with the WisDOT staff and transporting materials to the research team's laboratory. Any support or project assistance from the POC must be clearly stated in the work plan and agreed to by the POC. Describe the level of support required for a successful research project in the proposed work plan.

Note - Contractors and WisDOT will be conducting performance tests in parallel with research team. Assume testing conducted by the research team, from samples collected in the field, will be replicated in at least two additional laboratories.

Task 4: Final Report

The research team will prepare and submit a draft final report that will include project background, production data analysis and instructions for data acquisition of field sensor data for review. As part of this report, the research team will include Excel files with curated testing data for future use, analysis and interpretation.

Note - The selected research team will negotiate a contract that will include a Data Management Plan (DMP) that will document all the field monitoring data and analyses to ensure accessibility and transparency of research data as required by the Federal Highway Administration (<https://ntl.bts.gov/public-access/creating-data-management-plans-extramural-research>). The DMP will include the following items:

- *The final research data to be produced during the project;*
- *The standards to be used for data and metadata format and content;*
- *Policies for access and sharing the final research data, including provisions for appropriate protection of privacy, confidentiality, security, intellectual property and other rights or requirements;*
- *Policies and provisions for re-use, re-distribution and the production of derivatives; and*
- *Plans for archiving final research data and other research products, and for preservation of access to them.*

A Data Management Plan is not required as part of the proposal submission.

Task 5: Closeout Presentation

A closeout presentation (COP) will be scheduled by the WHRP in Madison, WI within three months before the end of the contract. At least one representative from the research team is expected to present in-person the results and recommendations from the project.

IV. Required Testing/Equipment

- A.** ASTM 8225 Standard Test Method for Determination of Cracking Tolerance Index of Asphalt Mixture Using the Indirect Tensile Cracking Test at Intermediate Temperature



- B. AASHTO T324 Standard Method of Test for Hamburg Wheel-Track Testing of Compacted Asphalt Mixtures.
- C. Additional performance test methods can be included in the workplan, but they should not affect the project budget.
- D. Installation of sensors to monitor the structural properties of the field test sections with time. Data acquisition equipment compatible with the installed sensors should be provided to the DOT after completion of the project.

V. **WisDOT/TOC Contribution**

WisDOT will provide the following support through the POC to support the successful completion of the project.

- A. Identification of field test section(s) for researchers to conduct the work plan.
- B. The research team will not assume the availability of WisDOT staff or equipment in the proposal. If WisDOT or another entity donates equipment or staff time, a letter of commitment must be included in the proposal.
- C. The Technical Oversight Committee (TOC) and POC will coordinate access to WisDOT aggregates used in laboratory test programs. Researcher team must arrange and cover cost of transport of aggregates and materials to their laboratory test facilities as needed.
- D. If field work on or around in-service facilities is anticipated by the researcher, the proposal will need to discuss the nature and extent of needed traffic control and support assistance that will be requested from 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 research team shall specify in the 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 (hours/day/location). It should not be assumed that WisDOT would fund the traffic control apart from the research project budget.

VI. **Required for Travel to Fulfill TOC Obligations**

The principal investigator (PI) is expected to deliver the final presentation in person in Madison, WI during the last three months of the project.

VII. **Deliverables**

- A. Quarterly Progress Reports
 - a. WHRP contracts require quarterly technical progress reports that serve both technical and administrative functions.
 - b. Detailed information regarding the content of the progress report can be found at: [Quarterly Progress Reports Guidelines](#)
- B. Invoices
 - a. Invoices shall be submitted quarterly for partial payments on the project for authorized services completed to date. Four invoices per year are expected, one partial invoice for each specified quarter.
 - b. Detailed information regarding invoicing can be found at: [Invoicing](#)



Requirements

- C. Before Close-Out Presentation (BCOP) Report
 - a. A BCOP report is required to be submitted three months before the contract end date to allow time for review and revision of the BCOP before the presentation.
 - b. Reports are expected to have quality technical writing and proper grammar. It is acceptable to dedicate funds in the project budget for the services of a technical editor to ensure these requirements are met.
 - c. The required elements of the BCOP report can be found at: [Before Close-Out Presentation Requirements](#)
- D. Project Close-Out Presentation (COP)
 - a. The Principal Investigator on the research team is required to give a presentation to the Technical Oversight Committee in-person.
 - b. Presentation and formatting requirements can be found at: [Close-Out Presentation Requirements](#)
- E. After Close-Out Presentation (ACOP) Report
 - a. The ACOP report is due within three weeks of the Close- Out Presentation for review and comments.
 - b. This report details the results of the research project. The final report should be as concise as possible (e.g., a maximum of 50 pages plus supporting appendices) and follow the report guidelines and submission requirements: [After Close-Out Presentation Report Requirements](#)
 - c. After revision(s) and oversight committee chair approval, an electronic copy of the Publication-Ready Report must be delivered to WisDOT by the contract end date.

VIII. Schedule and Budget

- A. Project budget shall not exceed \$250,000
- B. Proposed project duration is 24 months starting around October 1, 2021.
- C. Deadline for submittal of the BCOP is three months prior to the contract end date to allow for report review activities.
- D. Deadline for the research close out presentation is six to eight weeks prior to contract end date.
- E. The ACOP should be submitted within three weeks of the Close-Out presentation.

IX. Implementation

- A. Long term performance monitoring plan
- B. Structural analysis instructions based on structural sensor data
- C. Commentary of production variance of performance test data