



**Wisconsin Department of Transportation
Wisconsin Highway Research Program
Request for Proposals**

***Design Requirements for High Traffic Asphalt Mixes
to Ensure Pavement Performance***

Questions submitted to research@dot.wi.gov regarding the content of this RFP are due no later than 04:30 PM (CST) on January 3, 2023

Responses to questions will be posted to the WisDOT Research and Library website <http://wisdotresearch.wi.gov/rfps-and-proposals> by 04:30 PM (CST) on January 18, 2023

Proposers must submit a PDF version of their proposal by 4:30 PM (CST) on February 8, 2023 to: research@dot.wi.gov.

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

Proposers will be notified by April 28, 2023

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: <http://wisdotresearch.wi.gov/rfps-and-proposals>

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

***Design Requirements for High Traffic Asphalt Mixes
to Ensure Pavement Performance***

I. Background and Problem Statement

The Wisconsin Department of Transportation (WisDOT) currently considers three traffic level designations for the design of hot mix asphalt (HMA) mixtures: Low Traffic (LT), Medium Traffic (MT), and High Traffic (HT). The HT designation describes mixtures expected to withstand greater than 8 million Equivalent Single Axle Loads (ESALs) over a 20-year design life and are primarily used on high-volume freight corridors. WisDOT also routinely uses Stone Matrix Asphalt (SMA) for successful high-traffic design scenarios.

HMA mixtures meeting the HT designation in Wisconsin are compacted to 100 design gyrations during the mixture design and QC/QA processes. However, concerns have arisen that such compactive efforts may result in mixtures that are difficult to compact in the field and contain comparatively low asphalt contents. Therefore, a more equitable balance between mixture stiffness and cracking resistance is desirable.

For example, several State Department of Transportation (DOT) agencies have lowered design compaction requirements for high-traffic mixtures. Other approaches taken by DOTs include increasing minimum Voids in Mineral Aggregate (VMA) requirements or adopting the "Superpave5" design process. In order to optimize and/or improve the constructability and performance of HT mixtures, a performance-driven approach is needed to determine Wisconsin's design requirements.

II. Research Objectives

This research aims to validate or modify WisDOT HMA design requirements for HT mixtures to maintain or improve the constructability and performance of HT mixtures. Researchers must focus on validating or modifying the design number of gyrations for HT mixtures, although other mix design parameters may be included. The research will address the following specific objectives at a minimum:

- Summarize existing mix design requirements for HT HMA mixtures in regions with similar climates ("Wet-Freeze") and aggregate resources to Wisconsin. Identify potential areas of concern and/or improvement;
- Benchmark existing WisDOT HT mixture designs using volumetric and performance testing; proposed testing must include consideration of prior and ongoing WHRP HMA performance testing research;

- Propose modifications to existing HT mixture designs based on available data, benchmarking and testing, and determine whether improvements to constructability and performance can be achieved using the proposed mix design procedure changes.

Researchers will use a combination of laboratory-reproduced mix designs and construction/in-service performance data to complete this study. Based on the outcomes of this research, proposed changes to the HT mixture design process and/or criteria will be suggested. In addition, the research team should provide recommendations on the best-practice for the use and specification of HT mixtures relative to SMA mixtures, which are effectively used for similar design scenarios in Wisconsin.

III. Scope of Work

Task 1: Synthesis of Agency Practice and Landmark Research

Work during this task will focus on summarizing relevant literature on the design and performance of high-traffic HMA as well as a synthesis of Agency specifications related to the design of high-traffic HMA mixtures, focusing on regions with similar climate, traffic, and aggregate resources as Wisconsin.

Refer to the following WHRP HMA performance testing research:

- West et al. (2018). “Regressing Air Voids for Balanced HMA Mix Design.” WHRP study 0092-16-06. URL: <https://wisconsindot.gov/documents2/research/0092-16-06-final-report.pdf>.
- West et al. (2021). “Balanced Mixture Design Implementation Support.” WHRP study 0092-20-04. URL: <https://wisconsindot.gov/documents2/research/0092-20-04-final-report.pdf>.

Task 2: Benchmarking Existing Mix Designs

This task aims to summarize the performance of existing mixture designs to provide a reference database when changes to the design process are proposed. Mixture designs may include MT, HT, and SMA-type mixtures. The Project Oversight Committee (POC) will make existing mixture designs, project locations/performance data, and/or raw materials available to the research team as proposed and agreed to during the project kickoff meeting. In addition, the research team must explicitly describe their proposal's anticipated materials, data, and other support needs.

Task 3: Sampling of Materials

This task will be devoted to sampling materials, including, but not limited to, sampling raw mixture design materials, sampling field/plant loose mixtures, and delivery of performance databases as approved. The researchers will coordinate the sampling of materials with WisDOT staff and contractors. To support the researchers' efforts, POC members will help researchers with the logistics of sample collection and shipment of materials. The research budget should include costs associated with shipping sample materials.

Task 4: Conduct Approved Experimental Plan

The research team will propose a detailed experimental plan to the POC during this task. Once the POC approves the plan, researchers will conduct the experimental testing and synthesize the results.

Task 5: Final Report and Deliverables

A final report is expected to be submitted that includes a literature review, experimental design, analysis of test results, and suggestions for WisDOT specification improvement, including Standard Specifications Section 460 and Construction and Materials Manual (CMM) Section 866. In addition, any significant changes to the standard practice should be clearly articulated so that

contractors, mix designers, and agency personnel can reference this information for implementation purposes.

Task 6: Closeout Presentation

WHRP will schedule a closeout presentation (COP) within three months before the end of the contract. The research team's Principal Investigator is expected to present the results and recommendations from the project.

IV. Required Testing/Equipment

This study is expected to include the fabrication and testing of laboratory-produced mixtures and loose HMA sampled from the field/plant. Minimum mixture performance testing is expected to include the following:

1. Hamburg Wheel Tracking Test (HWTT)
2. IDEAL-CT cracking test

Although existing HT mix designs may be provided, the research team is expected to have the necessary equipment and competency to produce HMA mixture designs according to WisDOT CMM Section 866 and with WisDOT Standard Specification Section 460. AASHTO R18 or similar laboratory accreditation is desirable but not required.

V. WisDOT/TOC Contribution

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

- A. The POC will work with the research team on the shipment of materials. Please budget to cover shipment costs.
- 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 commitment letter 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. The research team must arrange and pay with research funds for the transport of aggregates and materials to their laboratory test facilities as needed. The Technical Oversight Committee (TOC) and POC will also coordinate access to WisDOT databases as requested and approved, including performance testing databases, field density databases, and in-service performance databases.
- D. If fieldwork on or around in-service facilities is anticipated, the proposal will describe the nature and extent of traffic control and support assistance required. The research team will 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, the traffic control measures for this project, including traffic flagging, signage, barricades, etc., and the duration (hours/day/location). WisDOT will not fund the traffic control apart from the research project budget.

VI. Required Travel

None

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 Closeout Presentation (BCOP) Report
 - a. A BCOP report must be submitted three months before the contract end date to allow time to review and revise the report before the presentation.
 - b. Reports must 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 Closeout Presentation Requirements](#)
- D. Project Closeout Presentation (COP)
 - a. The Principal Investigator on the research team is required to give a presentation to the TOC.
 - b. Presentation and formatting requirements can be found at [Closeout Presentation Requirements](#)
- E. After Closeout Presentation (ACOP) Report
 - a. The ACOP report is due within three weeks after the Closeout 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 Closeout 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. The project budget shall not exceed \$250,000.
- B. The proposed project duration is 24 months, starting around 10/01/2023.
- C. The deadline for submittal of the BCOP is three months before the contract end date to allow for report review activities.

IX. Implementation

The research proposal must include an implementation plan based on the study's findings. At a minimum, the implementation plan will include the following:

- A. Summarize any proposed changes to WisDOT specification, including Standard Specifications Section 460 and CMM Section 866. These changes will be summarized in tabular or red-line format for ease of review and comparison.
- B. All relevant project data will be documented in a user-friendly database supporting the proposed specifications changes. Excel is an acceptable format for such information.
- C. If applicable, produce a technical memo or similar document intended for mix designers that concisely summarizes the proposed changes to the mix design standard process.