



WHRP

Wisconsin Department of Transportation

Wisconsin Highway Research Program

Request for Proposal

Expansion of AASHTOWare ME Design Inputs

Questions submitted to 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 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.

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

Expansion of AASHTOWare ME Design Inputs

I. Background and Problem Statement

The Wisconsin Department of Transportation (WisDOT) designs pavements with the AASHTOWare Mechanistic Empirical (ME) and AASHTO 1972 methodologies. WisDOT engineers would like to increase usage of the ME design methodology but require additional high-level inputs to increase confidence in pavement structure designs. The ME design methodology can be completed using different material input levels (Levels 1 through 3). Level 1 inputs are preferred because they are determined from laboratory testing instead of material assumptions. Reliable hot mix asphalt (HMA) material inputs are particularly challenging to obtain because of the wide range of expected material properties and the required testing equipment. Ideally, a catalog of material properties from HMA facilities throughout Wisconsin would be available to WisDOT designers to provide accurate estimates, however a catalog of material properties does not yet exist. Therefore, there is a need to create a strategic collection and testing plan of HMA material properties to populate higher level inputs for ME design methodology.

Researchers will be asked to create a test matrix to represent material properties of Wisconsin mixtures and execute the approved testing plan. A similar study was completed through the 0092-08-06 WHRP project, but WisDOT material specification changes have resulted in production of mixtures that cannot be adequately represented by those testing results. To avoid this obstacle in the future, researchers will also be asked to develop a strategic testing plan to verify and update future material properties.

II. Research Objectives

The primary objective of this research is to update HMA material inputs for the Level 1 ME design methodology and compare them with current WisDOT inputs. Based on this comparison, researchers are expected to recommend a sampling strategy to verify/update HMA material inputs with time. Secondly, researchers are expected to compare the AASHTO 1972 design method layer coefficients with ME design material inputs. This comparison should consider how the surface layer properties contribute to the overall design structure using each methodology and recommend a new structural coefficient for HMA materials, if warranted.

III. Scope of Work

- A. Review historical versions of WisDOT standard specifications for HMA materials since 2006 (corresponding to the development of the 0092-08-06 WHRP project). Summarize significant changes and comment on how specification changes are expected to have impacted material inputs (both individual changes and collective changes to specifications).

- B. Review literature to investigate range of ME input material properties used by other states. Comment on the factors that lead to the range of inputs. Focus on midwestern states or states with similar geology. Establish a list of HMA material properties that are most sensitive to the design predication outputs.
- C. Work with Project Oversight Committee (POC) to collect HMA samples that best represent the range of material properties currently being produced. Select samples based on Wisconsin mixture usage and geology. A summary of mixture usage for the past three years is provided at the end of this RFP (Section J). Refer to WisDOT Standard Specification 460 for references to the labeling system.
- D. Conduct mechanical testing procedures required by Level 1 ME standard procedures. Summarize mechanical testing results in the format required by ME design software. Compare measured mechanical properties with those currently being used for WisDOT ME designs.
- E. At least one asphalt mixture type should be tested to include a binder modification comparison. In this testing, the mixture design remains the same and binder type is increased by one grade in accordance with AASHTO M332 and the Combined State Binder Group (CSBG).
- F. Draft a final report that includes: Analysis of testing results, schedule for verification/material updates, and AASHTO ME-1972 design method comparison.

IV. Recommended Testing

- A. AASHTO T 342 / R84 Determining Dynamic Modulus of Hot Mix Asphalt (HMA).
- B. AASHTO T 322 Determining the Creep Compliance and Strength of Hot Mix Asphalt (HMA) Using the Indirect Tensile Test Device.
- C. Repeated loading high temperature test to determine rutting ME model inputs.
- D. Asphalt binder testing to determine dynamic shear modulus and phase angle.
- E. Fatigue test to determine fatigue law ME model inputs.

V. WisDOT/TOC Contribution

- A. WisDOT/TOC will sample and store selected mixtures for researchers. Researchers are expected to collect samples from a central WisDOT storage location in Madison, WI.
- 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. WisDOT staff/TOC members can be expected to contribute a maximum of 40 hours over the duration of the project. The research team will consult with POC members in the selection of project sites.
- D. If field work on or around in-service facilities is anticipated to conduct this research then the researcher shall specify in the proposal the nature and extent of traffic control that will be required including: traffic flagging, signage, barricades, etc., as well as the duration needed (hours/day/location). There also needs to be a discussion in the proposal of the specific traffic control support that is being requested from WisDOT. The researcher will need to coordinate the location(s) of the project fieldwork with the POC chair, WisDOT regional personnel and possibly the county personnel. The researcher should make

accommodations in their proposal budget for traffic control and should not assume WisDOT will fund traffic control expenses.

VI. Required Travel

The researcher is expected to deliver the final presentation in-person in Madison, Wisconsin.

VII. Deliverables

- A. Reporting Requirements: A final electronic report delivered to WisDOT by the contract end date. This includes the report, specifications and manual recommendations. Please refer to the Implementation section for further details.
- B. Presentation Requirements: The researcher is required to give a Close-Out presentation to the TOC after submittal of the Before Close-Out presentation report.
- C. Create .XML files that can be input into ME Design.
- D. Submit close-out PowerPoint presentation for future usage.

VIII. Budget and Schedule

- A. Project budget shall not exceed **\$215,000**
- B. Proposed project duration is **24 months** starting around **October 1, 2019**.
- C. Deadline for submittal of Before Close-Out presentation (BCOP) report is three months prior to contract end date to allow for report review activities.
- D. Deadline for research Close-Out presentation is 4-6 weeks prior to contract end date.
- E. Deadline submittal for the publication-ready After Close-Out Presentation (ACOP) report is the contract end date.

IX. 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 at [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. The research report and the final presentation document will be used to develop training materials for industry professionals and WisDOT engineers.

X. HMA Material Type Usage

Mixture Type	Count	%Count	Tons	%Tons
HMA Pavement 4 LT 58-28 S	225	27.8%	1,550,248	26.6%
HMA Pavement 3 MT 58-28 S	89	11.0%	723,816	12.4%
HMA Pavement 4 MT 58-28 S	100	12.4%	676,994	11.6%
HMA Pavement 3 LT 58-28 S	141	17.4%	653,374	11.2%
HMA Pavement 4 MT 58-34 H	24	3.0%	379,835	6.5%
HMA Pavement 4 MT 58-28 H	42	5.2%	292,442	5.0%
HMA Pavement 3 HT 58-28 S	23	2.8%	289,028	5.0%
HMA Pavement 4 HT 58-28 H	24	3.0%	228,632	3.9%
HMA Pavement 2 HT 58-28 S	9	1.1%	133,954	2.3%
HMA Pavement 3 HT 58-28 H	11	1.4%	115,731	2.0%
HMA Pavement 4 HT 58-28 S	13	1.6%	109,040	1.9%
HMA Pavement 4 SMA 58-34 H	3	0.4%	92,920	1.6%
HMA Pavement 4 LT 58-34 S	26	3.2%	92,445	1.6%
HMA Pavement 4 MT 58-34 S	15	1.9%	86,480	1.5%
HMA Pavement 4 SMA 58-28 H	5	0.6%	75,530	1.3%
HMA Pavement 5 LT 58-28 S	12	1.5%	49,846	0.9%
HMA Pavement 5 MT 58-34 H	6	0.7%	49,616	0.8%
HMA Pavement 4 SMA 58-34 V	2	0.2%	45,988	0.8%
HMA Pavement 3 MT 58-34 S	3	0.4%	42,797	0.7%
HMA Pavement 4 HT 58-28 V	6	0.7%	30,319	0.5%
HMA Pavement 4 HT 58-34 V	5	0.6%	24,286	0.4%
HMA Pavement 4 SMA 58-28 V	3	0.4%	22,475	0.4%
HMA Pavement 4 HT 58-34 H	6	0.7%	18,735	0.3%
HMA Pavement 5 SMA 58-28 V	2	0.2%	13,518	0.2%
HMA Pavement 3 HT 58-34 H	3	0.4%	9,350	0.2%
HMA Pavement 4 LT 58-28 H	2	0.2%	7,822	0.1%
HMA Pavement 2 MT 58-28 S	2	0.2%	7,106	0.1%
HMA Pavement 5 SMA 58-34 V	1	0.1%	6,594	0.1%
HMA Pavement 3 MT 58-34 H	4	0.5%	5,887	0.1%
HMA Pavement 5 MT 58-28 H	1	0.1%	3,420	0.1%
HMA Pavement 3 LT 58-34 S	1	0.1%	90	0.0%
HMA Pavement 5 SMA 58-28 H	0	0.0%	-	0.0%
Totals:	809	100%	5,838,318	100%