



WHRP

Wisconsin Department of Transportation Wisconsin Highway Research Program

Request for Proposals

Wind-Loaded Structures

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://wisconsindot.gov/Pages/about-wisdot/research/researchers.aspx> by 04:30 PM (CST) by January 15, 2021

Proposers must submit a PDF version of their proposal by 4:30 PM (CST) by 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://wisconsindot.gov/Pages/about-wisdot/research/researchers.aspx>



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

Wind-Loaded Structures

I. Background and Problem Statement

WisDOT's wind-loaded structures (sign bridges, cantilevers, butterflies, overhead sign supports and high mast lightings) are designed according to all applicable construction specifications and standard drawings of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals 6th Edition, 2013. The new AASHTO Load Resistance Factor Design (LRFD) version of this specification was developed and released in 2015, with subsequent updates. WisDOT spends millions of dollars per year on the design and construction of these wind-loaded structures. This research study intends to develop and implement a monitoring and modelling program for multiple types of wind-loaded systems. As WisDOT uses the LRFD methodology for wind-loaded structures, this research project's results would help refine the design and construction of wind-loaded structures, with the potential to save design and construction costs.

II. Objectives

The research would provide actual field measurements of the structure and foundation wind-based deflections and loads on sign structures. The successful proposal should include:

1. A literature search to gather information on the development of the new LRFD design and construction methodologies;
2. An assessment of issues experienced, and lessons learned by transportation agencies who have incorporated the latest LRFD designs;
3. The design and deployment of a plan to determine wind loads and member (arms, posts and foundations) loads and deflections - specifically, lateral movements, axial resistance and torsional resistance of the foundation; and
4. The development of predictive models for deflections and loading on the sign structure and the potential modifications to design practices.

III. Scope of Work

Task 1: Literature Review

The research team will complete a detailed literature review on the state of the art and practice related to evaluating and measuring of wind forces on transportation sign structures, the load transfer from the wind load to the top of the shaft, the generation of torque and pullout actions, deflection and skin friction. At minimum, the researchers should compile information regarding how different transportation agencies evaluate and validate wind force actions on sign structures, the reliability of



their approaches and the built structures' performance. WisDOT is particularly interested in the methodologies for developing load and resistance factors to be used in design practices.

Task 2: Design of Monitoring Plan

Based on past research and transportation agencies' practices, the research team will develop a monitoring plan. The plan should allow for the measuring of wind loads, member (arms, posts and foundations) deflections and loads on a minimum of two proposed WisDOT wind-loaded structures (different types of wind-loaded system foundations must be considered). The Project Oversight Committee (POC) will provide input on the plan and then approval for field deployment.

Task 3: Deployment of Data Acquisition and Sensing Arrays

The research team will instrument and monitor a minimum of two proposed wind loaded structures in Wisconsin. The research team must deploy the proposed data acquisition systems and sensing arrays for a minimum of twelve months to provide statistically significant data to support analyses and recommendations for developing Wisconsin-specific LRFD parameters.

Task 4: Data Analysis and Interpretation

The research team will analyze and interpret the collected data to refine the design and construction of wind-loaded structures in Wisconsin. The research team will compare the measured data with current practices to evaluate improvements in the design and construction of wind-loaded structures. The research team must consider developing an analysis to help WHRP quantify the completed project's value.

Task 5: Final Report

The research team will prepare and submit a draft final report that will include project background, data analysis and interpretation. 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) documenting all field/laboratory data and analyses to ensure accessibility and transparency of research data as required by the USDOT per the Public Access Plan (<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 6: 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

- A.** The research team will develop and implement a plan to monitor action and reaction of at least two different proposed wind-loaded structures in Wisconsin. It is anticipated that the soil type of the two foundations shall be different.

V. WisDOT/TOC Contribution

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

- A.** Work will be conducted with project oversight by the WHRP Geotechnics TOC and POC.
- B.** WisDOT will provide a boring at each location of the proposed sign structure. The researcher will work with WisDOT to develop an instrumentation plan that will be incorporated into a let plan. In addition, the research team will not assume any additional 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.
- D.** The TOC and POC will coordinate access to applicable/available soil boring logs and project cross sections.
- E.** Field work on or around the proposed sign structure is anticipated to conduct this research. The researcher shall specify in the proposal the nature and extent of anticipated contractor coordination.

VI. Required Travel

- A.** Travel is required to conduct fieldwork.
- B.** This project will require travel to Madison, WI to deliver the COP.

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. Collected Data
 - a. The research team is expected to deliver all collected data and analysis to WisDOT.
- C. Invoices
 - a. Invoices shall be submitted quarterly for partial payments on the project for authorized services completed to date. Invoices may be submitted four times per year, one partial invoice for each specified quarter.
 - b. Detailed information regarding invoicing can be found at: [Invoicing Requirements](#)
- D. Before Close-Out Presentation Report
 - a. A Before Close-Out Presentation report is required to be submitted three months before the contract end date to allow time for review, revision and scheduling of the project COP.
 - b. Reports are expected to have quality technical writing and proper grammar. It is acceptable to dedicate resources from your project for the services of a technical editor to ensure these requirements are met.
 - c. The required elements of the Before COP report can be found at: [Before Close-Out Presentation Requirements](#)
- E. Project Close-Out Presentation
 - a. The Principal Investigator on the research team is required to give a presentation to the TOC in-person.
 - b. Presentation and formatting requirements can be found at: [Close-Out Presentation Requirements](#)
- F. After Close-Out Presentation 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 \$200,000. Matching funds will not be considered in the proposal evaluation process.
- B. Proposed project duration is 24 months starting around October 1, 2021.

IX. Implementation

- A. The research team will provide recommendations to refine the design and construction of wind-loaded structures in Wisconsin. The researcher should emphasize design solutions and construction approaches that improve safety and reduce the cost to taxpayers.



- B.** The final research report and presentation will be used to develop training materials for industry professionals and WisDOT engineers.
- C.** The research team should discuss the access and storage of completed project data and analyses in a brief data management plan.