



**Wisconsin Department of Transportation
Wisconsin Highway Research Program**

Request for Proposals

***State of Practice for Specifying and Repairing Mechanically Stabilized
Earth Walls***

Questions submitted to research@dot.wi.gov regarding the content of this RFP are due no later than 04:30 PM (CDT) on September 20, 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 (CDT) on October 4, 2023

Proposers must submit a PDF version of their proposal by 4:30 PM (CDT) on October 25, 2023 to: research@dot.wi.gov.

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

Proposers will be notified by December 8, 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)
Structural Technical Oversight Committee (TOC)
Request for Proposals**

***State of Practice for Specifying and Repairing Mechanically Stabilized
Earth Walls***

I. Background and Problem Statement

Wisconsin Department of Transportation (WisDOT) frequently employs mechanically stabilized earth (MSE) walls due to their cost-effectiveness and ability to tolerate movements during service life. However, WisDOT has observed excessive deformations and noted instances where MSE wall facings have become compromised due to aging deterioration, settlements, or vehicular impacts. For these reasons, WisDOT is interested in assessing the long-term durability and future repair and replacement options for MSE walls.

This research study will examine WisDOT's current uses of MSE walls in the transportation infrastructure, document best practices, and provide recommendations for repairing MSE walls. The scope of this research will also include an evaluation of the general uses (e.g., selection of MSE walls vs. wall types) and specifications of MSE walls and will critically assess inspection and maintenance/repair strategies. More specifically, the investigation on repair strategies shall address issues such as damaged precast concrete panel facings due to settlements, vehicular impacts, excessive modular block facing deterioration, and stability evaluations with or without retrofit solutions. WisDOT anticipates that this study will include an extensive literature review, a survey of state agencies, and the development of a set of recommendations for repair solutions for MSE walls at varying degrees of distress. Laboratory testing is not anticipated for this study.

II. Research Objectives

- A. Summarize best practices for MSE wall usage and implementation.
- B. Evaluate WisDOT's current design, construction, inspections and repair practices, critically evaluate other DOTs specifying MSE retaining walls, and prepare recommendations to maximize their service life potential.
- C. Summarize best practices to identify, evaluate, maintain, and repair distressed MSE walls.
- D. Prepare recommendations for specific retrofit solutions.
- E. Prepare recommendations for changes to WisDOT Manuals for selecting, using, inspecting, and repairing MSE walls.

III. Scope of Work

Task 1: Literature Review

Conduct a comprehensive literature review and assessment of current practices across DOTs, Canada's Ministries of Transportation, FHWA, industries, and manufacturers. WHRP

has completed an initial literature search that will be provided to the research team. In addition, the research team should include a collection of relevant DOT policies and practices related to evaluating and repairing MSE walls. Provide a summary draft report of the reviewed information.

Task 2: Summary of Practices and Operational Issues with MSE Walls

Document policies, practices, standard specifications, and operational issues related to the design, construction, and performance of MSE walls in Wisconsin and other neighboring states. Researchers will evaluate the long-term performance of MSE walls and their deterioration due to MSE wall facings having become compromised due to aging deterioration, excessive settlements, and vehicular impacts. The research team will contact at least ten Departments of Transportation in the upper Midwest and the North regarding using and repairing MSE walls.

Task 3: Evaluate WisDOT Practices

Evaluate the current WisDOT's MSE wall policies, practices, and standard specifications. This evaluation should include a review of the WisDOT Bridge Manual and Special Provisions. Researchers must also document recent issues experienced with WisDOT's walls with varying signs of distress, including excessive panel joint spacing, and the lack of filler or geofabric at joints, among some of distress issues. The research team will work with the Project Oversight Committee (POC) to collect and assess the following information (but is not limited to):

- Wall system pre-approval process.
- MSE wall use and design specifications (i.e., settlement limitations, settlement accommodations, wall height limitations, etc.).
- Special conditions (i.e., corners, bridge abutment-to-wall transitions, utilities below walls and within reinforced zones, panel penetrations, etc.).
- Backfill material acceptance criteria (gradations, friction angle, electrochemical, compaction, etc.). WisDOT engineers will provide test results from 10 projects representative of statewide backfill sources.
- Test methods for resistivity measurements.
- Backfill testing methodology and frequencies.
- QC/QA requirements.
- Design life and end-of-service life considerations.

Critically summarize the information related to WisDOT's current practices, operational issues, and repair strategies in an interim report.

Task 4: Develop WisDOT Inspection and Repair Strategies

Develop inspection and repair strategies addressing WisDOT's past operational issues with MSE walls. The research team will review current practices as described in the WisDOT Structures Inspection Field Manual and Structure Inspection Manual. This review should investigate, and document recent issues experienced in Wisconsin that have been identified

during construction, inspections, and repairs. The research team should discuss and correlate poor performance reasons to identify operational problems. The research team should use WisDOT's bridge management system (Highway Structures Information System, HSI) and interviews with regional construction and in-service inspection staff. The research team, which POC oversight, collect, assess, and provide recommendations addressing common WisDOT issues when constructing and maintaining MSE walls. At a minimum, this should include the following items:

- Excessive settlements
- Precast concrete panel facing rejection/repair criteria.
- Field modification limitations (e.g., cutting panels, use of post-installed anchors, etc.).
- Backfill migration from facings.
- Backfill void mitigation and void-filling techniques.
- Wall condition monitoring methods.
- Distressed joint openings.
- Local facing repair or replacement strategies (e.g., modular block repairs due to freeze/thaw deterioration, concrete panel replacement due to vehicular impact, etc.).
- Global repair or replacement strategies.
- Global wall stabilization.

Task 5: Final Report

The research team will prepare and submit a draft final report including background, best practices, recommendations, and interpretation developed during the project. As part of this report, develop recommendations and guidelines in a format consistent with WisDOT contract specifications and Bridge Manual. Please refer to the Implementation section for further details.

Task 6: Data Management Plan

The research team 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/publicaccess/creating-data-management-plans-extramural-research>).

The DMP will include the following items:

- The final research data produced during the project.
- The standards to be used for data and metadata format and content.
- Policies for accessing 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.

- Plans for archiving final research data and other research products and for the preservation of access to them.

IV. Required Testing/Equipment

None anticipated.

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 WisDOT's current practices and identify MSE wall repair needs.
- 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. WisDOT staff/POC members can be expected to contribute a maximum of 40 hours over the project's duration.
- 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 conducting project fieldwork. For WisDOT planning purposes, the research team shall specify in the proposal, as practical, 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 to Fulfill TOC Obligations

None anticipated. WHPR prefers a virtual Close-Out presentation, however, the researcher has the option to present the research results in person, paid by contract funds.

VII. Deliverables

- A. Quarterly Progress Reports
 - a. WHRP contracts require quarterly technical progress reports for technical and administrative functions.
 - b. Detailed information regarding the content of the progress report can be found in [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 in [Invoicing Requirements](#).
- C. Interim Reports
 - a. Literature Review.

- b. Summary of DOT Practices for MSE wall usage and specifications.
- D. Before Close-Out 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 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 Closeout Presentation Requirements](#).
- E. 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](#).
- F. After Closeout Presentation (ACOP) Report
 - a. The ACOP report, addressing comments made on the BCOP report and during the COP, is due within three weeks of the COP 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 completing revision(s) and TOC 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 \$160,000.
- B. Proposed project duration is 24 months, starting around 02/01/2024.
- C. Deadline for submittal of the BCOP is three months before the contract end date to allow for report review activities.

IX. Implementation

- A. During the completion of Task 4 and Task 5, researchers will review and recommend guidance for MSE wall use, inspection, and repair strategies. This information will be used to update the Bridge Manual, Special Provisions, the Construction and Materials Manual, and other WisDOT resources.
- B. The final research report and presentation will be used to develop training materials for industry professionals and WisDOT engineers.