

**ARKANSAS DEPARTMENT OF TRANSPORTATION
SYSTEM INFORMATION AND RESEARCH DIVISION
FISCAL YEAR 2021
REQUEST FOR PROPOSAL
RESEARCH PROJECT NO. TRC2104**

TITLE: Maintenance Guidelines for Mechanically Stabilized Earth (MSE) Walls

ARDOT POLICY

All proposals shall be submitted electronically per the Proposal section of this Request for Proposal. As of Fiscal Year 2020, all research project contracts will be managed under Info Tech's Doc Express Paperless Contracting platform. All information on the utilization of this platform for research projects can be found at http://www.ardot.gov/System_Info_and_Research/research.aspx or from the Research Section.

PROBLEM STATEMENT

Mechanically stabilized earth (MSE) walls have gained popularity because they offer a significant cost benefit over traditional retaining walls and bridge abutments. However, these benefits can quickly be overshadowed by repair costs or maintenance concerns when walls do not perform as intended. MSE walls often show signs of distress such as movement or settlement, cracking of the facing or vertical panels, and loss of material through gaps in the face panels. Regardless of the causes of poor performance or distress, maintenance personnel need to be equipped to address the underlying issues and be able to make decisions regarding the most appropriate repairs. Several manuals or handbooks exist for the design and construction/inspection of MSE walls, but there is no source which clearly presents maintenance requirements or repairs. Out of the 33 states who participated in a nationwide survey, only two states reported having a maintenance handbook. Even these handbooks focus primarily on the construction phases and do not give any information related to repairs. There is a need for a guidebook which addresses maintenance concerns and provides appropriate repair options.

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AREA OF STUDY

The objective of this study is to determine Best Management Practices (BMP) for MSE walls and to develop maintenance inspector's guidebook which could provide assistance to address potential signs of distress. A Grading Level (A – F) should then be applied in accordance with ARDOT Maintenance Guidelines and provide appropriate repair options.

Details for BMP would include, but not limited to:

1. Routine Inspections and Frequency of Inspections
2. Level of Effort Needed to Repair or Reconstruct problematic issues
3. Emergency and Significant Weather Event

Since their appearance in the 1970s, MSE walls have become a majority among all types of retaining walls due to their economics and satisfactory performance. Currently, only two of 33 DOTs reported having MSE wall maintenance handbooks. Both of these have very little information on actual post-construction practices and very little guidance on repairing versus rebuilding MSE walls.

METHOD OF STUDY

The first objective of this study is to expand an ArcGIS database, which will be provided by ARDOT Maintenance Division, to include an inventory of all MSE and other specified wall types currently maintained by ARDOT. Within the database, the metrics would outlined and categorized for each wall type to include, but not limited to, System/Type, Design Specifications, Materials, Performance, and Maintenance History.

The second objective is to perform an initial inspection of candidate sites considered most critical and recommendations changes to wall design and/or specification. These candidates would be selected by ARDOT. After completion of the manual, a test should be created if the wall designs have specific issues. Also to be included is a grade level for

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each type of wall (i.e. Critical, Additional Monitoring Needed, Good Condition, New/Recently Constructed).

The third objective is to determine BMP for MSE walls and to develop “Maintenance Guidelines for Mechanically Stabilized Earth (MSE) Walls.” Formatting for guidelines will be provided by ARDOT so as to follow the current maintenance manual for easy placement within the ARDOT Maintenance Manual.

BENEFITS

A detailed cost-benefit analysis shall be included in the proposal. The analysis must include but is not limited to the following:

1. Detailed cost analysis on savings to the Department with full implementation of the projects findings.
2. Any anticipated benefit not foreseen as a cost savings.

TIME AND FUNDING OF STUDY

Work will begin no earlier than July 1, 2020, contingent upon acceptance of the proposal and availability of research funds. The length of the project shall be 24 months. A final report is to be drafted and presented to the Research Subcommittee no later than the last day of the project. Up to 25% of the estimated project costs will be withheld pending final acceptance of the final report. Failure to deliver the required Final Report at the end of the project will result in the cancellation of the project and 25% of the total project cost will be retained by the Department.

REPORTS

All reports must be in accordance with the 2019 Research Manual (available at http://www.ardot.gov/System_Info_and_Research/research.aspx or from the Research Section). All reports are required to be submitted through the appropriate Doc Express

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process. An Implementation Report which details the recommended means/techniques for using the project results shall be submitted to the Department six (6) months prior to the research project's Final Report. All Final Reports are required to be reviewed by a technical editor before submission to the Department. An oral report to the Transportation Research Committee may be required. In addition to reports and publications, the Department shall be furnished one (1) copy of any master's thesis or doctoral dissertation which is a result of any investigation or study on this project. The submitting of any report to be published by an outside publication or presentation on this project before its completion; shall be submitted for the Department's approval before submission.

PROJECT DELIVERABLES

The proposed research will provide ARDOT with a final report and implementation plan, which will discuss how to incorporate a Maintenance Inspection Manual/Guidebook/Database. This could serve as an inventory guide that could be available for other Divisions at the Department. Another possible deliverable could be a rating system as MSE walls are monitored on a scheduled basis as to be determined by ARDOT Maintenance Division. Conclusions should also reflect proper inspection and updating of the MSE database, which will be developed at the conclusion of this research project. Project deliverables shall consist of, but not limited to:

1. An updated ArcGIS Database of all existing MSE and other wall types managed by ARDOT catalogued according to system/type, design specifics, materials, performance history, and maintenance history,
2. Maintenance inspection guidebook detailing MSE system type, performance measures, and appropriate repairs, actions, and/or stabilization for specific performance or distress observations, and
3. On-site training about MSE and other wall types for Construction, Design, and Maintenance personnel and use of the database and maintenance inspection guidebook.

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AUTHORIZATION TO BEGIN WORK

A letter separate from the contracting documents authorizing the beginning of work will be transmitted through Doc Express initiating the project. Any cost incurred before the authorization letter is received, will not be eligible for reimbursement. The project will begin work no earlier than July 1, 2020.

EQUIPMENT

A complete physical verification of all software and equipment purchased or built for use on this project and the actual location of the equipment will be made each year. An Equipment Capitalization Notice is available from the Research Section for the reporting of software or equipment purchased during the project. All software developed on the project will be completed in open source format and ARDOT shall be provided a copy of the source code. If non-expendable or special equipment is purchased with project funds, the equipment is owned by ARDOT and disposition of the equipment will be determined by ARDOT at the project's closeout session.

All rental rates shall be approved by ARDOT before the approval of the proposals. Should a subcontract be part of the proposal, ARDOT will not approve the purchase of any equipment in the subcontract. Any equipment purchased through ARDOT's Transportation-Related Research Grant Program is not eligible for rental rate charges.

All equipment shall be purchased in accordance with the State of Arkansas purchasing laws.

PROPOSALS

Proposals shall be submitted in two separate electronic formats, a word document and a pdf, to Research@ardot.gov no later than the end of business on April 3, 2020. This

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is a firm deadline. All procedures shall be in accordance with the 2019 Research Manual and Federal Aid Policy Guide (FAPG). In the event of policy contradiction, the FAPG shall govern.

Upon approval of the electronic version of the Proposal by the Research Subcommittee the Project Manager will initiate the process within Doc Express to acquire the appropriate electronic signatures from all parties.