ARDOT TRC TRANSPORTATION RESEARCH COMMITTEE

PROBLEM STATEMENT
No. 14

RESEARCH PROBLEM STATEMENT

DATE: 09/06/2019	**PROJECT AREA:** Maintenance

TITLE: Maintenance Guidelines for MSE Walls

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.

OBJECTIVES:

1. Catalogue all current MSE walls managed by ARDOT and generate database that categorizes the MSE walls according to system/type, design specifics, materials, and performance and maintenance history.
2. Provide a maintenance inspection guidebook focused on post-construction monitoring and appropriate repair options based on observed performance or distress metric.

FORM OF RESEARCH IMPLEMENTATION AND RETURN ON INVESTMENT:

1. Database of all existing MSE walls managed by ARDOT catalogued by system/type, design specifics, materials, performance and maintenance history.
2. Maintenance inspection guidebook detailing expected performance metrics and most appropriate repairs for specific performance or distress observations.

Estimated Project Duration: 24 **Months**

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Standing Subcommittee Ranking	Advisory Council Ranking	Statement Combined with Statement Number(s)

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Maintenance Guidelines for MSE Walls

ARDOT Problem Statements FY-2021

Mechanically Stabilized Earth (MSE) walls are cost-effective transportation structures.

Advantages of MSE walls

- Simple and faster construction process
- Reduces use of heavy equipment
- Less site preparation required
- Can be constructed in confined areas and reduces land required for construction
- Can be build in poor soil areas and in various shapes and orientations

TxDOT

Disadvantages of MSE walls

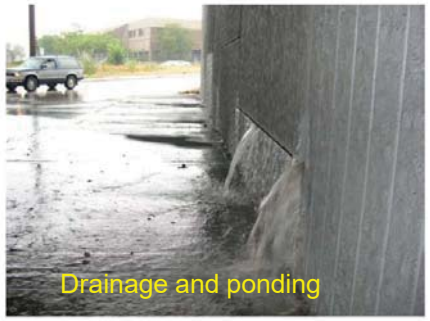
- Numerous system designs, reinforcement types, etc. can make it difficult to categorize for post-construction monitoring and maintenance
- Can be a disconnect between design and construction practices and specifications
- Poor performing MSE walls can lead to maintenance headaches!!!

There is limited information available to maintenance personnel regarding post-construction monitoring and appropriate repairs for given distress signs or performance metrics.

Existing MSE Wall Maintenance Guidance

- Only 2 of 33 states surveyed reported having MSE wall maintenance handbooks
- When further investigated, these handbooks were found to primarily focus on the construction phases and had very little information regarding post-construction monitoring and distress or warning signs
- No handbook was found which provides repair options for typical distress signs and maintenance concerns
- There is also very little guidance on repairing versus rebuilding MSE walls

Typical Maintenance Concerns



Research Goal and Objectives

The goal of this study is to develop a maintenance inspector's guidebook which addresses distress signs and provides appropriate repair options.

- Catalogue all current MSE walls managed by ARDOT and generate a database that categorizes the walls according to system/type, design specifics, materials, and performance and maintenance history
- Provide a maintenance inspection guidebook focused on post-construction monitoring and appropriate repair options based on observed performance or distress metrics

Proposed Research Tasks

1. Create a database of all existing MSE walls managed by ARDOT
    - Based on design/as-built drawings and field reports
2. Categorize existing MSE walls according to system/type, design specifics, materials (reinforcement, backfill, etc.), performance history, and maintenance history

http://www.ertesting.com/projects/mechanically-stabilized-earth

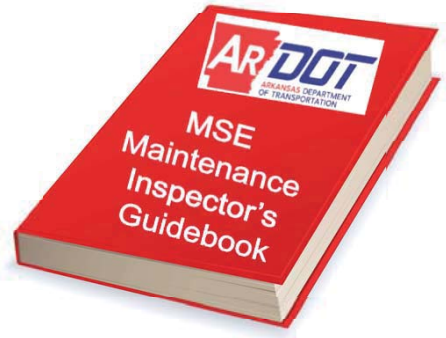
3. Catalogue possible distress signs and performance metrics
    - Existing metrics from construction inspector handbooks will also be considered
    - Special attention will be placed on wall types used in AR and distress signs observed for these walls
    - Possible links between distress signs observed and construction flaws will also be examined

4. Develop guidebook which provides monitoring metrics (based on distress signs and performance metrics defined previously) and appropriate repair techniques for each distress sign

Implementation and Deliverables

- Database of all existing MSE walls managed by ARDOT catalogued according to system/type, design specifics, materials, performance history, and maintenance history.
- Maintenance inspection guidebook detailing MSE system type, performance metrics, and most appropriate repairs for specific performance or distress observations.
- On-site training on use of database and maintenance inspection guidebook.

Sign of distress observed



Sign of distress observed and appropriate repair

- Improve safety
- Reduce confusion related to repair options
- Save time and money