



# PROJECT SUMMARY

## 5-6359-01: Implementation of New Specification Requirements for Coarse Wall Fill Materials for Mechanically Stabilized Earth (MSE) Walls

### Background

The service lives of mechanically stabilized earth (MSE) walls depend on the rate of corrosion of the metallic reinforcement used in their construction. The proper assessment of the corrosion potential requires the accurate evaluation of the pH, resistivity, and ionic (e.g., sulfate and chloride) concentrations of the aqueous solutions in contact with the surrounding aggregates. There is a tendency to utilize larger size aggregates that contain only a small amount of fine material (passing No. 10 sieve) in the backfill. The evaluation of the electrochemical parameters of coarse aggregates is challenging because traditional methods utilize specimens that have been separated from the coarser fraction of the sample. Previous studies have demonstrated that the finer fraction of samples collected from the field can be enriched with chemicals. When these fractions are exposed to water, pH and resistivity are lower, and the chloride or sulfate concentrations are higher relative to the bulk sample. This phenomenon may bias the traditional soil testing results and therefore the assessment of the corrosion potential.

### What the Researchers Did

Under Project 0-6359 entitled “Characterization of Backfill Materials for Prevention of Corrosion of MSE Metallic Wall Reinforcement,” more representative geochemical testing protocols were recommended for the consideration by TxDOT. This study was carried out to standardize the test protocols and provide specifications that TxDOT personnel can readily use. The outcome of this study is two test procedures that can supplant the test procedures for resistivity (Tex-129-E); pH (Tex-128-E), chloride and sulfate concentrations (Tex-620-J). These modified test procedures apply to soils and coarse aggregates used as MSE wall fill.

To achieve the goal of this project, the following milestones were achieved:

1. Produced material property data using the field leach test procedures (referred to as Tex-620-M) developed in Project 0-6359 and compared

with the data from traditional TxDOT methods including Resistivity (Tex-129-E), pH (Tex-128-E), and Chloride and Sulfate Contents (Tex-620-J), by testing Type AS and DS coarse aggregate, and Type BS well graded fill.

2. Collected field performance data using electrochemical methods and used these data to establish acceptance limits for electrochemical and geochemical properties of MSE wall fills tested in accordance with the modified test standards..
3. Developed guidance documents for proper selection and inspection of coarse aggregates used in constructing MSE walls.
4. Provided support and training to TxDOT personnel for the proper use of coarse aggregates in MSE wall construction.

To achieve this, the researchers sampled and tested materials from 20 sources throughout Texas, Arkansas, and Oklahoma (Figure 1) and instrumented five MSE walls in Texas for corrosion monitoring using the linear polarization resistance (LPR) technique. They then measured the electrochemical and geochemical parameters of coarse backfill materials using the following test procedures:

- Tex-129-M for measurement of the resistivity of fill materials, and
- Tex-620-M for measurement of the conductivity, pH, chloride and sulfate concentrations.

### Research Performed by:

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### Project Completed:

08-31-2018

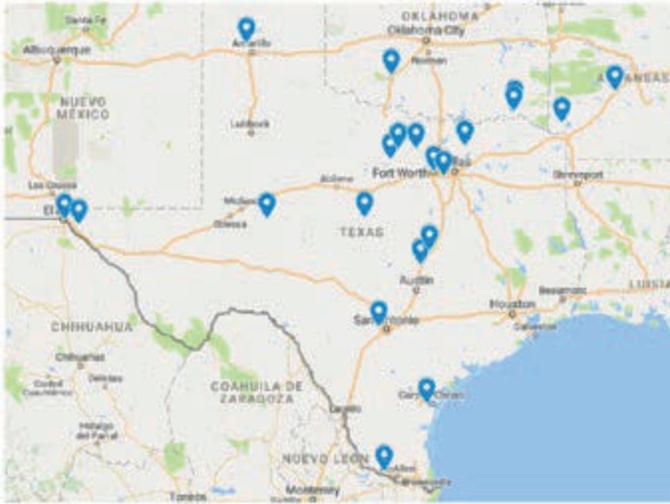


Figure 1-Location Map for Aggregate Sources

### What They Found

Test procedure Tex-129-M yielded much higher resistivity values when compared to those from Tex-129-E. Similarly, test procedure Tex-620-M yielded lower salt contents and pH when compared to those

from Tex-128-E, Tex-129-E and Tex-620-J. Figure 2 shows the average result ratios (modified/existing) of the measurements obtained for each gradation for the measurements of resistivity, conductivity, chloride content, sulfate content, and pH. The modified procedures proved to be simpler to conduct and more representative of observed performances/corrosion rates for testing coarse aggregates.

### What This Means

We recommend that the modified test standards be implemented for the measurement of electrochemical and geochemical parameters of fill materials. These tests will potentially allow additional sources of coarse aggregates to be used as MSE wall fill compared to the sources that are approved when tested with the existing test standards. Thus, the rate of construction will be accelerated, and the cost of construction will decrease.

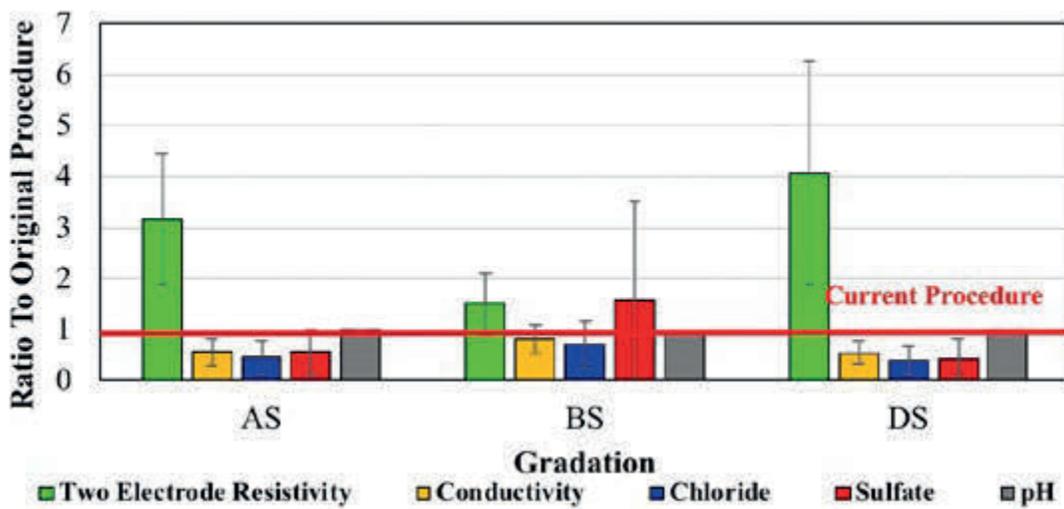


Figure 2- Summary of Ratios of Modified Procedure to Current Procedure

### For More Information

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