Kansas Department of Transportation

TECHNICAL SUMMARY

Investigation of Variations in Corrosion Potential in Mechanically Stabilized Earth Backfill Due to Migration of Fines

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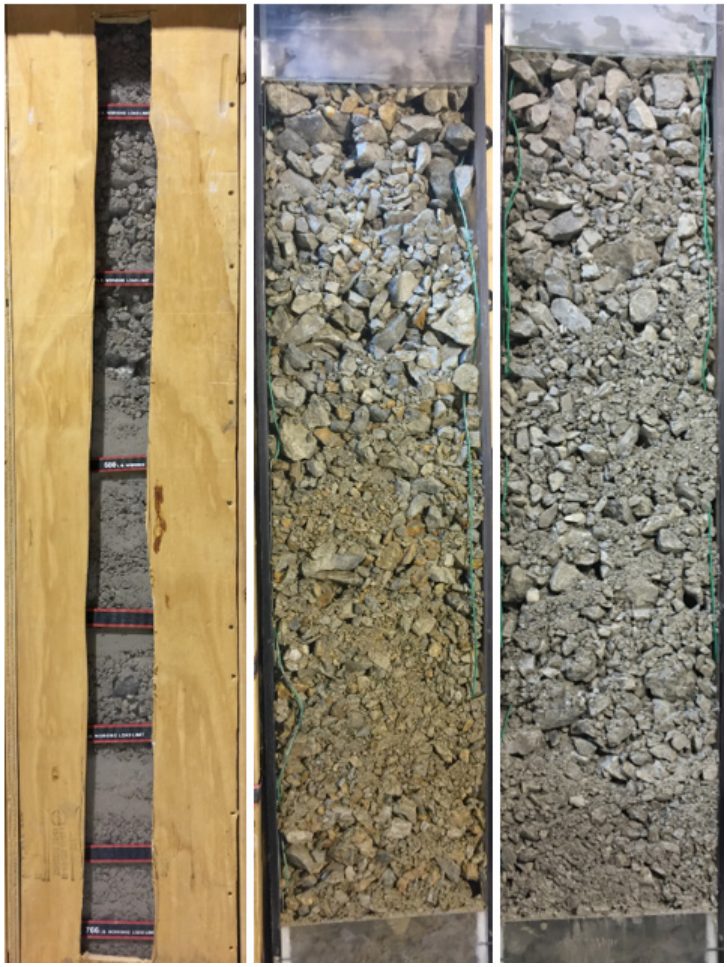
Chase Breckwoldt
Robert Parsons, Ph.D., P.E.
Jie Han, Ph.D., P.E.

The University of Kansas

Introduction

Departments of Transportation have constructed thousands of mechanically stabilized earth (MSE) walls to support bridge abutments in highway projects and for other applications. These MSE walls often include metal strips or grids as reinforcement, typically galvanized steel strips within granular backfill meeting Federal Highway Administration (FHWA) and American Association of State Highway and Transportation Officials (AASHTO) standards. Utilization of steel strips or grids creates a stronger composite material; however, minerals within the backfill or salts applied at the surface can create a corrosive environment. Excessive corrosion can lead to distresses or premature failure of MSE structures.



Internal erosion after saturated and drained cycle tests for three of the tested materials.

Corrosion may increase when cycles of water from precipitation promote migration of fines through the granular backfill. Migrating fines have the potential to accumulate at the base of the reinforced fill and clog drainage and retain water, which could accelerate the corrosion process.

Project Description

This study evaluated the potential for accelerated corrosion due to the accumulation of fines. Aggregate approved for use in MSE structures was placed in a test column with internal dimensions of 30 × 30 × 183 cm, which then had water flowed through it. The grain size distribution was measured at different elevations within the column and the resistivity of the aggregate, which is correlated with corrosion rate, was also evaluated at a series of elevations within the column after water has been passed through it. Results from the testing were compared with resistivity results from a test box consistent with current Kansas Department of Transportation (KDOT) use. All aggregates tested had a drained resistivity that was well above the 5,000-ohm-centimeter (ohm-cm) limit.

Project Results

The results of this study show that migration of fines can occur in KDOT aggregates, and that this migration can cause measurable changes in the grain size distribution, water content, and resistivity of the soil column. In addition, as the number of saturation and drained cycles increases for each material, the resistivity also increases. The current KDOT specification limiting the amount of material passing the No. 200 sieve is beneficial in that it limits the fines available for migration. Additional constraints within the specification could further limit the potential for suffusion.

Project Information

For information on this report, please contact Robert Parsons, Ph.D., P.E.; The University of Kansas, 1530 W. 15th St, Lawrence, KS 66045; (785) 864-2946 phone; rparsons@ku.edu.

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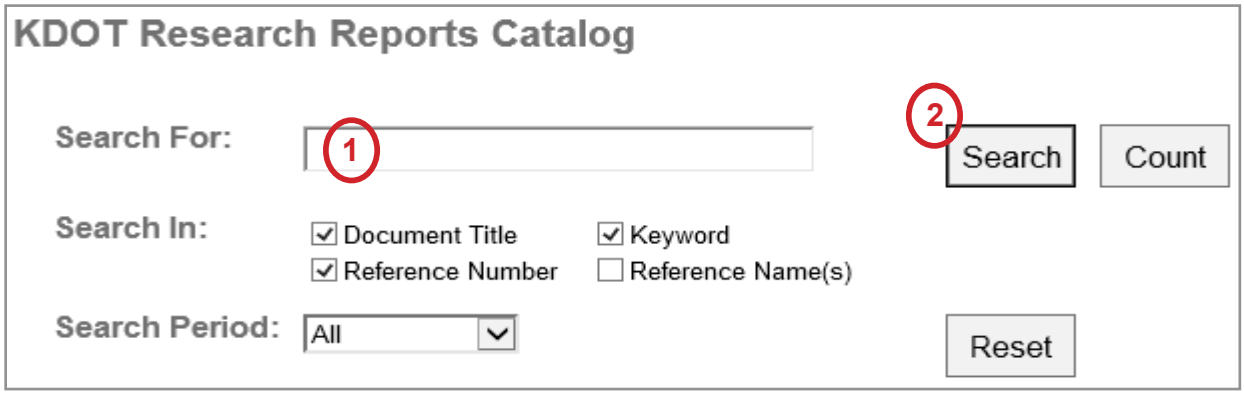

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