Kansas Department of Transportation

TECHNICAL SUMMARY

Field Monitoring of Mechanically Stabilized Earth Walls to Investigate Secondary Reinforcement Effects

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Introduction

Mechanically stabilized earth (MSE) walls have been commonly used in highway construction. AASHTO (2007) has detailed design procedures for such a wall system. In the current AASHTO design, only primary reinforcements are used in relatively large spacing (commonly 2 feet), which requires higher connection strength between reinforcements and wall facing. Large spacing between reinforcements may also increase the chances of wall facing bulging and construction-related problems. To alleviate such problems, the use of secondary reinforcements installed between primary reinforcements was proposed. The use of secondary reinforcements could (1) reduce the required connection load for primary reinforcement, (2) increase the internal stability by secondary reinforcement, (3) improve the compaction near the wall facing, and (4) mitigate the down-drag behind the wall facing. However, this idea was not verified in practice.

Project Description

To improve the understanding of the performance of MSE walls with secondary reinforcement and verify its benefits in practice, three MSE wall sections reinforced with geogrids were constructed and monitored in the field: (1) an MSE wall section with uniaxial geogrids as primary and secondary reinforcements, (2) an MSE wall section with uniaxial geogrids as primary reinforcements and with biaxial geogrids as secondary reinforcements, and (3) an MSE wall section with uniaxial geogrids as primary reinforcements only (i.e., the control section). Earth pressure cells, inclinometer pipes and a probe, and foil-type strain gauges were used in these three test wall sections to measure the vertical and lateral earth pressures, lateral wall facing deflections, and strains of primary and secondary geogrids, respectively. The measured results (i.e., the wall facing deflections, the vertical and horizontal earth pressures, and the strains of geogrids) were compared with those calculated using AASHTO (2007).

Project Results

Based on the analysis of the field test results, major conclusions can be drawn in the following: (1) the secondary reinforcements reduced the wall facing deflections as compared with those in the control section; (2) the measured vertical earth pressures were close to the computed trapezoid stresses and increased with the construction of the wall; (3) the distribution of the measured lateral earth pressures in the control section linearly increased with depth, while the distributions of the measured lateral earth pressures in the sections with secondary reinforcements were approximately uniform with depth; (4) the measured tensile strains at the connection in all sections were small; and (5) secondary reinforcements reduced the maximum tensile strains in the primary geogrids.

Project Information

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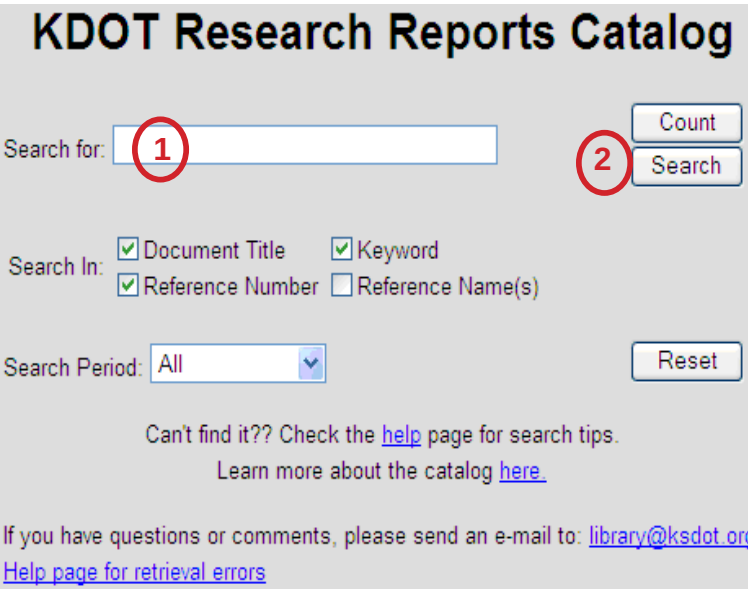

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