DRISI

CALTRANS DIVISION OF RESEARCH, INNOVATION AND SYSTEM INFORMATION

Research Notes

Behavior of Reinforced and Unreinforced Lightweight Cellular Concrete (LCC) for Retaining Walls

This overall objective of this research is to measure engineering design parameters and failure mechanisms for unreinforced and reinforced LCC backfills based on large-scale laboratory tests.

Geotech/ Structures

DECEMBER 2023

Project Title:
Behavior of Reinforced and Unreinforced Lightweight Cellular Concrete for Retaining Walls

Task Number: 3738

Start Date: May 1, 2020

Completion Date: March 31, 2024

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WHAT IS THE NEED?

Controversy exists within the industry regarding whether LCC should be modeled as a frictional or a cementitious (cohesive) material. In addition, earth pressures for retaining wall design and potential failure mechanisms of LCC are poorly understood for retaining wall applications, including uncertainty in LCC interaction with internal wall reinforcement in Mechanically Stabilized Earth (MSE) wall applications. The absence of a consistent design methodology has led to a wide range of design approaches with no consensus standard.

WHAT ARE WE DOING?

Funded tasks for this study include the following:

i. Perform literature review and survey to determine methods currently used in design of MSE walls with LCC backfill.
ii. Conduct Unconfined Compressive Strength (UCS), triaxial shear, direct shear, unit weight, and other laboratory tests to define basic material properties of LCC backfill.
iii. Perform large-scale tests on unreinforced and reinforced LCC backfills.
iv. Compare test results with design methods. Define earth pressure coefficients, wall displacement, and failure surface geometry for the unreinforced LCC backfill test and the reinforced MSE wall LCC backfill tests.

Prepare Final Reports that describe the test setup, test results, and provides comparisons with existing design procedures. The reports will also provide recommendations for design procedures based on test results and analyses of data relative to existing procedures.

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WHAT IS OUR GOAL?

The overall objective of this study is to measure engineering design parameters and failure mechanisms for unreinforced and reinforced LCC backfills based on large-scale laboratory tests.

WHAT IS THE BENEFIT?

Engineers and contractors are increasingly considering LCC backfills for abutments, embankments, and MSE retaining walls. The absence of a consistent design methodology has led to a wide range of design approaches with no consensus standard. The most common class of LCC used in previous highway projects does not strictly behave like a soil or like concrete and must be investigated as a new material for engineering applications. This research will provide recommendations for design procedures for the increased demands for alternative lightweight fill materials.

WHAT IS THE PROGRESS TO DATE?

Completed large-scale tests on unreinforced and reinforced LCC backfills. Conducted additional pull-out tests at high confining pressure to evaluate slope stability methods for internal stability. Continuing work on interim reports and comparing test results with design methods.