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Research Notes

Evaluation of the Settlements and Allowable Pressures of Footings in Cohesionless Soils

This research will result in new guidance for the estimation of footing settlements and allowable pressures in cohesionless soils.

Geotechnical /Structures

November 2025

Project Title: Evaluation of the Settlements and Allowable Pressures of Footings in Cohesionless Soils

Task Number: 4521

Start Date: April 4, 2025

Completion Date: April 1, 2027

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WHAT IS THE NEED?

Methods for estimating footing settlements and allowable pressures in cohesionless soils are known to be overconservative. Consequently, footings are often oversized or deep foundations are needed in cases where more reliable design procedures would allow the use of footings. The goal of this research project is to provide experimental data to refine the current methods used for design of footings in cohesionless soils accounting for variations in soil gradation as well as the quantity and plasticity of fines. The experimental data will be used to evaluate the accuracy of, and proposed modifications to, established design methods for estimation of footing settlement and allowable pressure based on in-situ tests.

WHAT ARE WE DOING?

The project will include 26 geotechnical centrifuge footing load tests to model the settlement and bearing capacity behavior of footings on cohesionless soils with differences in gradation as well as amount and plasticity of fines. Perform in-situ Cone Penetration Test (CPT) soundings in each centrifuge model to correlate the footing response with in-situ test results. Propose modifications to the existing design methodologies to better capture the settlement of footings, considering cohesionless soils ranging from poorly-graded clean sands to well-graded clean sands and sands with plastic and non-plastic fines.

WHAT IS OUR GOAL?

The goal of this research project is to provide experimental data to refine the current methods used for design of footings

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in cohesionless soils with consideration of differences in soil gradation and of the amount and plasticity of fines.

WHAT IS THE BENEFIT?

The experimental data will be used to evaluate the accuracy of, and proposed modifications to, established design methods for estimation of footing settlement and allowable pressure based on in-situ tests. This research will provide reliable and efficient design procedures for spread footings in cohesionless soils.

WHAT IS THE PROGRESS TO DATE?

Completed literature review. Preparing for geotechnical centrifuge footing load tests.

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