Next Generation Liquefaction (NGL) Models for Predicting Triggering and Manifestation of Liquefaction

This research focuses on advancing both susceptibility and triggering models by taking advantage of the recently created Next Generation Liquefaction (NGL) database.

Geotechnical/ Structures

MAY 2024

Project Title:
Next Generation Liquefaction (NGL) Models for Predicting Triggering and Manifestation of Liquefaction

Task Number: 4418

Start Date: March 1, 2024

Completion Date: February 28, 2025

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WHAT IS THE NEED?

Determination of whether a soil is susceptible to liquefaction or other forms of severe strength loss is the first step of geotechnical seismic hazard assessment. If susceptible soils are found within the soil strata at a project site a triggering analysis must be performed to determine the critical conditions necessary for the strength loss to advance.
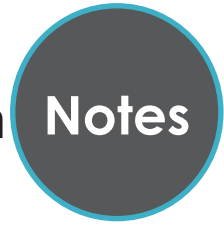
WHAT ARE WE DOING?

The specific tasks of this research are:
1. For liquefaction and severe strength loss susceptibility, develop a probabilistic based susceptibility model applicable to a broad range of soil types. A combination of dynamic laboratory testing, primarily taken from the NGL database, and field observations, also from the NGL database, will be used to identify significant dynamic strength loss and the mechanisms for that strength loss, for a broad range of soils and fines content.
2. For assessment of triggering potential, update current PGA based triggering model and related adjustment factors. Develop new triggering models using Arias Intensity and CAV5 as intensity measures. Evaluate the relative effectiveness of each model. A literature review as well as recent laboratory test data will guide the development of adjustment factors for fines content, overburden stress, and preshaking shear stress.

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Liquefaction

Research Notes

WHAT IS OUR GOAL?

To update liquefaction susceptibility and trigging models. A key difference relative to past studies is the explicit consideration of whether triggered liquefaction is likely to manifest itself at the ground surface. Susceptibility models will be developed probabilistically. Liquefaction triggering models will be developed for alternative intensity measures (Arias Intensity, CAV5) in additional to conventional peak ground acceleration (PGA). The effectiveness of these methods will be compared with final recommendations for design.

WHAT IS THE BENEFIT?

If susceptible soils are found within the soil strata at a project site a triggering analysis must be performed to determine the critical conditions necessary for the strength loss to advance. This research will provide new analytical procedures to evaluate and predict triggering and manifestation of liquefaction by taking advantage of the recently created Next Generation Liquefaction (NGL) database.

WHAT IS THE PROGRESS TO DATE?

The contract was executed on March 1, 2024, followed by a kick-off meeting to discuss the project's scope and schedule. The research team is currently conducting a literature survey on fines content and recent laboratory test data to inform the development of adjustment factors.