Center for Embedded Networked Sensing

Laboratory and Field Soil Testing

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Project Scope: Soil-structure interaction for performance based design of bridges

Full-Scale Field Test

- **Backfill-abutment wall specimen with *granular backfill***
- **Performed a full-scale cyclic lateral load test**
- **Six hydraulic actuators each capable of applying 500 kips of force**
- **Interested in the force-displacement relationship, initial stiffness, and *ultimate passive resistance* of the specimen**

  Can be used in CALTRANS *seismic design* criteria to build more efficient bridges

Photos of the field experiment setup

Objective: Measure parameters of soil behind wall-abutment system via lab testing

Test Methods

Triaxial Cell

Sieve Analysis

- **Sieve Analysis Test**

  To determine the *grain-size distribution* and classify the *backfill*
- **Dry Tipping & Modified Japanese Method**

  To obtain the maximum and minimum *void ratio* of the soil
- **Compaction Test--Modified Proctor Test**

  Construct compaction curves to evaluate *max dry density* and *optimum water content*
- **Triaxial Test**

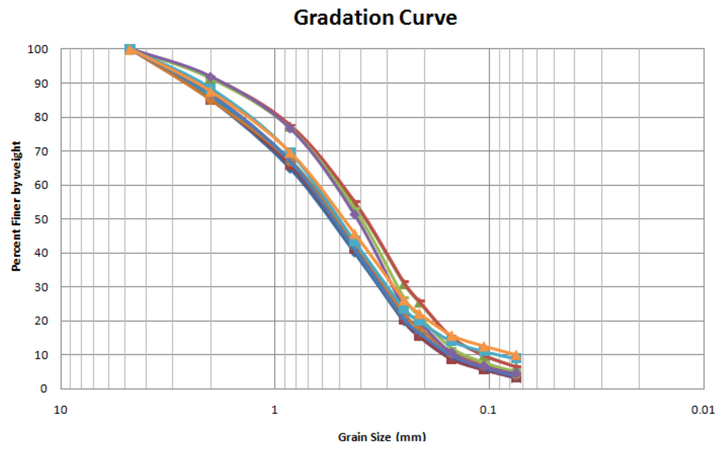
  Evaluate soil strength parameters such as *shear strength*, *cohesion*, and *friction angle*

Japanese Hammer Method

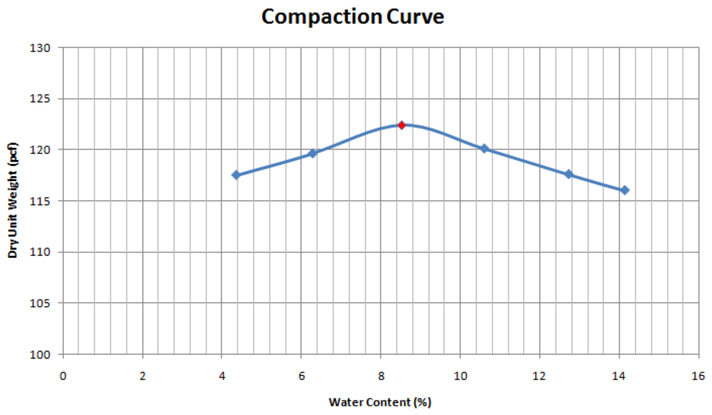
Triaxial Sample Preparation

Results and Conclusions

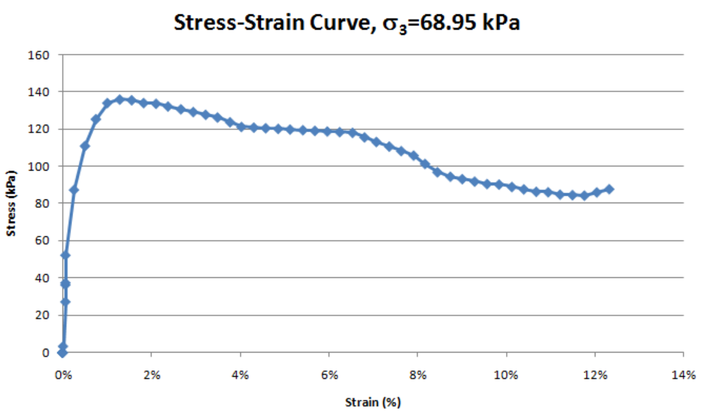
- **Sieve Analysis Results**
  - Gradation curves of six different bulk samples (show on right)
  - Indicates soil is well-graded sand with silt
  - Averaged fines content is about 3.4%

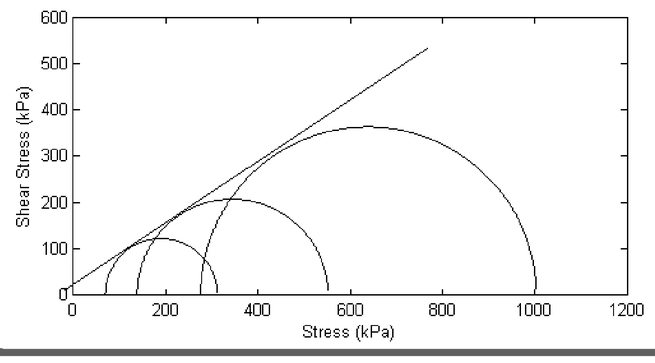


- **Compaction Test Results**
  - Compaction curves revealed an optimum water content of about 9%
  - An average max dry density of 122 pcf

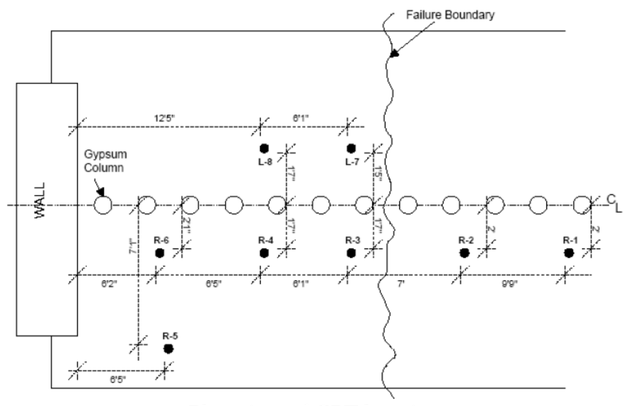


- **Triaxial Test Results**
  - Triaxial tests provided the stress-strain relation of soil samples (shown on right)
  - Each test used three samples with the first confined at 68.95 kPa, the second at 137.9 kPa, and the third at 275.8 kPa
  - Cohesion of 25 kPa and friction angle of 33°

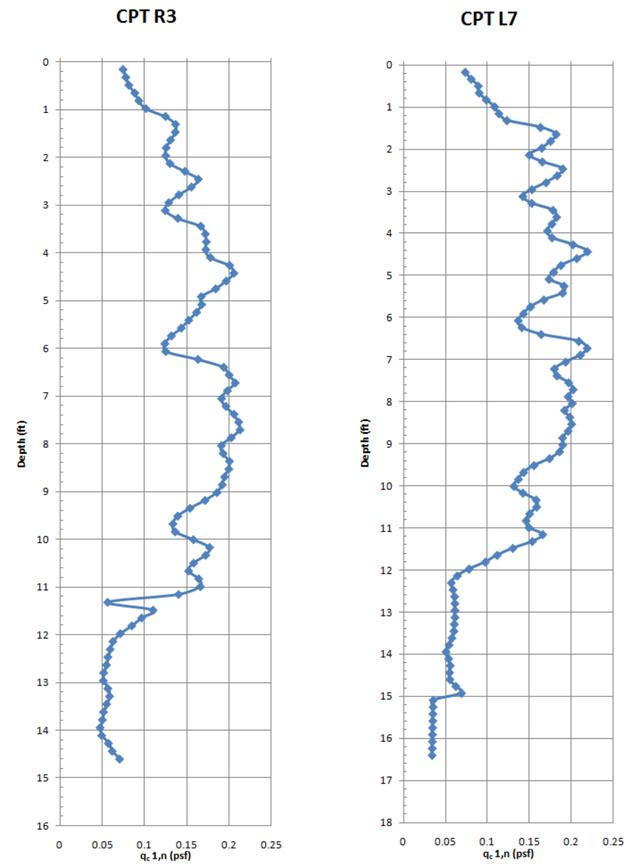




- **Cone Penetration Testing**
  - In situ test that continuously detects fine changes in the stratigraphy
  - Tip resistance vs. depth



Plan view of CPT locations



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