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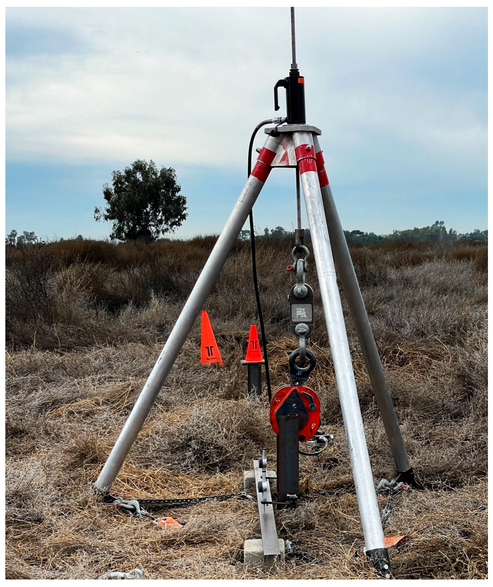
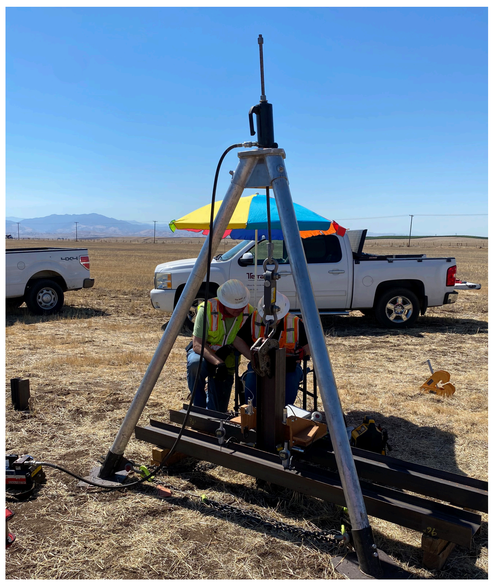
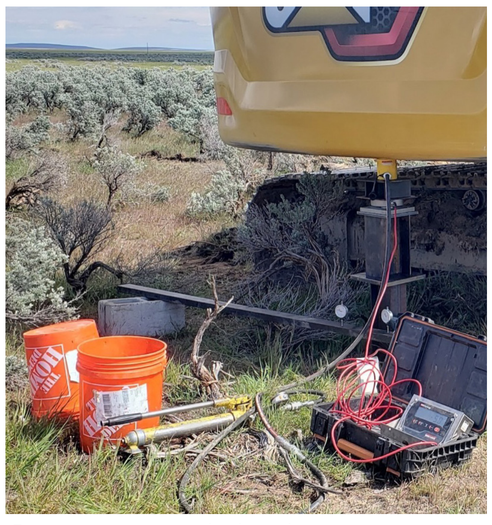
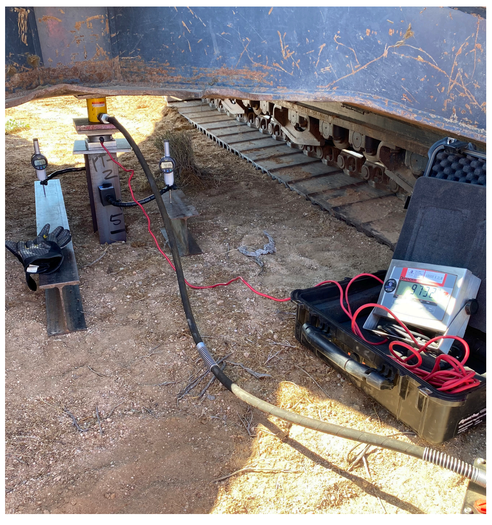
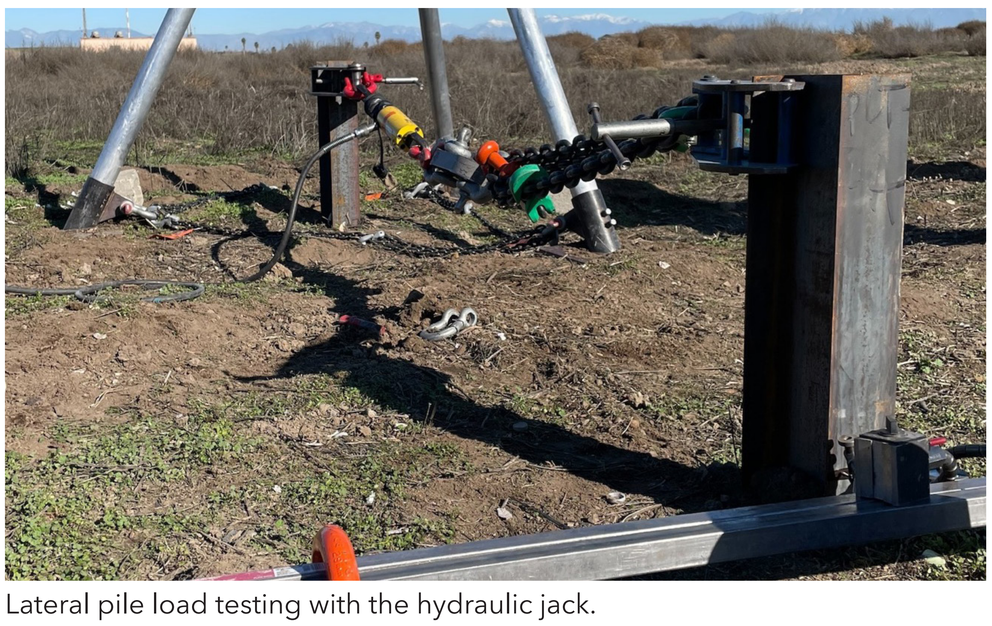
PILE TESTING FOR FOUNDATION DESIGN OPTIMIZATION



Axial load testing with the lightweight tripod.



Compression pile load testing using excavator.


Lateral pile load testing with the hydraulic jack.

Purpose:

Pile load testing (PLT) provides site-specific empirical data of pile capacity relative to axial and lateral load forces. The results are used to optimize the pile design and to provide more information relative to pile performance during construction. PLT is an invaluable step in the design process and should be included in the geotechnical scope of work to validate design recommendations and to evaluate opportunities for efficiencies.

Methods:

Test piles are typically installed at two embedment depths at each test location. The embedment depths are selected based upon information provided during the geotechnical investigation. When the test piles are installed it is important to use equipment similar to that which will be used during project construction. Trained technicians record their observations during test pile installation. Important information is documented such as resistance, drivability, and anticipated drive times. This information is used by the project contractor to refine their estimates of construction labor.

The load testing procedure includes applying an axial load to the top of the pile; both in tension and in compression. The pile is also tested against lateral load forces. The loads are applied with hydraulic jacks. Instrumentation is installed between the reaction force and the hydraulic jack so that precise load readings can be recorded. Other instruments are placed on the pile to measure movement when the pile is subject to the loading sequence. These methods have evolved over time to provide more accurate results and to maximize safety of the workers performing the testing.

The vertical and lateral capacity of the piles are a function of engineering properties specific to the site soils. These include:

- Soil type
- Density
- Cohesion
- Soil friction angles

The data from the load testing is used as input parameters to model various scenarios so that multiple loading conditions, pile sections, and installation depths can be evaluated. LPILE is the most common design program used for modeling. When used by an experienced engineer, the program can be utilized to:

- Better understand the soil/structure interaction of the pile foundation,
- Model the soil behavior under the observed lateral loading using the p-y method, and
- Compute deflection, bending moment, and shear force over the length of the pile.

The results of the modeling are used to optimize the pile design. These results typically support a shallower required embedment depth than that which might be derived from theoretical calculations. This is because the soil parameters generated during the testing, and verified during modeling, are generally higher than theoretical assumptions of soil behavior for similar soils.

Testing procedures can even be modified to account for challenging site conditions and issues commonly referred to as geohazards. Testing procedures can be specifically implemented to address shallow refusals, adfreeze depths, karst, and expansive soils. adfreeze depths, and expansive soils.

Summary of Results:

In summary, utilizing innovative pile load testing methods not only can help with the validation of the theoretical assumptions, but also provides the owner, design engineer, and/or contractor with cost effective design parameters and site-specific information to support the project construction timeline.