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PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING
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Levare
Timber Pile Connection
Field Test & Report

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INTRODUCTION:
On May 1, 2025, Trevor Paitz, P.E., representative of Marais Consultants, visited a future hotel site in Covington, LA to witness the lateral load test on a timber pile.

The purpose of the lateral load test was to verify the structural capacity of the connection for the Levare Elevating Sleeve Pile Repair System (ESPRS).

TEST METHOD:

Equipment Used
Hydraulic Jack
Threaded Rod
Tape Measure
Metal Stake
Inclinometer

Construction Material
Levare ESPRS
¾" Diameter, 8" Long Steel Lag Bolts
Two Timber Piles

Application of Load:
A hydraulic jack and threaded rod were used to apply a lateral load to the pile by pulling on the piles. The load was calculated by multiplying the pressure gage reading by the area of the ram. The load was then divided by two, assuming the piles shared the load equally.

Figure 1: Pile Connection Test Setup

Measurement of Deflection:
A tape measure was positioned on the ESPRS, and a metal stake was driven in the ground to measure the lateral movement or deflection of the pile as the load increases.
Measurement of ESPRS Incline:
An inclinometer was positioned on the ESPRS to measure the plumbness of the ESPRS and pile as the load increases. The chart below shows the results of the test.

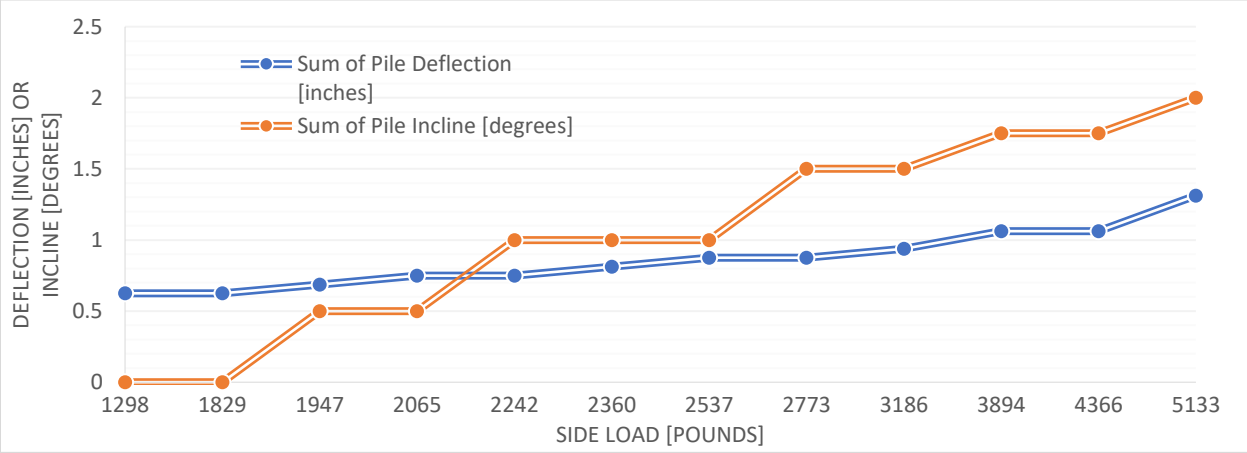

Figure 2: Side Load vs. Pile Deflection & Incline

ANALYSIS:
Multiple analyses were run to determine the structural capacity of the timber pile, the connection, and to verify the results of the test. The American Wood Council (AWC) National Design Standard (NDS) for timber construction was used to design the connection and verify the results of the test.
After calculating the capacities of the timber pile and connection, a RISA 3d model was used as verification.

RESULTS & CONCLUSION:
The results of the analysis show the following capacities for the timber pile and connection.

Based on the geometry of the connection into the pile and the point at which the load was applied, we determined the approximate shear in the bolts from the test load.

Approximate Load Applied During Test: 5,133 lbs
Moment Arm: 10.5”
Approximate Moment Resisted by Connection: 43,631 in-lbs
Overturning Arm: 13”
Approximate Shear in Bolt Row from Test Load: 3,356 lbs

Using the NDS, we calculated the tearout capacity of the connection used in the test, then used the geometry of the connection and the point at which the load was applied to determine the equivalent side load to fail the connection.

Calculated Tear Out Capacity of Multiple Fasteners in a Row: 10,240 lbs
Calculated Partial Moment Connection Capacity: 133,120 lb-in or 11 k-ft
Calculated Equivalent Load to Fail Connection: 8,241 lbs

Using an estimated pile cantilever length above the ground, we can calculate an equivalent side load that would fail the timber pile in bending.

Estimated Timber Pile Cantilever Length: 60”
Calculated Timber Pile Bending Capacity Required for Failure: 505,440 in-lbs
Approximate Load for Bending Capacity Failure: 8,111 lbs

We used RISA 3d to analyze the installed design of the ESPRS. We used the connection calculations from above to determine the stiffness of a partial moment between the elevating sleeve-spool connection and the spool-timber pile connections.

We analyzed the deflection of the pile to determine the stiffness of the soil. In our analysis we applied springs along the length of the pile to appropriately analyze the timber pile embedded in the soil.

We also applied a weak spring (1k/in) at the top of the pile to imitate a cantilevered deck structure (similar to a bridge or dock). An 8,111 lb. calculated lateral load on the deck structure. The max code check for any member in the system was less than 30% (SF of 3.0) and any connection was less than 36% (SF of 2.8). The figure to the right shows a scaled, deflected shape of the model.

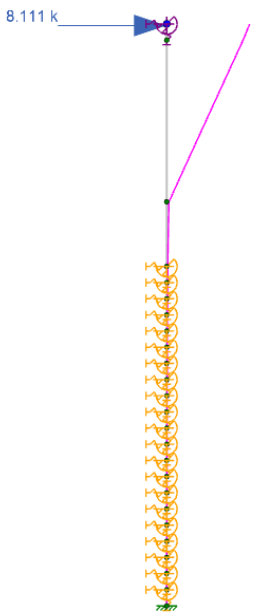

Figure 3: Scaled Display of the Deflected Shape of the Model

CONCLUSION:
Based on these calculations, the geometry of the pile, connection and cantilever length of the pile, if the load was increased until a failure occurs, our calculations show the failure of the pile would occur before the failure of the connection.

Furthermore, the installed ESPRS, yielded better results and was capable of resisting a much greater load, achieving a safety factor of nearly 3.0.