Micropile Performance and Durability

A fifteen year record of monitored micropile response to sustained static load
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• Installation @ MP C19, Sept. 18, 1998

• Load test @ MP BB7 August 11, 1998
- Micropile L18
  8/27/1998

- Temporary data logger mount & cables
- SMSG’s with PVC covers

- Installation complete
  10/30/1998
• By September 2012, 210 gauges had failed

• Both gauges on 64 micropiles

• One of two on 82 additional micropiles

• Maintenance in 2013 restored both SMSG’s on 58 micropiles and recovered one gauge on 25 additional micropiles.
Micropile N31
Installed 7/24/1998
Load tested 8/4/1998
Conditions 12/12/2013

• Condition at micropile grid Q32 on 12/12/2013

• Conduit conditions 12/12/2013 at grid lines 27 - 28
Conditions 12/12/2013 at cable box on north wall of NW elevator

- Micropile plan, grid line J 12/12/2013
• Micropiles began taking on load as soon as the grout set.
• Load development of approximately 15 kN/day before load test and 10 kN/day by 8/25/1998.

• Data only collected from one micropile (N31) between the load test (8/4/1998) and the 11/13/1998 load application due to site congestion.
Micropile load by depth interval in time domain

- Typical load pattern for 14 depth intervals.
- Fifty dates from the 15 year period
- November 13, 1998 load applied to top of each micropile - 222 kN/pile
- January 1, 2014 average load at top of each micropile 270 kN/pile
- Higher loads consistent with soft/compressible layers
- Lower loads consistent with cemented/strong layers
Micropile load centroid in time domain

- Daily observations 11/13/98 to 12/28/2012
- Load centroid depth has remained nearly constant for past 14 years

Neutral load depth (meters) = [(Σ load*Depth)/(Σ Load)] (meters)
Conclusions

• “Steady State” is a little like “uniform, homogeneous, isotropic, normally consolidated, immediate elastic settlement, all in an infinite half-space”.

• The simplifying assumptions may be completely adequate for “geotechnical engineers” where “close enough for government work” meets the test.

• The equations of design have no basis in reality if the loads and material properties are not compliant with the design assumptions.

• And then there is the future...................... The load? Load case? Construction sequence? Soil chemistry? Water levels? Climate cycles?

• And then the rest of the story.
HH10 & HH11
Separated by 1.2 meters c/c

Strain Gauges referenced to zero on 11/10/1998

Load (kN)

Date

HH10 150 ft
HH10 70 ft
HH-10

HH11 170 ft
HH11 110 ft
HH-11

DD8 150 ft
DD8 70 ft
DD-8

GG22 120 ft
GG22 100 ft
GG-22
All data are discrete daily (11 to 12 PM) observations.
Implied tension based on the gauge zero reference established 11/10/1998

Note scale
Questions and Discussion

Thank you for your time!

It was fun then And it’s still fun