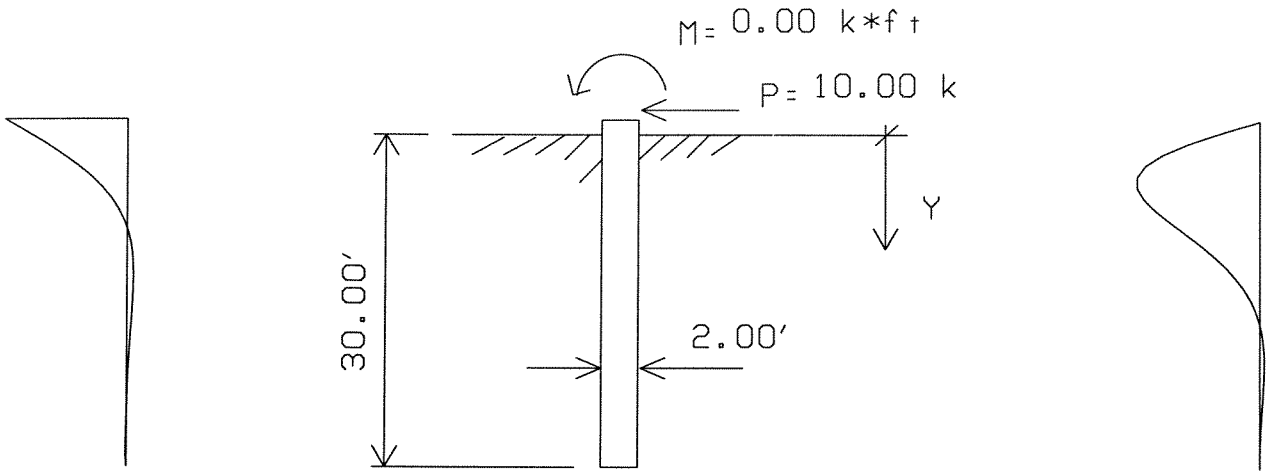
FIRM:Your Firm JOB NO. SHEET NO: 1
MADE BY:KJH DATE:05-24-2006 CHECKED BY: DATE:
TITLE:Example LATPILE calculation

LATERALLY LOADED PILE:



DEFLECTION MOMENT

DESIGN DATA:

Pile is free to rotate at top.
Modulus of elasticity, E= 29000 ksi
Moment of inertia, I= 1000.00 in^4

Theory:

The program models the soil as a series of springs. Spring constants are based on the concept of a subgrade modulus. The choice of spring spring constant is derived using a method suggested by J.E. Bowles ("Foundation Analysis and Design", 1988), with an additional reduction in stiffness for clay proposed by Terzaghi:

Assuming that the soil displaces roughly 1 inch at qult,

ks1 = 12 * qult (kcf)

For piles, due to the substantial side shear resistance, ks is approximately doubled:

For sand, ks=2*ks1 = 24 * qult (kcf) (p. 772)
For clay, ks=24*qult/(1.5*PileWidth) (using Terzaghi's reduction)

(1) For sand, the program uses,

qult= Effective Soil Weight* y * Nq

where Nq is derived from the Terzaghi bearing capacity equation,

$Nq=a^2 / [2(\cos(45+ \phi /2))^2]$ (p. 188)

$a = 2.71828 (3.14159*(.75 - \phi /360) * \tan(\phi))$

qult for sand is limited to the following value determined by Meyerhof,

qult(max) = Nq * TAN(ϕ) (p. 741)

The allowable bearing pressure for sand is, qa=qult/2.

LATERALLY LOADED PILE:

Theory (Cont'd)

(2) For clay, the program uses a commonly used expression for ultimate bearing pressure,

qult=3 * qu, for shallow footings (p. 201)

where qu=unconfined compressive strength

The allowable bearing pressure of clay is, qa=qult/3

Number of soil layers= 1

Layer No.	From Y(ft)	To Y(ft)	Calculation
1	0.00	30.00	Dry or moist medium sand Dry Wt.= .100 kcf, Sat. Wt.= .119 kcf Submerged Wt.= .057 kcf ϕ = 33.000 deg., Nq= 32.22 qult= 3.222 * y < 20.930 ksf qa = 1.611 * y < 10.465 ksf ks = 77.351 * y < 502.323 kcf

LATERALLY LOADED PILE:

RESULTS OF 31 NODE FINITE ELEMENT MODEL:

Location Y (ft)	Spring Constant (k/in)	Lateral Disp. (in)	Moment (k')	Shear (k)	Pressure (ksf)	Allowable Pressure (ksf)
0.00	0.00	-.10	0.0	-10.0	0.000	0.000
1.00	12.83	-0.09	-10.0	-10.0	-.590	1.611
2.00	25.83	-0.07	-18.8	-9.4	-.974	3.222
3.00	38.66	-0.05	-25.6	-7.8	-1.156	4.834
4.00	51.50	-0.04	-30.1	-5.6	-1.178	6.445
5.00	64.50	-0.03	-32.2	-3.3	-1.079	8.057
6.00	77.33	-0.02	-32.2	-1.0	-.892	9.668
7.00	83.66	-0.01	-30.4	.9	-.610	10.465
8.00	83.66	-0.00	-27.4	2.4	-.331	10.465
9.00	83.66	-0.00	-23.7	3.3	-.119	10.465
10.00	83.66	0.00	-19.8	3.8	0.032	10.465
11.00	83.66	0.00	-15.9	3.8	.135	10.465
12.00	83.66	0.00	-12.4	3.7	.198	10.465
13.00	83.66	0.00	-9.2	3.3	.229	10.465
14.00	83.66	0.00	-6.4	2.9	.238	10.465
15.00	83.66	0.00	-4.2	2.4	.230	10.465
16.00	83.66	0.00	-2.4	2.0	.211	10.465
17.00	83.66	0.00	-1.1	1.5	.186	10.465
18.00	83.66	0.00	-.1	1.1	.159	10.465
19.00	83.66	0.00	.5	.8	.130	10.465
20.00	83.66	0.00	.9	.5	.103	10.465
21.00	83.66	0.00	1.1	.2	0.078	10.465
22.00	83.66	0.00	1.1	.1	0.056	10.465
23.00	83.66	0.00	1.0	-0.0	0.037	10.465
24.00	83.66	0.00	.9	-.1	0.021	10.465
25.00	83.66	0.00	.7	-.1	0.007	10.465
26.00	83.66	-0.00	.5	-.2	-0.005	10.465
27.00	83.66	-0.00	.3	-.2	-0.015	10.465
28.00	83.66	-0.00	.1	-.1	-0.026	10.465
29.00	83.66	-0.00	0.0	-.1	-0.035	10.465
30.00	41.83	-0.00	-0.0	-.1	-0.045	10.465