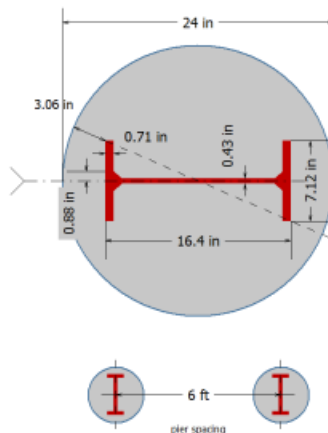
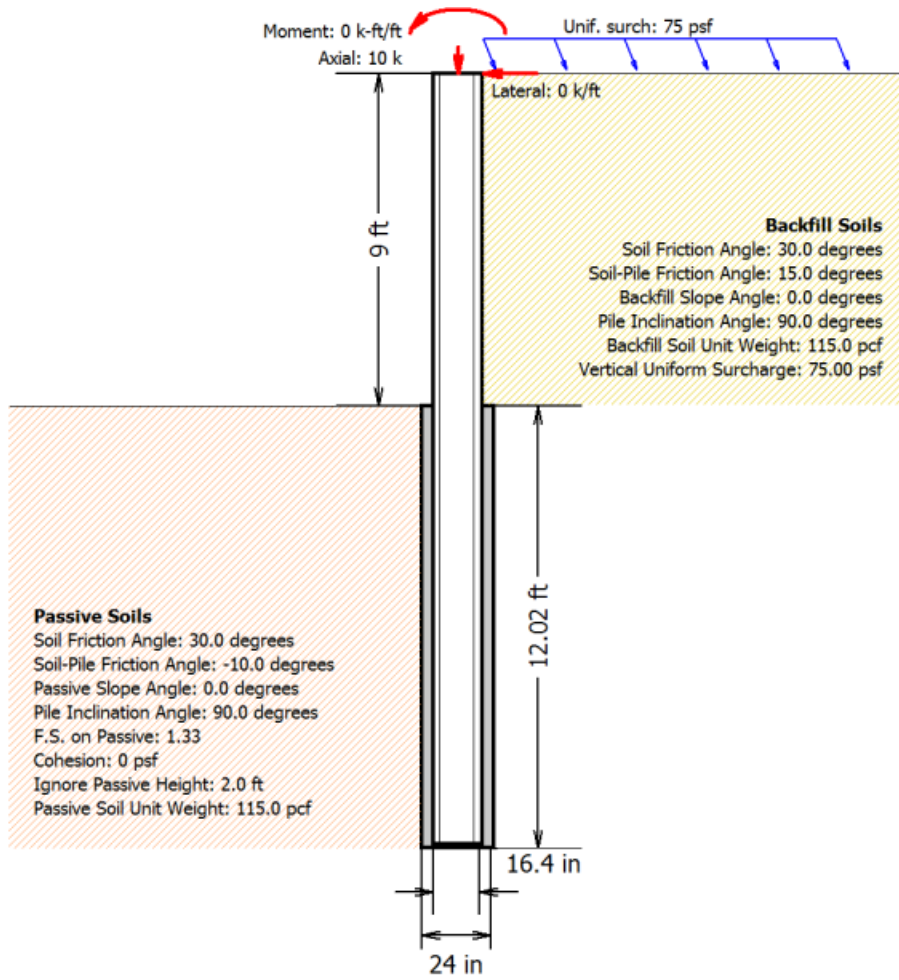


# Cantilever Shoring Analysis

Organization:  
 Project Name: **50 TB CANTILEVER**  
 Design by:  
 Job #:  
 Date: **7/2/2017**



## Inputs

### General Data

Units	English
Analysis Method	Net Pressure
Installation Method	Drilled
Pile Type	Soldier Beam (King Pile)
Shored Height, H	9.00 ft
Pile Spacing	6.00 ft
Pile Width or Pier Diameter	2.00 ft

### Backfill Soils

Soil Friction Angle	30.0 degrees
Soil-Pile Friction Angle	15.0 degrees
Backfill Slope Angle	0.0 degrees
Pile Inclination Angle	90.0 degrees
Backfill Soil Unit Weight	115.0 pcf
Vertical Uniform Surcharge	75.00 psf

### Passive Soils

Soil Friction Angle	30.0 degrees
Soil-Pile Friction Angle	-10.0 degrees
Passive Slope Angle	0.0 degrees
Pile Inclination Angle	90.0 degrees
F.S. on Passive	1.33
Passive Soil Unit Weight	115.0 pcf
Cohesion	0 psf
Ignore Passive Height	2.0 ft
Passive Wedge Multiplier	2.00

### Structural data and loads

Elastic Pile Modulus	29000 ksi
Beam Type	North American
Beam Size	W16X57
Beam Diagonal Length (<24 in - 4 in, O.K.)	17.88 in
Yield Strength	50 ksi
Allow. Top of Pile Defl.	0.25 in
Conc. Compress. Str, f'c	3.00 ksi

### Loads Applied @ Top of Pile

Axial	10.00 k
Lateral	0.00 k/ft
Moment	0.00 k-ft/ft

### Lagging Design

Plate Type	Pressure-Treated Wood
Arching Factor	0.6
Allowed Stress	
Bending, Fb	1200.00 psi
Shear Parallel to Grain, Fv	150.00 psi
Compr. Perpind. to Grain	625.00 psi
Lagging Size factor	1.00
Lagging Flat use factor	1.00

## Results

### Coulomb Method

Act. Earth Press. Coef, Ka	0.298
E.F.P. Active	34.3 psf/ft
Pass. Earth Press. Coef, Kp	4.143
E.F.P. Passive	358.3 psf/ft
Max. Passive Thrust, Pp	3583 psf/ft

### Pressure Data (ASD) per ft Length of Wall

	Loading Side		Passive Side	
	x, ft	w, ksf	x, ft	w, ksf
1	0.00	0.022	11.00	-1.433
2	3.00	0.125	13.14	-2.965
3	6.00	0.228	15.28	-3.583
4	9.00	0.331	17.42	-3.583
5	9.00	0.000		
6	11.80	0.000		
7	14.62	0.000		
8	17.42	0.000		

### Output Data

Total Beam Length	21.02 ft
Unbraced Length, Lr	18.28 ft
Unbraced Length, Lp	5.65 ft
Max. Shear	-36 k @ 13.16 ft
Max. Moment Above Grade	30.3 k-ft @ 9.00 ft
Max. Moment Below Grade	40.7 k-ft @ 11.00 ft
Max Deflection	0.090 in @ 0.00 ft

### Checks

	Capacity	Utilization
Moment Above Grade	235 k-ft	
Moment Below Grade	262 k-ft	16 %
Shear	141 k	25 %
Axial	126 k	8 %
P-M interaction	20 %	
Slenderness Ratio, kL/r	141.8	

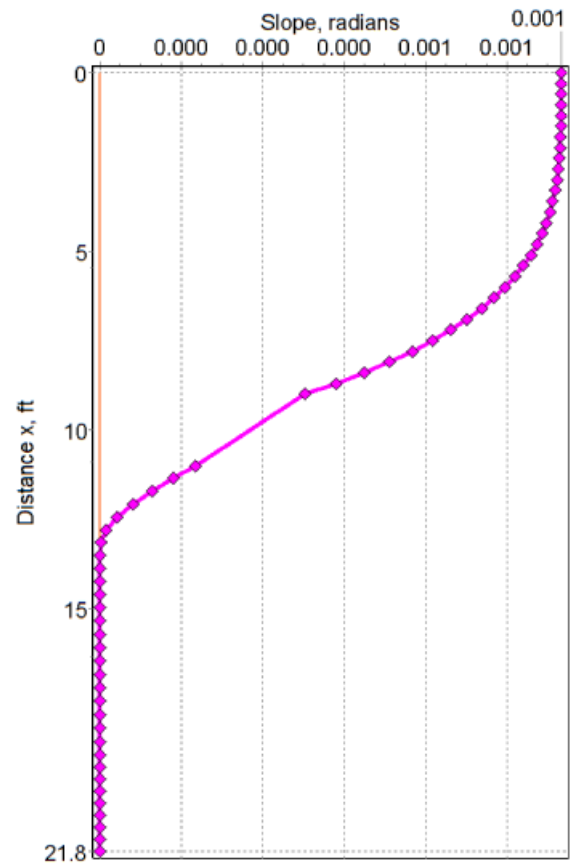
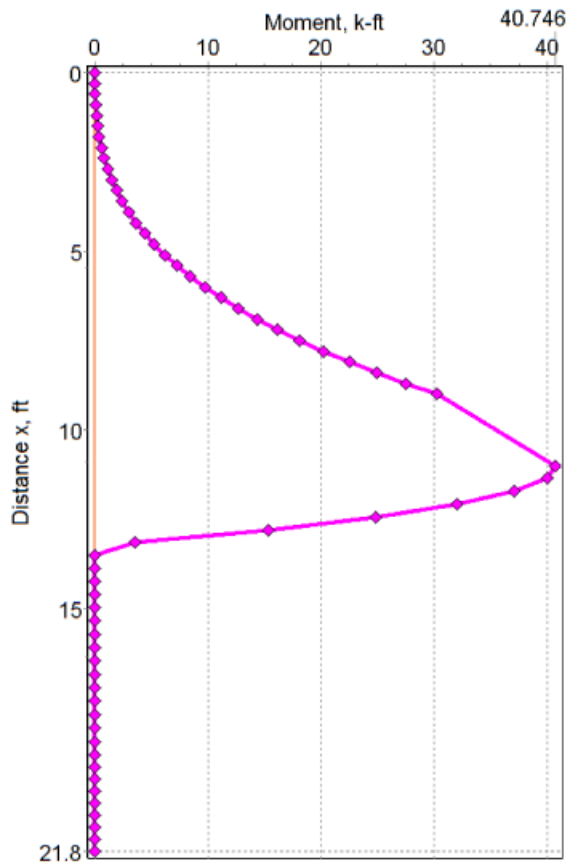
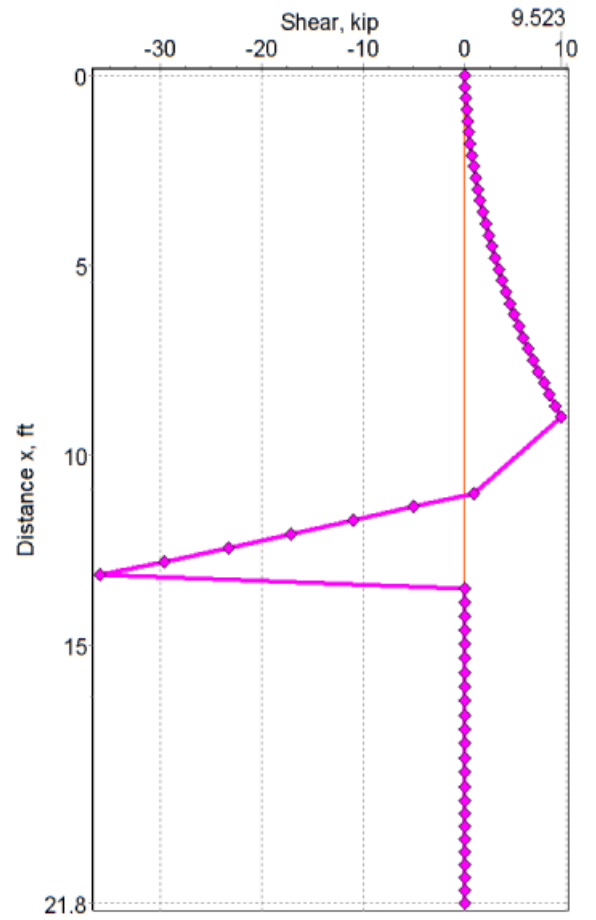
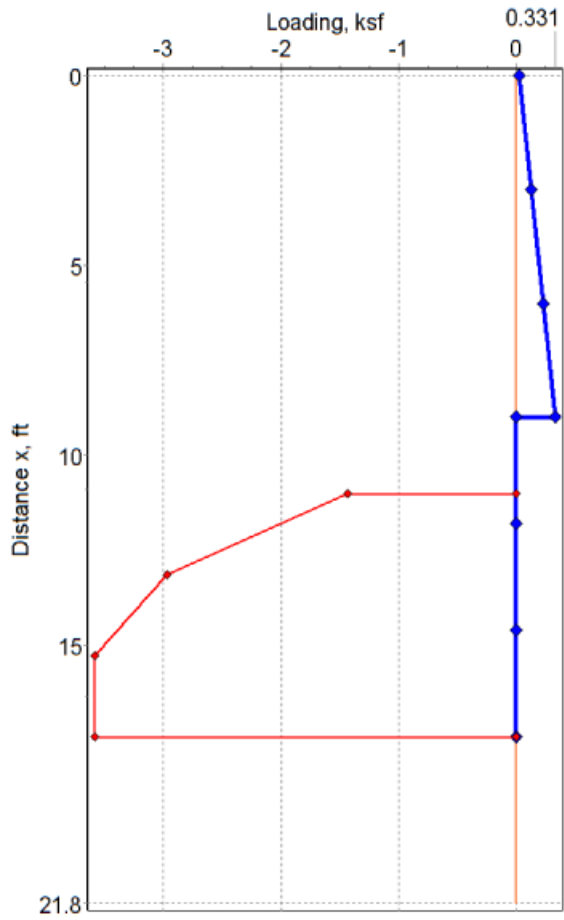
## Lagging Design

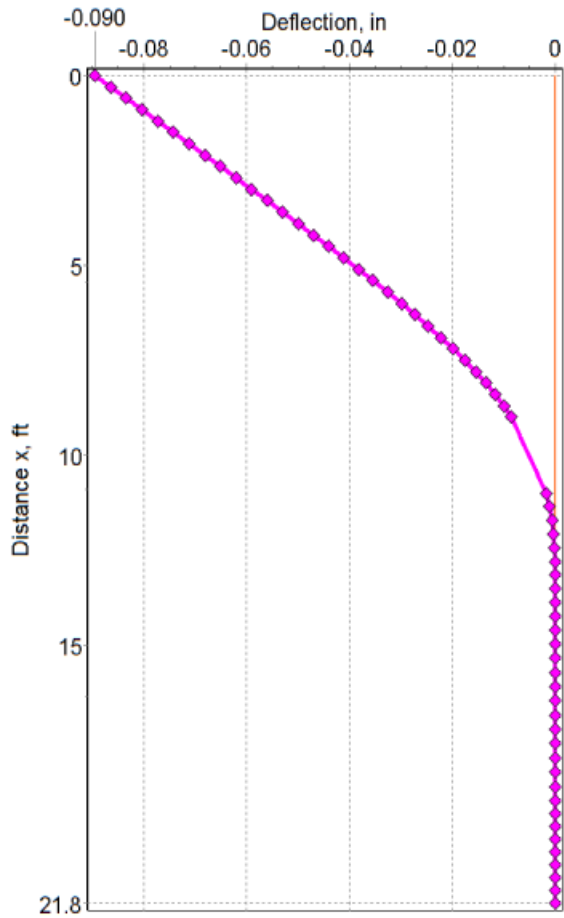
Soil Pressure	145 psf
Max Bending Moment	436 lb-ft/ft
Lagg. Area Required	6.25 in <sup>2</sup>
Req. Section Modulus of Lagging	4.36 in <sup>3</sup>
Wood Lagging Size	3x12 pressure treated

## Table of Test Results

Node #	Depth, ft	Shear, k	Moment, k-ft	Slope, rad.	Defl, inch
0	0.00	0.00	0.00	0.00085	-0.090
1	0.30	0.03	0.00	0.00085	-0.086
2	0.60	0.10	0.02	0.00085	-0.083
3	0.90	0.19	0.07	0.00085	-0.080
4	1.20	0.29	0.14	0.00085	-0.077
5	1.50	0.42	0.25	0.00085	-0.074
6	1.80	0.56	0.39	0.00085	-0.071
7	2.10	0.72	0.58	0.00085	-0.068
8	2.40	0.90	0.83	0.00085	-0.065
9	2.70	1.10	1.13	0.00084	-0.062
10	3.00	1.31	1.49	0.00084	-0.059
11	3.30	1.55	1.92	0.00084	-0.056
12	3.60	1.80	2.42	0.00083	-0.053
13	3.90	2.07	3.00	0.00083	-0.050
14	4.20	2.36	3.66	0.00082	-0.047
15	4.50	2.67	4.42	0.00081	-0.044
16	4.80	3.00	5.27	0.00080	-0.041
17	5.10	3.34	6.22	0.00079	-0.038
18	5.40	3.71	7.28	0.00078	-0.035
19	5.70	4.09	8.45	0.00076	-0.033
20	6.00	4.49	9.73	0.00075	-0.030
21	6.30	4.91	11.14	0.00073	-0.027
22	6.60	5.35	12.68	0.00070	-0.025
23	6.90	5.81	14.36	0.00068	-0.022
24	7.20	6.28	16.17	0.00065	-0.020
25	7.50	6.78	18.13	0.00061	-0.018
26	7.80	7.29	20.24	0.00057	-0.015
27	8.10	7.82	22.50	0.00053	-0.013
28	8.40	8.37	24.93	0.00049	-0.012
29	8.70	8.94	27.53	0.00043	-0.010
30	9.00	9.52	30.30	0.00038	-0.008
31	9.00	9.52	30.30	0.00038	-0.008
32	11.00	0.93	40.75	0.00018	-0.002
33	11.00	0.93	40.75	0.00018	-0.002
34	11.36	-4.99	40.01	0.00014	-0.001
35	11.72	-10.99	37.14	0.00010	-0.001
36	12.08	-17.08	32.09	0.00006	0.000
37	12.44	-23.26	24.83	0.00003	0.000
38	12.80	-29.53	15.32	0.00001	0.000
39	13.16	-35.90	3.54	0.00000	0.000
40	13.52	0.00	0.00	0.00000	0.000
41	13.88	0.00	0.00	0.00000	0.000
42	14.24	0.00	0.00	0.00000	0.000
43	14.60	0.00	0.00	0.00000	0.000
44	14.98	0.00	0.00	0.00000	0.000
45	15.35	0.00	0.00	0.00000	0.000
46	15.73	0.00	0.00	0.00000	0.000
47	16.10	0.00	0.00	0.00000	0.000
48	16.48	0.00	0.00	0.00000	0.000
49	16.85	0.00	0.00	0.00000	0.000
50	17.23	0.00	0.00	0.00000	0.000
51	17.60	0.00	0.00	0.00000	0.000
52	17.98	0.00	0.00	0.00000	0.000
53	18.35	0.00	0.00	0.00000	0.000
54	18.73	0.00	0.00	0.00000	0.000
55	19.10	0.00	0.00	0.00000	0.000
56	19.44	0.00	0.00	0.00000	0.000
57	19.78	0.00	0.00	0.00000	0.000
58	20.11	0.00	0.00	0.00000	0.000
59	20.45	0.00	0.00	0.00000	0.000
60	20.79	0.00	0.00	0.00000	0.000
61	21.13	0.00	0.00	0.00000	0.000
62	21.46	0.00	0.00	0.00000	0.000
63	21.80	0.00	0.00	0.00000	0.000

# Charts





### References:

1. EM 1110-2-2502, Retaining Walls, Corps of Engineers, 1961
2. Foundation Design, W.C. Teng, 1962
3. Foundation Engineering, A.R. Jumikis, 2nd Ed., 1987
4. Foundation Analysis & Design, J. E. Bowles, 5th Ed., 1996
5. 2012 IBC + 2015 IBC, International Code Council
6. Recommendations on Excavations, DGGT, 3rd Ed., 2014
7. AISC Steel Construction Manual, 14th Ed., 2010
8. Hot Rolled & Structural Steel Products - 7th Ed, OneSteel Manufacturing, Australia, 2014
9. Guide to Design of Slabs on Ground - ACI 360R-10, American Concrete Institute, 2010
10. SoilStructure Software: Cantilever Shoring v1.0.4