

# Driven Pile Analysis

Organization: **SoilStructure.com**  
 Project Name: **Example 1**  
 Job #: **888888**  
 Design by: **LAA**  
 Date: **January 17, 2018**

## Loading

Units	<b>English</b>	Passive Wedge	<b>2.5</b>
Top of Pile Cond.	<b>Free Head</b>	F.S. Side Friction	<b>2.0</b>
Downward Load	<b>400.00 kips</b>	F.S. End Bearing	<b>2.0</b>
Pile Length	<b>72.00 ft</b>	Groundwater	<b>72.00 ft</b>
Lateral Load (Shear)	<b>1.00 kips</b>	O.C. Ratio	<b>1.00</b>
Moment Load	<b>1.00 kip-ft</b>		
Allow. Lat. Deflection	<b>0.10 in</b>		
Uplift Load	<b>160.00 kips</b>		

## Pile Properties

Pile & Soil Interface	<b>Rough Steel</b>	Cross Section Area	<b>198.56 in<sup>2</sup></b>
Pile Type	<b>Pile - small displ.</b>	Pile Perimeter	<b>4.700 ft</b>
Shape	<b>I/H Shape</b>	Tip Area	<b>1.379 ft<sup>2</sup></b>
Width	<b>1.22 ft</b>		
Drying	<b>N/A</b>	Modulus of Elasticity (E)	<b>29000 ksi</b>
Static Analysis	<b>Yes</b>	Moment of Inertia (I)	<b>3060.5 in<sup>4</sup></b>
Cyclic Analysis	<b>No</b>		

## Geotechnical Properties

#	Material Type	USCS	Layer Thick, ft	SPT Field N	Consistency	Lat. S.G, kcf	Kp	F.S. on Kp	Cohesion, ksf	Gamma, pcf	NSF
1	Cohesive Soil	CL	13.0 0 - 13	10	Stiff	90.0- 150.0	2.61	1.25	1.20	110.0	No
2	Granular Soil	SP	10.0 13 - 23	10	Medium Dense	150.0- 260.0	3.06	1.25	0.10	115.0	No
3	Granular Soil	SW	19.0 23 - 42	20	Medium Dense	260.0- 450.0	3.39	1.25	0.10	120.0	No
4	Cohesive Soil	CL	20.0 42 - 62	20	Very Stiff	450.0- 260.0	2.88	1.25	2.00	115.0	No
5	Sandstone Bedrock	Bedrock1	10.0 62 - 72	30	Dense	260.0- 390.0	3.77	1.25	3.00	125.0	No

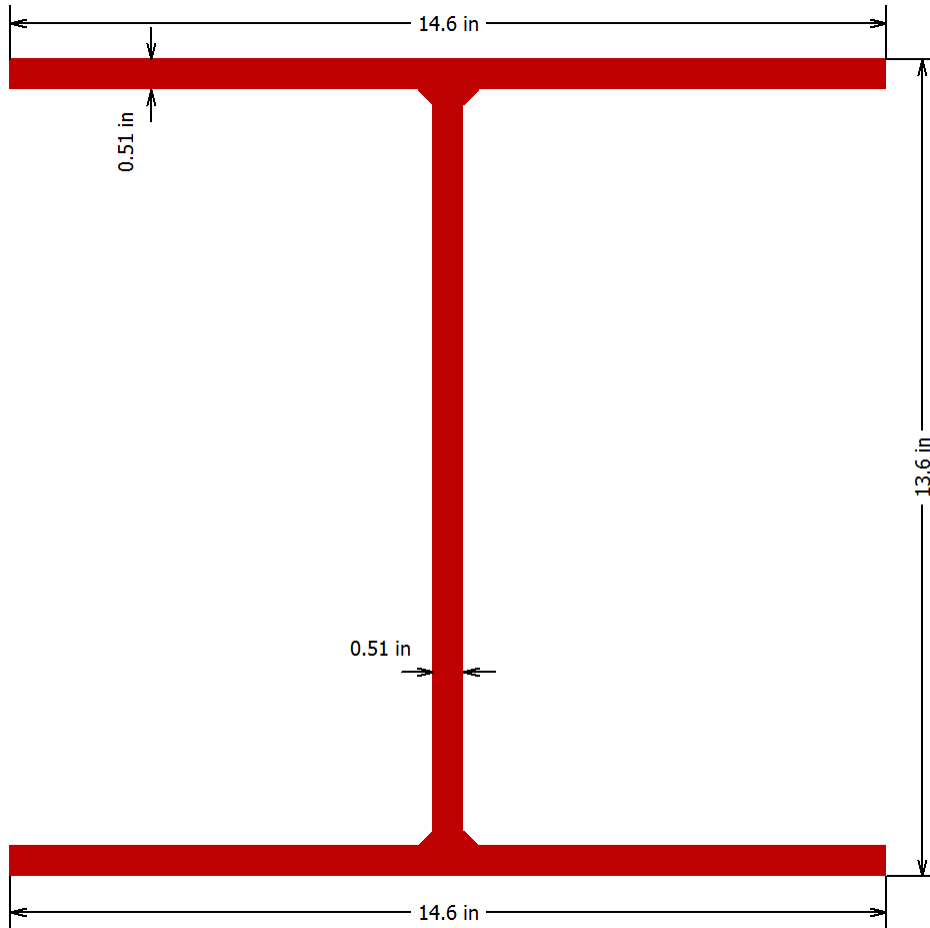
## Results

Axial Load - P util.	<b>0.910</b>	<b>Maximum Deflection is 0.02 in at 0.00 ft</b>
Moment Load Mx util.	<b>0.007</b>	<b>Maximum Moment is 4.30 k-ft at 7.20 ft</b>
Moment Load My util.	<b>0.000</b>	<b>Maximum Shear is 1.00 kips at 0.00 ft</b>
Combined Util. Ratio	<b>0.916</b>	<b>Pile Tip Movement is 0.00 in at the bottom (72.00 ft)</b>
		<b>Downward Capacity is 433.7 kips</b>
		<b>Negative Skin Friction is 0.00 kips</b>
		<b>Uplift Capacity is 216.8 kips</b>
		<b>Pile Movement is 0.15 in</b>



## Structural Design - Rectangular Steel

Shapes	<b>North American</b>	Effective Length, Kx	<b>1.00</b>
Member Type	<b>Beam-Column</b>	Effective Length, Ky	<b>1.00</b>
Beam Size	<b>HP14X73</b>	Unbraced Length, Lx	<b>15.00 ft</b>
Downward Load, P	<b>480.00 kips</b>	Unbraced Length, Ly	<b>15.00 ft</b>
Moment Load, Mx	<b>1.60 kips-ft</b>	Unbraced Length, Lb	<b>15.00 ft</b>
Moment Load, My	<b>0.00 kips-ft</b>	Stress Bend. Coeff, Cb	<b>1.00</b>
Yield Strength, Fy	<b>50.00 ksi</b>	X-axis Bend. Coeff, Cmx	<b>1.00</b>



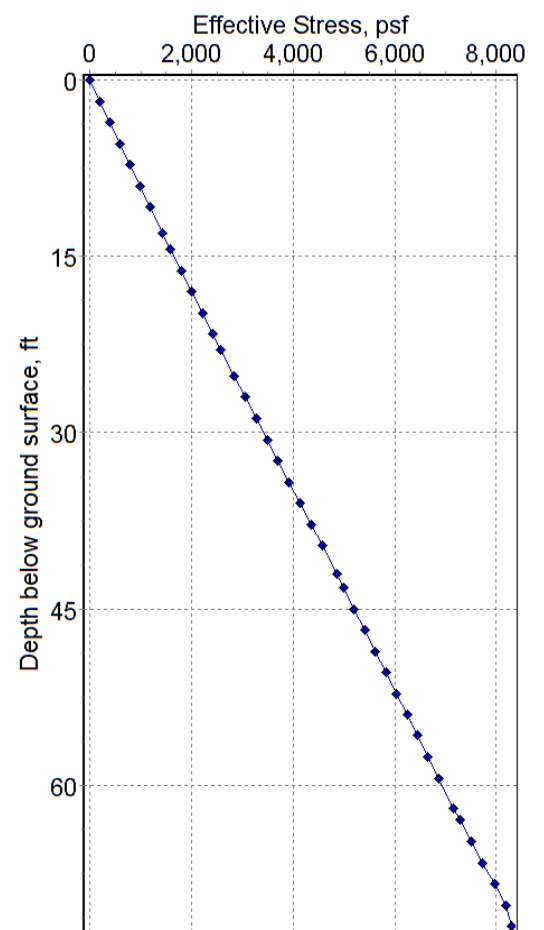
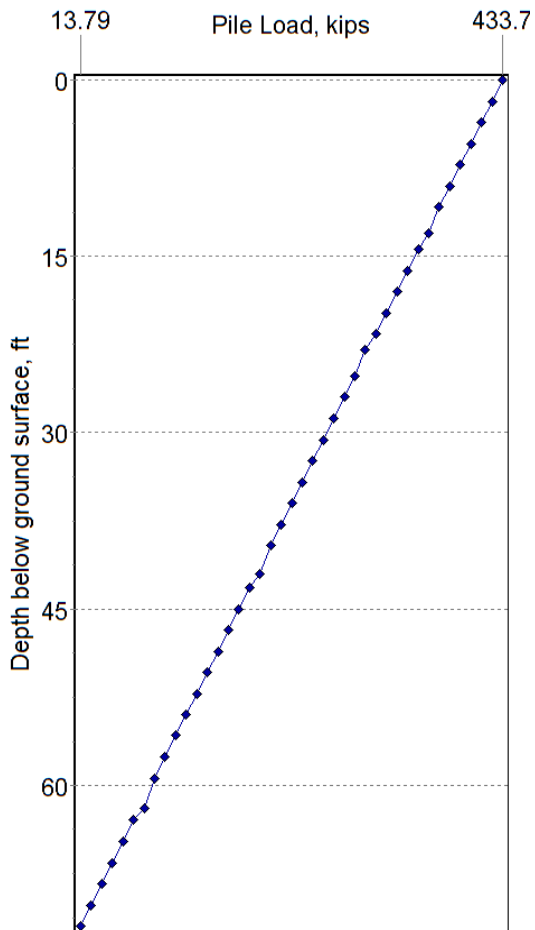
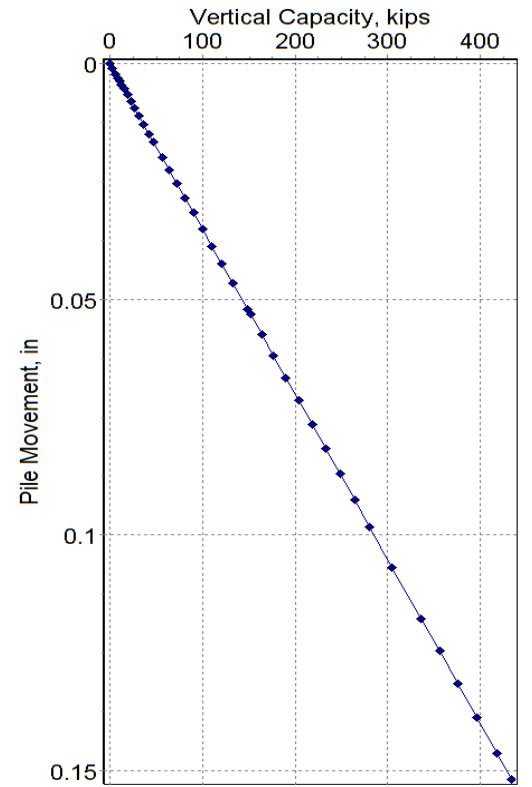
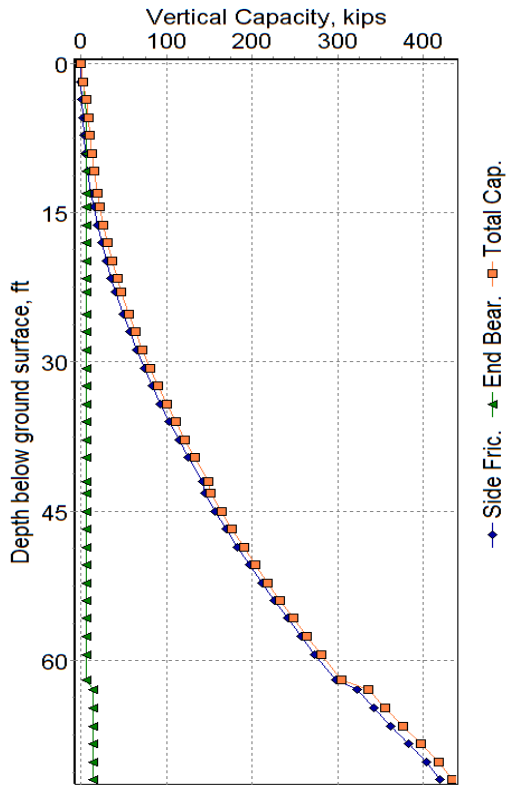
## Vertical Table

Node #	Depth ft	Sigma' V psf	Phi deg	NSF kips	Ultimate Side Fric. kips	Allow. Side Fric. kips	Ultimate End Bear. kips	Allow. End Bear. kips	Vertical Capacity kips	Pile Movement in
1	0.00	0.00	26.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	1.80	198.00	26.50	0.00	0.46	0.23	5.32	2.66	2.89	0.00
3	3.60	396.00	26.50	0.00	1.85	0.93	10.65	5.32	6.25	0.00
4	5.40	594.00	26.50	0.00	4.16	2.08	13.79	6.89	8.98	0.00
5	7.20	792.00	26.50	0.00	7.40	3.70	13.79	6.89	10.59	0.00
6	9.00	990.00	26.50	0.00	11.56	5.78	13.79	6.89	12.68	0.00
7	10.80	1188.00	26.50	0.00	16.65	8.33	13.79	6.89	15.22	0.01
8	13.00	1430.00	26.50	0.00	24.13	12.06	13.79	6.89	18.96	0.01
9	14.40	1591.00	30.50	0.00	31.24	15.62	13.79	6.89	22.51	0.01
10	16.20	1798.00	30.50	0.00	39.71	19.86	13.79	6.89	26.75	0.01
11	18.00	2005.00	30.50	0.00	49.20	24.60	13.79	6.89	31.50	0.01
12	19.80	2212.00	30.50	0.00	59.71	29.86	13.79	6.89	36.75	0.01
13	21.60	2419.00	30.50	0.00	71.24	35.62	13.79	6.89	42.51	0.01
14	23.00	2580.00	30.50	0.00	80.90	40.45	13.79	6.89	47.35	0.02
15	25.20	2844.00	33.00	0.00	99.61	49.80	13.79	6.89	56.70	0.02
16	27.00	3060.00	33.00	0.00	114.83	57.42	13.79	6.89	64.31	0.02
17	28.80	3276.00	33.00	0.00	131.13	65.57	13.79	6.89	72.46	0.03
18	30.60	3492.00	33.00	0.00	148.51	74.26	13.79	6.89	81.15	0.03
19	32.40	3708.00	33.00	0.00	166.98	83.49	13.79	6.89	90.38	0.03
20	34.20	3924.00	33.00	0.00	186.52	93.26	13.79	6.89	100.15	0.04
21	36.00	4140.00	33.00	0.00	207.14	103.57	13.79	6.89	110.47	0.04
22	37.80	4356.00	33.00	0.00	228.85	114.42	13.79	6.89	121.32	0.04
23	39.60	4572.00	33.00	0.00	251.64	125.82	13.79	6.89	132.71	0.05
24	42.00	4860.00	33.00	0.00	283.70	141.85	13.79	6.89	148.74	0.05
25	43.20	4998.00	29.00	0.00	289.80	144.90	13.79	6.89	151.79	0.05
26	45.00	5205.00	29.00	0.00	314.38	157.19	13.79	6.89	164.08	0.06
27	46.80	5412.00	29.00	0.00	339.95	169.98	13.79	6.89	176.87	0.06
28	48.60	5619.00	29.00	0.00	366.53	183.27	13.79	6.89	190.16	0.07
29	50.40	5826.00	29.00	0.00	394.11	197.06	13.79	6.89	203.95	0.07
30	52.20	6033.00	29.00	0.00	422.69	211.34	13.79	6.89	218.24	0.08
31	54.00	6240.00	29.00	0.00	452.27	226.13	13.79	6.89	233.03	0.08
32	55.80	6447.00	29.00	0.00	482.85	241.42	13.79	6.89	248.32	0.09
33	57.60	6654.00	29.00	0.00	514.43	257.21	13.79	6.89	264.11	0.09
34	59.40	6861.00	29.00	0.00	547.01	273.50	13.79	6.89	280.40	0.10
35	62.00	7160.00	29.00	0.00	595.83	297.91	13.79	6.89	304.81	0.11
36	63.00	7285.00	35.50	0.00	645.15	322.57	27.58	13.79	336.36	0.12
37	64.80	7510.00	35.50	0.00	684.07	342.04	27.58	13.79	355.83	0.12
38	66.60	7735.00	35.50	0.00	724.14	362.07	27.58	13.79	375.86	0.13
39	68.40	7960.00	35.50	0.00	765.34	382.67	27.58	13.79	396.46	0.14
40	70.20	8185.00	35.50	0.00	807.69	403.84	27.58	13.79	417.63	0.15
41	72.00	8297.64	35.50	0.00	839.80	419.90	27.58	13.79	433.69	0.15

Notes:

Sigma' V Effective Stress  
Phi Soil/Rock Friction Angle  
NSF Negative Skin Friction

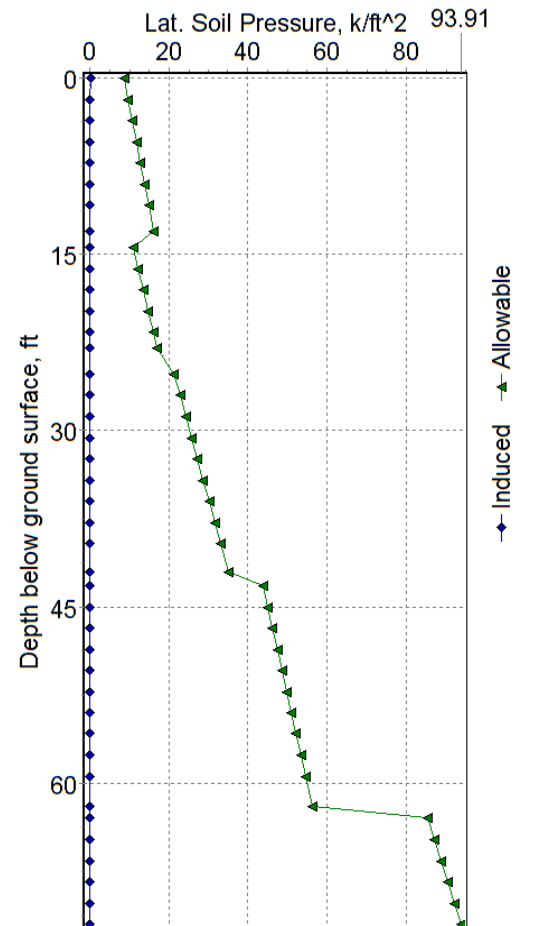
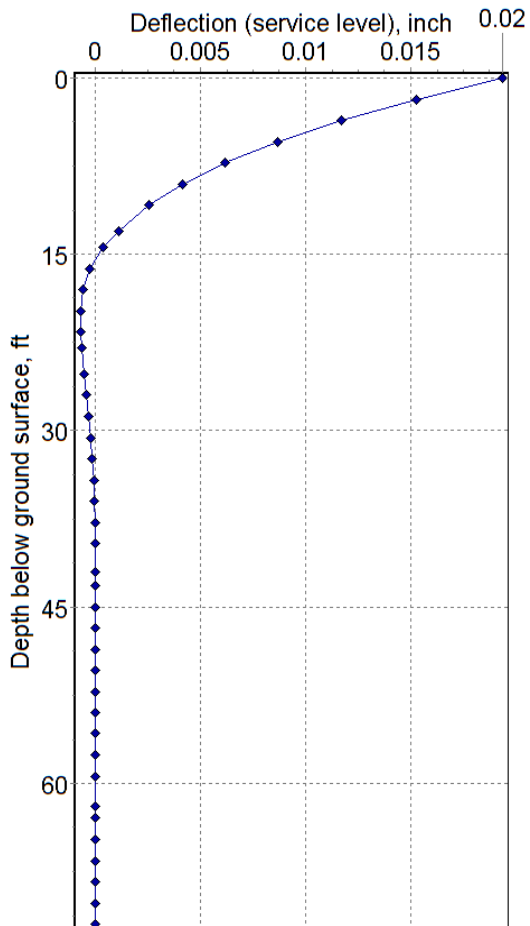
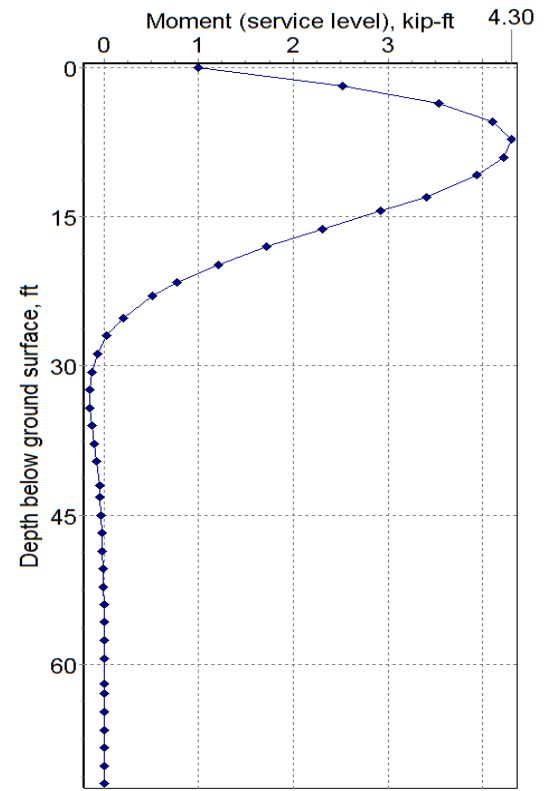
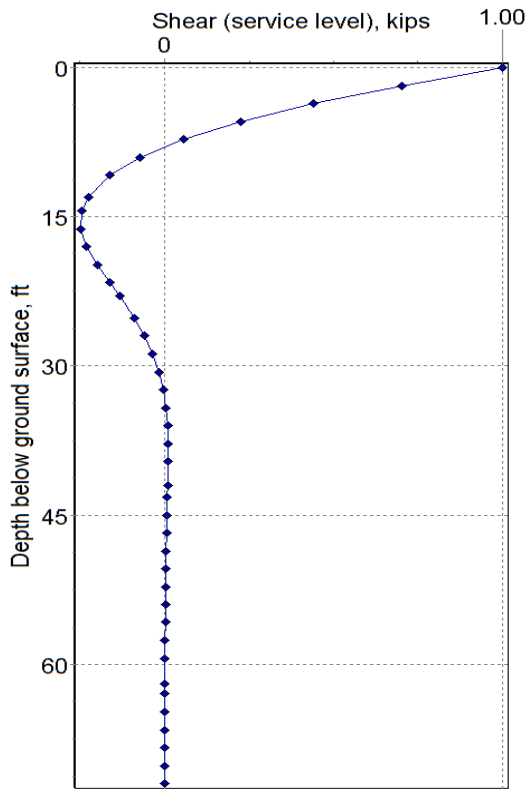
# Vertical Charts



## Lateral Table

Node #	Depth, ft	Soil Modulus, ksf	Shear, kips	Moment, kip-ft	Deflection, in	Lat. Soil Pr, k/ft^2	Allow. Soil Pr, k/ft^2
1	0.00	110	1.00	1.00	0.02	0.15	8.67
2	1.80	120	0.70	2.52	0.02	0.13	9.71
3	3.60	130	0.44	3.53	0.01	0.11	10.74
4	5.40	140	0.23	4.10	0.01	0.09	11.77
5	7.20	150	0.06	4.30	0.01	0.07	12.81
6	9.00	160	-0.07	4.22	0.00	0.05	13.84
7	10.80	170	-0.16	3.93	0.00	0.03	14.88
8	13.00	183	-0.22	3.40	0.00	0.02	16.14
9	14.40	201	-0.25	2.92	0.00	0.01	10.92
10	16.20	225	-0.25	2.30	0.00	0.00	12.19
11	18.00	249	-0.23	1.72	0.00	-0.01	13.46
12	19.80	274	-0.20	1.20	0.00	-0.01	14.72
13	21.60	298	-0.16	0.78	0.00	-0.01	15.99
14	23.00	316	-0.13	0.51	0.00	-0.01	16.98
15	25.20	343	-0.09	0.20	0.00	-0.01	21.34
16	27.00	365	-0.06	0.03	0.00	-0.01	22.80
17	28.80	387	-0.04	-0.07	0.00	-0.01	24.27
18	30.60	409	-0.02	-0.13	0.00	-0.01	25.74
19	32.40	431	0.00	-0.15	0.00	0.00	27.20
20	34.20	453	0.00	-0.15	0.00	0.00	28.67
21	36.00	475	0.01	-0.13	0.00	0.00	30.13
22	37.80	496	0.01	-0.10	0.00	0.00	31.60
23	39.60	518	0.01	-0.08	0.00	0.00	33.06
24	42.00	548	0.01	-0.05	0.00	0.00	35.02
25	43.20	534	0.01	-0.04	0.00	0.00	43.82
26	45.00	513	0.01	-0.03	0.00	0.00	45.01
27	46.80	492	0.01	-0.02	0.00	0.00	46.21
28	48.60	471	0.00	-0.01	0.00	0.00	47.40
29	50.40	450	0.00	-0.01	0.00	0.00	48.59
30	52.20	430	0.00	0.00	0.00	0.00	49.79
31	54.00	409	0.00	0.00	0.00	0.00	50.98
32	55.80	388	0.00	0.00	0.00	0.00	52.17
33	57.60	367	0.00	0.00	0.00	0.00	53.37
34	59.40	346	0.00	0.00	0.00	0.00	54.56
35	62.00	316	0.00	0.01	0.00	0.00	56.28
36	63.00	332	0.00	0.01	0.00	0.00	85.43
37	64.80	361	0.00	0.01	0.00	0.00	87.12
38	66.60	389	0.00	0.01	0.00	0.00	88.82
39	68.40	418	0.00	0.00	0.00	0.00	90.51
40	70.20	446	0.00	0.00	0.00	0.00	92.21
41	72.00	475	0.00	0.00	0.00	0.00	93.91

# Lateral Charts



## References:

1. "Steel Construction Manual", 15th Ed, AISC, 2017
2. "ACI 318-14 Building Code Requirements for Structural Concrete", ACI, 2014
3. "2018 International Building Code", ICC, 2018
4. "Foundation Analysis and Design", 5th Ed., J.E. Bowles, 1996
5. "Foundation Settlement Analysis - Practice VS Research", H.G. Poulos, 8th Spencer J. Buchanan Lecture, 2000.
6. "Roark's Formulas for Stress and Strain", 7th Ed., W.C. Young & R.G. Budynas, 2002
7. "Engineering Design in Geotechnics" , F. Azizi, 2nd Ed, 2013
8. "Pile Design & Construction", Tomlinson & Woodward, 5th ed, 2007.
9. "Foundation Design: Principles & Practices", 3rd Ed., Coduto, Kitch, Yeung, 2015
10. "Tall Building Foundation Design", Harry G. Poulos, 1st Ed, 2017
11. "Steel H Piles", Handbook 2196, Bethlehem Steel, 1965
12. Driven Pile Professional v1.0.0 Software by SoilStructure.com