
APILE for Windows, Version 2023.10.2

Serial Number : 158112091

A Program for Analyzing the Axial Capacity
and Short-term Settlement of Driven Piles
under Axial Loading.

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Ensoft

Austin, TX, USA

Path to file locations : C:\Ensoft\Apile2023-Examples\

Name of input data file : Example 1 - Steel Pipe Pile in Sand and Clay.ap10d

Name of output file : Example 1 - Steel Pipe Pile in Sand and Clay.ap10o

Name of plot output file : Example 1 - Steel Pipe Pile in Sand and Clay.ap10p

Date: August 15, 2023 Time: 14:04:49

Input Information

DESIGNER : Ensoft

JOB NUMBER : 05-01-2018

METHOD FOR UNIT LOAD TRANSFERS :

- API RP 2A (American Petroleum Institute)

Unfactored Unit Side Friction and Unit Side Resistance are used.

COMPUTATION METHOD(S) FOR PILE CAPACITY :

- FHWA (Federal Highway Administration)

- USACE (U.S. Army Corps of Engineers)

Critical Depth Method for Sand:

10 to 20 Pile Diameter based on the Density

- Revised Lambda

- API RP 2A (American Petroleum Institute)

TYPE OF LOADING :

- COMPRESSION

PILE TYPE :
Steel pipe pile or non-tapered portion of monotube pile
- Open-Ended Pile

AVERAGE DEPTH TO ESTIMATE TIP RESISTANCE:
- USE 1.5 DIAMETERS ABOVE AND BELOW TIP

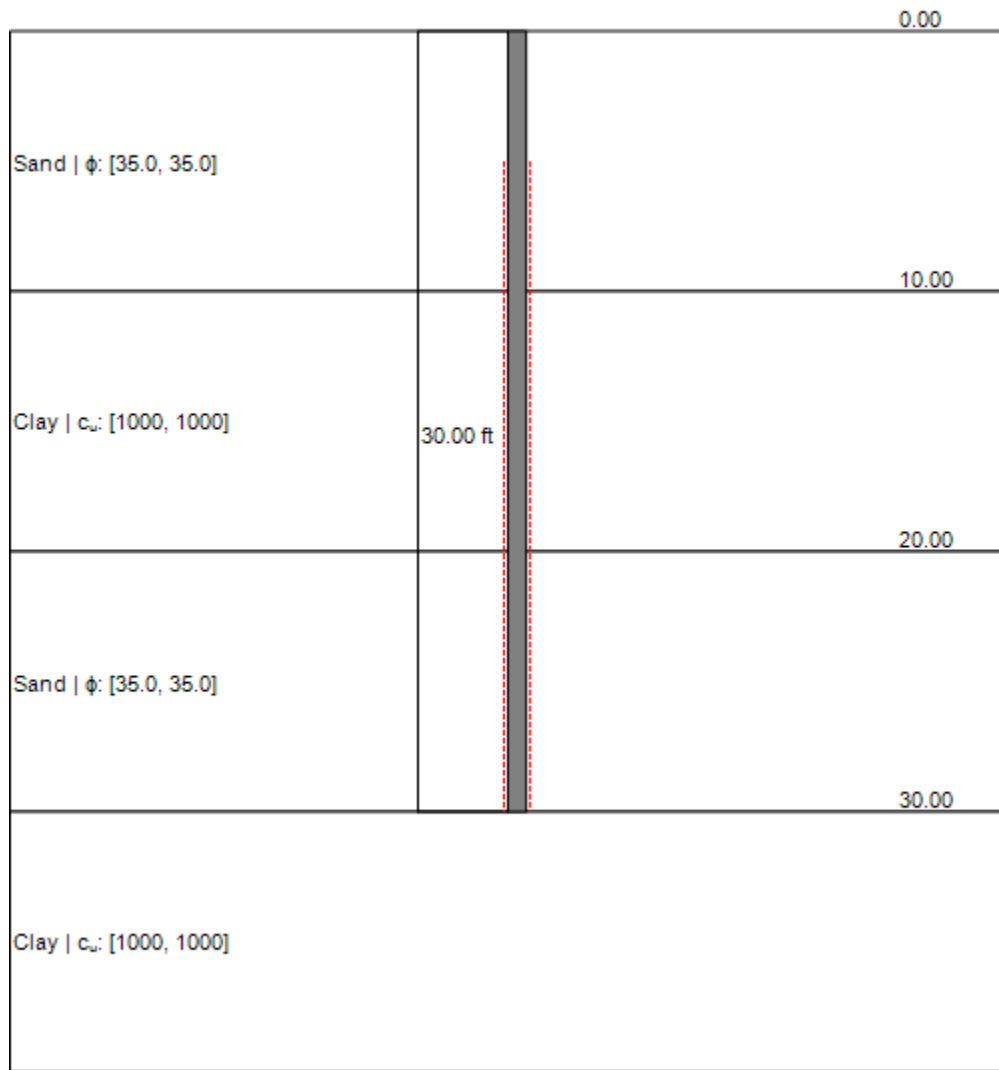


Figure 1 - Pile Model

Table 1 - Pile Properties

Pile Type	- Open-Ended Pile
Outside Diameter	10.00 IN.
Internal Diameter	9.00 IN.
Total Pile Length	30.00 FT.
Batter Angle	0.00 DEG
Pile Stickup Length	0.00 FT.
Zero Friction Length	5.00 FT.
Elastic Modulus	0.290E+08 PSI
Cross Section Area	14.92 IN ²

Table 2 - Soil layer information. Single asterisk (*) indicates values assumed by APILE, and double asterisks (**) indicates values estimated by the software based on friction angle

DEPTH FT.	SOIL TYPE	LATERAL EARTH PRESSURE	EFFECTIVE UNIT WEIGHT LB/FT ³	FRICTION ANGLE DEGREES	BEARING CAPACITY FACTOR	Nq FACTOR FHWA	Nq FACTOR ARMY C.
0.00	SAND	0.80	60.00	35.00	40.00	64.00**	49.50**
10.00	SAND	0.80	60.00	35.00	40.00	64.00**	49.50**
10.00	CLAY	0.80*	50.00	0.00	8.00**	4.80**	1.00**
20.00	CLAY	0.80*	50.00	0.00	8.00**	4.80**	1.00**
20.00	SAND	0.80	60.00	35.00	40.00	64.00**	49.50**
30.00	SAND	0.80	60.00	35.00	40.00	64.00**	49.50**
30.00	CLAY	0.80*	50.00	0.00	8.00**	4.80**	1.00**
40.00	CLAY	0.80*	50.00	0.00	8.00**	4.80**	1.00**

Computational Results

An asterisk (*) is placed in the end-bearing column if the tip resistance is controlled by the friction of soil plug inside an open-ended pipe pile.

Table 3 - FED. HWY. METHOD

PILE LENGTH BELOW GND. FT.	SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
0.00	0.0	0.0	0.0
1.00	0.0	0.3	0.3
2.00	0.0	0.5	0.5
3.00	0.0	0.8	0.8
4.00	0.0	1.1	1.1
5.00	0.1	1.4	1.4
6.00	0.2	1.6	1.8

7.00	0.3	1.9	2.2
8.00	0.5	2.2	2.6
9.00	0.7	2.4	3.1
10.00	0.9	2.7	3.6
11.00	2.3	0.9	3.2
12.00	4.9	0.9	5.8
13.00	7.5	0.9	8.4
14.00	10.1	0.9	11.1
15.00	12.8	0.9	13.7
16.00	15.4	0.9	16.3
17.00	18.0	0.9	18.9
18.00	20.6	0.9	21.5
19.00	23.2	0.9	24.2
20.00	25.8	0.9	26.8
21.00	27.4	5.2	32.6
22.00	27.8	5.5	33.3
23.00	28.2	5.8	34.0
24.00	28.7	6.0	34.7
25.00	29.2	6.3	35.5
26.00	29.7	6.6	36.3
27.00	30.2	6.9	37.1
28.00	30.8	7.1	37.9
29.00	31.4	7.4	38.8
30.00	32.0	7.7	39.6

Table 4 - ARMY CORPS METHOD

PILE LENGTH BELOW GND. FT.	SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
0.00	0.0	0.0	0.0
1.00	0.0	0.3	0.3
2.00	0.0	0.6	0.6
3.00	0.0	0.9	0.9
4.00	0.0	1.2	1.2
5.00	0.2	1.5	1.8
6.00	0.8	1.8	2.6
7.00	1.4	2.2	3.6
8.00	2.1	2.5	4.6
9.00	3.0	2.8	5.7
10.00	3.9	3.1	7.0
11.00	5.3	0.9	6.3
12.00	7.3	0.9	8.2
13.00	9.3	0.9	10.2
14.00	11.2	0.9	12.2
15.00	13.2	0.9	14.1
16.00	15.2	0.9	16.1

17.00	17.1	0.9	18.1
18.00	19.1	0.9	20.0
19.00	21.0	0.9	22.0
20.00	23.0	0.9	23.9
21.00	24.6	3.7	28.3
22.00	25.7	3.7	29.5
23.00	26.9	3.7	30.6
24.00	28.1	3.7	31.8
25.00	29.3	3.7	33.0
26.00	30.4	3.7	34.1
27.00	31.6	3.7	35.3
28.00	32.8	3.7	36.5
29.00	33.9	3.7	37.7
30.00	35.1	3.7	38.8

Table 5 - LAMBDA 2 METHOD

PILE LENGTH BELOW GND. FT.	SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
0.00	0.0	0.0	0.0
1.00	0.0	0.2	0.2
2.00	0.0	0.5	0.5
3.00	0.0	0.7	0.7
4.00	0.0	1.0	1.0
5.00	0.0	1.2	1.2
6.00	1.1	1.5	2.6
7.00	1.7	1.7	3.4
8.00	2.3	2.0	4.2
9.00	2.9	2.2	5.2
10.00	5.5	2.5	8.0
11.00	7.7	0.9	8.6
12.00	9.8	0.9	10.7
13.00	11.9	0.9	12.8
14.00	13.9	0.9	14.8
15.00	15.9	0.9	16.9
16.00	17.9	0.9	18.9
17.00	19.9	0.9	20.9
18.00	21.9	0.9	22.8
19.00	23.9	0.9	24.8
20.00	25.8	0.9	26.8
21.00	27.3	4.8	32.1
22.00	28.9	5.1	33.9
23.00	30.5	5.3	35.8
24.00	32.2	5.6	37.7
25.00	33.9	5.8	39.7
26.00	35.7	6.1	41.8

27.00	37.6	6.3	43.9
28.00	39.4	6.5	46.0
29.00	41.4	6.8	48.2
30.00	43.4	7.0	50.4

Table 6 - API RP-2A (2010)

PILE LENGTH BELOW GND. FT.	SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
0.00	0.0	0.0	0.0
1.00	0.0	0.2	0.2
2.00	0.0	0.5	0.5
3.00	0.0	0.7	0.7
4.00	0.0	1.0	1.0
5.00	0.2	1.2	1.4
6.00	0.6	1.5	2.1
7.00	1.1	1.7	2.8
8.00	1.6	2.0	3.6
9.00	2.2	2.2	4.5
10.00	2.9	2.5	5.4
11.00	3.9	0.9	4.8
12.00	5.0	0.9	6.0
13.00	6.2	0.9	7.2
14.00	7.5	0.9	8.4
15.00	8.7	0.9	9.7
16.00	10.0	0.9	10.9
17.00	11.3	0.9	12.2
18.00	12.6	0.9	13.5
19.00	13.9	0.9	14.8
20.00	15.3	0.9	16.2
21.00	16.6	4.8	21.5
22.00	18.1	5.1	23.1
23.00	19.6	5.3	24.9
24.00	21.2	5.6	26.7
25.00	22.8	5.8	28.6
26.00	24.6	6.1	30.6
27.00	26.4	6.3	32.7
28.00	28.2	6.5	34.8
29.00	30.2	6.8	37.0
30.00	32.2	7.0	39.3

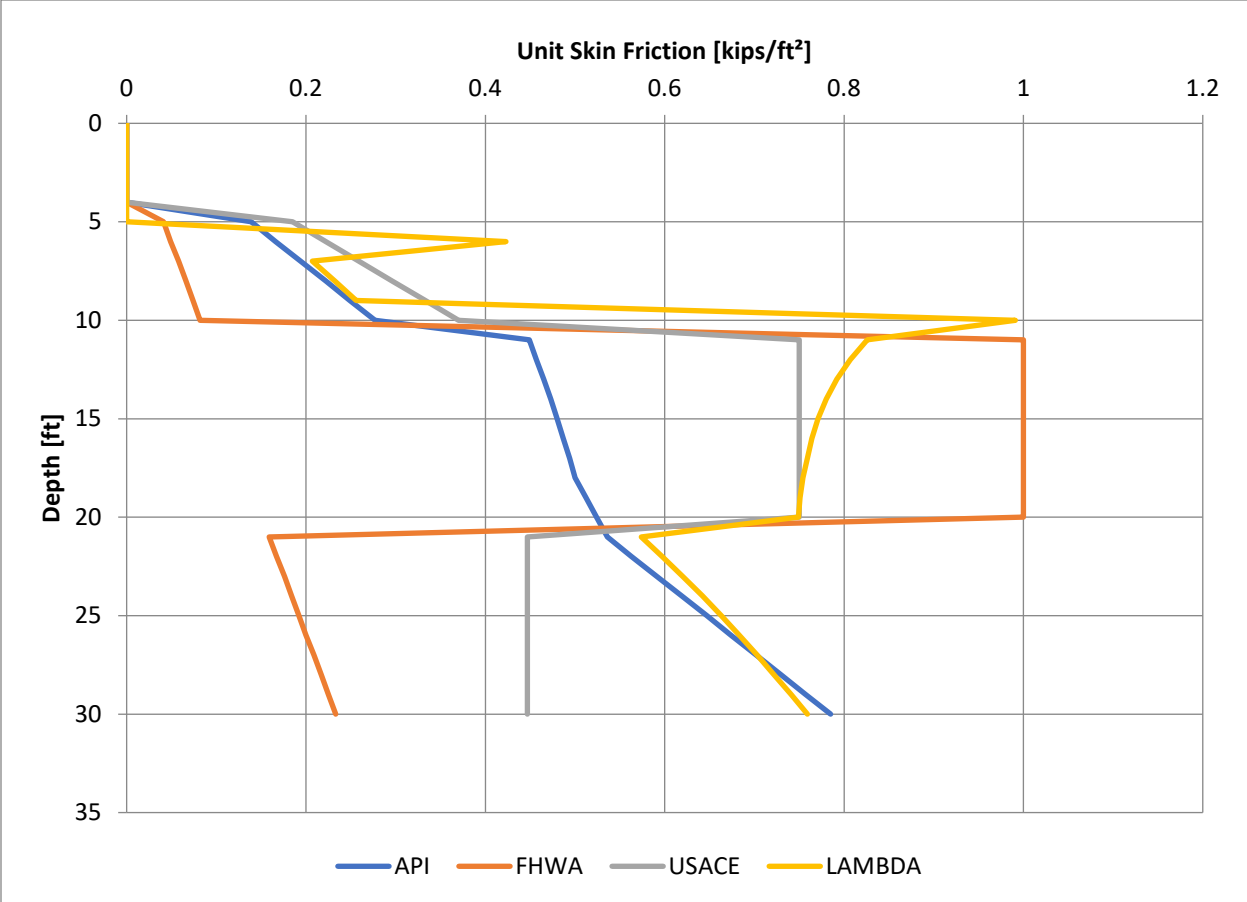


Figure 2 - Unit Skin Friction

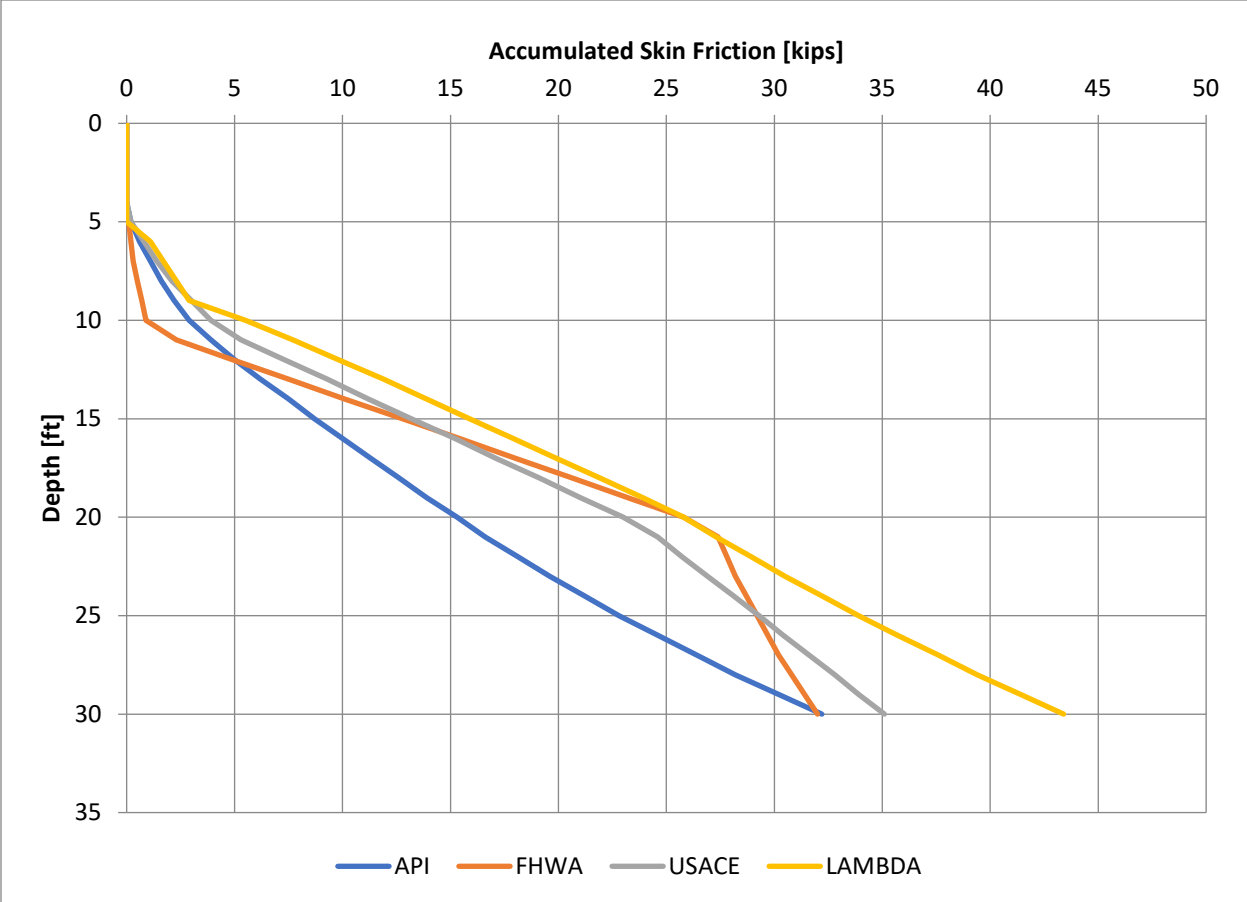


Figure 3 - Accumulated Skin Friction



Figure 4 - Tip Resistance

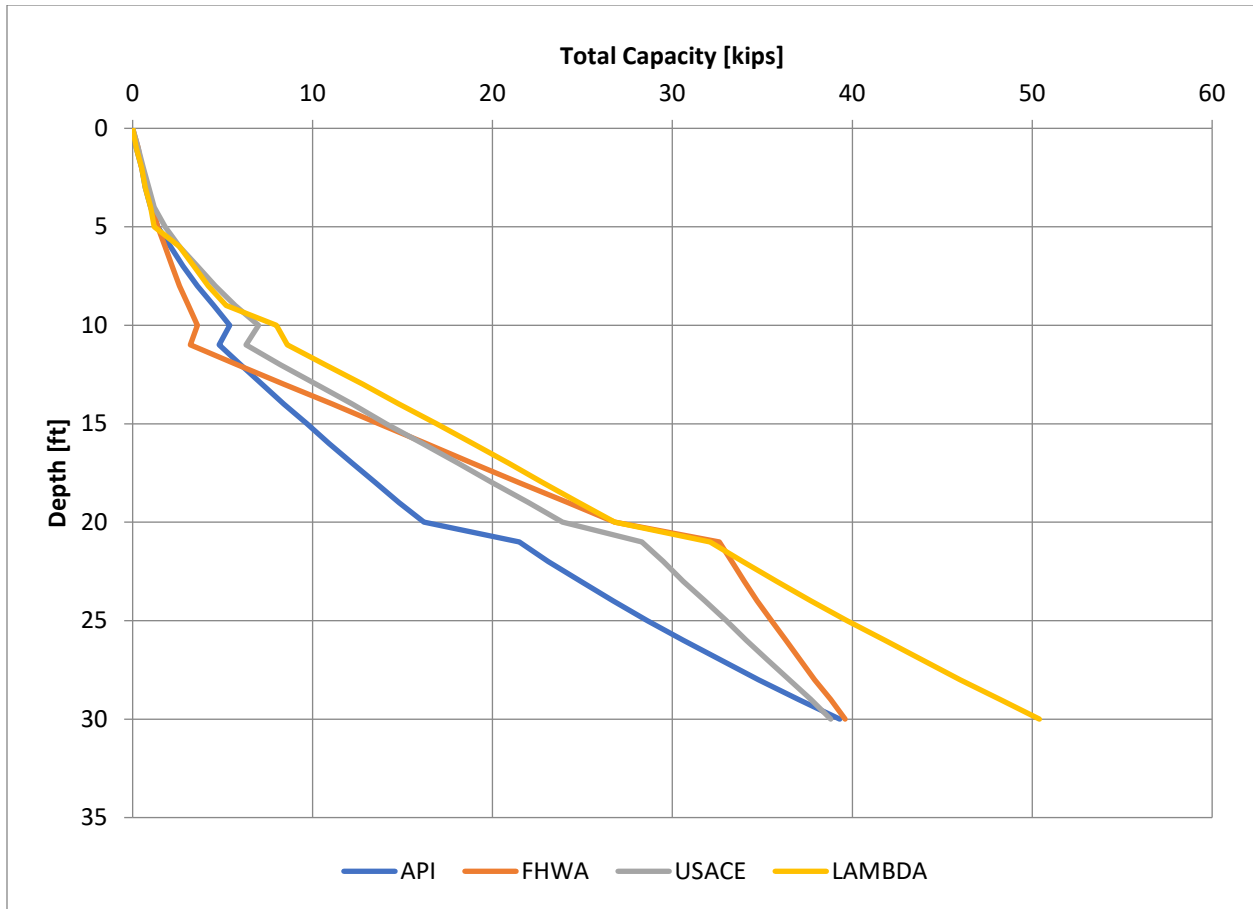


Figure 5 - Total Capacity

Tz Curves

Table 7 - TZ Curve at 0.042 ft

Load Transfer, psf	Pile Movement, in
0.00E+000	0.00E+000
0.00E+000	1.60E-002
0.00E+000	3.10E-002
0.00E+000	5.70E-002
0.00E+000	8.00E-002
0.00E+000	1.00E-001
0.00E+000	2.00E-001
0.00E+000	3.00E-001
0.00E+000	5.00E-001
0.00E+000	2.00E+000

Table 8 - TZ Curve at 5.000 ft

Load Transfer, psf	Pile Movement, in
0.00E+000	0.00E+000
2.89E-001	1.60E-002

4.81E-001	3.10E-002
7.22E-001	5.70E-002
8.66E-001	8.00E-002
9.62E-001	1.00E-001
9.62E-001	2.00E-001
9.62E-001	3.00E-001
9.62E-001	5.00E-001
9.62E-001	2.00E+000

Table 9 - TZ Curve at 9.958 ft

Load Transfer, psf	Pile Movement, in
0.00E+000	0.00E+000
5.75E-001	1.60E-002
9.58E-001	3.10E-002
1.44E+000	5.70E-002
1.73E+000	8.00E-002
1.92E+000	1.00E-001
1.92E+000	2.00E-001
1.92E+000	3.00E-001
1.92E+000	5.00E-001
1.92E+000	2.00E+000

Table 10 - TZ Curve at 10.040 ft

Load Transfer, psf	Pile Movement, in
0.00E+000	0.00E+000
5.92E-001	1.60E-002
9.87E-001	3.10E-002
1.48E+000	5.70E-002
1.78E+000	8.00E-002
1.97E+000	1.00E-001
1.78E+000	2.00E-001
1.78E+000	3.00E-001
1.78E+000	5.00E-001
1.78E+000	2.00E+000

Table 11 - TZ Curve at 15.000 ft

Load Transfer, psf	Pile Movement, in
0.00E+000	0.00E+000
1.00E+000	1.60E-002
1.67E+000	3.10E-002
2.50E+000	5.70E-002
3.00E+000	8.00E-002
3.33E+000	1.00E-001

3.00E+000	2.00E-001
3.00E+000	3.00E-001
3.00E+000	5.00E-001
3.00E+000	2.00E+000

Table 12 - TZ Curve at 19.960 ft

Load Transfer, psf	Pile Movement, in
0.00E+000	0.00E+000
1.09E+000	1.60E-002
1.82E+000	3.10E-002
2.73E+000	5.70E-002
3.27E+000	8.00E-002
3.64E+000	1.00E-001
3.27E+000	2.00E-001
3.27E+000	3.00E-001
3.27E+000	5.00E-001
3.27E+000	2.00E+000

Table 13 - TZ Curve at 20.040 ft

Load Transfer, psf	Pile Movement, in
0.00E+000	0.00E+000
1.09E+000	1.60E-002
1.82E+000	3.10E-002
2.73E+000	5.70E-002
3.28E+000	8.00E-002
3.65E+000	1.00E-001
3.65E+000	2.00E-001
3.65E+000	3.00E-001
3.65E+000	5.00E-001
3.65E+000	2.00E+000

Table 14 - TZ Curve at 25.000 ft

Load Transfer, psf	Pile Movement, in
0.00E+000	0.00E+000
1.35E+000	1.60E-002
2.25E+000	3.10E-002
3.37E+000	5.70E-002
4.04E+000	8.00E-002
4.49E+000	1.00E-001
4.49E+000	2.00E-001
4.49E+000	3.00E-001
4.49E+000	5.00E-001
4.49E+000	2.00E+000

Table 15 - TZ Curve at 29.960 ft

Load Transfer, psf	Pile Movement, in
0.00E+000	0.00E+000
1.63E+000	1.60E-002
2.72E+000	3.10E-002
4.08E+000	5.70E-002
4.90E+000	8.00E-002
5.45E+000	1.00E-001
5.45E+000	2.00E-001
5.45E+000	3.00E-001
5.45E+000	5.00E-001
5.45E+000	2.00E+000

Table 16 - TZ Curve at 30.040 ft

Load Transfer, psf	Pile Movement, in
0.00E+000	0.00E+000
1.64E+000	1.60E-002
2.73E+000	3.10E-002
4.09E+000	5.70E-002
4.91E+000	8.00E-002
5.45E+000	1.00E-001
4.91E+000	2.00E-001
4.91E+000	3.00E-001
4.91E+000	5.00E-001
4.91E+000	2.00E+000

Table 17 - TZ Curve at 35.000 ft

Load Transfer, psf	Pile Movement, in
0.00E+000	0.00E+000
1.64E+000	1.60E-002
2.73E+000	3.10E-002
4.09E+000	5.70E-002
4.91E+000	8.00E-002
5.45E+000	1.00E-001
4.91E+000	2.00E-001
4.91E+000	3.00E-001
4.91E+000	5.00E-001
4.91E+000	2.00E+000

Table 18 - TZ Curve at 39.960 ft

Load Transfer, psf	Pile Movement, in
0.00E+000	0.00E+000
1.64E+000	1.60E-002
2.73E+000	3.10E-002
4.09E+000	5.70E-002
4.91E+000	8.00E-002
5.45E+000	1.00E-001
4.91E+000	2.00E-001
4.91E+000	3.00E-001
4.91E+000	5.00E-001
4.91E+000	2.00E+000

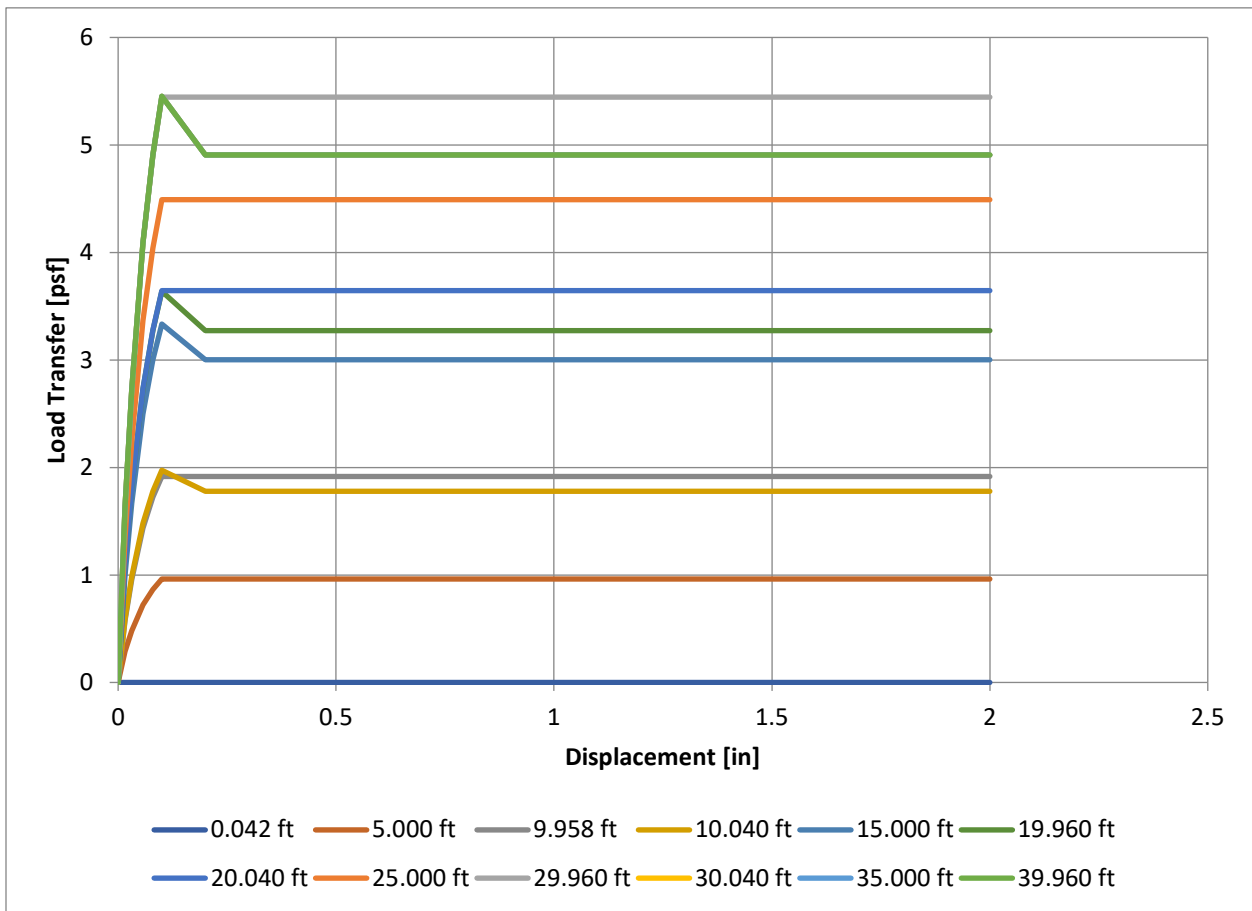


Figure 6 - TZ Graph