



October 21, 2019, Revision 2, November 14, 2019

Project No. 17-0822

Ms. Allison Coburn, Facilities Project Manager  
Facility Planning, District Construction and Support Services  
2323 North Broadway, Suite 112  
Santa Ana, California, 92706-1640

**SUBJECT: Response to DSA Comments for Santa Ana College  
New Health Science Building  
1530 W. 17<sup>th</sup> Street, Santa Ana, CA 92706**

Dear Ms. Coburn:

This report is in response to Division of State Architect (DSA) comments that were provided by HGA Architects. The reviewer asked for additional information or clarification as outlined on the Structural Plans, S121 and S201, and Civil Plan C 1.30. The review comments are presented first, followed by our response.

*Comment 1: Geotechnical Engineer to clarify why there is a discrepancy for historic water table of 36' vs. 24' as noted below:*

- a. *Health Sciences Building: water table is identified at 36' (surface elevation = 100) per Borings B-1 and B-2. Project No. 17-0822 (Koury Engineering and Testing, Inc.).*
- b. *Stem Building: water table is identified at 24' (surface elevation = 103) per borings CS-1 and CS-2. Project No. 60145101 (Terracon Consultants).*

**Response to Comment 1:** Koury encountered groundwater at a depth of 49½ feet below ground surface in Boring B-2. No groundwater was encountered for Boring B-1 to the maximum depth of 56½ feet. Koury's Cone Penetration Tests CPT-1 through CPT-3 indicate groundwater at depth of about 49½ feet. Koury's liquefaction analyses utilized a historic high groundwater level of 36 feet below the ground surface based on the Seismic Hazard Zone Report for the Anaheim and Newport Beach 7.5-Minute Quadrangles. The historic groundwater depth is defined by the "state".

Terracon reported that groundwater was observed only in Boring B-1 at a depth of about 24 feet below ground surface. Terracon reported that the shallow groundwater at Boring B-1 is an indication of perched water. Perched water does not have to be utilized as historic high groundwater.

**Comment 2:** *The liquefiable layers are not uniform on the footprint of the building based on borings B-1, B-2, CS-1 and CS-2. How can we verify what liquefaction zones are directly below the piles? Is there a weighted average that can be applied across the footprint of the building?*

- a) *Revise Table 2 from geotechnical report (page 19 of 33) to ignore end bearing and skin friction in liquefiable layers per the CGS approval. It is permitted to reduce skin friction capacity by a constant factor to be applied to revised Table 2 capacity values.*
- b) *Design for post liquefaction event for gravity loads, unless the Geotechnical engineer deems the piles need to be designed for seismic event during the process of liquefaction with losses in end bearing and skin friction in liquefiable layers. EOR to revise calculations based on revised Table 2 from Geotechnical Engineer*

**Response to Comment 2:** The liquefaction analyses are based on Koury’s Borings and CPTs. The intent was to check each boring and CPT to verify that the liquefiable layers have been accounted for. With the request of deeper pile tips to account for the pile cap and floor thickness, we elected to neglect the tip resistance in all the analyses. We also neglected the skin friction between piles and soil where the piles penetrate layers of significant liquefiable zones. Table 2 from the geotechnical report was revised as indicated below. These analyses are in conformance with CGS approval.

The worst condition occurs during liquefaction since the load is higher and some of the side friction and end bearing are neglected. Following liquefaction, the pore water pressure will dissipate and some of the end bearing and friction resistance will be restored.

The revised analyses with the new pile cap thickness and pile lengths are attached. Depending on the floor thickness and pile cap thickness, the friction within the upper 4½ to 8½ feet from finish floor was ignored in the analyses. Table 2A, inserted as part of Attachment 1, summarizes the side resistance, the ultimate capacities up and down, and the calculated safety factors during the design seismic event.

**Table 2 – Revised Summary of CIDH Pile Axial Capacities**

Pile Diameter (inch)	Pile Tip Depth (ft)	Design Pile Length (ft)	Allowable Capacity (kips)	
			Compression	Uplift
30	49	42-44	130	65
30	54	47.5-50	150	75
30	60+	53.5-55.5	165	82
30	60	53.5	170	85
30	65+	58-60.5	180	90

Notes: Pile tip depth is measured from the finish floor elevation 0’0”. Where the pile cap is between 5 and 6½ feet below the existing ground surface, the vertical pile capacities should be reduced by 5 kips. The allowable capacities and the corresponding safety factors during liquefaction are shown in Table 2A. Without liquefaction, the piles will have higher capacity due to additional resistance from end bearing and side friction without liquefaction layers. These capacities are not provided since they are higher than those provided.

**Comment 3:** *Geotechnical engineer to clarify how the weight of the superstructure, pile cap and pile weight is supported on the compression side (Downward) when there is no end bearing capacity for scenarios discussed above.*

**Response 3:** During liquefaction, when the end bearing capacity decreases, the pile is supported by skin friction above the liquefaction zone or in between liquefaction zones.

**Comment 4:** *Geotechnical engineer to revise statement on page 19 of 33 of report to state that pile weight has already been taken into account for uplift capacity. See ALLPILE analysis where mass has been taken into account on sheet S121.*

**Response 4:** The statement on Page 19 of 33 of the Geotechnical report should state that the pile weight has already been considered in the uplift capacities indicated in Table 2.

**Comment 5:** *Apply 30% crack factor per ACI 318-14, Table 6.6.3.1 (a) to Table 3 of geotechnical report. Comment refers to moment of inertia (I) used in the ALLPile Analysis, which is provided by the geotechnical report. Please adjust the response. The intent is to use 0.7I in the analysis instead of full I. Not sure if it will change the axial capacities.*

**Response 5:** We applied a cracked factor of 30 percent in ALLPile analyses and no change occurred. The moment of inertia is used to calculate the lateral capacities of piles, not the geotechnical vertical capacities of piles. For axially loaded piles, ALLPile does not account for inertia (I) and crack factor for analysis, even though the values are provided as an input in the software.

**Comment 6:** *Geotechnical Engineer to clarify if the engineered fill must extend to the bottom of the pile cap for the lateral resistance at the pile cap as discussed on page 21 of the report.*

**Response 6:** Page 12 of the geotechnical report recommends overexcavating 3½ feet below the slab on grade or 3½ feet below the existing ground surface, whichever is greater, and to remove all undocumented fill. Based on the passive pressure recommended, no additional overexcavation is recommended to extend the overexcavation below the pile cap unless the soils get disturbed during pile installation or unexpected soft/wet conditions are encountered during construction.

**Comment 7:** *Geotechnical Engineer to justify the lateral pile capacity of these 2 pile caps in the east direction due to the proximity of existing 60" diameter metal pipe (Existing 60" infiltration corrugated metal pipe). Is this pipe in a vault or encased in concrete?*

**Response 7:** The pipe is not in a vault or encased in concrete. Reference is made to the Rough Grading Plan, Drawing C 1.30 with one pile cap (2 piles, Grid A8) located in the southeast corner of the of the building and a second pile cap (3 piles, Grid C8) located along the east perimeter of the building and about 52 feet north of the southeast corner. This second pile cap has a proposed minimum distance of 13½ feet from the 60" diameter metal pipe and the supporting piles are located about 6.5 diameters and 8+ diameters away from the metal pipe.

For the second pile cap, based on the data provided by the Structural Engineer, the lateral demand on each pile is 33 kips, which is less than one half the capacity of the pile. Based on the distance from the metal pipe, it is our opinion that pile lateral loading will not affect the pipe.

In the southeast corner of the building, there is a proposed CDS Unit located about 3½ feet east of the pile cap and 5 feet west of the 60” metal infiltration pipe. The pile cap is located about 18 feet from the metal pipe. During the design seismic event, the pile cap and the piles should be anticipated to push on the CDS Unit, which in turn may transmit lateral loading to the metal pipe.

As a solution, we recommend adding two piles to the pile cap. The four-pile cap configuration of line C7 may be used at the discretion of the Structural Engineer. The CDS Unit should be backfilled with 3-sack sand cement slurry. The CDS Unit should be designed to resist the soil passive pressure.

*Comment 8: Do we need to add weight of pile cap to the column load for compression? If we have to add, can we consider net weight (=concrete weight – displaced soil weight)?*

**Response 8:** The pile cap weight should be added to the column load. It is acceptable to consider the pile cap net weight (concrete weight minus displaced soil weight) for compression, and the pile cap full weight (concrete weight plus side friction at the perimeter of the pile cap) for tension.

*Comment 9: Please note that in reference to DSA comments on S012, DSA is asking if the numbers provided in the report of pile lateral capacities are ultimate or allowable?*

**Response 9:** Although Table 3 calls for allowable lateral capacities for CIDH piles, the values provided are ultimate for any given displacement.

*Comment 10: Geotechnical Engineer to clarify how tie beam is braced for slenderness effects between pile caps.*

**Response 10:** The proposed tie beam is located 2 to 4 feet below the finished surface. The soil will provide a bracing effect on four sides of the tie beam and the floor load will provide an additional restrictive effect on top of the tie beam. The Structural Engineer should determine if the bracing effects of the soil and floor load are sufficient to prevent damage/buckling to the tie beam. The soil passive pressure may be used in the horizontal direction and a vertical bearing resistance of 1500 psf may be used in the vertical downward direction. The soil weight and floor load may be used above the grade beam.

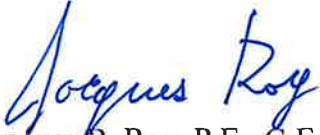
### **Pile Lateral Capacities with Over Strength Factor**

At the request of DSA, the Project Structural Engineer provided the ultimate pile demands with over strength factor of 2 for L Pile analysis. Two cases were considered; Case 1 called for a maximum compression load of 390 kips, a maximum tension load of 164 kips and a shear load of 84 kips. For Case 2, a maximum compression load of 385 kips, a maximum tension load of 226 kips and a shear load of 106 kips were considered. For both cases, a concrete compressive strength of 4000 psi along nine # 11 bars were utilized in the analyses for fixed head conditions. The results of analysis and graphic showing the plots of deflection, moment and shear versus depth are included in attachment 2.

Should you have any questions concerning this submittal, please call our office.

Respectfully submitted,

Koury Engineering & Testing, Inc.



Jacques B. Roy, P.E., G.E.

Principal Geotechnical Engineer



Distribution: 1. Addressee (a pdf copy via e-mail)  
2. File (B)

Enclosures: 1. Attachment 1, AllPILE Output (18 pages)  
2. Attachment 2, LPILE Output (46 pages)

# **ATTACHMENT 1**

ALLPILE Output

**Table 2A- Breakdown of Piles Capacity & Ultimate Resistance During Earthquake**

Based on Soil Profile Boring B-2 (Worse Case)			Capacity from ALLPILE Analysis				Project #: 17-0822		
30-in Pile Depth (ft)	Side Friction Ignored from - to Elevation (ft)	Ultimate Capacity Down (kips)	Ultimate Capacity Up (kips)	Side Resistance Down (Kips)	Side Resistance Up (Kips)	Safety Factor Down	Safety Factor Up	Allowable Capacity Compression (Kips)	Allowable Capacity Uplift (Kips)
49	0 - 6.5 & 36 - 38	217.7	247.0	217.7	214.7	1.26 * 1.33 = 1.6758	2.48 * 1.33 = 3.2984	130.00	65.00
54	0 - 7 & 36 - 38	243.3	274.8	243.3	240.4	1.22 * 1.33 = 1.6226	2.41 * 1.33 = 3.2053	150.00	75.00
60	0 - 8 & 36 - 38	272.3	306.8	272.3	269.8	1.24 * 1.33 = 1.6492	2.47 * 1.33 = 3.2851	165.00	82.00
65	0 - 8.5 & 36 - 38	291.7	327.9	291.7	289.2	1.22 * 1.33 = 1.6226	2.41 * 1.33 = 3.2053	180.00	90.00

Based on Soil Profile CPT-2 (Worse Case)			Capacity from ALLPILE Analysis						
30-in Pile Depth (ft)	Side Friction Ignored from - to Elevation (ft)	Ultimate Capacity Down (kips)	Ultimate Capacity Up (kips)	Side Resistance Down (Kips)	Side Resistance Up (Kips)	Safety Factor Down	Safety Factor Up	Allowable Capacity Compression (Kips)	Allowable Capacity Uplift (Kips)
49	0 - 6.5 & 36 - 40	206.4	235.7	206.4	203.4	1.19 * 1.33 = 1.5827	2.35 * 1.33 = 3.1255	130.00	65.00
54	0 - 7 & 36 - 40	232.6	264.1	232.6	229.7	1.16 * 1.33 = 1.5428	2.30 * 1.33 = 3.0590	150.00	75.00
60	0 - 6 & 48 - 50 & 54 - 60	249.9	283.5	249.9	246.5	1.14 * 1.33 = 1.5162	2.26 * 1.33 = 3.0058	165.00	82.00
60	0 - 4.5 & 48 - 50 & 54 - 60	263.9	297.2	263.9	260.2	1.16 * 1.33 = 1.5428	2.30 * 1.33 = 3.0590	170.00	85.00
65	0 - 8.5 & 48 - 50 & 54 - 60	272.0	308.0	272.0	269.3	1.13 * 1.33 = 1.5029	2.25 * 1.33 = 2.9925	180.00	90.00

**General Note:**

Zero end bearing was used for all piles

Ultimate Capacity Up = Side Resistance Up + Pile Weight

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 VERTICAL ANALYSIS SUMMARY OUTPUT  
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 Date: 10/22/2019 File: G:\Projects\2017\17-0822 Russell Hall Replacement Project Soils Investigation\Soils Folder\Soils Reports-Certificates\Mehrab Draft\Response to CGS-Pile\Per Jacques\B-2\Pile-B-2-30in-49ft Rev Oct 2019-Seismic.alp

Title 1: 17-0822-Russel Hall Replacement  
 Title 2: Deep Foundation Calculation

ALLPILE INPUT DATA:

\* Pile Type Page \*

Unit: English  
 Diameter more than 24in (61cm). For bell section, select "Belled" in Diameter Variation (Pile Section Screen, Item 4). Recommendation: 2 to 4 in Item 3 of Page F.  
 Pile Type: Drilled Shaft (dia >24 in. or 61 cm)

\* Pile Profile \*

Foundation Depth: 49.0 -ft  
 Top Height: 0.0 -ft  
 Slope Angle: 0  
 Pile Angle: 0.0

\* Pile Properties \*

Zs -ft	Width -in	Area -in <sup>2</sup>	Perim. -in	I -in <sup>4</sup>	E -kp/i <sup>2</sup>	Weight -kp/f	Mix* %	Out Side	In Side	Other Par.	Type
0.0	30	706.9	94.2	39760.8	3000	0.736	0.0	3	3	30	Concrete (rough)
49.0	30	706.9	94.2								Pile Tip

Note: Mix = % of Inside material/Outside material

Group Type: 0  
 Top Type: 1

Water Table: 36.5 -ft  
 No Elevation Input

\* Soil Properties \*

Zs -ft	Gamma -lb/f <sup>3</sup>	Phi o	C -kp/f <sup>2</sup>	K -lb/i <sup>3</sup>	E50/Dr - %	Nspt	Type	Soil
0.0	126.6	15	0.33	222.9	1.00	8	1	Soft Clay
5.0	128.7	30	0.2	290.1	0.90	10	3	Silt (Phi + C)
7.5	124.0	20	0.46	166.5	1.11	7	1	Soft Clay
10.0	127.1	20	0.46	236.2	0.98	8	1	Soft Clay
16.0	132.0	32	0.26	584.7	0.67	16	3	Silt (Phi + C)
17.5	130.8	20	0.53	407.0	0.78	12	1	Soft Clay
36.5	66.9	32	0.26	317.7	0.87	10	3	Silt (Phi + C)
40.0	63.8	20	0.53	214.1	1.01	8	1	Soft Clay
45.5	75.6	31.0	0.15	97.1	66.40	31	4	Sand/Gravel
52.0	75.4	33.0	0.05	92.6	64.70	29	4	Sand/Gravel

Surcharge Pressure on ground: 0 -kp/f<sup>2</sup>

\* Zero Tip Resistance \*

The tip resistance is zero

\* Zero Friction \*

Zero Friction Start: 0 -ft      End: 6.5 -ft  
 Zero Friction Start: 36 -ft      End: 38 -ft

ALLPILE ANALYSIS AND RESULTS:

TOTAL LOADS:

Vertical Load, Q: 173.0 -kp



Pile-B-2-30in-49ft-Oct 2019

Vertical Load with Load Factor, Q: 173.0 -kp  
Vertical Load with Load factor and Pile Cap, Q= 173.0 -kp  
Load Factor for Vertical Load and Torsion= 1.0  
Vertical Loads Supported by Pile Cap: 0 %  
Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 49.0 -ft  
Top Height, H= 0.0 -ft  
Slope Angle, As= 0  
Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

\*To consider the influence of different soils below the pile tip, bearing stratum is defined from pile tip extending to 4 Diameter of pile, which is 10.0-ft (Input Page F, Item 3)

SINGLE PILE:

Kdown= 0.5 Kup= 0.4 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 217.723-kp Total Ultimate Capacity (Up)= 246.987-kp  
Total Allowable Capacity (Down)= 217.723-kp Total Allowable Capacity (Up)= 246.987-kp

Weight above Ground= 0.00 Total Weight= 32.24-kp \*Soil Weight is not included  
Side Resistance (Down)= 217.723-kp Side Resistance (Up)= 214.743-kp  
Tip Resistance (Down)= 0.000-kp Tip Resistance (Up)= 0.000-kp  
Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)  
Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 173.00-kp, Settlement= 0.36692-in  
At Work Load= 173.00-kp, Secant Stiffness Kqx= 471.49-kp/-in  
At Allowable Settlement= 0.600000-in, Capacity= 206.94-kp  
Work Load, 173.00-kp, OK with the Capacity at Allowable Settlement= 0.60000-in, Capacity= 206.94-kp  
Work Load, 173.00-kp, OK with the Allowable Capacity (Down)= 217.72-kp

FACTOR OF SAFETY:

FSSide	FStip	FSuplif	FSweight
1.0	1.0	1.0	1.0

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

1	1	1	1	1
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 Reports-Certificates\Mehrab Draft\Response to CGS-Pile\Per Jacques\B-2\Pile-B-2-30in-54ft Rev Oct 2019-' discounted Seismic.alp

Title 1: 17-0822-Russel Hall Replacement  
 Title 2: Deep Foundation Calculation

ALLPILE INPUT DATA:

\* Pile Type Page \*

Unit: English  
 Diameter more than 24in (61cm). For bell section, select "Belled" in Diameter Variation (Pile Section Screen, Item 4). Recommendation: 2 to 4  
 in Item 3 of Page F.  
 Pile Type: Drilled Shaft (dia >24 in. or 61 cm)

\* Pile Profile \*

Foundation Depth: 54.0 -ft  
 Top Height: 0.0 -ft  
 Slope Angle: 0  
 Pile Angle: 0.0

\* Pile Properties \*

Zs -ft	Width -in	Area -in2	Perim. -in	I -in4	E -kp/i2	Weight -kp/f	Mix* %	Out Side	In Side	Other Par.	Type
0.0	30	706.9	94.2	39760.8	3000	0.736	0.0	3	3	30	Concrete (rough)
54.0	30	706.9	94.2								Pile Tip

Note: Mix = % of Inside material/Outside material

Group Type: 0  
 Top Type: 1

Water Table: 36.5 -ft  
 No Elevation Input

\* Soil Properties \*

Zs -ft	Gamma -lb/f3	Phi o	C -kp/f2	K -lb/i3	E50/Dr - %	Nspt	Type	Soil
0.0	126.6	15	0.33	222.9	1.00	8	1	Soft Clay
5.0	128.7	30	0.2	290.1	0.90	10	3	Silt (Phi + C)
7.5	124.0	20	0.46	166.5	1.11	7	1	Soft Clay
10.0	127.1	20	0.46	236.2	0.98	8	1	Soft Clay
16.0	132.0	32	0.26	584.7	0.67	16	3	Silt (Phi + C)
17.5	130.8	20	0.53	407.0	0.78	12	1	Soft Clay
36.5	66.9	32	0.26	317.7	0.87	10	3	Silt (Phi + C)
40.0	63.8	20	0.53	214.1	1.01	8	1	Soft Clay
45.5	75.6	31.0	0.15	97.1	66.40	31	4	Sand/Gravel
56.5	75.4	33.0	0.05	92.6	64.70	29	4	Sand/Gravel

Surcharge Pressure on ground: 0 -kp/f2

\* Zero Tip Resistance \*

The tip resistance is zero

\* Zero Friction \*

Zero Friction Start: 0 -ft      End: 7.0 -ft  
 Zero Friction Start: 36 -ft      End: 38 -ft

ALLPILE ANALYSIS AND RESULTS:

TOTAL LOADS:

Vertical Load, Q: 200.0 -kp

Pile-B-2-30in-54ft-Oct 2019

Vertical Load with Load Factor, Q: 200.0 -kp  
Vertical Load with Load factor and Pile Cap, Q= 200.0 -kp  
Load Factor for Vertical Load and Torsion= 1.0  
Vertical Loads Supported by Pile Cap: 0 %  
Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 54.0 -ft  
Top Height, H= 0.0 -ft  
Slope Angle, As= 0  
Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

\*To consider the influence of different soils below the pile tip, bearing stratum is defined from pile tip extending to 2 Diameter of pile, which is 5.0-ft (Input Page F, Item 3)

SINGLE PILE:

Kdown= 0.5 Kup= 0.4 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 243.267-kp Total Ultimate Capacity (Up)= 274.839-kp  
Total Allowable Capacity (Down)= 243.267-kp Total Allowable Capacity (Up)= 274.839-kp

Weight above Ground= 0.00 Total Weight= 34.41-kp \*Soil Weight is not included  
Side Resistance (Down)= 243.267-kp Side Resistance (Up)= 240.432-kp  
Tip Resistance (Down)= 0.000-kp Tip Resistance (Up)= 0.000-kp  
Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)  
Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 200.00-kp, Settlement= 0.39706-in  
At Work Load= 200.00-kp, Secant Stiffness Kqx= 503.70-kp/-in  
At Allowable Settlement= 0.600000-in, Capacity= 230.84-kp  
Work Load, 200.00-kp, OK with the Capacity at Allowable Settlement= 0.600000-in, Capacity= 230.84-kp  
Work Load, 200.00-kp, OK with the Allowable Capacity (Down)= 243.27-kp

FACTOR OF SAFETY:

FSSide	FStip	FSuplif	FSweight
1.0	1.0	1.0	1.0

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

1	1	1	1	1
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 Date: 10/22/2019 File: G:\Projects\2017\17-0822 Russell Hall Replacement Project Soils Investigation\Soils Folder\Soils Reports-Certificates\Mehrab Draft\Response to CGS-Pile\Per Jacques\B-2\Pile-B-2-30in-60ft Rev Oct 2019-7' discounted Seismic.alp

Title 1: 17-0822-Russel Hall Replacement  
 Title 2: Deep Foundation Calculation

ALLPILE INPUT DATA:

\* Pile Type Page \*

Unit: English  
 Diameter more than 24in (61cm). For bell section, select "Belled" in Diameter Variation (Pile Section Screen, Item 4). Recommendation: 2 to 4 in Item 3 of Page F.  
 Pile Type: Drilled Shaft (dia >24 in. or 61 cm)

\* Pile Profile \*

Foundation Depth: 60.0 -ft  
 Top Height: 0.0 -ft  
 Slope Angle: 0  
 Pile Angle: 0.0

\* Pile Properties \*

Zs -ft	Width -in	Area -in <sup>2</sup>	Perim. -in	I -in <sup>4</sup>	E -kp/i <sup>2</sup>	Weight -kp/f	Mix* %	Out Side	In Side	Other Par.	Type
0.0	30	706.9	94.2	39760.8	3000	0.736	0.0	3	3	30	Concrete (rough)
60.0	30	706.9	94.2								Pile Tip

Note: Mix = % of Inside material/Outside material

Group Type: 0  
 Top Type: 1

Water Table: 36.5 -ft  
 No Elevation Input

\* Soil Properties \*

Zs -ft	Gamma -lb/f <sup>3</sup>	Phi o	C -kp/f <sup>2</sup>	K -lb/i <sup>3</sup>	E50/Dr - %	Nspt	Type	Soil
0.0	126.6	15	0.33	222.9	1.00	8	1	Soft Clay
5.0	128.7	30	0.2	290.1	0.90	10	3	Silt (Phi + C)
7.5	124.0	20	0.46	166.5	1.11	7	1	Soft Clay
10.0	127.1	20	0.46	236.2	0.98	8	1	Soft Clay
16.0	132.0	32	0.26	584.7	0.67	16	3	Silt (Phi + C)
17.5	130.8	20	0.53	407.0	0.78	12	1	Soft Clay
36.5	66.9	32	0.26	317.7	0.87	10	3	Silt (Phi + C)
40.0	63.8	20	0.53	214.1	1.01	8	1	Soft Clay
45.5	75.6	31.0	0.15	97.1	66.40	31	4	Sand/Gravel
60.0	75.4	33.0	0.05	92.6	64.70	29	4	Sand/Gravel

Surcharge Pressure on ground: 0 -kp/f<sup>2</sup>

\* Zero Tip Resistance \*

The tip resistance is zero

\* Zero Friction \*

Zero Friction Start: 0 -ft      End: 8 -ft  
 Zero Friction Start: 36 -ft      End: 38 -ft

ALLPILE ANALYSIS AND RESULTS:

TOTAL LOADS:

Vertical Load, Q: 220.0 -kp

Pile-B-2-30in-60ft-Oct 2019

Vertical Load with Load Factor, Q: 220.0 -kp  
Vertical Load with Load factor and Pile Cap, Q= 220.0 -kp  
Load Factor for Vertical Load and Torsion= 1.0  
Vertical Loads Supported by Pile Cap: 0 %  
Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 60.0 -ft  
Top Height, H= 0.0 -ft  
Slope Angle, As= 0  
Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

\*To consider the influence of different soils below the pile tip, bearing stratum is defined from pile tip extending to 2 Diameter of pile, which is 5.0-ft (Input Page F, Item 3)

SINGLE PILE:

Kdown= 0.5 Kup= 0.4 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 272.299-kp Total Ultimate Capacity (Up)= 306.755-kp  
Total Allowable Capacity (Down)= 272.299-kp Total Allowable Capacity (Up)= 306.755-kp

Weight above Ground= 0.00 Total Weight= 36.98-kp \*Soil Weight is not included  
Side Resistance (Down)= 272.299-kp Side Resistance (Up)= 269.777-kp  
Tip Resistance (Down)= 0.000-kp Tip Resistance (Up)= 0.000-kp  
Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)  
Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 220.00-kp, Settlement= 0.38776-in  
At Work Load= 220.00-kp, Secant Stiffness Kqx= 567.36-kp/-in  
At Allowable Settlement= 0.600000-in, Capacity= 257.69-kp  
Work Load, 220.00-kp, OK with the Capacity at Allowable Settlement= 0.60000-in, Capacity= 257.69-kp  
Work Load, 220.00-kp, OK with the Allowable Capacity (Down)= 272.30-kp

FACTOR OF SAFETY:

FSSide	FStip	FSuplif	FSweight
1.0	1.0	1.0	1.0

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

1	1	1	1	1
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Title 1: 17-0822-Russel Hall Replacement  
 Title 2: Deep Foundation Calculation

ALLPILE INPUT DATA:

\* Pile Type Page \*

Unit: English  
 Diameter more than 24in (61cm). For bell section, select "Belled" in Diameter Variation (Pile Section Screen, Item 4). Recommendation: 2 to 4 in Item 3 of Page F.  
 Pile Type: Drilled Shaft (dia >24 in. or 61 cm)

\* Pile Profile \*

Foundation Depth: 64.0 -ft  
 Top Height: 0.0 -ft  
 Slope Angle: 0  
 Pile Angle: 0.0

\* Pile Properties \*

Zs -ft	Width -in	Area -in <sup>2</sup>	Perim. -in	I -in <sup>4</sup>	E -kp/i <sup>2</sup>	Weight -kp/f	Mix* %	Out Side	In Side	Other Par.	Type
0.0	30	706.9	94.2	39760.8	3000	0.736	0.0	3	3	30	Concrete (rough)
64.0	30	706.9	94.2								Pile Tip

Note: Mix = % of Inside material/Outside material

Group Type: 0  
 Top Type: 1

Water Table: 36.5 -ft  
 No Elevation Input

\* Soil Properties \*

Zs -ft	Gamma -lb/f <sup>3</sup>	Phi o	C -kp/f <sup>2</sup>	K -lb/i <sup>3</sup>	E50/Dr - %	Nspt	Type	Soil
0.0	126.6	15	0.33	222.9	1.00	8	1	Soft Clay
5.0	128.7	30	0.2	290.1	0.90	10	3	Silt (Phi + C)
7.5	124.0	20	0.46	166.5	1.11	7	1	Soft Clay
10.0	127.1	20	0.46	236.2	0.98	8	1	Soft Clay
16.0	132.0	32	0.26	584.7	0.67	16	3	Silt (Phi + C)
17.5	130.8	20	0.53	407.0	0.78	12	1	Soft Clay
36.5	66.9	32	0.26	317.7	0.87	10	3	Silt (Phi + C)
40.0	63.8	20	0.53	214.1	1.01	8	1	Soft Clay
45.5	75.6	31.0	0.15	97.1	66.40	31	4	Sand/Gravel
60.0	75.4	33.0	0.05	92.6	64.70	29	4	Sand/Gravel

Surcharge Pressure on ground: 0 -kp/f<sup>2</sup>

\* Zero Tip Resistance \*

The tip resistance is zero

\* Zero Friction \*

Zero Friction Start: 0 -ft      End: 8.5 -ft  
 Zero Friction Start: 36 -ft      End: 38 -ft

ALLPILE ANALYSIS AND RESULTS:

TOTAL LOADS:

Vertical Load, Q: 240.0 -kp

Pile-B-2-30in-64ft-Oct 2019

Vertical Load with Load Factor, Q: 240.0 -kp  
Vertical Load with Load factor and Pile Cap, Q= 240.0 -kp  
Load Factor for Vertical Load and Torsion= 1.0  
Vertical Loads Supported by Pile Cap: 0 %  
Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 64.0 -ft  
Top Height, H= 0.0 -ft  
Slope Angle, As= 0  
Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

\*To consider the influence of different soils below the pile tip, bearing stratum is defined from pile tip extending to 4 Diameter of pile, which is 10.0-ft (Input Page F, Item 3)

SINGLE PILE:

Kdown= 0.5 Kup= 0.4 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 291.659-kp Total Ultimate Capacity (Up)= 327.932-kp  
Total Allowable Capacity (Down)= 291.659-kp Total Allowable Capacity (Up)= 327.932-kp

Weight above Ground= 0.00 Total Weight= 38.70-kp \*Soil Weight is not included  
Side Resistance (Down)= 291.659-kp Side Resistance (Up)= 289.236-kp  
Tip Resistance (Down)= 0.000-kp Tip Resistance (Up)= 0.000-kp  
Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)  
Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 240.00-kp, Settlement= 0.40696-in  
At Work Load= 240.00-kp, Secant Stiffness Kqx= 589.73-kp/-in  
At Allowable Settlement= 0.600000-in, Capacity= 275.52-kp  
Work Load, 240.00-kp, OK with the Capacity at Allowable Settlement= 0.60000-in, Capacity= 275.52-kp  
Work Load, 240.00-kp, OK with the Allowable Capacity (Down)= 291.66-kp

FACTOR OF SAFETY:

FSSide	FStip	FSuplif	FSweight
1.0	1.0	1.0	1.0

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

1	1	1	1	1
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 Reports-Certificates\Mehrab Draft\Response to CGS-Pile\Per Jacques\CPT-2\30in\Pile-CPT-2-30in-49ft-Seismic.alp

Title 1: 17-0822-Russel Hall Replacement  
 Title 2: Deep Foundation Calculation

ALLPILE INPUT DATA:

\* Pile Type Page \*

Unit: English  
 Diameter more than 24in (61cm). For bell section, select "Belled" in Diameter Variation (Pile Section Screen, Item 4). Recommendation: 2 to 4  
 in Item 3 of Page F.  
 Pile Type: Drilled Shaft (dia >24 in. or 61 cm)

\* Pile Profile \*

Foundation Depth: 49.0 -ft  
 Top Height: 0.0 -ft  
 Slope Angle: 0  
 Pile Angle: 0.0

\* Pile Properties \*

Zs -ft	Width -in	Area -in2	Perim. -in	I -in4	E -kp/i2	Weight -kp/f	Mix* %	Out Side	In Side	Other Par.	Type
0.0	30	706.9	94.2	39760.8	3000	0.736	0.0	3	3	30	Concrete (rough)
49.0	30	706.9	94.2								Pile Tip

Note: Mix = % of Inside material/Outside material

Group Type: 0  
 Top Type: 1

Water Table: 36.5 -ft  
 No Elevation Input

\* Soil Properties \*

Zs -ft	Gamma -lb/f3	Phi o	C -kp/f2	K -lb/i3	E50/Dr - %	Nspt	Type	Soil
0.0	126.6	15	0.33	222.9	1.00	8	1	Soft Clay
5.0	128.7	30	0.2	290.1	0.90	10	3	Silt (Phi + C)
7.5	124.0	20	0.46	166.5	1.11	7	1	Soft Clay
10.0	127.1	20	0.46	236.2	0.98	8	1	Soft Clay
16.0	132.0	32	0.26	584.7	0.67	16	3	Silt (Phi + C)
17.5	130.8	20	0.53	407.0	0.78	12	1	Soft Clay
36.5	66.9	32	0.26	317.7	0.87	10	3	Silt (Phi + C)
40.0	63.8	20	0.53	214.1	1.01	8	1	Soft Clay
44.0	63.8	20	0.53	214.1	1.01	8	1	Soft Clay
51.5	66.8	30	0.26	313.1	0.87	10	3	Silt (Phi + C)

Surcharge Pressure on ground: 0 -kp/f2

\* Zero Tip Resistance \*

The tip resistance is zero

\* Zero Friction \*

Zero Friction Start: 0 -ft      End: 6.5 -ft  
 Zero Friction Start: 36 -ft      End: 40 -ft

ALLPILE ANALYSIS AND RESULTS:

TOTAL LOADS:

Vertical Load, Q: 173.0 -kp



Pile-CPT-2-30in-49ft-Oct 2019

Vertical Load with Load Factor, Q: 173.0 -kp  
Vertical Load with Load factor and Pile Cap, Q= 173.0 -kp  
Load Factor for Vertical Load and Torsion= 1.0  
Vertical Loads Supported by Pile Cap: 0 %  
Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 49.0 -ft  
Top Height, H= 0.0 -ft  
Slope Angle, As= 0  
Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

\*To consider the influence of different soils below the pile tip, bearing stratum is defined from pile tip extending to 4 Diameter of pile, which is 10.0-ft (Input Page F, Item 3)

SINGLE PILE:

Kdown= 0.5 Kup= 0.4 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 206.391-kp Total Ultimate Capacity (Up)= 235.656-kp  
Total Allowable Capacity (Down)= 206.391-kp Total Allowable Capacity (Up)= 235.656-kp

Weight above Ground= 0.00 Total Weight= 32.24-kp \*Soil Weight is not included  
Side Resistance (Down)= 206.391-kp Side Resistance (Up)= 203.412-kp  
Tip Resistance (Down)= 0.000-kp Tip Resistance (Up)= 0.000-kp  
Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)  
Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 173.00-kp, Settlement= 0.15123-in  
At Work Load= 173.00-kp, Secant Stiffness Kqx= 1143.97-kp/-in  
At Allowable Settlement= 0.600000-in, Capacity= 204.15-kp  
Work Load, 173.00-kp, OK with the Capacity at Allowable Settlement= 0.600000-in, Capacity= 204.15-kp  
Work Load, 173.00-kp, OK with the Allowable Capacity (Down)= 206.39-kp

FACTOR OF SAFETY:

FSSide	FStip	FSuplif	FSweight
1.0	1.0	1.0	1.0

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

1	1	1	1	1
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 Reports-Certificates\Mehrab Draft\Response to CGS-Pile\Per Jacques\CPT-2\30in\Pile-CPT-2-30in-54ft-Seismic.alp

Title 1: 17-0822-Russel Hall Replacement  
 Title 2: Deep Foundation Calculation

ALLPILE INPUT DATA:

\* Pile Type Page \*

Unit: English  
 Diameter more than 24in (61cm). For bell section, select "Belled" in Diameter Variation (Pile Section Screen, Item 4). Recommendation: 2 to 4  
 in Item 3 of Page F.  
 Pile Type: Drilled Shaft (dia >24 in. or 61 cm)

\* Pile Profile \*

Foundation Depth: 54.0 -ft  
 Top Height: 0.0 -ft  
 Slope Angle: 0  
 Pile Angle: 0.0

\* Pile Properties \*

Zs -ft	Width -in	Area -in2	Perim. -in	I -in4	E -kp/i2	Weight -kp/f	Mix* %	Out Side	In Side	Other Par.	Type
0.0	30	706.9	94.2	39760.8	3000	0.736	0.0	3	3	30	Concrete (rough)
54.0	30	706.9	94.2								Pile Tip

Note: Mix = % of Inside material/Outside material

Group Type: 0  
 Top Type: 1

Water Table: 36.5 -ft  
 No Elevation Input

\* Soil Properties \*

Zs -ft	Gamma -lb/f3	Phi o	C -kp/f2	K -lb/i3	E50/Dr - %	Nspt	Type	Soil
0.0	126.6	15	0.33	222.9	1.00	8	1	Soft Clay
5.0	128.7	30	0.2	290.1	0.90	10	3	Silt (Phi + C)
7.5	124.0	20	0.46	166.5	1.11	7	1	Soft Clay
10.0	127.1	20	0.46	236.2	0.98	8	1	Soft Clay
16.0	132.0	32	0.26	584.7	0.67	16	3	Silt (Phi + C)
17.5	130.8	20	0.53	407.0	0.78	12	1	Soft Clay
36.5	66.9	32	0.26	317.7	0.87	10	3	Silt (Phi + C)
40.0	63.8	20	0.53	214.1	1.01	8	1	Soft Clay
44.0	63.8	20	0.53	214.1	1.01	8	1	Soft Clay
54.0	66.8	30	0.26	313.1	0.87	10	3	Silt (Phi + C)

Surcharge Pressure on ground: 0 -kp/f2

\* Zero Tip Resistance \*

The tip resistance is zero

\* Zero Friction \*

Zero Friction Start: 0 -ft      End: 7.0 -ft  
 Zero Friction Start: 36 -ft      End: 40 -ft

ALLPILE ANALYSIS AND RESULTS:

TOTAL LOADS:

Vertical Load, Q: 200.0 -kp

Pile-CPT-2-30in-54ft-Oct 2019

Vertical Load with Load Factor, Q: 200.0 -kp  
Vertical Load with Load factor and Pile Cap, Q= 200.0 -kp  
Load Factor for Vertical Load and Torsion= 1.0  
Vertical Loads Supported by Pile Cap: 0 %  
Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 54.0 -ft  
Top Height, H= 0.0 -ft  
Slope Angle, As= 0  
Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

\*To consider the influence of different soils below the pile tip, bearing stratum is defined from pile tip extending to 4 Diameter of pile, which is 10.0-ft (Input Page F, Item 3)

SINGLE PILE:

Kdown= 0.5 Kup= 0.4 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 232.563-kp Total Ultimate Capacity (Up)= 264.135-kp  
Total Allowable Capacity (Down)= 232.563-kp Total Allowable Capacity (Up)= 264.135-kp

Weight above Ground= 0.00 Total Weight= 34.41-kp \*Soil Weight is not included  
Side Resistance (Down)= 232.563-kp Side Resistance (Up)= 229.728-kp  
Tip Resistance (Down)= 0.000-kp Tip Resistance (Up)= 0.000-kp  
Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)  
Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 200.00-kp, Settlement= 0.19385-in  
At Work Load= 200.00-kp, Secant Stiffness Kqx= 1031.75-kp/-in  
At Allowable Settlement= 0.600000-in, Capacity= 232.00-kp  
Work Load, 200.00-kp, OK with the Capacity at Allowable Settlement= 0.60000-in, Capacity= 232.00-kp  
Work Load, 200.00-kp, OK with the Allowable Capacity (Down)= 232.56-kp

FACTOR OF SAFETY:

FSSide	FStip	FSuplif	FSweight
1.0	1.0	1.0	1.0

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

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 Reports-Certificates\Mehrab Draft\Response to CGS-Pile\Per Jacques\CPT-2\30in\Pile-CPT-2-30in-60ft-Seismic.alp

Title 1: 17-0822-Russel Hall Replacement  
 Title 2: Deep Foundation Calculation

ALLPILE INPUT DATA:

\* Pile Type Page \*

Unit: English  
 Diameter more than 24in (61cm). For bell section, select "Belled" in Diameter Variation (Pile Section Screen, Item 4). Recommendation: 2 to 4  
 in Item 3 of Page F.  
 Pile Type: Drilled Shaft (dia >24 in. or 61 cm)

\* Pile Profile \*

Foundation Depth: 60.0 -ft  
 Top Height: 0.0 -ft  
 Slope Angle: 0  
 Pile Angle: 0.0

\* Pile Properties \*

Zs -ft	Width -in	Area -in <sup>2</sup>	Perim. -in	I -in <sup>4</sup>	E -kp/i <sup>2</sup>	Weight -kp/f	Mix* %	Out Side	In Side	Other Par.	Type
0.0	30	706.9	94.2	39760.8	3000	0.736	0.0	3	3	30	Concrete (rough)
60.0	30	706.9	94.2								Pile Tip

Note: Mix = % of Inside material/Outside material

Group Type: 0  
 Top Type: 1

Water Table: 36.5 -ft  
 No Elevation Input

\* Soil Properties \*

Zs -ft	Gamma -lb/f <sup>3</sup>	Phi o	C -kp/f <sup>2</sup>	K -lb/i <sup>3</sup>	E50/Dr - %	Nspt	Type	Soil
0.0	126.6	15	0.33	222.9	1.00	8	1	Soft Clay
5.0	128.7	30	.2	290.1	0.90	10	3	Silt (Phi + C)
7.5	124.0	20	.46	166.5	1.11	7	1	Soft Clay
10.0	127.1	20	.46	236.2	0.98	8	1	Soft Clay
16.0	132.0	32	.26	584.7	0.67	16	3	Silt (Phi + C)
17.5	130.8	20	0.53	407.0	0.78	12	1	Soft Clay
36.5	66.9	32	.26	317.7	0.87	10	3	Silt (Phi + C)
40.0	63.8	20	.53	214.1	1.01	8	1	Soft Clay
54.0	63.8	1	.01	214.1	1.01	8	1	Soft Clay
60.0	66.8	1	.01	313.1	0.87	10	3	Silt (Phi + C)

Surcharge Pressure on ground: 0 -kp/f<sup>2</sup>

\* Zero Tip Resistance \*

The tip resistance is zero

\* Zero Friction \*

Zero Friction Start: 0 -ft      End: 6 -ft  
 Zero Friction Start: 48 -ft      End: 50 -ft

ALLPILE ANALYSIS AND RESULTS:

TOTAL LOADS:

Vertical Load, Q: 220.0 -kp

Pile-CPT-2-30in-60ft-Oct 2019

Vertical Load with Load Factor, Q: 220.0 -kp  
Vertical Load with Load factor and Pile Cap, Q= 220.0 -kp  
Load Factor for Vertical Load and Torsion= 1.0  
Vertical Loads Supported by Pile Cap: 0 %  
Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 60.0 -ft  
Top Height, H= 0.0 -ft  
Slope Angle, As= 0  
Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

\*To consider the influence of different soils below the pile tip, bearing stratum is defined from pile tip extending to 4 Diameter of pile, which is 10.0-ft (Input Page F, Item 3)

SINGLE PILE:

Kdown= 0.5 Kup= 0.4 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 249.940-kp Total Ultimate Capacity (Up)= 283.455-kp  
Total Allowable Capacity (Down)= 249.940-kp Total Allowable Capacity (Up)= 283.455-kp

Weight above Ground= 0.00 Total Weight= 36.98-kp \*Soil Weight is not included  
Side Resistance (Down)= 249.940-kp Side Resistance (Up)= 246.477-kp  
Tip Resistance (Down)= 0.000-kp Tip Resistance (Up)= 0.000-kp  
Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)  
Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 220.00-kp, Settlement= 0.53137-in  
At Work Load= 220.00-kp, Secant Stiffness Kqx= 414.03-kp/-in  
At Allowable Settlement= 0.600000-in, Capacity= 229.34-kp  
Work Load, 220.00-kp, OK with the Capacity at Allowable Settlement= 0.600000-in, Capacity= 229.34-kp  
Work Load, 220.00-kp, OK with the Allowable Capacity (Down)= 249.94-kp

FACTOR OF SAFETY:

FSSide	FStip	FSuplif	FSweight
1.0	1.0	1.0	1.0

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.  
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 Reports-Certificates\Mehrab Draft\Response to CGS-Pile\Per Jacques\CPT-2\30in\Pile-CPT-2-30in-60ft-4.5' of free at surface Seismic.alp

Title 1: 17-0822-Russel Hall Replacement  
 Title 2: Deep Foundation Calculation

ALLPILE INPUT DATA:

\* Pile Type Page \*

Unit: English  
 Diameter more than 24in (61cm). For bell section, select "Belled" in Diameter Variation (Pile Section Screen, Item 4). Recommendation: 2 to 4 in Item 3 of Page F.  
 Pile Type: Drilled Shaft (dia >24 in. or 61 cm)

\* Pile Profile \*

Foundation Depth: 60.0 -ft  
 Top Height: 0.0 -ft  
 Slope Angle: 0  
 Pile Angle: 0.0

\* Pile Properties \*

Zs -ft	Width -in	Area -in <sup>2</sup>	Perim. -in	I -in <sup>4</sup>	E -kp/i <sup>2</sup>	Weight -kp/f	Mix* %	Out Side	In Side	Other Par.	Type
0.0	30	706.9	94.2	39760.8	3000	0.736	0.0	3	3	30	Concrete (rough)
60.0	30	706.9	94.2								Pile Tip

Note: Mix = % of Inside material/Outside material

Group Type: 0  
 Top Type: 1

Water Table: 36.5 -ft  
 No Elevation Input

\* Soil Properties \*

Zs -ft	Gamma -lb/f <sup>3</sup>	Phi o	C -kp/f <sup>2</sup>	K -lb/i <sup>3</sup>	E50/Dr - %	Nspt	Type	Soil
0.0	126.6	15	0.33	222.9	1.00	8	1	Soft Clay
5.0	128.7	30	.2	290.1	0.90	10	3	Silt (Phi + C)
7.5	124.0	20	.46	166.5	1.11	7	1	Soft Clay
16.0	132.0	32	.26	605.0	0.66	16	3	Silt (Phi + C)
17.5	132.0	20	0.53	605.0	0.66	16	1	Soft Clay
36.5	68.4	32	.26	407.0	0.78	12	3	Silt (Phi + C)
40.0	63.8	20	.53	313.1	0.87	10	1	Soft Clay
54.0	63.8	1	.01	214.1	1.01	8	1	Soft Clay
58.0	63.8	15	0.53	214.1	1.01	8	1	Soft Clay
60.0	66.8	31	0.44	313.1	0.87	10	3	Silt (Phi + C)

Surcharge Pressure on ground: 0 -kp/f<sup>2</sup>

\* Zero Tip Resistance \*

The tip resistance is zero

\* Zero Friction \*

Zero Friction Start: 0 -ft      End: 4.5 -ft  
 Zero Friction Start: 48 -ft      End: 50 -ft

ALLPILE ANALYSIS AND RESULTS:

TOTAL LOADS:

Vertical Load, Q: 227.0 -kp

Pile-CPT-2-30in-60ft-4.5' of free surface-Oct 2019

Vertical Load with Load Factor, Q: 227.0 -kp  
Vertical Load with Load factor and Pile Cap, Q= 227.0 -kp  
Load Factor for Vertical Load and Torsion= 1.0  
Vertical Loads Supported by Pile Cap: 0 %  
Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 60.0 -ft  
Top Height, H= 0.0 -ft  
Slope Angle, As= 0  
Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

\*To consider the influence of different soils below the pile tip, bearing stratum is defined from pile tip extending to 4 Diameter of pile, which is 10.0-ft (Input Page F, Item 3)

SINGLE PILE:

Kdown= 0.5 Kup= 0.4 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 263.935-kp Total Ultimate Capacity (Up)= 297.210-kp  
Total Allowable Capacity (Down)= 263.935-kp Total Allowable Capacity (Up)= 297.210-kp

Weight above Ground= 0.00 Total Weight= 36.98-kp \*Soil Weight is not included  
Side Resistance (Down)= 263.935-kp Side Resistance (Up)= 260.233-kp  
Tip Resistance (Down)= 0.000-kp Tip Resistance (Up)= 0.000-kp  
Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)  
Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 227.00-kp, Settlement= 0.20633-in  
At Work Load= 227.00-kp, Secant Stiffness Kqx= 1100.18-kp/-in  
At Allowable Settlement= 0.600000-in, Capacity= 263.44-kp  
Work Load, 227.00-kp, OK with the Capacity at Allowable Settlement= 0.60000-in, Capacity= 263.44-kp  
Work Load, 227.00-kp, OK with the Allowable Capacity (Down)= 263.94-kp

---

FACTOR OF SAFETY:

FSSide	FStip	FSuplif	FSweight
1.0	1.0	1.0	1.0

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

1	1	1	1	1
---	---	---	---	---

\*\*\*\*\*  
 ALLPILE 7  
 VERTICAL ANALYSIS SUMMARY OUTPUT  
 Copyright by CivilTech Software  
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 \*\*\*\*\*

Licensed to  
 Date: 10/22/2019 File: G:\Projects\2017\17-0822 Russell Hall Replacement Project Soils Investigation\Soils Folder\Soils Reports-Certificates\Mehrab Draft\Response to CGS-Pile\Per Jacques\CPT-2\30in\Pile-CPT-2-30in-64ft- 8.5 feet free at surface Seismic.alp

Title 1: 17-0822-Russel Hall Replacement  
 Title 2: Deep Foundation Calculation

ALLPILE INPUT DATA:

\* Pile Type Page \*  
 Unit: English  
 Diameter more than 24in (61cm). For bell section, select "Belled" in Diameter Variation (Pile Section Screen, Item 4). Recommendation: 2 to 4 in Item 3 of Page F.  
 Pile Type: Drilled Shaft (dia >24 in. or 61 cm)

\* Pile Profile \*  
 Foundation Depth: 64.0 -ft  
 Top Height: 0.0 -ft  
 Slope Angle: 0  
 Pile Angle: 0.0

\* Pile Properties \*

Zs -ft	Width -in	Area -in2	Perim. -in	I -in4	E -kp/i2	Weight -kp/f	Mix* %	Out Side	In Side	Other Par.	Type
0.0	30	706.9	94.2	39760.8	3000	0.736	0.0	3	3	30	Concrete (rough)
64.0	30	706.9	94.2								Pile Tip

Note: Mix = % of Inside material/Outside material

Group Type: 0  
 Top Type: 1

Water Table: 36.5 -ft  
 No Elevation Input

\* Soil Properties \*

Zs -ft	Gamma -lb/f3	Phi o	C -kp/f2	K -lb/i3	E50/Dr - %	Nspt	Type	Soil
0.0	126.6	15	0.33	222.9	1.00	8	1	Soft Clay
5.0	128.7	30	0.2	290.1	0.90	10	3	Silt (Phi + C)
7.5	124.0	20	0.46	166.5	1.11	7	1	Soft Clay
16.0	132.0	32	0.26	605.0	0.66	16	3	Silt (Phi + C)
17.5	132.0	20	0.53	605.0	0.66	16	1	Soft Clay
36.5	68.4	32	0.26	407.0	0.78	12	3	Silt (Phi + C)
40.0	66.8	20	0.53	313.1	0.87	10	1	Soft Clay
54.0	63.8	1	.01	214.1	1.01	8	1	Soft Clay
58.0	63.8	15	0.53	214.1	1.01	8	1	Soft Clay
64.0	66.8	1	.01	313.1	0.87	10	3	Silt (Phi + C)

Surcharge Pressure on ground: 0 -kp/f2

\* Zero Tip Resistance \*  
 The tip resistance is zero

\* Zero Friction \*  
 Zero Friction Start: 0 -ft End: 8.5 -ft  
 Zero Friction Start: 48 -ft End: 50 -ft

ALLPILE ANALYSIS AND RESULTS:

TOTAL LOADS:  
 Vertical Load, Q: 240.0 -kp



Pile-CPT-2-30in-64ft-8.5' of free surface-Oct 2019

Vertical Load with Load Factor, Q: 240.0 -kp  
Vertical Load with Load factor and Pile Cap, Q= 240.0 -kp  
Load Factor for Vertical Load and Torsion= 1.0  
Vertical Loads Supported by Pile Cap: 0 %  
Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 64.0 -ft  
Top Height, H= 0.0 -ft  
Slope Angle, As= 0  
Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

\*To consider the influence of different soils below the pile tip, bearing stratum is defined from pile tip extending to 4 Diameter of pile, which is 10.0-ft (Input Page F, Item 3)

SINGLE PILE:

Kdown= 0.5 Kup= 0.4 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 272.037-kp Total Ultimate Capacity (Up)= 307.989-kp  
Total Allowable Capacity (Down)= 272.037-kp Total Allowable Capacity (Up)= 307.989-kp

Weight above Ground= 0.00 Total Weight= 38.70-kp \*Soil Weight is not included  
Side Resistance (Down)= 272.037-kp Side Resistance (Up)= 269.293-kp  
Tip Resistance (Down)= 0.000-kp Tip Resistance (Up)= 0.000-kp  
Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)  
Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 240.00-kp, Settlement= 0.55276-in  
At Work Load= 240.00-kp, Secant Stiffness Kqx= 434.18-kp/-in  
At Allowable Settlement= 0.600000-in, Capacity= 247.16-kp  
Work Load, 240.00-kp, OK with the Capacity at Allowable Settlement= 0.60000-in, Capacity= 247.16-kp  
Work Load, 240.00-kp, OK with the Allowable Capacity (Down)= 272.04-kp

FACTOR OF SAFETY:

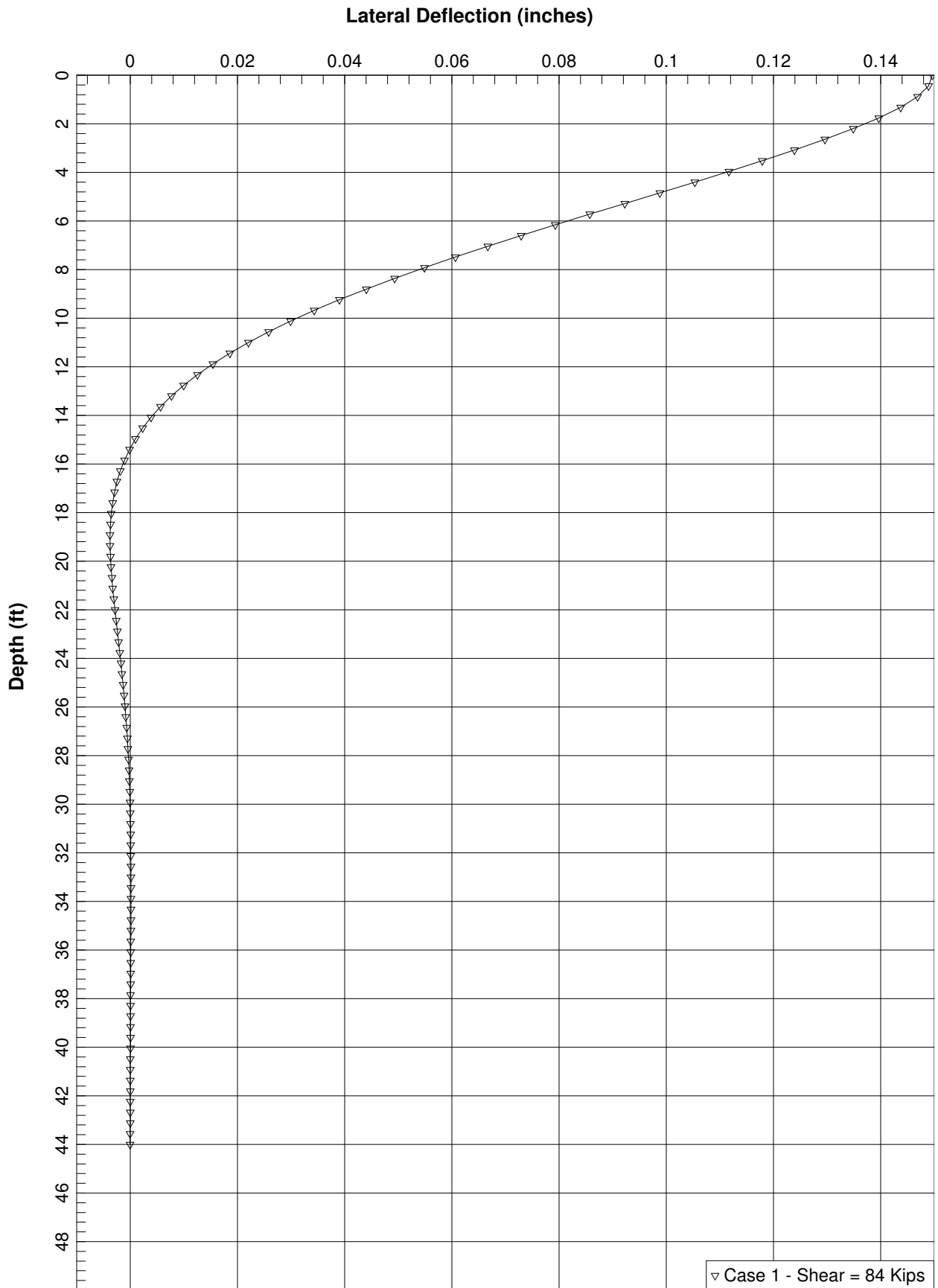
FSSide	FStip	FSuplif	FSweight
1.0	1.0	1.0	1.0

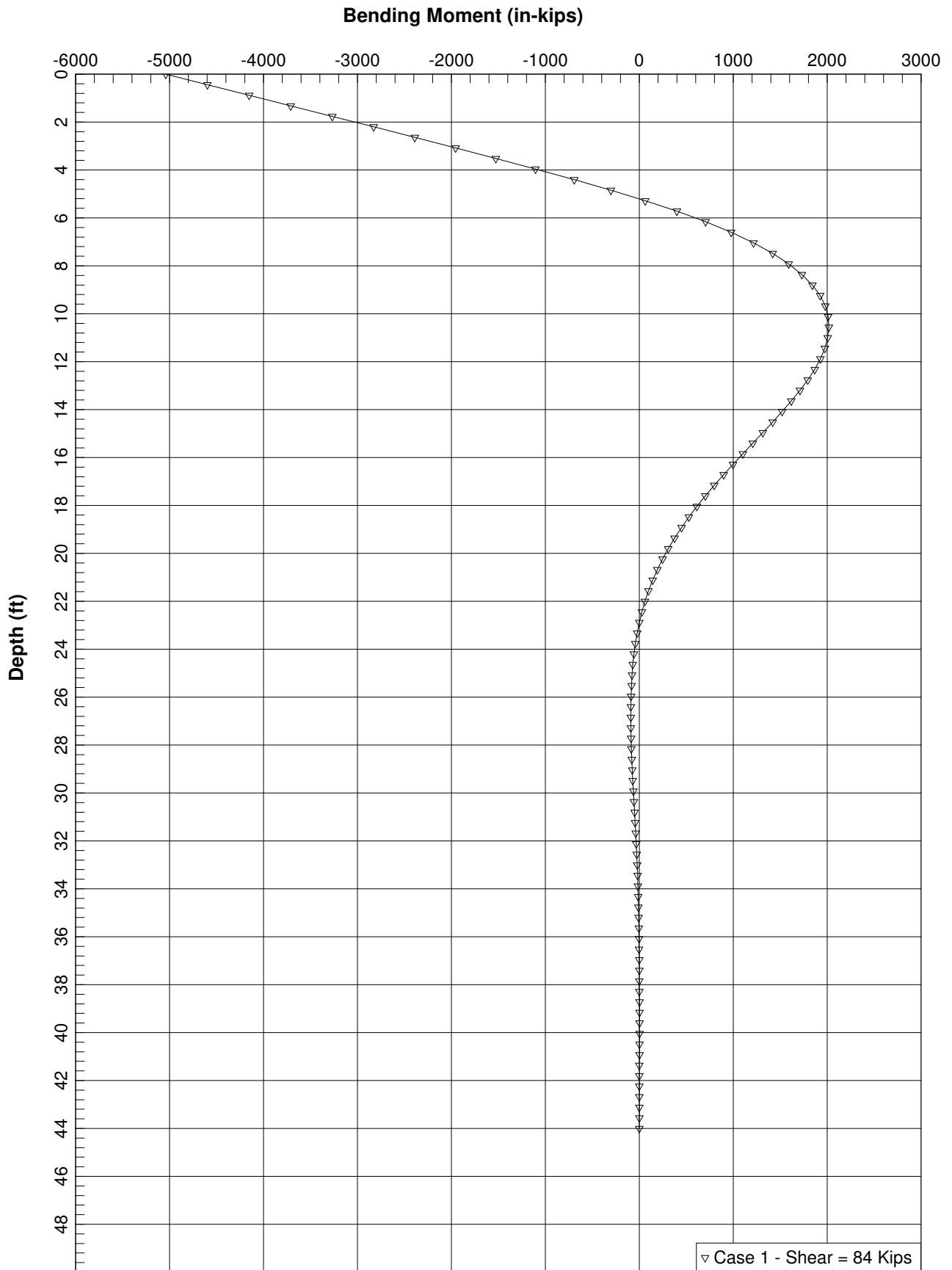
Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

1 1 1 1 1

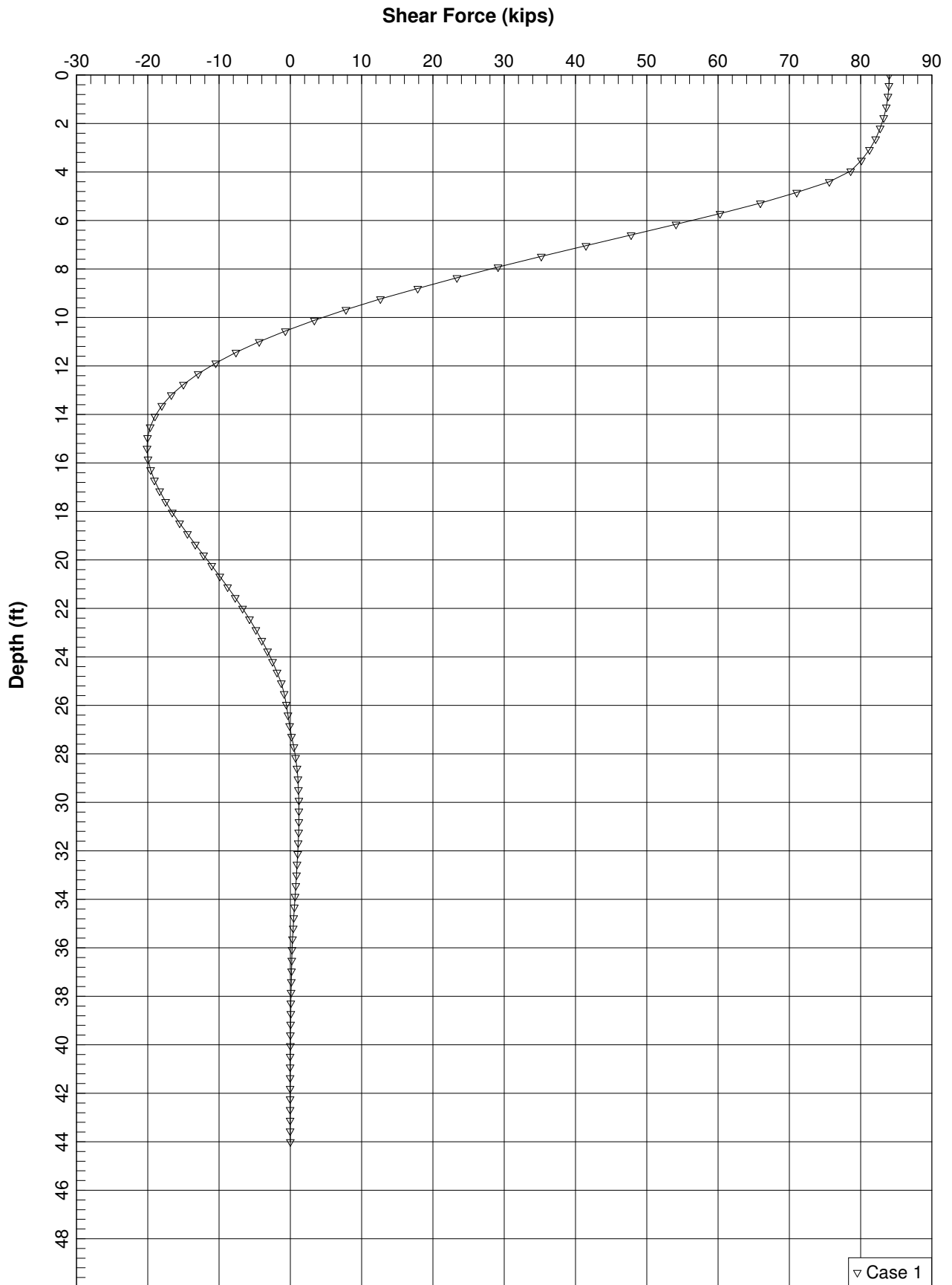
# **ATTACHMENT 2**

LPile Output





▽ Case 1 - Shear = 84 Kips



LPILE Plus for Windows, Version 6 (6.0.24)

Analysis of Individual Piles and Drilled Shafts  
Subjected to Lateral Loading Using the p-y Method

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ko  
ko

Serial Number of Security Device: 228748185  
Company Name Stored in Security Device: Koury Engineering & Testing

Files Used for Analysis

Path to file locations: G:\Projects\2017\17-0822 Russell Hall Replacement Project Soils Investigation\Soils  
Folder\Soils Reports-Certificates\DSA\DSA - Lateral Pile Capacities\  
Name of input data file: 30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 1.lp6d  
Name of output report file: 30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 1.lp60  
Name of plot output file: 30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 1.lp6p  
Name of runtime message file: 30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 1.lp6r

Date and Time of Analysis

Date: November 12, 2019 Time: 16:50:10

Problem Title

Health Science Building

Job Number: 17-0822

Client:

Engineer:

Description: Building Piles

Program Options

Engineering units are US Customary Units: pounds, inches, feet

Basic Program Options:

This analysis computes nonlinear bending stiffness and nominal moment  
capacity with pile response computed using nonlinear EI

Computation Options:

- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No p-y curves to be computed and output for user-specified depths

Solution Control Parameters:

- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-03 in
- Maximum allowable deflection = 100.0000 in

Pile Response Output Options:

- Values of pile-head deflection, bending moment, shear force, and  
soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1

-----  
Pile Structural Properties and Geometry  
-----

Total Number of Sections = 1  
Total Pile Length = 44.00 ft  
Depth of ground surface below top of pile = 0.00 ft  
Slope angle of ground surface = 0.00 deg.

Pile dimensions used for p-y curve computations defined using 2 points.  
p-y curves are computed using values of pile diameter interpolated over  
the length of the pile.

Point	Depth X ft	Pile Diameter in
1	0.00000	30.0000000
2	44.000000	30.0000000

-----  
Input Structural Properties:  
-----

Pile Section No. 1:

Section Type = Drilled Shaft (Bored Pile)  
Section Length = 44.000 ft  
Section Diameter = 30.000 in

-----  
Ground Slope and Pile Batter Angles  
-----

Ground Slope Angle = 0.000 degrees  
= 0.000 radians  
Pile Batter Angle = 0.000 degrees  
= 0.000 radians

-----  
Soil and Rock Layering Information  
-----

The soil profile is modelled using 9 layers

Layer 1 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 0.000 ft  
Distance from top of pile to bottom of layer = 2.000 ft  
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for  
the above soil layer.

Layer 2 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 2.000 ft  
Distance from top of pile to bottom of layer = 4.000 ft  
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for  
the above soil layer.

Layer 3 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 4.000 ft  
Distance from top of pile to bottom of layer = 7.500 ft  
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for  
the above soil layer.

Layer 4 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 7.500 ft  
Distance from top of pile to bottom of layer = 9.500 ft  
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3

30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 1.1p60  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 5 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 9.500 ft  
 Distance from top of pile to bottom of layer = 25.500 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 6 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 25.500 ft  
 Distance from top of pile to bottom of layer = 27.000 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 7 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 27.000 ft  
 Distance from top of pile to bottom of layer = 36.000 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 8 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 36.000 ft  
 Distance from top of pile to bottom of layer = 37.500 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 9 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 37.500 ft  
 Distance from top of pile to bottom of layer = 44.000 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

(Depth of lowest layer extends 0.00 ft below pile tip)

-----  
 Effective Unit weight of Soil vs. Depth  
 -----

Effective unit weight of soil with depth defined using 18 points

Point No.	Depth x ft	Eff. Unit weight pcf
1	0.00	123.00000
2	2.00	123.00000
3	2.00	123.00000
4	4.00	123.00000
5	4.00	131.50000
6	7.50	131.50000
7	7.50	123.00000
8	9.50	123.00000
9	9.50	130.20000
10	25.50	130.20000
11	25.50	122.00000
12	27.00	122.00000
13	27.00	127.50000
14	36.00	127.50000
15	36.00	69.30000
16	37.50	69.30000
17	37.50	66.30000
18	44.00	66.30000

-----  
 Summary of Soil Properties  
 -----



30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 1.lp60

Layer Num.	Epsilon 50	Soil Type J (p-y Curve Criteria)	kpy Criteria) pci	Rock Emass psi	Depth ft	Eff. Unit krm Wt., pcf	Cohesion Test Type psf	Friction Test Prop. Ang., deg.	Elas. Subgr. psi	qu psi	RQD percent
1	0.00	Cemented Silt	default	--	0.00	123.000	1.000	20.000	--	--	--
	0.00	--	default	--	2.000	123.000	1.000	20.000	--	--	--
2	0.00	Cemented Silt	default	--	2.000	123.000	1.000	20.000	--	--	--
	0.00	--	default	--	4.000	123.000	1.000	20.000	--	--	--
3	0.00	Cemented Silt	default	--	4.000	131.500	350.000	15.000	--	--	--
	0.00	--	default	--	7.500	131.500	350.000	15.000	--	--	--
4	0.00	Cemented Silt	default	--	7.500	123.000	90.000	22.000	--	--	--
	0.00	--	default	--	9.500	123.000	90.000	22.000	--	--	--
5	0.00	Cemented Silt	default	--	9.500	130.200	420.000	12.000	--	--	--
	0.00	--	default	--	25.500	130.200	420.000	12.000	--	--	--
6	0.00	Cemented Silt	default	--	25.500	122.000	100.000	29.000	--	--	--
	0.00	--	default	--	27.000	122.000	100.000	29.000	--	--	--
7	0.00	Cemented Silt	default	--	27.000	127.500	370.000	6.000	--	--	--
	0.00	--	default	--	36.000	127.500	370.000	6.000	--	--	--
8	0.00	Cemented Silt	default	--	36.000	69.300	450.000	23.000	--	--	--
	0.00	--	default	--	37.500	69.300	450.000	23.000	--	--	--
9	0.00	Cemented Silt	default	--	37.500	66.300	470.000	11.000	--	--	--
	0.00	--	default	--	44.000	66.300	470.000	11.000	--	--	--

-----  
Loading Type  
-----

Static loading criteria were used when computing p-y curves for all analyses.

-----  
Pile-head Loading and Pile-head Fixity Conditions  
-----

Number of loads specified = 1

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs
1	2	v = 84000. lbs	s = 0.0000 in/in	390000.

V = perpendicular shear force applied to pile head  
M = bending moment applied to pile head  
y = lateral deflection relative to pile axis  
S = pile slope relative to original pile batter angle  
R = rotational stiffness applied to pile head  
Axial thrust is assumed to be acting axially for all pile batter angles.

-----  
Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness  
-----

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft:

Length of Section	=	44.00000000 ft
Shaft Diameter	=	30.00000000 in
Concrete Cover Thickness	=	3.00000000 in
Number of Reinforcing Bars	=	9 bars

30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 1.lp60  
 Yield Stress of Reinforcing Bars = 60.0000000 ksi  
 Modulus of Elasticity of Reinforcing Bars = 29000. ksi  
 Gross Area of Shaft = 706.85834706 sq. in.  
 Total Area of Reinforcing Steel = 14.04000000 sq. in.  
 Area Ratio of Steel Reinforcement = 1.99 percent  
 Edge-to-Edge Bar Spacing = 6.31623504 in

Axial Structural Capacities:

Nom. Axial Structural Capacity =  $0.85 F_c A_c + F_y A_s$  = 3197.982 kips  
 Tensile Load for Cracking of Concrete = -335.124 kips  
 Nominal Axial Tensile Capacity = -842.400 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.41000	1.56000	11.29500	0.00000
2	1.41000	1.56000	8.65247	7.26029
3	1.41000	1.56000	1.96136	11.12340
4	1.41000	1.56000	-5.64750	9.78176
5	1.41000	1.56000	-10.61383	3.86312
6	1.41000	1.56000	-10.61383	-3.86312
7	1.41000	1.56000	-5.64750	-9.78176
8	1.41000	1.56000	1.96136	-11.12340
9	1.41000	1.56000	8.65247	-7.26029

Concrete Properties:

Compressive Strength of Concrete = 4.0000000 ksi  
 Modulus of Elasticity of Concrete = 3604.9965326 ksi  
 Modulus of Rupture of Concrete = -0.4743416 ksi  
 Compression Strain at Peak Stress = 0.0018863  
 Tensile Strain at Fracture of Concrete = -0.0001154  
 Maximum coarse Aggregate Size = 0.7500000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	390.000

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension  
 Y = stress in reinforcing steel has reached yield stress  
 T = tensile strain in reinforcement exceeds 0.005 when compressive strain in concrete is less than 0.003.  
 Z = depth of tensile zone in concrete section is less than 10 percent of section depth  
 Bending Stiffness (EI) = Bending Moment / Curvature  
 Position of neutral axis is computed from compression side of pile  
 Compressive stresses are positive in sign. Tensile stresses are negative in sign.

Axial Thrust Force = 390.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in <sup>2</sup>	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Run Msg
0.000001250	225.5024883	180401991.	110.9547609	0.0001387	0.0001012	0.5658607	4.0166726	
0.000002500	450.9768689	180390748.	63.0033006	0.0001575	0.0000825	0.6386712	4.5568643	
0.000003750	676.4229307	180379448.	47.0310100	0.0001764	0.0000639	0.7108679	5.0983098	
0.000005000	901.8265014	180365300.	39.0535132	0.0001953	0.0000453	0.7824453	5.6410094	
0.000006250	1127.1734041	180347745.	34.2739355	0.0002142	0.0000267	0.8533979	6.1849633	
0.000007500	1352.4494559	180326594.	31.0933190	0.0002332	0.000008200	0.9237204	6.7301719	
0.000008750	1577.6331728	180300934.	28.8263780	0.0002522	-0.0000103	0.9934068	7.2766309	
0.0000100	1802.5278988	180252790.	27.1300643	0.0002713	-0.0000287	1.0624362	7.8242186	
0.0000113	2026.7835180	180158535.	25.8134193	0.0002904	-0.0000471	1.1307736	8.3726906	
0.0000125	2250.1511881	180012095.	24.7620043	0.0003095	-0.0000655	1.1983910	8.9218516	
0.0000138	2472.4728021	179816204.	23.9031371	0.0003287	-0.0000838	1.2652687	9.4715634	
0.0000150	2693.6445008	179576300.	23.1884501	0.0003478	-0.0001022	1.3313923	10.0217258	
0.0000163	2693.6445008	165762739.	21.9237967	0.0003563	-0.0001312	1.3598863	10.2609017	C
0.0000175	2693.6445008	153922543.	21.2710372	0.0003722	-0.0001528	1.4140258	10.7189263	C
0.0000188	2765.2350646	147479203.	20.6899848	0.0003879	-0.0001746	1.4666346	11.1686167	C
0.0000200	2871.6193381	143580967.	20.1688193	0.0004034	-0.0001966	1.5178511	11.6109152	C
0.0000213	2973.1867103	139914669.	19.6981516	0.0004186	-0.0002189	1.5677846	12.0465484	C
0.0000225	3070.5507990	136468924.	19.2703295	0.0004336	-0.0002414	1.6165146	12.4760149	C
0.0000238	3164.4929814	133241810.	18.8799696	0.0004484	-0.0002641	1.6641688	12.9002666	C
0.0000250	3255.6070564	130224282.	18.5225010	0.0004631	-0.0002869	1.7108488	13.3200632	C
0.0000263	3344.1568948	127396453.	18.1935303	0.0004776	-0.0003099	1.7565953	13.7356374	C

30- Diameter Pile - Reduced 0.5 Fixed(11_12_19) - Case 1.lpf6									
0.0000275	3430.3553938	124740196.	17.8893822	0.0004920	-0.0003330	1.8014405	14.1471573	C	
0.0000288	3514.4413568	122241438.	17.6071366	0.0005062	-0.0003563	1.8454261	14.5548876	C	
0.0000300	3596.6715627	119889052.	17.3444662	0.0005203	-0.0003797	1.8886027	14.9591856	C	
0.0000313	3677.2944499	117673422.	17.0994638	0.0005344	-0.0004031	1.9310233	15.3604516	C	
0.0000325	3756.5464463	115586045.	16.8705583	0.0005483	-0.0004267	1.9727437	15.7591262	C	
0.0000338	3834.6049557	113617925.	16.6563254	0.0005622	-0.0004503	2.0138088	16.1555661	C	
0.0000350	3911.0612526	111744607.	16.4539105	0.0005759	-0.0004741	2.0540931	16.5484692	C	
0.0000363	3986.6852491	109977524.	16.2640019	0.0005896	-0.0004979	2.0938103	16.9398446	C	
0.0000375	4061.4048452	108304129.	16.0851332	0.0006032	-0.0005218	2.1329420	17.3294574	C	
0.0000388	4134.9534430	106708476.	15.9153624	0.0006167	-0.0005458	2.1713964	17.7163260	C	
0.0000400	4208.0923714	105202309.	15.7558732	0.0006302	-0.0005698	2.2094134	18.1028131	C	
0.0000413	4279.9536348	103756452.	15.6032609	0.0006436	-0.0005939	2.2467079	18.4859634	C	
0.0000425	4351.6267082	102391217.	15.4598548	0.0006570	-0.0006180	2.2836371	18.8693962	C	
0.0000438	4422.1862441	101078543.	15.3222504	0.0006703	-0.0006422	2.3198854	19.2479727	C	
0.0000450	4492.5308539	99834019.	15.1924124	0.0006837	-0.0006663	2.3557617	19.6303484	C	
0.0000463	4562.1147043	98640318.	15.0681345	0.0006969	-0.0006906	2.3910695	20.0089480	C	
0.0000475	4631.2412112	97499815.	14.9498121	0.0007101	-0.0007149	2.4259200	-20.5250088	C	
0.0000488	4700.1348680	96413023.	14.8375777	0.0007233	-0.0007392	2.4603916	-21.2238119	C	
0.0000513	4836.0081771	94361135.	14.6261748	0.0007496	-0.0007879	2.5277469	-22.6264100	C	
0.0000538	4970.4022526	92472600.	14.4327949	0.0007758	-0.0008367	2.5933737	-24.0315684	C	
0.0000563	5103.6673904	90731865.	14.2559759	0.0008019	-0.0008856	2.6574175	-25.4377516	C	
0.0000588	5235.0576060	89107364.	14.0912891	0.0008279	-0.0009346	2.7195580	-26.8489037	C	
0.0000613	5365.7904780	87604742.	13.9405905	0.0008539	-0.0009836	2.7803043	-28.2590885	C	
0.0000638	5494.8539136	86193787.	13.7992366	0.0008797	-0.0010328	2.8392139	-29.6738486	C	
0.0000663	5623.3927306	84881400.	13.6694006	0.0009056	-0.0010819	2.8967909	-31.0869765	C	
0.0000688	5750.5240253	83643986.	13.5471500	0.0009314	-0.0011311	2.9526263	-32.5038072	C	
0.0000713	5876.9720087	82483818.	13.4337911	0.0009572	-0.0011803	3.0070589	-33.9199915	C	
0.0000738	6002.7134189	81392724.	13.3283084	0.0009830	-0.0012295	3.0600680	-35.3357678	C	
0.0000763	6127.2390181	80357233.	13.2283409	0.0010087	-0.0012788	3.1114094	-36.7546435	C	
0.0000788	6251.2455384	79380896.	13.1354512	0.0010344	-0.0013281	3.1614207	-38.1718506	C	
0.0000813	6374.7188461	78458078.	13.0489639	0.0010602	-0.0013773	3.2100886	-39.5874411	C	
0.0000838	6496.9623876	77575670.	12.9660527	0.0010859	-0.0014266	3.2570588	-41.0068868	C	
0.0000863	6618.6859896	76738388.	12.8886309	0.0011116	-0.0014759	3.3026937	-42.4246243	C	
0.0000888	6739.8841072	75942356.	12.8162414	0.0011374	-0.0015251	3.3469843	-43.8406359	C	
0.0000913	6860.5381682	75183980.	12.7484321	0.0011633	-0.0015742	3.3899145	-45.2550237	C	
0.0000938	6980.1185970	74454598.	12.6830317	0.0011890	-0.0016235	3.4312040	-46.6726949	C	
0.0000963	7099.1714196	73757625.	12.6216662	0.0012148	-0.0016727	3.4711417	-48.0885865	C	
0.0000988	7217.6908697	73090540.	12.5640360	0.0012407	-0.0017218	3.5097179	-49.5026790	C	
0.0001013	7335.6710739	72451072.	12.5098715	0.0012666	-0.0017709	3.5469229	-50.9149520	C	
0.0001038	7453.1060474	71837167.	12.4589289	0.0012926	-0.0018199	3.5827470	-52.3253849	C	
0.0001063	7569.6651850	71243908.	12.4097667	0.0013185	-0.0018690	3.6170098	-53.7377187	C	
0.0001088	7685.6075397	70672253.	12.3631997	0.0013445	-0.0019180	3.6498507	-55.1489961	C	
0.0001113	7801.0001660	70121350.	12.3193953	0.0013705	-0.0019670	3.6812988	-56.5583582	C	
0.0001138	7915.8367469	69589774.	12.2779156	0.0013966	-0.0020159	3.7113437	-57.9657813	C	
0.0001163	8030.1108130	69076222.	12.2389532	0.0014228	-0.0020647	3.7399746	-59.3712412	C	
0.0001188	8143.8157589	68579501.	12.2021703	0.0014490	-0.0021135	3.7671806	-60.7700000	CY	
0.0001213	8256.9448390	68098514.	12.1674769	0.0014753	-0.0021622	3.7929507	-60.0000000	CY	
0.0001238	8369.3750796	67631314.	12.1342480	0.0015016	-0.0022109	3.8172167	-60.0000000	CY	
0.0001263	8481.0955462	67176994.	12.1023532	0.0015279	-0.0022596	3.8399727	-60.0000000	CY	
0.0001288	8592.2315965	66735779.	12.0722650	0.0015543	-0.0023082	3.8612743	-60.0000000	CY	
0.0001313	8702.7759274	66306864.	12.0438879	0.0015808	-0.0023567	3.8811093	-60.0000000	CY	
0.0001338	8812.7210596	65889503.	12.0171337	0.0016073	-0.0024052	3.8994654	-60.0000000	CY	
0.0001363	8922.0593365	65483004.	11.9919209	0.0016339	-0.0024536	3.9163300	-60.0000000	CY	
0.0001388	9030.7829170	65086724.	11.9681744	0.0016606	-0.0025019	3.9316902	-60.0000000	CY	
0.0001413	9137.6900138	64691611.	11.9453452	0.0016873	-0.0025502	3.9454994	-60.0000000	CY	
0.0001438	9238.7156167	64269326.	11.9217355	0.0017137	-0.0025988	3.9576522	-60.0000000	CY	
0.0001463	9332.5715101	63812455.	11.8967937	0.0017399	-0.0026476	3.9681557	-60.0000000	CY	
0.0001488	9419.4849981	63324269.	11.8705933	0.0017658	-0.0026967	3.9770646	-60.0000000	CY	
0.0001588	9715.5818120	61200515.	11.7570301	0.0018664	-0.0028961	3.9978575	-60.0000000	CY	
0.0001688	9932.1775142	58857348.	11.6330601	0.0019631	-0.0030994	3.9997271	-60.0000000	CY	
0.0001788	10125.	56643555.	11.5214329	0.0020595	-0.0033030	3.9997636	-60.0000000	CY	
0.0001888	10300.	54568540.	11.4194961	0.0021554	-0.0035071	3.9979905	60.0000000	CY	
0.0001988	10429.	52471474.	11.3138648	0.0022486	-0.0037139	3.9992859	60.0000000	CY	
0.0002088	10530.	50444389.	11.2100135	0.0023401	-0.0039224	3.9997169	60.0000000	CY	
0.0002188	10627.	48582162.	11.1165886	0.0024318	-0.0041307	3.9998291	60.0000000	CY	
0.0002288	10722.	46870093.	11.0347354	0.0025242	-0.0043383	3.9997793	60.0000000	CY	
0.0002388	10813.	45290356.	10.9627833	0.0026174	-0.0045451	3.9995057	60.0000000	CY	
0.0002488	10898.	43810267.	10.8944493	0.0027100	-0.0047525	3.9986647	60.0000000	CY	
0.0002588	10968.	42388164.	10.8256870	0.0028011	-0.0049614	3.9965450	60.0000000	CY	
0.0002688	11023.	41014904.	10.7556401	0.0028906	-0.0051719	3.9999862	60.0000000	CY	
0.0002788	11065.	39693879.	10.6859840	0.0029787	-0.0053838	3.9985030	60.0000000	CY	
0.0002888	11103.	38451819.	10.6198910	0.0030665	-0.0055960	3.9966186	60.0000000	CY	
0.0002988	11137.	37278815.	10.5606101	0.0031550	-0.0058075	3.9989300	60.0000000	CY	
0.0003088	11169.	36176100.	10.5076415	0.0032442	-0.0060183	3.9953282	60.0000000	CY	
0.0003188	11199.	35133255.	10.4617950	0.0033347	-0.0062278	3.9987186	60.0000000	CY	
0.0003288	11226.	34147310.	10.4216262	0.0034261	-0.0064364	3.9965038	60.0000000	CY	
0.0003388	11251.	33212640.	10.3869033	0.0035186	-0.0066439	3.9977718	60.0000000	CY	
0.0003488	11274.	32326919.	10.3564057	0.0036118	-0.0068507	3.9999993	60.0000000	CY	
0.0003588	11295.	31484451.	10.3285898	0.0037054	-0.0070571	3.9953480	60.0000000	CY	
0.0003688	11315.	30684740.	10.3033911	0.0037994	-0.0072631	3.9994139	60.0000000	CY	
0.0003788	11315.	29874582.	10.3076785	0.0039040	-0.0074585	3.9920107	60.0000000	CY	

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Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1  
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Moment values interpolated at maximum compressive strain = 0.003  
or maximum developed moment if pile fails at smaller strains.

Load	Axial Thrust	Nominal Mom. Cap.	Max. Comp.
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No.	kips	30- Diameter Pile - Reduced 0.5 Fixed(11_12_19) - Case 1.lp60 in-kip	Strain
1	390.000	11073.954	0.00300000

Note note that the values of moment capacity in the table above are not factored by a strength reduction factor ( $\phi$ -factor).

In ACI 318-08, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are spirals or tied hoops.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318-08, Section 9.3.2.2 or the value required by the design standard being followed.

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 Computed Values of Pile Loading and Deflection  
 for Lateral Loading for Load Case Number 1  
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Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head = 84000.000 lbs  
 Rotation of pile head = 0.000E+00 radians  
 Axial load at pile head = 390000.000 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth X inches	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in <sup>2</sup>	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.1496	-5040361.	84000.	0.000	0.000	9.871E+10	0.000	0.000	0.000
5.280	0.1489	-4596564.	83958.	-0.000258	0.000	9.871E+10	-15.8627	562.4209	0.000
10.560	0.1469	-4152702.	83829.	-0.000492	0.000	9.871E+10	-33.1713	1192.1964	0.000
15.840	0.1437	-3709308.	83595.	-0.000686	0.000	1.172E+11	-55.3049	2031.7033	0.000
21.120	0.1397	-3267111.	83229.	-0.000836	0.000	1.299E+11	-83.3708	3151.8886	0.000
26.400	0.1349	-2826965.	82744.	-0.000954	0.000	1.452E+11	-100.3593	3928.2119	0.000
31.680	0.1296	-2389406.	82111.	-0.001041	0.000	1.799E+11	-139.4689	5682.6780	0.000
36.960	0.1239	-1955590.	81248.	-0.001104	0.000	1.802E+11	-187.3246	7982.4254	0.000
42.240	0.1179	-1526878.	80103.	-0.001155	0.000	1.803E+11	-246.3649	11031.	0.000
47.520	0.1117	-1104943.	78609.	-0.001194	0.000	1.803E+11	-319.5564	15104.	0.000
52.800	0.1053	-691849.	75604.	-0.001220	0.000	1.804E+11	-418.8761	41054.	0.000
58.080	0.0988	-301543.	71038.	-0.001235	0.000	1.804E+11	-910.6928	48658.	0.000
63.360	0.0923	63392.	65947.	-0.001238	0.000	1.804E+11	-1017.6441	58228.	0.000
68.640	0.0857	399954.	60262.	-0.001231	0.000	1.804E+11	-1135.6571	69931.	0.000
73.920	0.0793	704831.	54116.	-0.001215	0.000	1.804E+11	-1192.3868	79417.	0.000
79.200	0.0729	976424.	47793.	-0.001191	0.000	1.804E+11	-1202.5638	87084.	0.000
84.480	0.0667	1214432.	41459.	-0.001159	0.000	1.803E+11	-1196.9739	94751.	0.000
89.760	0.0607	1418998.	35191.	-0.001120	0.000	1.803E+11	-1176.9885	102417.	0.000
95.040	0.0549	1590665.	29147.	-0.001076	0.000	1.803E+11	-1112.5204	107047.	0.000
100.320	0.0493	1731221.	23381.	-0.001027	0.000	1.803E+11	-1071.4447	114713.	0.000
105.600	0.0440	1841803.	17859.	-0.000975	0.000	1.802E+11	-1020.4339	122380.	0.000
110.880	0.0390	1923825.	12628.	-0.000920	0.000	1.802E+11	-961.0767	130046.	0.000
116.160	0.0343	1978938.	7787.4023	-0.000863	0.000	1.802E+11	-872.3226	134231.	0.000
121.440	0.0299	2009613.	3362.2965	-0.000804	0.000	1.802E+11	-803.8539	141898.	0.000
126.720	0.0258	2017756.	-690.8035	-0.000745	0.000	1.802E+11	-731.4113	149565.	0.000
132.000	0.0220	2005387.	-4354.5915	-0.000686	0.000	1.802E+11	-656.3872	157231.	0.000
137.280	0.0186	1974597.	-7618.8688	-0.000628	0.000	1.802E+11	-580.0815	164898.	0.000
142.560	0.0154	1927517.	-10480.	-0.000571	0.000	1.802E+11	-503.6895	172564.	0.000
147.840	0.0125	1866279.	-12940.	-0.000515	0.000	1.802E+11	-428.2924	180231.	0.000
153.120	0.009971	1792988.	-15008.	-0.000462	0.000	1.803E+11	-354.8505	187897.	0.000
158.400	0.007673	1709696.	-16695.	-0.000410	0.000	1.803E+11	-284.1997	195564.	0.000
163.680	0.005639	1618378.	-18018.	-0.000362	0.000	1.803E+11	-217.0512	203230.	0.000
168.960	0.003855	1520911.	-18998.	-0.000316	0.000	1.803E+11	-153.9916	210897.	0.000
174.240	0.002307	1419059.	-19657.	-0.000273	0.000	1.803E+11	-95.4861	218564.	0.000
179.520	0.000978	1314460.	-20019.	-0.000232	0.000	1.803E+11	-41.8840	226230.	0.000
184.800	-0.000148	1208614.	-20112.	-0.000196	0.000	1.803E+11	6.5762	233897.	0.000
190.080	-0.001088	1102879.	-19964.	-0.000162	0.000	1.803E+11	49.7584	241563.	0.000
195.360	-0.001856	998464.	-19601.	-0.000131	0.000	1.804E+11	87.6205	249230.	0.000
200.640	-0.002471	896432.	-19052.	-0.000103	0.000	1.804E+11	120.2057	256896.	0.000
205.920	-0.002946	797697.	-18345.	-7.843E-05	0.000	1.804E+11	147.6323	264563.	0.000
211.200	-0.003299	703029.	-17506.	-5.647E-05	0.000	1.804E+11	170.0836	272230.	0.000
216.480	-0.003543	613061.	-16562.	-3.721E-05	0.000	1.804E+11	187.7986	279896.	0.000
221.760	-0.003692	528291.	-15535.	-2.050E-05	0.000	1.804E+11	201.0613	287563.	0.000
227.040	-0.003759	449095.	-14449.	-6.197E-06	0.000	1.804E+11	210.1916	295229.	0.000
232.320	-0.003757	375732.	-13325.	5.874E-06	0.000	1.804E+11	215.5363	302896.	0.000
237.600	-0.003697	308354.	-12182.	1.589E-05	0.000	1.804E+11	217.4597	310562.	0.000
242.880	-0.003589	247021.	-11037.	2.401E-05	0.000	1.804E+11	216.3367	318229.	0.000
248.160	-0.003444	191703.	-9904.8581	3.043E-05	0.000	1.804E+11	212.5448	325895.	0.000
253.440	-0.003268	142300.	-8798.6917	3.532E-05	0.000	1.804E+11	206.4577	333562.	0.000
258.720	-0.003071	98644.	-7729.7626	3.885E-05	0.000	1.804E+11	198.4397	341229.	0.000
264.000	-0.002858	60514.	-6707.3415	4.118E-05	0.000	1.804E+11	188.8410	348895.	0.000
269.280	-0.002636	27645.	-5738.8998	4.247E-05	0.000	1.804E+11	177.9930	356562.	0.000
274.560	-0.002409	-263.8592	-4830.2163	4.287E-05	0.000	1.804E+11	166.2053	364228.	0.000
279.840	-0.002183	-23539.	-3985.4995	4.252E-05	0.000	1.804E+11	153.7632	371895.	0.000
285.120	-0.001960	-42526.	-3207.5218	4.155E-05	0.000	1.804E+11	140.9253	379561.	0.000
290.400	-0.001744	-57581.	-2497.7628	4.009E-05	0.000	1.804E+11	127.9228	387228.	0.000
295.680	-0.001537	-69067.	-1856.5572	3.823E-05	0.000	1.804E+11	114.9581	394894.	0.000

30- Diameter Pile - Reduced 0.5 Fixed(11_12_19) - Case 1.lp6o									
300.960	-0.001341	-77344.	-1283.2451	3.609E-05	0.000	1.804E+11	102.2055	402561.	0.000
306.240	-0.001156	-82767.	-860.5020	3.375E-05	0.000	1.804E+11	57.9244	264581.	0.000
311.520	-0.000984	-86570.	-573.6150	3.127E-05	0.000	1.804E+11	50.7449	272247.	0.000
316.800	-0.000826	-88953.	-324.0809	2.870E-05	0.000	1.804E+11	43.7756	279914.	0.000
322.080	-0.000681	-90111.	-110.5821	2.608E-05	0.000	1.804E+11	37.0951	287580.	0.000
327.360	-0.000550	-90228.	164.6888	2.344E-05	0.000	1.804E+11	67.1742	644490.	0.000
332.640	-0.000434	-88468.	483.3921	2.083E-05	0.000	1.804E+11	53.5468	652157.	0.000
337.920	-0.000330	-85209.	733.7575	1.829E-05	0.000	1.804E+11	41.2886	659823.	0.000
343.200	-0.000240	-80795.	923.0037	1.586E-05	0.000	1.804E+11	30.3956	667490.	0.000
348.480	-0.000163	-75528.	1058.2602	1.357E-05	0.000	1.804E+11	20.8379	675157.	0.000
353.760	-9.716E-05	-69675.	1146.4429	1.144E-05	0.000	1.804E+11	12.5646	682823.	0.000
359.040	-4.212E-05	-63469.	1194.1556	9.495E-06	0.000	1.804E+11	5.5084	690490.	0.000
364.320	3.107E-06	-57104.	1207.6130	7.730E-06	0.000	1.804E+11	-0.4109	698156.	0.000
369.600	3.951E-05	-50748.	1192.5846	6.152E-06	0.000	1.804E+11	-5.2817	705823.	0.000
374.880	6.807E-05	-44536.	1154.3564	4.758E-06	0.000	1.804E+11	-9.1986	713489.	0.000
380.160	8.975E-05	-38578.	1097.7099	3.541E-06	0.000	1.804E+11	-12.2584	721156.	0.000
385.440	0.000105	-32959.	1026.9138	2.494E-06	0.000	1.804E+11	-14.5583	728822.	0.000
390.720	0.000116	-27744.	945.7296	1.606E-06	0.000	1.804E+11	-16.1933	736489.	0.000
396.000	0.000122	-22978.	857.4261	8.639E-07	0.000	1.804E+11	-17.2550	744156.	0.000
401.280	0.000125	-18693.	764.8033	2.541E-07	0.000	1.804E+11	-17.8294	751822.	0.000
406.560	0.000125	-14903.	670.2232	-2.376E-07	0.000	1.804E+11	-17.9964	759489.	0.000
411.840	0.000123	-11614.	575.6454	-6.256E-07	0.000	1.804E+11	-17.8285	767155.	0.000
417.120	0.000119	-8821.7202	482.6681	-9.247E-07	0.000	1.804E+11	-17.3902	774822.	0.000
422.400	0.000113	-6513.4685	392.5704	-1.149E-06	0.000	1.804E+11	-16.7377	782488.	0.000
427.680	0.000106	-4671.4443	306.3583	-1.313E-06	0.000	1.804E+11	-15.9184	790155.	0.000
432.960	9.908E-05	-3272.9177	246.3858	-1.429E-06	0.000	1.804E+11	-6.7985	362300.	0.000
438.240	9.128E-05	-2063.7244	211.5527	-1.507E-06	0.000	1.804E+11	-6.3959	369967.	0.000
443.520	8.316E-05	-1032.7146	178.9650	-1.552E-06	0.000	1.804E+11	-5.9479	377634.	0.000
448.800	7.489E-05	-167.4602	148.8359	-1.570E-06	0.000	1.804E+11	-5.4647	385300.	0.000
454.080	6.658E-05	545.4583	116.1746	-1.564E-06	0.000	1.804E+11	-6.9070	547725.	0.000
459.360	5.836E-05	1065.7871	81.7325	-1.541E-06	0.000	1.804E+11	-6.1392	555392.	0.000
464.640	5.031E-05	1414.8998	51.3610	-1.505E-06	0.000	1.804E+11	-5.3651	563059.	0.000
469.920	4.248E-05	1614.3561	25.0761	-1.460E-06	0.000	1.804E+11	-4.5913	570725.	0.000
475.200	3.489E-05	1685.7177	2.8651	-1.412E-06	0.000	1.804E+11	-3.8220	578392.	0.000
480.480	2.757E-05	1650.4266	-15.3023	-1.363E-06	0.000	1.804E+11	-3.0596	586058.	0.000
485.760	2.049E-05	1529.7392	-29.4639	-1.317E-06	0.000	1.804E+11	-2.3046	593725.	0.000
491.040	1.366E-05	1344.7105	-39.6560	-1.275E-06	0.000	1.804E+11	-1.5560	601391.	0.000
496.320	7.036E-06	1116.2211	-45.9064	-1.239E-06	0.000	1.804E+11	-0.8116	609058.	0.000
501.600	5.822E-07	865.0394	-48.2285	-1.210E-06	0.000	1.804E+11	-0.0680	616725.	0.000
506.880	-5.737E-06	611.9097	-46.6168	-1.188E-06	0.000	1.804E+11	0.6785	624391.	0.000
512.160	-1.196E-05	377.6581	-41.0451	-1.173E-06	0.000	1.804E+11	1.4320	632058.	0.000
517.440	-1.813E-05	183.3058	-31.4658	-1.165E-06	0.000	1.804E+11	2.1965	639724.	0.000
522.720	-2.427E-05	50.1783	-17.8116	-1.162E-06	0.000	1.804E+11	2.9755	647391.	0.000
528.000	-3.040E-05	0.000	0.000	-1.161E-06	0.000	1.804E+11	3.7713	327529.	0.000

\* This analysis makes computations of pile response using nonlinear moment-curvature relationships. The above values of total stress are computed for combined axial stress and do not equal the actual stresses in concrete and steel in the range of nonlinear bending.

Output Verification: Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.1496309 inches  
 Computed slope at pile head = 0.000000 radians  
 Maximum bending moment = -5040361. inch-lbs  
 Maximum shear force = 84000. lbs  
 Depth of maximum bending moment = 0.000000 inches below pile head  
 Depth of maximum shear force = 0.000000 inches below pile head  
 Number of iterations = 7  
 Number of zero deflection points = 3

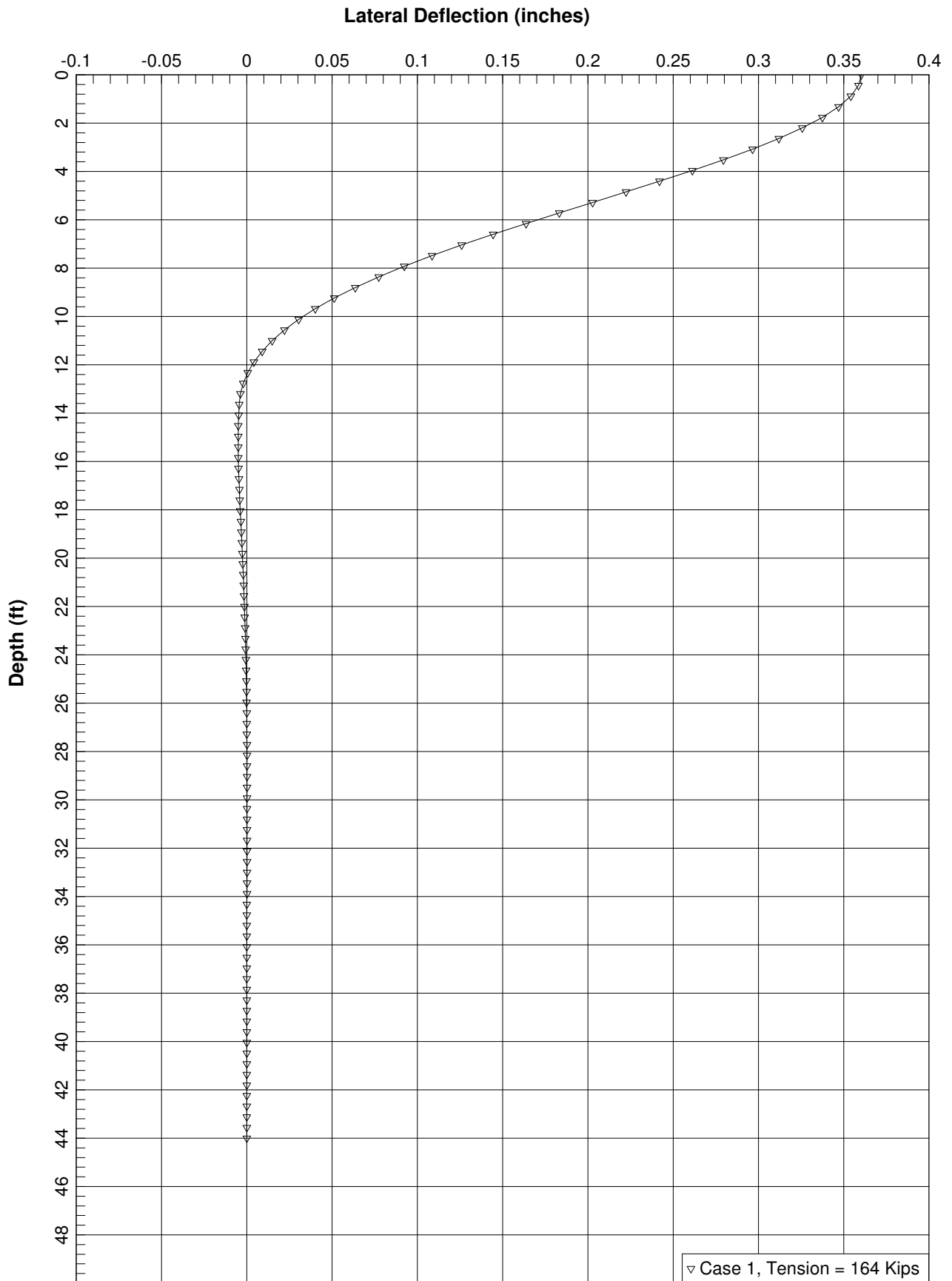
-----  
 Summary of Pile Response(s)  
 -----

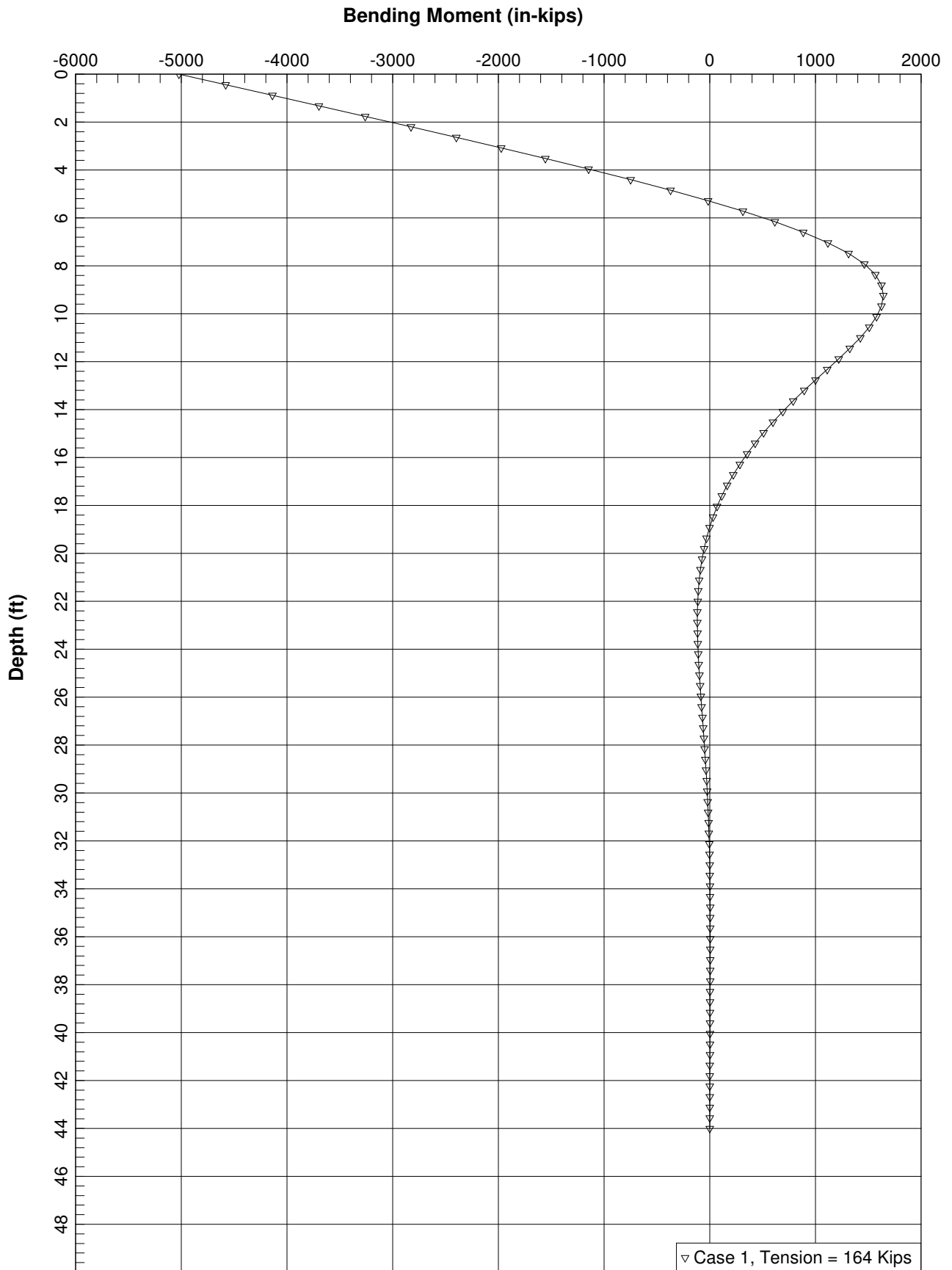
Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs  
 Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians  
 Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian  
 Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs  
 Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians

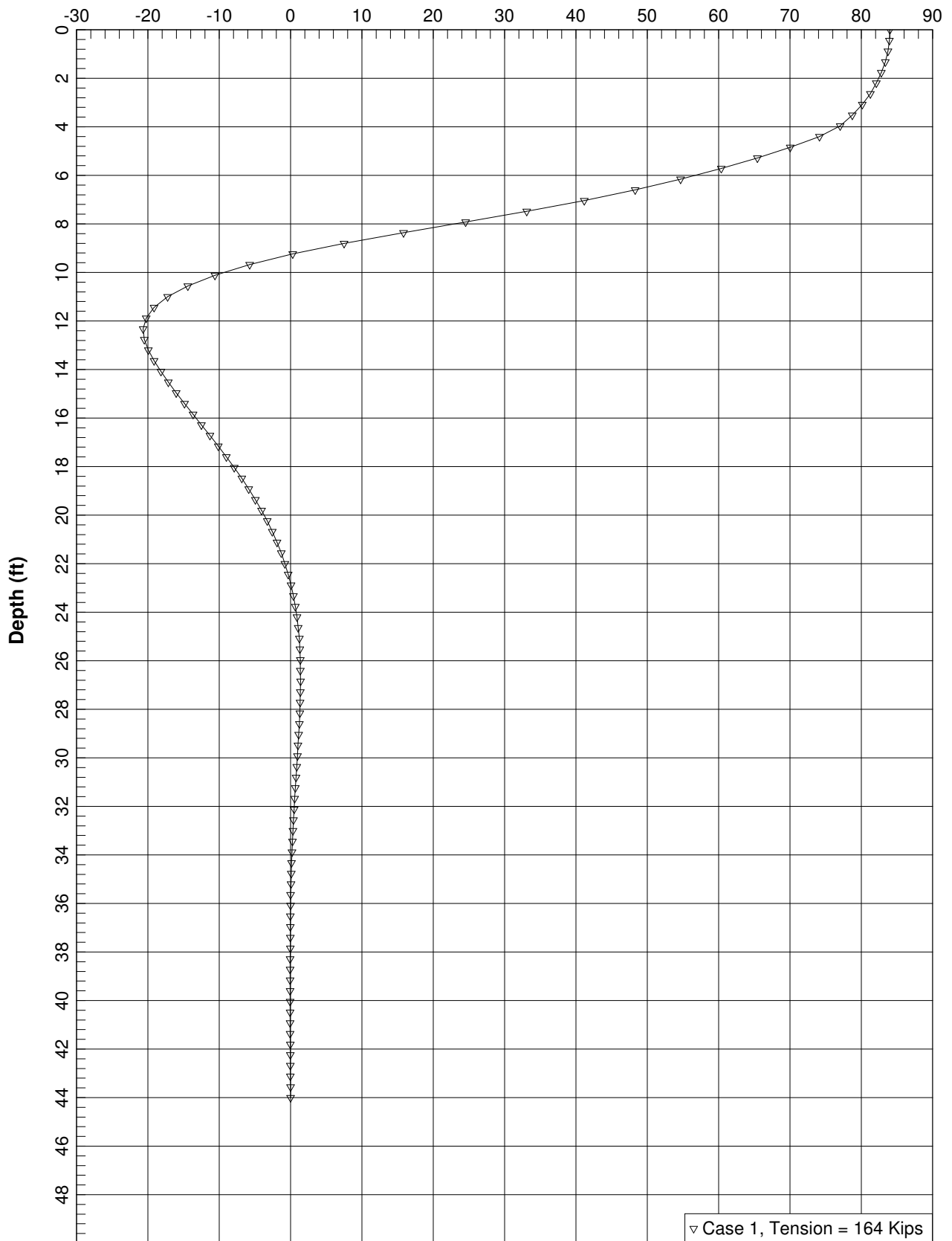
Load Case No.	Load Type No.	Pile-head Condition 1 V(lbs) or y(inches)	Pile-head Condition 2 in-lb, rad., or in-lb/rad.	Axial Loading lbs	Pile-head Deflection inches	Maximum Moment in-lbs	Maximum Shear lbs	Pile-head Rotation radians
1	2	v = 84000.	s = 0.000	390000.	0.14963087	-5040361.	84000.	0.00000000

The analysis ended normally.





### Shear Force (kips)



▽ Case 1, Tension = 164 Kips



LPILE Plus for Windows, Version 6 (6.0.24)

Analysis of Individual Piles and Drilled Shafts  
Subjected to Lateral Loading Using the p-y Method

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ko  
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Serial Number of Security Device: 228748185  
Company Name Stored in Security Device: Koury Engineering & Testing

Files Used for Analysis

Path to file locations: G:\Projects\2017\17-0822 Russell Hall Replacement Project Soils Investigation\Soils  
Folder\Soils Reports-Certificates\DSA\DSA - Lateral Pile Capacities\  
Name of input data file: 30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 1 Tension.lp6d  
Name of output report file: 30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 1 Tension.lp6o  
Name of plot output file: 30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 1 Tension.lp6p  
Name of runtime message file: 30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 1 Tension.lp6r

Date and Time of Analysis

Date: November 12, 2019 Time: 17:00:04

Problem Title

Health Science Building

Job Number: 17-0822

Client:

Engineer:

Description: Building Piles

Program Options

Engineering units are US Customary Units: pounds, inches, feet

Basic Program Options:

This analysis computes nonlinear bending stiffness and nominal moment  
capacity with pile response computed using nonlinear EI

Computation Options:

- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No p-y curves to be computed and output for user-specified depths

Solution Control Parameters:

- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-03 in
- Maximum allowable deflection = 100.0000 in

Pile Response Output Options:

- Values of pile-head deflection, bending moment, shear force, and  
soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1

-----  
Pile Structural Properties and Geometry  
-----

Total Number of Sections = 1  
Total Pile Length = 44.00 ft  
Depth of ground surface below top of pile = 0.00 ft  
Slope angle of ground surface = 0.00 deg.

Pile dimensions used for p-y curve computations defined using 2 points.  
p-y curves are computed using values of pile diameter interpolated over  
the length of the pile.

Point	Depth X ft	Pile Diameter in
1	0.00000	30.0000000
2	44.000000	30.0000000

-----  
Input Structural Properties:  
-----

Pile Section No. 1:

Section Type = Drilled Shaft (Bored Pile)  
Section Length = 44.000 ft  
Section Diameter = 30.000 in

-----  
Ground Slope and Pile Batter Angles  
-----

Ground Slope Angle = 0.000 degrees  
= 0.000 radians  
Pile Batter Angle = 0.000 degrees  
= 0.000 radians

-----  
Soil and Rock Layering Information  
-----

The soil profile is modelled using 9 layers

Layer 1 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 0.000 ft  
Distance from top of pile to bottom of layer = 2.000 ft  
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for  
the above soil layer.

Layer 2 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 2.000 ft  
Distance from top of pile to bottom of layer = 4.000 ft  
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for  
the above soil layer.

Layer 3 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 4.000 ft  
Distance from top of pile to bottom of layer = 7.500 ft  
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for  
the above soil layer.

Layer 4 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 7.500 ft  
Distance from top of pile to bottom of layer = 9.500 ft  
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3

30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 1 Tension.lrp60  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 5 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 9.500 ft  
 Distance from top of pile to bottom of layer = 25.500 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 6 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 25.500 ft  
 Distance from top of pile to bottom of layer = 27.000 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 7 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 27.000 ft  
 Distance from top of pile to bottom of layer = 36.000 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 8 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 36.000 ft  
 Distance from top of pile to bottom of layer = 37.500 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 9 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 37.500 ft  
 Distance from top of pile to bottom of layer = 44.000 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

(Depth of lowest layer extends 0.00 ft below pile tip)

-----  
 Effective Unit weight of Soil vs. Depth  
 -----

Effective unit weight of soil with depth defined using 18 points

Point No.	Depth x ft	Eff. Unit weight pcf
1	0.00	123.00000
2	2.00	123.00000
3	2.00	123.00000
4	4.00	123.00000
5	4.00	131.50000
6	7.50	131.50000
7	7.50	123.00000
8	9.50	123.00000
9	9.50	130.20000
10	25.50	130.20000
11	25.50	122.00000
12	27.00	122.00000
13	27.00	127.50000
14	36.00	127.50000
15	36.00	69.30000
16	37.50	69.30000
17	37.50	66.30000
18	44.00	66.30000

-----  
 Summary of Soil Properties  
 -----

30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 1 Tension.lp60

Layer Num.	Epsilon 50	Soil Type J (p-y Curve Criteria)	kpy Criteria) pci	Rock Emass psi	Depth ft	Eff. Unit krm Wt., pcf	Cohesion Test Type psf	Friction Test Prop. Ang., deg.	Elas. Subgr. psi	qu psi	RQD percent
1	0.00	Cemented Silt	default	--	0.00	123.000	1.000	20.000	--	--	--
	0.00	--	default	--	2.000	123.000	1.000	20.000	--	--	--
2	0.00	Cemented Silt	default	--	2.000	123.000	1.000	20.000	--	--	--
	0.00	--	default	--	4.000	123.000	1.000	20.000	--	--	--
3	0.00	Cemented Silt	default	--	4.000	131.500	350.000	15.000	--	--	--
	0.00	--	default	--	7.500	131.500	350.000	15.000	--	--	--
4	0.00	Cemented Silt	default	--	7.500	123.000	90.000	22.000	--	--	--
	0.00	--	default	--	9.500	123.000	90.000	22.000	--	--	--
5	0.00	Cemented Silt	default	--	9.500	130.200	420.000	12.000	--	--	--
	0.00	--	default	--	25.500	130.200	420.000	12.000	--	--	--
6	0.00	Cemented Silt	default	--	25.500	122.000	100.000	29.000	--	--	--
	0.00	--	default	--	27.000	122.000	100.000	29.000	--	--	--
7	0.00	Cemented Silt	default	--	27.000	127.500	370.000	6.000	--	--	--
	0.00	--	default	--	36.000	127.500	370.000	6.000	--	--	--
8	0.00	Cemented Silt	default	--	36.000	69.300	450.000	23.000	--	--	--
	0.00	--	default	--	37.500	69.300	450.000	23.000	--	--	--
9	0.00	Cemented Silt	default	--	37.500	66.300	470.000	11.000	--	--	--
	0.00	--	default	--	44.000	66.300	470.000	11.000	--	--	--

-----  
Loading Type  
-----

Static loading criteria were used when computing p-y curves for all analyses.

-----  
Pile-head Loading and Pile-head Fixity Conditions  
-----

Number of loads specified = 1

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs
1	2	v = 84000. lbs	s = 0.0000 in/in	-164000.

V = perpendicular shear force applied to pile head  
M = bending moment applied to pile head  
y = lateral deflection relative to pile axis  
S = pile slope relative to original pile batter angle  
R = rotational stiffness applied to pile head  
Axial thrust is assumed to be acting axially for all pile batter angles.

-----  
Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness  
-----

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft:

Length of Section	=	44.00000000 ft
Shaft Diameter	=	30.00000000 in
Concrete Cover Thickness	=	3.00000000 in
Number of Reinforcing Bars	=	9 bars

30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 1 Tension.lp6o  
 Yield Stress of Reinforcing Bars = 60.0000000 ksi  
 Modulus of Elasticity of Reinforcing Bars = 29000. ksi  
 Gross Area of Shaft = 706.85834706 sq. in.  
 Total Area of Reinforcing Steel = 14.04000000 sq. in.  
 Area Ratio of Steel Reinforcement = 1.99 percent  
 Edge-to-Edge Bar Spacing = 6.31623504 in

Axial Structural Capacities:

Nom. Axial Structural Capacity =  $0.85 F_c A_c + F_y A_s$  = 3197.982 kips  
 Tensile Load for Cracking of Concrete = -335.124 kips  
 Nominal Axial Tensile Capacity = -842.400 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.41000	1.56000	11.29500	0.00000
2	1.41000	1.56000	8.65247	7.26029
3	1.41000	1.56000	1.96136	11.12340
4	1.41000	1.56000	-5.64750	9.78176
5	1.41000	1.56000	-10.61383	3.86312
6	1.41000	1.56000	-10.61383	-3.86312
7	1.41000	1.56000	-5.64750	-9.78176
8	1.41000	1.56000	1.96136	-11.12340
9	1.41000	1.56000	8.65247	-7.26029

Concrete Properties:

Compressive Strength of Concrete = 4.0000000 ksi  
 Modulus of Elasticity of Concrete = 3604.9965326 ksi  
 Modulus of Rupture of Concrete = -0.4743416 ksi  
 Compression Strain at Peak Stress = 0.0018863  
 Tensile Strain at Fracture of Concrete = -0.0001154  
 Maximum coarse Aggregate Size = 0.7500000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	-164.000

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension  
 Y = stress in reinforcing steel has reached yield stress  
 T = tensile strain in reinforcement exceeds 0.005 when compressive strain in concrete is less than 0.003.  
 Z = depth of tensile zone in concrete section is less than 10 percent of section depth  
 Bending Stiffness (EI) = Bending Moment / Curvature  
 Position of neutral axis is computed from compression side of pile  
 Compressive stresses are positive in sign. Tensile stresses are negative in sign.

Axial Thrust Force = -164.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in <sup>2</sup>	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Run Msg
0.000001250	233.1655771	186532462.	-24.6914321	-0.0000309	-0.0000684	-0.1306120	-1.9771269	
0.000002500	233.1655771	93266231.	-146.1163562	-0.0003653	-0.0004403	0.0000000	-12.7575608	C
0.000003750	699.4483260	186519554.	1.7249594	0.000006469	-0.0001060	0.0250096	-3.0585982	
0.000005000	699.4483260	139889665.	-65.5583446	-0.0003278	-0.0004778	0.0000000	-13.8342100	C
0.000006250	699.4483260	111911732.	-49.4467423	-0.0003090	-0.0004965	0.0000000	-14.3725346	C
0.000007500	699.4483260	93259777.	-38.7056741	-0.0002903	-0.0005153	0.0000000	-14.9108590	C
0.000008750	699.4483260	79936952.	-31.0334825	-0.0002715	-0.0005340	0.0000000	-15.4491836	C
0.0000100	699.4483260	69944833.	-25.2793388	-0.0002528	-0.0005528	0.0000000	-15.9875082	C
0.0000113	699.4483260	62173185.	-20.8038937	-0.0002340	-0.0005715	0.0000000	-16.5258328	C
0.0000125	699.4483260	55955866.	-17.2235377	-0.0002153	-0.0005903	0.0000000	-17.0641574	C
0.0000138	699.4483260	50868969.	-14.2941554	-0.0001965	-0.0006090	0.0000000	-17.6024819	C
0.0000150	699.4483260	46629888.	-11.8530036	-0.0001778	-0.0006278	0.0000000	-18.1408065	C
0.0000163	699.4483260	43042974.	-9.7874135	-0.0001590	-0.0006465	0.0000000	-18.6791311	C
0.0000175	699.4483260	39968476.	-8.0169078	-0.0001403	-0.0006653	0.0000000	-19.2174556	C
0.0000188	699.4483260	37303911.	-6.4824694	-0.0001215	-0.0006840	0.0000000	-19.7557802	C
0.0000200	699.4483260	34972416.	-5.1398359	-0.0001028	-0.0007028	0.0000000	-20.2941048	C
0.0000213	699.4483260	32915215.	-3.9551593	-0.0000840	-0.0007215	0.0000000	-20.8324293	C
0.0000225	699.4483260	31086592.	-2.9021134	-0.0000653	-0.0007403	0.0000000	-21.3707539	C
0.0000238	699.4483260	29450456.	-1.9599144	-0.0000465	-0.0007590	0.0000000	-21.9090785	C
0.0000250	699.4483260	27977933.	-1.1119353	-0.0000278	-0.0007778	0.0000000	-22.4474031	C
0.0000263	699.4483260	26645651.	-0.3447162	-0.000009049	-0.0007965	0.0000000	-22.9857276	C

30- Diameter Pile - Reduced 0.5 Fixed(11_12_19) - Case 1 Tension.lp60							
0.0000275	716.0993509	26039976.	0.3502637	0.00009632	-0.0008154	0.0233231	-23.5260396 C
0.0000288	752.9660533	26190124.	0.9617836	0.0000277	-0.0008348	0.0983714	-24.0855504 C
0.0000300	795.1543765	26505146.	1.4912276	0.0000447	-0.0008553	0.1688312	-24.6721322 C
0.0000313	841.7371306	26935588.	1.9526489	0.0000610	-0.0008765	0.2353494	-25.2819745 C
0.0000325	892.5370732	27462679.	2.3538421	0.0000765	-0.0008985	0.2980060	-25.9151288 C
0.0000338	946.1541005	28034196.	2.7087000	0.0000914	-0.0009211	0.3578675	-26.5645474 C
0.0000350	1002.1161587	28631890.	3.0243613	0.0001059	-0.0009441	0.4152950	-27.2280233 C
0.0000363	1059.9594695	29240261.	3.3071008	0.0001199	-0.0009676	0.4706559	-27.9032228 C
0.0000375	1119.2334021	29846224.	3.5624683	0.0001336	-0.0009914	0.5243226	-28.5876907 C
0.0000388	1179.5595790	30440247.	3.7950685	0.0001471	-0.0010154	0.5766215	-29.2792291 C
0.0000400	1240.9013855	31022535.	4.0070498	0.0001603	-0.0010397	0.6275768	-29.9778221 C
0.0000413	1303.1234792	31590872.	4.2008049	0.0001733	-0.0010642	0.6772923	-30.6828697 C
0.0000425	1365.7037902	32134207.	4.3808987	0.0001862	-0.0010888	0.7262695	-31.3906673 C
0.0000438	1429.0919674	32664959.	4.5457944	0.0001989	-0.0011136	0.7740655	-32.1047107 C
0.0000450	1492.7053031	33171229.	4.6998979	0.0002115	-0.0011385	0.8212477	-32.8207657 C
0.0000463	1556.8600425	33661839.	4.8425028	0.0002240	-0.0011635	0.8675020	-33.5413055 C
0.0000475	1621.0861795	34128130.	4.9768826	0.0002364	-0.0011886	0.9133050	-34.2627191 C
0.0000488	1685.8596281	34581736.	5.1009647	0.0002487	-0.0012138	0.9581565	-34.9889485 C
0.0000513	1815.6221076	35426773.	5.3290416	0.0002731	-0.0012644	1.0465145	-36.4442743 C
0.0000538	1945.8836599	36202487.	5.5322702	0.0002974	-0.0013151	1.1328693	-37.9052611 C
0.0000563	2076.8397350	36921595.	5.7125221	0.0003213	-0.0013662	1.2169655	-39.3742611 C
0.0000588	2207.7142435	37578115.	5.8769624	0.0003453	-0.0014172	1.2997136	-40.8440627 C
0.0000613	2339.0607926	38188748.	6.0243398	0.0003690	-0.0014685	1.3804479	-42.3203288 C
0.0000638	2470.1222336	38747015.	6.1607801	0.0003927	-0.0015198	1.4600909	-43.7954450 C
0.0000663	2601.6055658	39269518.	6.2834994	0.0004163	-0.0015712	1.5377497	-45.2771391 C
0.0000688	2732.7403894	39748951.	6.3982321	0.0004399	-0.0016226	1.6144141	-46.7569620 C
0.0000713	2863.8858022	40194888.	6.5037377	0.0004634	-0.0016741	1.6895961	-48.2392143 C
0.0000738	2995.0125109	40610339.	6.6011323	0.0004868	-0.0017257	1.7633503	-49.7235155 C
0.0000763	3125.7937125	40994016.	6.6929697	0.0005103	-0.0017772	1.8361053	-51.2059831 C
0.0000788	3256.4189983	41351352.	6.7786822	0.0005338	-0.0018287	1.9075864	-52.6891219 C
0.0000813	3387.0607474	41686902.	6.8578895	0.0005572	-0.0018803	1.9775654	-54.1751600 C
0.0000838	3517.3589152	41998315.	6.9331085	0.0005806	-0.0019319	2.0465380	-55.6593999 C
0.0000863	3647.3095260	42287647.	7.0046950	0.0006042	-0.0019833	2.1144969	-57.1418188 C
0.0000888	3777.0583751	42558404.	7.0721278	0.0006277	-0.0020348	2.1812219	-58.6245496 C
0.0000913	3906.7489004	42813687.	7.1349741	0.0006511	-0.0020864	2.2465167	-60.0000000 CY
0.0000938	4036.0924329	43051653.	7.1951271	0.0006745	-0.0021380	2.3107879	-60.0000000 CY
0.0000963	4165.0849552	43273610.	7.2528045	0.0006981	-0.0021894	2.3740282	-60.0000000 CY
0.0000988	4293.7223599	43480733.	7.3082023	0.0007217	-0.0022408	2.4362297	-60.0000000 CY
0.0001013	4422.0754325	43674819.	7.3610916	0.0007452	-0.0022922	2.4972780	-60.0000000 CY
0.0001038	4550.3394336	43858693.	7.4106244	0.0007689	-0.0023436	2.5568974	-60.0000000 CY
0.0001063	4678.2472481	44030562.	7.4584132	0.0007925	-0.0023950	2.6154657	-60.0000000 CY
0.0001088	4804.1769434	44176340.	7.5036046	0.0008160	-0.0024465	2.6727143	-60.0000000 CY
0.0001113	4920.2558117	44227019.	7.5415728	0.0008390	-0.0024985	2.7273729	-60.0000000 CY
0.0001138	5025.5059909	44180272.	7.5719943	0.0008613	-0.0025512	2.7793162	-60.0000000 CY
0.0001163	5121.8139922	44058615.	7.5962911	0.0008831	-0.0026044	2.8288928	-60.0000000 CY
0.0001188	5211.0320494	43882375.	7.6157974	0.0009044	-0.0026581	2.8764362	-60.0000000 CY
0.0001213	5290.4703142	43632745.	7.6289897	0.0009250	-0.0027125	2.9215238	-60.0000000 CY
0.0001238	5360.7162658	43318919.	7.6364163	0.0009450	-0.0027675	2.9642912	-60.0000000 CY
0.0001263	5424.4219853	42965719.	7.6399065	0.0009645	-0.0028230	3.0052208	-60.0000000 CY
0.0001288	5486.0578235	42610158.	7.6423676	0.0009840	-0.0028785	3.0450871	-60.0000000 CY
0.0001313	5547.5416369	42266984.	7.6450239	0.0010034	-0.0029341	3.0842151	-60.0000000 CY
0.0001338	5608.8722233	41935493.	7.6478673	0.0010229	-0.0029896	3.1226006	-60.0000000 CY
0.0001363	5669.3508580	41609915.	7.6504238	0.0010424	-0.0030451	3.1601161	-60.0000000 CY
0.0001388	5726.8684689	41274728.	7.6513413	0.0010616	-0.0031009	3.1964040	-60.0000000 CY
0.0001413	5779.0822375	40913857.	7.6492772	0.0010805	-0.0031570	3.2311161	-60.0000000 CY
0.0001438	5825.4967969	40525195.	7.6438305	0.0010988	-0.0032137	3.2641586	-60.0000000 CY
0.0001463	5865.7671144	40107809.	7.6348950	0.0011166	-0.0032709	3.2955196	-60.0000000 CY
0.0001488	5902.0911754	39677924.	7.6239602	0.0011341	-0.0033284	3.3256018	-60.0000000 CY
0.0001513	5937.424402	38068614.	7.5835957	0.0012039	-0.0033836	3.3533497	-60.0000000 CY
0.0001538	5971.8854096	36640506.	7.5507501	0.0012742	-0.0034383	3.3793750	-60.0000000 CY
0.0001563	6005.4178618	35331009.	7.5203944	0.0013443	-0.0034928	3.4037263	-60.0000000 CY
0.0001588	6038.0138599	33973591.	7.4733575	0.0014139	-0.0035471	3.4264443	-60.0000000 CY
0.0001613	6069.6845430	32617587.	7.4160520	0.0014739	-0.0036011	3.4476254	-60.0000000 CY
0.0001638	6100.4251050	31379569.	7.3650531	0.0015375	-0.0036548	3.4672750	-60.0000000 CY
0.0001663	6130.22188	30249241.	7.3188670	0.0016010	-0.0037081	3.4854961	-60.0000000 CY
0.0001688	6159.075759	29212947.	7.2777528	0.0016648	-0.0037611	3.5022836	-60.0000000 CY
0.0001713	6187.877665	28259174.	7.2418411	0.0017290	-0.0038138	3.5176433	-60.0000000 CY
0.0001738	6216.7295474	27374727.	7.2099541	0.0017935	-0.0038662	3.5315716	-60.0000000 CY
0.0001763	6245.5453106	26529644.	7.1771899	0.0018571	-0.0039182	3.5440633	-60.0000000 CY
0.0001788	6274.3680783	25704179.	7.1400426	0.0019189	-0.0039699	3.5551234	-60.0000000 CY
0.0001813	6293.2048562	24898562.	7.0990659	0.0019789	-0.0040212	3.5647573	-60.0000000 CY
0.0001838	6312.0516155	24124263.	7.0571954	0.0020378	-0.0040722	3.5729602	-60.0000000 CY
0.0001863	6330.9083808	23394963.	7.0163755	0.0020961	-0.0041228	3.5797273	-60.0000000 CY
0.0001888	6349.7752429	22710379.	6.9790276	0.0021548	-0.0041731	3.5850542	-60.0000000 CY
0.0001913	6368.6521050	22067005.	6.9450965	0.0022137	-0.0042231	3.5890346	-60.0000000 CY
0.0001938	6387.5389671	21460699.	6.9144644	0.0022731	-0.0042728	3.5916654	-60.0000000 CY
0.0001963	6406.4358292	20888805.	6.8865565	0.0023328	-0.0043222	3.5929898	-60.0000000 CY
0.0001988	6425.3436913	20347948.	6.8613561	0.0023929	-0.0043713	3.5930111	-60.0000000 CY
0.0002013	6444.2609834	19836034.	6.8383958	0.0024533	-0.0044201	3.5920371	-60.0000000 CY
0.0002038	6463.1882955	19350568.	6.8175799	0.0025140	-0.0044685	3.5900716	-60.0000000 CY
0.0002063	6482.1236276	18889495.	6.7987251	0.0025750	-0.0045165	3.5872105	-60.0000000 CY
0.0002088	6501.0689697	18451310.	6.7814835	0.0026363	-0.0045642	3.5834576	-60.0000000 CY
0.0002113	6520.0252218	18033829.	6.7660062	0.0026979	-0.0046115	3.5788157	-60.0000000 CY
0.0002138	6539.0024731	17635512.	6.7516847	0.0027598	-0.0046584	3.5732897	-60.0000000 CY
0.0002163	6558.0007244	17254009.	6.7369545	0.0028211	-0.0047049	3.5668746	-60.0000000 CY
0.0002188	6577.0299757	16889241.	6.7235761	0.0028827	-0.0047510	3.5595627	-60.0000000 CY
0.0002213	6596.0902270	16534024.	6.7097516	0.0029431	-0.0047967	3.5513591	-60.0000000 CY
0.0002238	6615.1814783	16194244.	6.6934454	0.0030037	-0.0048420	3.5422676	-60.0000000 CY
0.0002263	6634.3037296	15864948.	6.6778989	0.0030635	-0.0048869	3.5322931	-60.0000000 CY
0.0002288	6653.4579809	15545820.	6.6617495	0.0031227	-0.0049314	3.5215306	-60.0000000 CY
0.0002313	6672.6442322	15239793.	6.6465742	0.0031820	-0.0049754	3.5100000	-60.0000000 CY

30- Diameter Pile - Reduced 0.5 Fixed(11_12_19) - Case 1 Tension.lp6o									
0.0004888	7302.3784173	14940928.	6.6291511	0.0032400	-0.0114225	3.9982715	60.0000000	CY	
0.0004988	7308.0866378	14652805.	6.6120389	0.0032978	-0.0116647	3.9998886	60.0000000	CY	
0.0005088	7313.6149631	14375656.	6.5960519	0.0033557	-0.0119068	3.9938759	60.0000000	CY	
0.0005188	7317.2402365	14105523.	6.5786570	0.0034127	-0.0121498	3.9869707	60.0000000	CY	
0.0005288	7320.5339046	13844981.	6.5617449	0.0034695	-0.0123930	3.9923833	60.0000000	CY	
0.0005388	7323.7744520	13594013.	6.5456394	0.0035265	-0.0126360	3.9963640	60.0000000	CY	
0.0005488	7326.8596398	13351908.	6.5301631	0.0035834	-0.0128791	3.9988911	60.0000000	CY	
0.0006088	7326.8596398	12035909.	6.4750784	0.0039417	-0.0143208	3.9977482	60.0000000	CY	

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Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1  
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Moment values interpolated at maximum compressive strain = 0.003  
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	-164.000	7266.385	0.0030000

Note note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318-08, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are spirals or tied hoops.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318-08, Section 9.3.2.2 or the value required by the design standard being followed.

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Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1  
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Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head	=	84000.000 lbs
Rotation of pile head	=	0.000E+00 radians
Axial load at pile head	=	-164000.000 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth X inches	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in <sup>2</sup>	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.3602	-5022999.	84000.	0.000	0.000	4.389E+10	0.000	0.000	0.000
5.280	0.3586	-4579740.	83931.	-0.000578	0.000	4.389E+10	-25.9652	382.2599	0.000
10.560	0.3541	-4137683.	83722.	-0.001102	0.000	4.389E+10	-53.3396	795.2549	0.000
15.840	0.3470	-3697543.	83357.	-0.001581	0.000	4.238E+10	-85.1004	1294.8620	0.000
21.120	0.3374	-3260175.	82811.	-0.002020	0.000	4.134E+10	-121.5162	1901.3605	0.000
26.400	0.3257	-2826556.	82116.	-0.002414	0.000	4.005E+10	-141.8752	2300.0964	0.000
31.680	0.3120	-2397214.	81251.	-0.002765	0.000	3.841E+10	-185.8304	3145.3058	0.000
36.960	0.2965	-1973338.	80138.	-0.003073	0.000	3.632E+10	-235.5542	4194.9539	0.000
42.240	0.2795	-1556277.	78744.	-0.003339	0.000	3.367E+10	-292.3616	5523.0441	0.000
47.520	0.2612	-1147578.	77027.	-0.003561	0.000	3.035E+10	-358.0335	7236.8197	0.000
52.800	0.2419	-749034.	74136.	-0.003678	0.000	1.136E+11	-737.1243	16090.	0.000
58.080	0.2224	-371070.	70026.	-0.003702	0.000	1.456E+11	-819.9449	19468.	0.000
63.360	0.2028	-15976.	65449.	-0.003709	0.000	1.865E+11	-913.5899	23786.	0.000
68.640	0.1832	313649.	60352.	-0.003702	0.000	1.133E+11	-1017.2839	29317.	0.000
73.920	0.1637	614925.	54667.	-0.003678	0.000	9.541E+10	-1135.8165	36633.	0.000
79.200	0.1444	884567.	48305.	-0.003576	0.000	2.749E+10	-1274.1145	46595.	0.000
84.480	0.1259	1118835.	41158.	-0.003392	0.000	2.998E+10	-1433.1030	60080.	0.000
89.760	0.1086	1313321.	33092.	-0.003185	0.000	3.174E+10	-1622.2730	78906.	0.000
95.040	0.0923	1462770.	24542.	-0.002958	0.000	3.295E+10	-1616.4244	92450.	0.000
100.320	0.0773	1567358.	15840.	-0.002718	0.000	3.375E+10	-1679.7870	114713.	0.000
105.600	0.0636	1625330.	7512.6894	-0.002470	0.000	3.416E+10	-1474.3910	122380.	0.000
110.880	0.0512	1642415.	288.9749	-0.002218	0.000	3.428E+10	-1261.8645	130046.	0.000
116.160	0.0402	1624540.	-5739.7147	-0.001966	0.000	3.415E+10	-1021.7301	134231.	0.000
121.440	0.0305	1578399.	-10599.	-0.001717	0.000	3.382E+10	-818.9482	141898.	0.000
126.720	0.0221	1509640.	-14411.	-0.001474	0.000	3.330E+10	-624.8037	149565.	0.000
132.000	0.0149	1423669.	-17232.	-0.001239	0.000	3.259E+10	-443.8553	157231.	0.000
137.280	0.008971	1325525.	-19143.	-0.001014	0.000	3.174E+10	-280.1740	164898.	0.000
142.560	0.004201	1219761.	-20245.	-0.000799	0.000	3.084E+10	-137.3130	172564.	0.000
147.840	0.000534	1110349.	-20656.	-0.000595	0.000	2.956E+10	-18.2359	180231.	0.000
153.120	-0.002086	1000601.	-20508.	-0.000404	0.000	2.865E+10	74.2224	187897.	0.000
158.400	-0.003732	893082.	-19947.	-0.000225	0.000	2.719E+10	138.2269	195564.	0.000
163.680	-0.004462	789566.	-19129.	-9.678E-05	0.000	5.015E+10	171.7624	203230.	0.000
168.960	-0.004754	690911.	-18174.	-4.528E-05	0.000	1.836E+11	189.8864	210897.	0.000
174.240	-0.004941	597567.	-17133.	-2.637E-05	0.000	1.758E+11	204.5137	218564.	0.000
179.520	-0.005032	509940.	-16024.	-8.128E-06	0.000	1.453E+11	215.6216	226230.	0.000
184.800	-0.005026	428340.	-14867.	7.847E-06	0.000	1.685E+11	222.6632	233897.	0.000
190.080	-0.004950	352959.	-13681.	2.054E-05	0.000	1.558E+11	226.4447	241563.	0.000
195.360	-0.004810	283901.	-12484.	3.254E-05	0.000	1.244E+11	227.0228	249230.	0.000
200.640	-0.004606	221183.	-11293.	4.170E-05	0.000	1.865E+11	224.0975	256896.	0.000

30- Diameter Pile - Reduced 0.5 Fixed(11_12_19) - Case 1 Tension.lp6o									
205.920	-0.004369	164718.	-10124.	4.716E-05	0.000	1.865E+11	218.9244	264563.	0.000
211.200	-0.004108	114360.	-8986.4494	5.111E-05	0.000	1.865E+11	211.7946	272230.	0.000
216.480	-0.003829	69910.	-7891.3918	5.372E-05	0.000	1.865E+11	202.9999	279896.	0.000
221.760	-0.003541	31120.	-6846.4073	5.515E-05	0.000	1.865E+11	192.8276	287563.	0.000
227.040	-0.003247	-2292.6857	-5858.0337	5.556E-05	0.000	1.865E+11	181.5563	295229.	0.000
232.320	-0.002954	-30644.	-4931.3709	5.509E-05	0.000	1.865E+11	169.4523	302896.	0.000
237.600	-0.002665	-54273.	-4070.1536	5.389E-05	0.000	1.865E+11	156.7663	310562.	0.000
242.880	-0.002385	-73532.	-3276.8402	5.208E-05	0.000	1.865E+11	143.7311	318229.	0.000
248.160	-0.002115	-88786.	-2552.7124	4.978E-05	0.000	1.865E+11	130.5597	325895.	0.000
253.440	-0.001859	-100402.	-1897.9826	4.711E-05	0.000	1.865E+11	117.4440	333562.	0.000
258.720	-0.001618	-108747.	-1311.9083	4.415E-05	0.000	1.865E+11	104.5539	341229.	0.000
264.000	-0.001393	-114179.	-792.9075	4.099E-05	0.000	1.865E+11	92.0373	348895.	0.000
269.280	-0.001185	-117049.	-338.6768	3.772E-05	0.000	1.865E+11	80.0198	356562.	0.000
274.560	-0.000995	-117691.	53.6933	3.440E-05	0.000	1.865E+11	68.6053	364228.	0.000
279.840	-0.000822	-116422.	387.6058	3.108E-05	0.000	1.865E+11	57.8767	371895.	0.000
285.120	-0.000666	-113544.	666.8487	2.783E-05	0.000	1.865E+11	47.8971	379561.	0.000
290.400	-0.000528	-109332.	895.4934	2.467E-05	0.000	1.865E+11	38.7107	387228.	0.000
295.680	-0.000406	-104044.	1077.7988	2.165E-05	0.000	1.865E+11	30.3444	394894.	0.000
300.960	-0.000299	-97913.	1218.1236	1.880E-05	0.000	1.865E+11	22.8090	402561.	0.000
306.240	-0.000207	-91149.	1305.7545	1.612E-05	0.000	1.865E+11	16.1276	409228.	0.000
311.520	-0.000129	-84097.	1350.7203	1.364E-05	0.000	1.865E+11	6.6479	416895.	0.000
316.800	-6.319E-05	-76861.	1377.1154	1.136E-05	0.000	1.865E+11	3.3502	424561.	0.000
322.080	-8.946E-06	-69535.	1387.2463	9.290E-06	0.000	1.865E+11	0.4873	432228.	0.000
327.360	3.491E-05	-62196.	1377.2832	7.426E-06	0.000	1.865E+11	-4.2612	440894.	0.000
332.640	6.947E-05	-54978.	1343.3808	5.767E-06	0.000	1.865E+11	-8.5806	449561.	0.000
337.920	9.581E-05	-48000.	1289.1176	4.310E-06	0.000	1.865E+11	-11.9736	458228.	0.000
343.200	0.000115	-41357.	1219.1318	3.045E-06	0.000	1.865E+11	-14.5362	466895.	0.000
348.480	0.000128	-35121.	1137.5552	1.963E-06	0.000	1.865E+11	-16.3640	475561.	0.000
353.760	0.000136	-29341.	1048.0199	1.051E-06	0.000	1.865E+11	-17.5508	484228.	0.000
359.040	0.000139	-24052.	953.6731	2.950E-07	0.000	1.865E+11	-18.1866	492894.	0.000
364.320	0.000139	-19270.	857.1984	-3.181E-07	0.000	1.865E+11	-18.3568	501561.	0.000
369.600	0.000136	-15000.	760.8432	-8.032E-07	0.000	1.865E+11	-18.1414	510228.	0.000
374.880	0.000130	-11237.	666.4494	-1.175E-06	0.000	1.865E+11	-17.6139	518895.	0.000
380.160	0.000123	-7964.4785	575.4873	-1.446E-06	0.000	1.865E+11	-16.8415	527561.	0.000
385.440	0.000115	-5162.0119	489.0914	-1.632E-06	0.000	1.865E+11	-15.8843	536228.	0.000
390.720	0.000106	-2802.5001	408.0965	-1.745E-06	0.000	1.865E+11	-14.7956	544894.	0.000
396.000	9.665E-05	-855.5344	333.0748	-1.797E-06	0.000	1.865E+11	-13.6217	553561.	0.000
401.280	8.710E-05	711.6588	264.3715	-1.799E-06	0.000	1.865E+11	-12.4023	562228.	0.000
406.560	7.766E-05	1933.1137	202.1396	-1.761E-06	0.000	1.865E+11	-11.1704	570895.	0.000
411.840	6.850E-05	2843.2029	146.3735	-1.694E-06	0.000	1.865E+11	-9.9531	579561.	0.000
417.120	5.977E-05	3475.8854	96.9405	-1.604E-06	0.000	1.865E+11	-8.7716	588228.	0.000
422.400	5.156E-05	3864.1164	53.6097	-1.500E-06	0.000	1.865E+11	-7.6416	596894.	0.000
427.680	4.393E-05	4039.4052	16.0795	-1.388E-06	0.000	1.865E+11	-6.5743	605561.	0.000
432.960	3.690E-05	4031.5113	-7.9616	-1.274E-06	0.000	1.865E+11	-5.5322	614228.	0.000
438.240	3.048E-05	3953.1238	-20.2842	-1.161E-06	0.000	1.865E+11	-4.5355	622895.	0.000
443.520	2.464E-05	3815.2998	-30.5744	-1.051E-06	0.000	1.865E+11	-3.5724	631561.	0.000
448.800	1.938E-05	3628.4375	-38.9598	-9.458E-07	0.000	1.865E+11	-2.6439	640228.	0.000
454.080	1.465E-05	3402.2459	-46.7056	-8.463E-07	0.000	1.865E+11	-1.7501	648894.	0.000
459.360	1.044E-05	3133.7610	-53.6173	-7.538E-07	0.000	1.865E+11	-0.8098	657561.	0.000
464.640	6.693E-06	2834.7415	-58.4004	-6.693E-07	0.000	1.865E+11	-0.7137	666228.	0.000
469.920	3.371E-06	2515.8939	-61.2464	-5.936E-07	0.000	1.865E+11	-0.3643	674895.	0.000
475.200	4.243E-07	2186.9510	-62.3310	-5.271E-07	0.000	1.865E+11	-0.0465	683561.	0.000
480.480	-2.195E-06	1856.7660	-61.8104	-4.698E-07	0.000	1.865E+11	0.2437	692228.	0.000
485.760	-4.537E-06	1533.4192	-59.8203	-4.218E-07	0.000	1.865E+11	0.5102	700894.	0.000
491.040	-6.650E-06	1224.3330	-56.4738	-3.828E-07	0.000	1.865E+11	0.7574	709561.	0.000
496.320	-8.580E-06	936.3924	-51.8616	-3.522E-07	0.000	1.865E+11	0.9897	718228.	0.000
501.600	-1.037E-05	676.0651	-46.0513	-3.294E-07	0.000	1.865E+11	1.2112	726895.	0.000
506.880	-1.206E-05	449.5202	-39.0893	-3.135E-07	0.000	1.865E+11	1.4259	735561.	0.000
512.160	-1.368E-05	262.7394	-31.0016	-3.034E-07	0.000	1.865E+11	1.6376	744228.	0.000
517.440	-1.526E-05	121.6180	-21.7967	-2.980E-07	0.000	1.865E+11	1.8491	752894.	0.000
522.720	-1.683E-05	32.0508	-11.4683	-2.958E-07	0.000	1.865E+11	2.0631	761561.	0.000
528.000	-1.839E-05	0.000	0.000	-2.953E-07	0.000	1.865E+11	2.2810	770228.	0.000

\* This analysis makes computations of pile response using nonlinear moment-curvature relationships. The above values of total stress are computed for combined axial stress and do not equal the actual stresses in concrete and steel in the range of nonlinear bending.

Output Verification: Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.3602415 inches  
 Computed slope at pile head = 0.000000 radians  
 Maximum bending moment = -5022999. inch-lbs  
 Maximum shear force = 84000. lbs  
 Depth of maximum bending moment = 0.000000 inches below pile head  
 Depth of maximum shear force = 0.000000 inches below pile head  
 Number of iterations = 12  
 Number of zero deflection points = 3

-----  
 Summary of Pile Response(s)  
 -----

Definitions of Pile-head Loading Conditions:



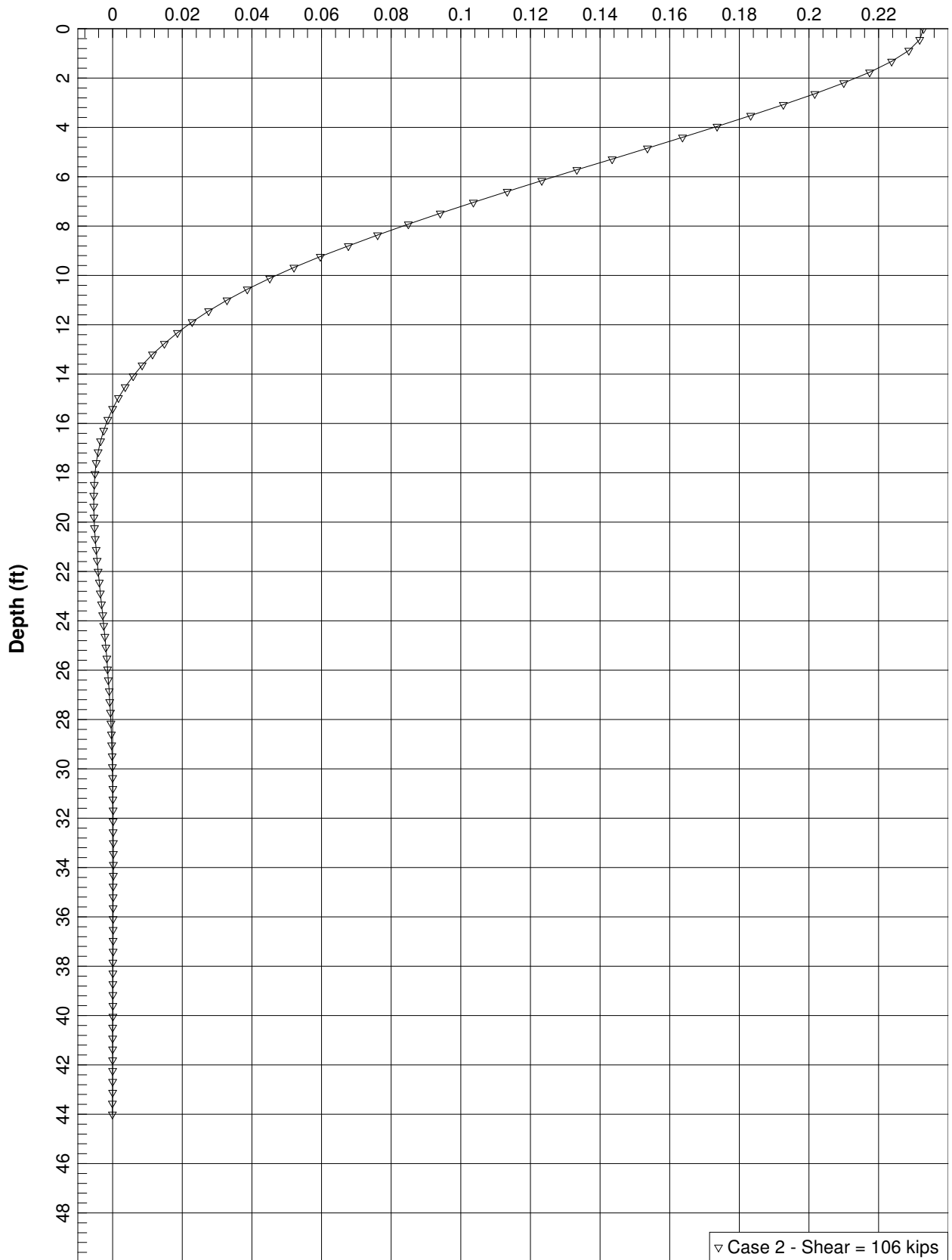
30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 1 Tension.lp60

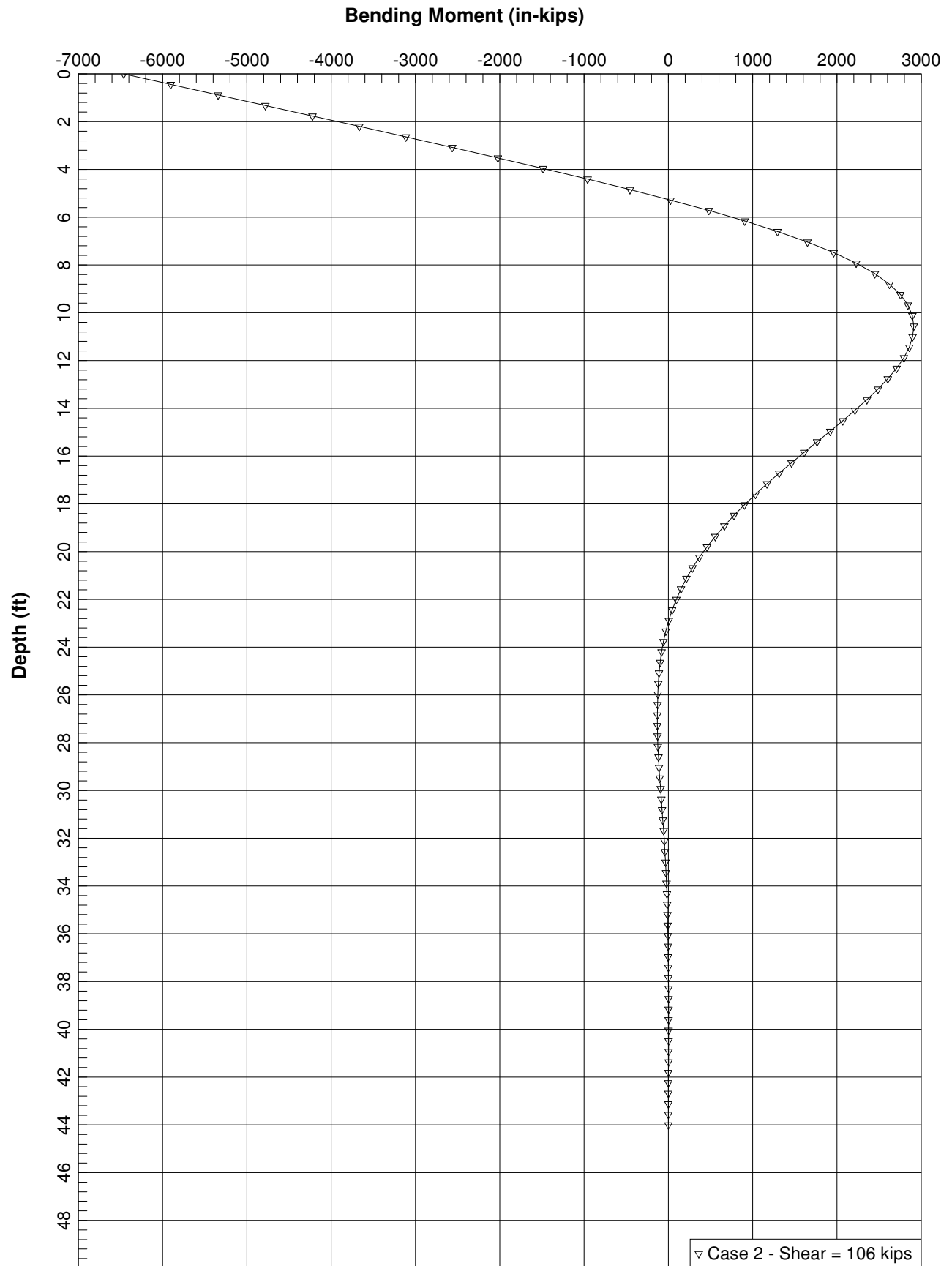
Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs  
 Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians  
 Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian  
 Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs  
 Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians

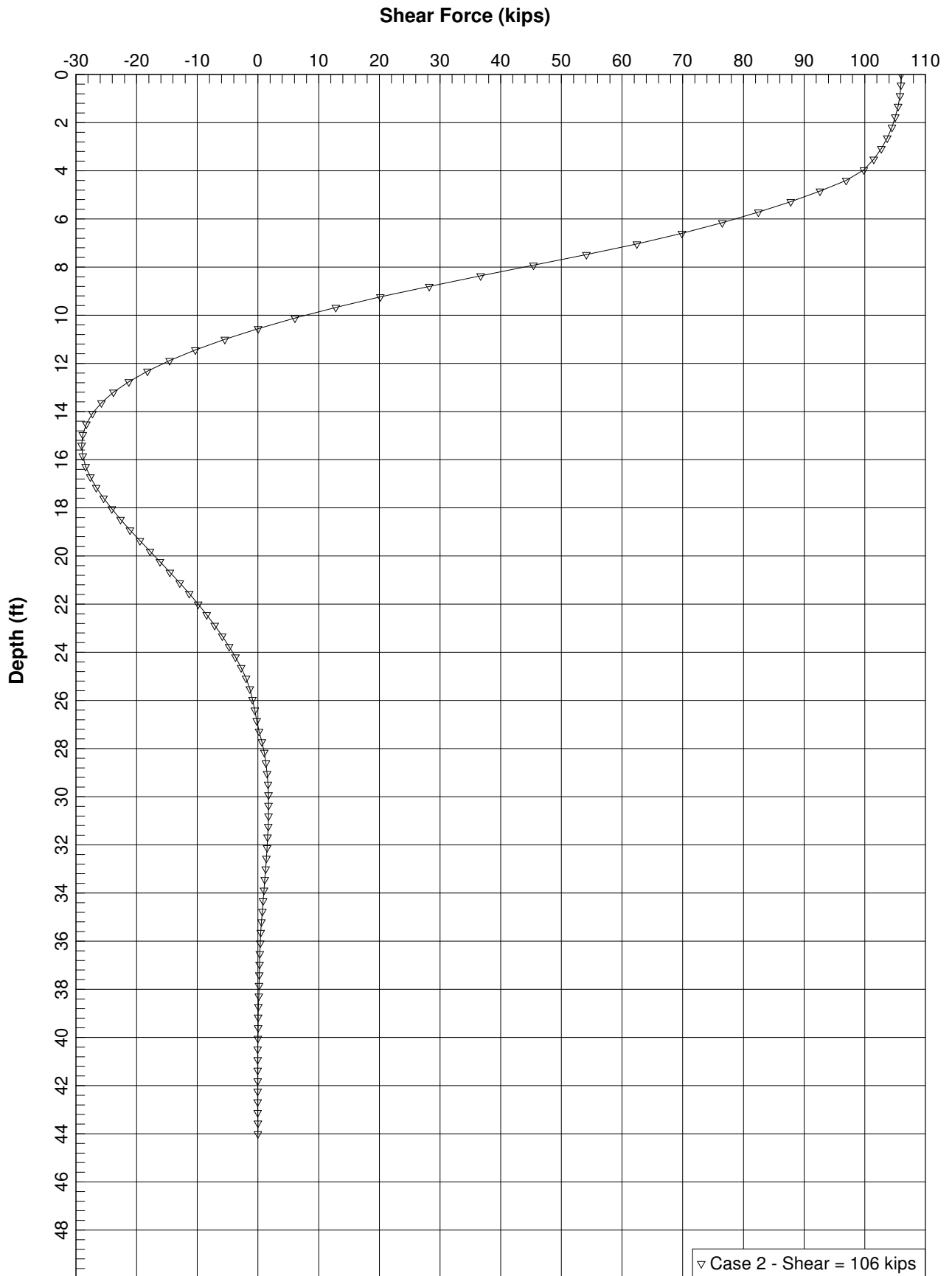
Load Case No.	Load Type No.	Pile-head Condition 1 V(lbs) or y(inches)	Pile-head Condition 2 in-lb, rad., or in-lb/rad.	Axial Loading lbs	Pile-head Deflection inches	Maximum Moment in-lbs	Maximum Shear lbs	Pile-head Rotation radians
1	2	V = 84000.	S = 0.000	-164000.	0.36024151	-5022999.	84000.	0.00000000

The analysis ended normally.

### Lateral Deflection (inches)







LPILE Plus for Windows, Version 6 (6.0.24)

Analysis of Individual Piles and Drilled Shafts  
Subjected to Lateral Loading Using the p-y Method

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ko  
ko

Serial Number of Security Device: 228748185  
Company Name Stored in Security Device: Koury Engineering & Testing

Files Used for Analysis

Path to file locations: G:\Projects\2017\17-0822 Russell Hall Replacement Project Soils Investigation\Soils  
Folder\Soils Reports-Certificates\DSA\DSA - Lateral Pile Capacities\  
Name of input data file: 30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 2.1p6d  
Name of output report file: 30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 2.1p60  
Name of plot output file: 30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 2.1p6p  
Name of runtime message file: 30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 2.1p6r

Date and Time of Analysis

Date: November 12, 2019 Time: 17:27:06

Problem Title

Health Science Building

Job Number: 17-0822

Client:

Engineer:

Description: Building Piles

Program Options

Engineering units are US Customary Units: pounds, inches, feet

Basic Program Options:

This analysis computes nonlinear bending stiffness and nominal moment capacity with pile response computed using nonlinear EI

Computation Options:

- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No p-y curves to be computed and output for user-specified depths

Solution Control Parameters:

- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-03 in
- Maximum allowable deflection = 100.0000 in

Pile Response Output Options:

- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1

-----  
Pile Structural Properties and Geometry  
-----

Total Number of Sections = 1  
Total Pile Length = 44.00 ft  
Depth of ground surface below top of pile = 0.00 ft  
Slope angle of ground surface = 0.00 deg.

Pile dimensions used for p-y curve computations defined using 2 points.  
p-y curves are computed using values of pile diameter interpolated over  
the length of the pile.

Point	Depth X ft	Pile Diameter in
1	0.00000	30.0000000
2	44.000000	30.0000000

-----  
Input Structural Properties:  
-----

Pile Section No. 1:

Section Type = Drilled Shaft (Bored Pile)  
Section Length = 44.000 ft  
Section Diameter = 30.000 in

-----  
Ground Slope and Pile Batter Angles  
-----

Ground Slope Angle = 0.000 degrees  
= 0.000 radians  
Pile Batter Angle = 0.000 degrees  
= 0.000 radians

-----  
Soil and Rock Layering Information  
-----

The soil profile is modelled using 9 layers

Layer 1 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 0.000 ft  
Distance from top of pile to bottom of layer = 2.000 ft  
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for  
the above soil layer.

Layer 2 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 2.000 ft  
Distance from top of pile to bottom of layer = 4.000 ft  
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for  
the above soil layer.

Layer 3 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 4.000 ft  
Distance from top of pile to bottom of layer = 7.500 ft  
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for  
the above soil layer.

Layer 4 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 7.500 ft  
Distance from top of pile to bottom of layer = 9.500 ft  
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3

30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 2.1p60  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 5 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 9.500 ft  
 Distance from top of pile to bottom of layer = 25.500 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 6 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 25.500 ft  
 Distance from top of pile to bottom of layer = 27.000 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 7 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 27.000 ft  
 Distance from top of pile to bottom of layer = 36.000 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 8 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 36.000 ft  
 Distance from top of pile to bottom of layer = 37.500 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 9 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 37.500 ft  
 Distance from top of pile to bottom of layer = 44.000 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

(Depth of lowest layer extends 0.00 ft below pile tip)

-----  
 Effective Unit weight of Soil vs. Depth  
 -----

Effective unit weight of soil with depth defined using 18 points

Point No.	Depth x ft	Eff. Unit weight pcf
1	0.00	123.00000
2	2.00	123.00000
3	2.00	123.00000
4	4.00	123.00000
5	4.00	131.50000
6	7.50	131.50000
7	7.50	123.00000
8	9.50	123.00000
9	9.50	130.20000
10	25.50	130.20000
11	25.50	122.00000
12	27.00	122.00000
13	27.00	127.50000
14	36.00	127.50000
15	36.00	69.30000
16	37.50	69.30000
17	37.50	66.30000
18	44.00	66.30000

-----  
 Summary of Soil Properties  
 -----

30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 2.1p60

Layer Num.	Epsilon 50	Soil Type J (p-y Curve Criteria)	kpy Criteria) pci	Rock Emass psi	Depth ft	Eff. Unit krm Wt., pcf	Cohesion Test Type psf	Friction Test Prop. Ang., deg.	Elas. Subgr. psi	qu psi	RQD percent
1	0.00	Cemented Silt	default	--	0.00	123.000	1.000	20.000	--	--	--
	0.00	--	default	--	2.000	123.000	1.000	20.000	--	--	--
2	0.00	Cemented Silt	default	--	2.000	123.000	1.000	20.000	--	--	--
	0.00	--	default	--	4.000	123.000	1.000	20.000	--	--	--
3	0.00	Cemented Silt	default	--	4.000	131.500	350.000	15.000	--	--	--
	0.00	--	default	--	7.500	131.500	350.000	15.000	--	--	--
4	0.00	Cemented Silt	default	--	7.500	123.000	90.000	22.000	--	--	--
	0.00	--	default	--	9.500	123.000	90.000	22.000	--	--	--
5	0.00	Cemented Silt	default	--	9.500	130.200	420.000	12.000	--	--	--
	0.00	--	default	--	25.500	130.200	420.000	12.000	--	--	--
6	0.00	Cemented Silt	default	--	25.500	122.000	100.000	29.000	--	--	--
	0.00	--	default	--	27.000	122.000	100.000	29.000	--	--	--
7	0.00	Cemented Silt	default	--	27.000	127.500	370.000	6.000	--	--	--
	0.00	--	default	--	36.000	127.500	370.000	6.000	--	--	--
8	0.00	Cemented Silt	default	--	36.000	69.300	450.000	23.000	--	--	--
	0.00	--	default	--	37.500	69.300	450.000	23.000	--	--	--
9	0.00	Cemented Silt	default	--	37.500	66.300	470.000	11.000	--	--	--
	0.00	--	default	--	44.000	66.300	470.000	11.000	--	--	--

-----  
Loading Type  
-----

Static loading criteria were used when computing p-y curves for all analyses.

-----  
Pile-head Loading and Pile-head Fixity Conditions  
-----

Number of loads specified = 1

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs
1	2	v = 106000. lbs	s = 0.0000 in/in	385000.

V = perpendicular shear force applied to pile head  
M = bending moment applied to pile head  
y = lateral deflection relative to pile axis  
S = pile slope relative to original pile batter angle  
R = rotational stiffness applied to pile head  
Axial thrust is assumed to be acting axially for all pile batter angles.

-----  
Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness  
-----

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft:

Length of Section	=	44.00000000 ft
Shaft Diameter	=	30.00000000 in
Concrete Cover Thickness	=	3.00000000 in
Number of Reinforcing Bars	=	9 bars



30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 2.lp60  
 Yield Stress of Reinforcing Bars = 60.0000000 ksi  
 Modulus of Elasticity of Reinforcing Bars = 29000. ksi  
 Gross Area of Shaft = 706.85834706 sq. in.  
 Total Area of Reinforcing Steel = 14.04000000 sq. in.  
 Area Ratio of Steel Reinforcement = 1.99 percent  
 Edge-to-Edge Bar Spacing = 6.31623504 in

Axial Structural Capacities:

Nom. Axial Structural Capacity =  $0.85 F_c A_c + F_y A_s$  = 3197.982 kips  
 Tensile Load for Cracking of Concrete = -335.124 kips  
 Nominal Axial Tensile Capacity = -842.400 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.41000	1.56000	11.29500	0.00000
2	1.41000	1.56000	8.65247	7.26029
3	1.41000	1.56000	1.96136	11.12340
4	1.41000	1.56000	-5.64750	9.78176
5	1.41000	1.56000	-10.61383	3.86312
6	1.41000	1.56000	-10.61383	-3.86312
7	1.41000	1.56000	-5.64750	-9.78176
8	1.41000	1.56000	1.96136	-11.12340
9	1.41000	1.56000	8.65247	-7.26029

Concrete Properties:

Compressive Strength of Concrete = 4.0000000 ksi  
 Modulus of Elasticity of Concrete = 3604.9965326 ksi  
 Modulus of Rupture of Concrete = -0.4743416 ksi  
 Compression Strain at Peak Stress = 0.0018863  
 Tensile Strain at Fracture of Concrete = -0.0001154  
 Maximum coarse Aggregate Size = 0.7500000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	385.000

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension  
 Y = stress in reinforcing steel has reached yield stress  
 T = tensile strain in reinforcement exceeds 0.005 when compressive strain in concrete is less than 0.003.  
 Z = depth of tensile zone in concrete section is less than 10 percent of section depth  
 Bending Stiffness (EI) = Bending Moment / Curvature  
 Position of neutral axis is computed from compression side of pile  
 Compressive stresses are positive in sign. Tensile stresses are negative in sign.

Axial Thrust Force = 385.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in <sup>2</sup>	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Run Msg
0.000001250	225.6751572	180540126.	109.6889025	0.0001371	0.0000996	0.5596397	3.9707852	
0.000002500	451.3224030	180528961.	62.3703512	0.0001559	0.0000809	0.6325163	4.5109755	
0.000003750	676.9413521	180517694.	46.6090213	0.0001748	0.0000623	0.7047791	5.0524186	
0.000005000	902.5178431	180503569.	38.7369981	0.0001937	0.0000437	0.7764226	5.5951147	
0.000006250	1128.0377104	180486034.	34.0206991	0.0002126	0.0000251	0.8474415	6.1390642	
0.000007500	1353.4867821	180464904.	30.8822639	0.0002316	0.00000617	0.9178302	6.6842674	
0.000008750	1578.8389294	180438735.	28.6454367	0.0002506	-0.0000119	0.9875824	7.2307171	
0.0000100	1803.8703996	180387040.	26.9716295	0.0002697	-0.0000303	1.0566750	7.7782726	
0.0000113	2028.2313550	180287232.	25.6724121	0.0002888	-0.0000487	1.1250726	8.3266870	
0.0000125	2251.6822489	180134580.	24.6348830	0.0003079	-0.0000671	1.1927480	8.8757701	
0.0000138	2474.0712637	179932456.	23.7873355	0.0003271	-0.0000854	1.2596820	9.4253876	
0.0000150	2695.2983958	179686560.	23.0820494	0.0003462	-0.0001038	1.3258606	9.9754415	
0.0000163	2695.2983958	165864517.	21.8016396	0.0003543	-0.0001332	1.3530422	10.2033351	C
0.0000175	2695.2983958	154017051.	21.1544380	0.0003702	-0.0001548	1.4070629	10.6597521	C
0.0000188	2752.4969142	146799835.	20.5779041	0.0003858	-0.0001767	1.4595365	11.1076727	C
0.0000200	2857.7456833	142887284.	20.0604425	0.0004012	-0.0001988	1.5106042	11.5480565	C
0.0000213	2958.4596627	139221631.	19.5935724	0.0004164	-0.0002211	1.5604295	11.9821015	C
0.0000225	3055.0333802	135779261.	19.1691641	0.0004313	-0.0002437	1.6090568	12.4100047	C
0.0000238	3148.4754070	132567386.	18.7825121	0.0004461	-0.0002664	1.6566611	12.8331428	C
0.0000250	3238.9574839	129558299.	18.4279481	0.0004607	-0.0002893	1.7032584	13.2515123	C
0.0000263	3326.8277922	126736297.	18.1013725	0.0004752	-0.0003123	1.7489050	13.6654824	C

30- Diameter Pile - Reduced 0.5 Fixed(11_12_19) - Case 2.1p60								
0.0000275	3412.4870190	124090437.	17.7996775	0.0004895	-0.0003355	1.7936770	14.0756179	C
0.0000288	3496.1806890	121606285.	17.5200017	0.0005037	-0.0003588	1.8376214	14.4822390	C
0.0000300	3578.0916428	119269721.	17.2598493	0.0005178	-0.0003822	1.8807734	14.8855690	C
0.0000313	3658.1991362	117062372.	17.0165760	0.0005318	-0.0004057	1.9231149	15.2853345	C
0.0000325	3736.9405818	114982787.	16.7891944	0.0005456	-0.0004294	1.9647518	15.6824408	C
0.0000338	3814.5402632	113023415.	16.5764290	0.0005595	-0.0004530	2.0057419	16.0773675	C
0.0000350	3891.0141845	111171834.	16.3766724	0.0005732	-0.0004768	2.0460880	16.4700726	C
0.0000363	3966.1386237	109410721.	16.1877905	0.0005868	-0.0005007	2.0857133	16.8597273	C
0.0000375	4040.6303464	107750143.	16.0105617	0.0006004	-0.0005246	2.1248303	17.2483610	C
0.0000388	4113.9759799	106167122.	15.8423927	0.0006139	-0.0005486	2.1632791	17.6343264	C
0.0000400	4186.6792869	104666982.	15.6836906	0.0006273	-0.0005727	2.2012109	18.0190812	C
0.0000413	4258.5551032	103237699.	15.5330681	0.0006407	-0.0005968	2.2385684	18.4019954	C
0.0000425	4329.8473751	101878762.	15.3903835	0.0006541	-0.0006209	2.2754246	18.7837728	C
0.0000438	4400.3909793	100580365.	15.2544819	0.0006674	-0.0006451	2.3117260	19.1638115	C
0.0000450	4470.6165490	99347034.	15.1259343	0.0006807	-0.0006693	2.3476172	19.5435945	C
0.0000463	4539.9384298	98160831.	15.0024667	0.0006939	-0.0006936	2.3828898	19.9208711	C
0.0000475	4609.1225001	97034158.	14.8857996	0.0007071	-0.0007179	2.4178200	-20.6131859	C
0.0000488	4677.5897523	95950559.	14.7737186	0.0007203	-0.0007423	2.4521893	-21.3140927	C
0.0000513	4813.5767653	93923449.	14.5652861	0.0007465	-0.0007910	2.5197067	-22.7169059	C
0.0000538	4947.6094952	92048549.	14.3732257	0.0007726	-0.0008399	2.5890519	-24.1244220	C
0.0000563	5080.5646550	90321149.	14.1976369	0.0007986	-0.0008889	2.6493421	-25.5329172	C
0.0000588	5212.0174653	88715191.	14.0351426	0.0008246	-0.0009379	2.7116305	-26.9445632	C
0.0000613	5342.4054732	87222947.	13.8851968	0.0008505	-0.0009870	2.7723453	-28.3574815	C
0.0000638	5471.5808691	85828720.	13.7458674	0.0008763	-0.0010362	2.8314277	-29.7725150	C
0.0000663	5599.9598657	84527696.	13.6170461	0.0009021	-0.0010854	2.8890519	-31.1875625	C
0.0000688	5727.0391157	83302387.	13.4960517	0.0009279	-0.0011346	2.9449884	-32.6056843	C
0.0000713	5853.6004396	82155796.	13.3843391	0.0009536	-0.0011839	2.9995996	-34.0221715	C
0.0000738	5979.0414038	81071748.	13.2790684	0.0009793	-0.0012332	3.0525872	-35.4410798	C
0.0000763	6103.6813811	80048280.	13.1805659	0.0010050	-0.0012825	3.1041125	-36.8602859	C
0.0000788	6227.8033426	79083217.	13.0890459	0.0010308	-0.0013317	3.1543091	-38.2778287	C
0.0000813	6351.0049439	78166215.	13.0025539	0.0010565	-0.0013810	3.2029657	-39.6967048	C
0.0000838	6473.3655260	77293917.	12.9208769	0.0010821	-0.0014304	3.2501272	-41.1166074	C
0.0000863	6595.2073439	76466172.	12.8446156	0.0011078	-0.0014797	3.2959550	-42.5347174	C
0.0000888	6716.5248932	75679154.	12.7733191	0.0011336	-0.0015289	3.3404401	-43.9511073	C
0.0000913	6836.9426102	74925398.	12.7052959	0.0011594	-0.0015781	3.3833774	-45.3691730	C
0.0000938	6956.6448898	74204212.	12.6408933	0.0011851	-0.0016274	3.4248684	-46.7872586	C
0.0000963	7075.8208859	73515022.	12.5804714	0.0012109	-0.0016766	3.4650094	-48.2035713	C
0.0000988	7194.4648808	72855344.	12.5237349	0.0012367	-0.0017258	3.5037908	-49.6180914	C
0.0001013	7312.5710328	72222924.	12.4704175	0.0012626	-0.0017749	3.5412029	-51.0307988	C
0.0001038	7429.8882849	71613381.	12.4193546	0.0012885	-0.0018240	3.5771039	-52.4444541	C
0.0001063	7546.5035913	71025916.	12.3706972	0.0013144	-0.0018731	3.6115427	-53.8581014	C
0.0001088	7662.5769522	70460478.	12.3248745	0.0013403	-0.0019222	3.6446012	-55.2698641	C
0.0001113	7778.1022061	69915525.	12.28117025	0.0013662	-0.0019712	3.6762692	-56.6797193	C
0.0001138	7893.0730548	69389653.	12.2410136	0.0013921	-0.0020201	3.7065362	-58.0876437	C
0.0001163	8007.4830696	68881575.	12.2026545	0.0014186	-0.0020689	3.7353916	-59.4936132	C
0.0001188	8121.3256878	68390111.	12.1664853	0.0014448	-0.0021177	3.7628245	-60.9000000	CY
0.0001213	8234.4598162	67913071.	12.1317975	0.0014710	-0.0021665	3.7887553	-60.0000000	CY
0.0001238	8346.9005049	67449701.	12.0985655	0.0014972	-0.0022153	3.8131914	-60.0000000	CY
0.0001263	8458.7658646	67000126.	12.0672183	0.0015235	-0.0022640	3.8361877	-60.0000000	CY
0.0001288	8570.0488103	66563486.	12.0376537	0.0015498	-0.0023127	3.8577323	-60.0000000	CY
0.0001313	8680.7420882	66138987.	12.0097774	0.0015763	-0.0023612	3.8778132	-60.0000000	CY
0.0001338	8790.8382752	65725894.	11.9835026	0.0016028	-0.0024097	3.8964182	-60.0000000	CY
0.0001363	8900.3297727	65323521.	11.9587489	0.0016294	-0.0024581	3.9135347	-60.0000000	CY
0.0001388	9009.1946241	64931132.	11.9354363	0.0016560	-0.0025065	3.9291494	-60.0000000	CY
0.0001413	9116.1225879	64538921.	11.9129751	0.0016827	-0.0025548	3.9432123	-60.0000000	CY
0.0001438	9216.6022154	64115494.	11.8894929	0.0017091	-0.0026034	3.9556054	-60.0000000	CY
0.0001463	9309.7290391	63656267.	11.8645954	0.0017352	-0.0026523	3.9663488	-60.0000000	CY
0.0001488	9395.8140740	63165137.	11.8380089	0.0017609	-0.0027016	3.9754816	-60.0000000	CY
0.0001513	9483.9675555	62674007.	11.8124039	0.0017867	-0.0027509	3.9839752	-60.0000000	CY
0.0001538	9574.2310890	62182877.	11.7878875	0.0018125	-0.0028002	3.9919288	-60.0000000	CY
0.0001563	9666.5956225	61691747.	11.7644823	0.0018383	-0.0028495	3.9993524	-60.0000000	CY
0.0001588	9760.9601560	61200617.	11.7421771	0.0018641	-0.0029000	3.9999999	-60.0000000	CY
0.0001613	9857.3246895	60709487.	11.7209719	0.0018900	-0.0029505	3.9999999	-60.0000000	CY
0.0001638	9955.6892230	60218357.	11.7008667	0.0019158	-0.0030010	3.9999999	-60.0000000	CY
0.0001663	10055.0537565	59727227.	11.6818615	0.0019417	-0.0030515	3.9999999	-60.0000000	CY
0.0001688	10155.4182900	59236097.	11.6638563	0.0019675	-0.0031020	3.9999999	-60.0000000	CY
0.0001713	10256.7828235	58744967.	11.6468511	0.0019934	-0.0031525	3.9999999	-60.0000000	CY
0.0001738	10359.1473570	58253837.	11.6308459	0.0020192	-0.0032030	3.9999999	-60.0000000	CY
0.0001763	10462.5118905	57762707.	11.6158407	0.0020451	-0.0032535	3.9999999	-60.0000000	CY
0.0001788	10566.8764240	57271577.	11.6018355	0.0020709	-0.0033040	3.9999999	-60.0000000	CY
0.0001813	10672.2409575	56780447.	11.5888303	0.0020968	-0.0033545	3.9999999	-60.0000000	CY
0.0001838	10778.6054910	56289317.	11.5768251	0.0021226	-0.0034050	3.9999999	-60.0000000	CY
0.0001863	10885.9700245	55800187.	11.5658199	0.0021485	-0.0034555	3.9999999	-60.0000000	CY
0.0001888	10994.3345580	55311057.	11.5558147	0.0021743	-0.0035060	3.9999999	-60.0000000	CY
0.0001913	11103.7000915	54821927.	11.5468095	0.0022002	-0.0035565	3.9999999	-60.0000000	CY
0.0001938	11214.0646250	54332797.	11.5388043	0.0022260	-0.0036070	3.9999999	-60.0000000	CY
0.0001963	11325.4291585	53843667.	11.5317991	0.0022519	-0.0036575	3.9999999	-60.0000000	CY
0.0001988	11437.7936920	53354537.	11.5257939	0.0022777	-0.0037080	3.9999999	-60.0000000	CY
0.0002013	11551.1582255	52865407.	11.5207887	0.0023036	-0.0037585	3.9999999	-60.0000000	CY
0.0002038	11665.5227590	52376277.	11.5167835	0.0023294	-0.0038090	3.9999999	-60.0000000	CY
0.0002063	11780.8872925	51887147.	11.5137783	0.0023553	-0.0038595	3.9999999	-60.0000000	CY
0.0002088	11897.2518260	51398017.	11.5117731	0.0023811	-0.0039100	3.9999999	-60.0000000	CY
0.0002113	12014.6163595	50908887.	11.5107679	0.0024070	-0.0039605	3.9999999	-60.0000000	CY
0.0002138	12132.9808930	50419757.	11.5107627	0.0024328	-0.0040110	3.9999999	-60.0000000	CY
0.0002163	12252.3454265	49930627.	11.5117575	0.0024587	-0.0040615	3.9999999	-60.0000000	CY
0.0002188	12372.7099600	49441497.	11.5137523	0.0024845	-0.0041120	3.9999999	-60.0000000	CY
0.0002213	12494.0744935	48952367.	11.5167471	0.0025104	-0.0041625	3.9999999	-60.0000000	CY
0.0002238	12616.4390270	48463237.	11.5207419	0.0025362	-0.0042130	3.9999999	-60.0000000	CY
0.0002263	12740.8035605	47974107.	11.5257367	0.0025621	-0.0042635	3.9999999	-60.0000000	CY
0.0002288	12867.1680940	47484977.	11.5317315	0.0025879	-0.0043140	3.9999999	-60.0000000	CY
0.0002313	12994.5326275	46995847.	11.5387263	0.0026138	-0.0043645	3.9999999	-60.0000000	CY
0.0002338	13122.8971610	46506717.	11.5467211	0.0026396	-0.0044150	3.9999999	-60.0000000	CY
0.0002363	13252.2616945	46017587.	11.5557159	0.0026655	-0.0044655	3.9999999	-60.0000000	CY
0.0002388	13382.6262280	45528457.	11.5657107	0.0026913	-0.0045160	3.9999999	-60.0000000	CY
0.0002413	13513.9907615	45039327.	11.5767055	0.0027172	-0.0045665	3.9999999	-60.0000000	CY
0.0002438	13646.3552950	44550197.	11.5887003	0.0027430	-0.0046170	3.9999999	-60.0000000	CY
0.0002463	13779.7198285	44061067.	11.6016951	0.0027689	-0.0046675	3.99		

30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 2.lp60

No.	kips	in-kip	Strain
1	385.000	11046.611	0.00300000

Note note that the values of moment capacity in the table above are not factored by a strength reduction factor ( $\phi$ -factor).

In ACI 318-08, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are spirals or tied hoops.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318-08, Section 9.3.2.2 or the value required by the design standard being followed.

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 Computed Values of Pile Loading and Deflection  
 for Lateral Loading for Load Case Number 1  
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Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head = 106000.000 lbs  
 Rotation of pile head = 0.000E+00 radians  
 Axial load at pile head = 385000.000 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth X inches	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in <sup>2</sup>	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2329	-6461736.	106000.	0.000	0.000	8.187E+10	0.000	0.000	0.000
5.280	0.2318	-5901633.	105946.	-0.000399	0.000	8.187E+10	-20.3337	463.1208	0.000
10.560	0.2287	-5341322.	105781.	-0.000761	0.000	8.187E+10	-42.1337	972.6857	0.000
15.840	0.2238	-4781486.	105489.	-0.001067	0.000	9.464E+10	-68.6898	1620.6788	0.000
21.120	0.2174	-4223023.	105041.	-0.001307	0.000	1.043E+11	-100.7548	2446.5114	0.000
26.400	0.2100	-3666933.	104460.	-0.001497	0.000	1.173E+11	-119.4535	3003.6845	0.000
31.680	0.2016	-3113839.	103719.	-0.001640	0.000	1.343E+11	-161.2122	4221.3316	0.000
36.960	0.1927	-2564990.	102738.	-0.001739	0.000	1.798E+11	-210.4514	5767.6324	0.000
42.240	0.1833	-2021855.	101472.	-0.001806	0.000	1.803E+11	-269.0430	7750.8323	0.000
47.520	0.1736	-1486100.	99866.	-0.001858	0.000	1.804E+11	-339.2021	10318.	0.000
52.800	0.1637	-959713.	96925.	-0.001894	0.000	1.805E+11	-775.1355	25008.	0.000
58.080	0.1536	-454878.	92605.	-0.001914	0.000	1.805E+11	-860.9242	29597.	0.000
63.360	0.1434	25982.	87801.	-0.001921	0.000	1.805E+11	-958.7514	35291.	0.000
68.640	0.1333	480112.	82456.	-0.001913	0.000	1.805E+11	-1066.0589	42225.	0.000
73.920	0.1232	904494.	76506.	-0.001893	0.000	1.805E+11	-1187.5594	50879.	0.000
79.200	0.1133	1295715.	69867.	-0.001861	0.000	1.805E+11	-1327.4558	61853.	0.000
84.480	0.1036	1649851.	62442.	-0.001818	0.000	1.804E+11	-1484.8072	75680.	0.000
89.760	0.0941	1962495.	54119.	-0.001765	0.000	1.803E+11	-1667.9130	93566.	0.000
95.040	0.0850	2228524.	45395.	-0.001703	0.000	1.801E+11	-1636.6766	101719.	0.000
100.320	0.0761	2448792.	36707.	-0.001635	0.000	1.800E+11	-1654.0991	114713.	0.000
105.600	0.0677	2622800.	28198.	-0.001560	0.000	1.798E+11	-1568.9810	122380.	0.000
110.880	0.0597	2752911.	20177.	-0.001475	0.000	1.562E+11	-1469.3661	130046.	0.000
116.160	0.0521	2841869.	12800.	-0.001377	0.000	1.441E+11	-1324.8730	134231.	0.000
121.440	0.0451	2893680.	6101.5186	-0.001271	0.000	1.419E+11	-1212.5826	141898.	0.000
126.720	0.0387	2911467.	6.6360	-0.001163	0.000	1.412E+11	-1096.0851	149565.	0.000
132.000	0.0328	2898476.	-5469.0548	-0.001054	0.000	1.418E+11	-978.0402	157231.	0.000
137.280	0.0276	2858000.	-10324.	-0.000948	0.000	1.436E+11	-860.8044	164898.	0.000
142.560	0.0228	2793312.	-14567.	-0.000846	0.000	1.492E+11	-746.3727	172564.	0.000
147.840	0.0186	2707615.	-18216.	-0.000755	0.000	1.758E+11	-636.0377	180231.	0.000
153.120	0.0149	2604021.	-21291.	-0.000677	0.000	1.798E+11	-528.7786	187897.	0.000
158.400	0.0115	2485530.	-23811.	-0.000602	0.000	1.799E+11	-425.5150	195564.	0.000
163.680	0.008503	2355029.	-25798.	-0.000531	0.000	1.800E+11	-327.2873	203230.	0.000
168.960	0.005882	2215262.	-27282.	-0.000464	0.000	1.802E+11	-234.9559	210897.	0.000
174.240	0.003604	2068814.	-28296.	-0.000401	0.000	1.803E+11	-149.2041	218564.	0.000
179.520	0.001646	1918082.	-28877.	-0.000343	0.000	1.803E+11	-70.5464	226230.	0.000
184.800	-1.493E-05	1765270.	-29061.	-0.000289	0.000	1.804E+11	0.6616	233897.	0.000
190.080	-0.001404	1612371.	-28890.	-0.000239	0.000	1.804E+11	64.2133	241563.	0.000
195.360	-0.002543	1461167.	-28403.	-0.000194	0.000	1.805E+11	120.0381	249230.	0.000
200.640	-0.003457	1313222.	-27642.	-0.000154	0.000	1.805E+11	168.1887	256896.	0.000
205.920	-0.004168	1169887.	-26647.	-0.000118	0.000	1.805E+11	208.8279	264563.	0.000
211.200	-0.004698	1032305.	-25456.	-8.531E-05	0.000	1.805E+11	242.2145	272230.	0.000
216.480	-0.005069	901415.	-24108.	-5.703E-05	0.000	1.805E+11	268.6884	279896.	0.000
221.760	-0.005300	777961.	-22636.	-3.247E-05	0.000	1.805E+11	288.6564	287563.	0.000
227.040	-0.005411	662508.	-21075.	-1.140E-05	0.000	1.805E+11	302.5787	295229.	0.000
232.320	-0.005420	555451.	-19456.	6.410E-06	0.000	1.805E+11	310.9548	302896.	0.000
237.600	-0.005344	457030.	-17805.	2.122E-05	0.000	1.805E+11	314.3118	310562.	0.000
242.880	-0.005196	367344.	-16148.	3.327E-05	0.000	1.805E+11	313.1922	318229.	0.000
248.160	-0.004992	286368.	-14508.	4.283E-05	0.000	1.805E+11	308.1435	325895.	0.000
253.440	-0.004744	213966.	-12903.	5.015E-05	0.000	1.805E+11	299.7086	333562.	0.000
258.720	-0.004463	149906.	-11351.	5.547E-05	0.000	1.805E+11	288.4175	341229.	0.000
264.000	-0.004158	93877.	-9863.7898	5.903E-05	0.000	1.805E+11	274.7799	348895.	0.000
269.280	-0.003839	45504.	-8453.8736	6.107E-05	0.000	1.805E+11	259.2793	356562.	0.000
274.560	-0.003513	4356.2957	-7129.5257	6.180E-05	0.000	1.805E+11	242.3677	364228.	0.000
279.840	-0.003187	-30035.	-5897.0951	6.143E-05	0.000	1.805E+11	224.4621	371895.	0.000
285.120	-0.002865	-58167.	-4760.8302	6.014E-05	0.000	1.805E+11	205.9413	379561.	0.000
290.400	-0.002552	-80554.	-3723.0846	5.811E-05	0.000	1.805E+11	187.1441	387228.	0.000
295.680	-0.002251	-97719.	-2784.5318	5.550E-05	0.000	1.805E+11	168.3683	394894.	0.000

30- Diameter Pile - Reduced 0.5 Fixed(11_12_19) - Case 2.lp6o									
300.960	-0.001966	-110184.	-1944.3829	5.246E-05	0.000	1.805E+11	149.8699	402561.	0.000
306.240	-0.001697	-118465.	-1324.2013	4.912E-05	0.000	1.805E+11	85.0473	264581.	0.000
311.520	-0.001447	-124367.	-902.7022	4.557E-05	0.000	1.805E+11	74.6114	272247.	0.000
316.800	-0.001216	-128183.	-535.5351	4.187E-05	0.000	1.805E+11	64.4670	279914.	0.000
322.080	-0.001005	-130193.	-220.8552	3.809E-05	0.000	1.805E+11	54.7299	287580.	0.000
327.360	-0.000814	-130670.	185.8616	3.428E-05	0.000	1.805E+11	99.3295	644490.	0.000
332.640	-0.000643	-128370.	657.7102	3.049E-05	0.000	1.805E+11	79.4011	652157.	0.000
337.920	-0.000492	-123848.	1029.5663	2.680E-05	0.000	1.805E+11	61.4535	659823.	0.000
343.200	-0.000360	-117606.	1311.8836	2.327E-05	0.000	1.805E+11	45.4848	667490.	0.000
348.480	-0.000246	-110089.	1515.0051	1.994E-05	0.000	1.805E+11	31.4551	675157.	0.000
353.760	-0.000149	-101689.	1648.9811	1.685E-05	0.000	1.805E+11	19.2934	682823.	0.000
359.040	-6.809E-05	-92745.	1723.4221	1.400E-05	0.000	1.805E+11	8.9040	690490.	0.000
364.320	-1.306E-06	-83546.	1747.3844	1.143E-05	0.000	1.805E+11	0.1727	698156.	0.000
369.600	5.257E-05	-74339.	1729.2866	9.117E-06	0.000	1.805E+11	-7.0279	705823.	0.000
374.880	9.497E-05	-65322.	1676.8516	7.075E-06	0.000	1.805E+11	-12.8338	713489.	0.000
380.160	0.000127	-56660.	1597.0734	5.291E-06	0.000	1.805E+11	-17.3852	721156.	0.000
385.440	0.000151	-48479.	1496.2048	3.754E-06	0.000	1.805E+11	-20.8226	728822.	0.000
390.720	0.000167	-40875.	1379.7623	2.447E-06	0.000	1.805E+11	-23.2844	736489.	0.000
396.000	0.000177	-33918.	1252.5470	1.354E-06	0.000	1.805E+11	-24.9032	744156.	0.000
401.280	0.000181	-27654.	1118.6782	4.534E-07	0.000	1.805E+11	-25.8046	751822.	0.000
406.560	0.000181	-22107.	981.6368	-2.743E-07	0.000	1.805E+11	-26.1050	759489.	0.000
411.840	0.000178	-17287.	844.3171	-8.503E-07	0.000	1.805E+11	-25.9101	767155.	0.000
417.120	0.000173	-13188.	709.0847	-1.296E-06	0.000	1.805E+11	-25.3143	774822.	0.000
422.400	0.000165	-9793.3997	577.8394	-1.632E-06	0.000	1.805E+11	-24.3998	782488.	0.000
427.680	0.000155	-7078.9130	452.0803	-1.879E-06	0.000	1.805E+11	-23.2362	790155.	0.000
432.960	0.000145	-5011.7935	364.5056	-2.056E-06	0.000	1.805E+11	-9.9361	362300.	0.000
438.240	0.000134	-3221.3775	313.5673	-2.176E-06	0.000	1.805E+11	-9.3587	369967.	0.000
443.520	0.000122	-1691.6764	265.8575	-2.248E-06	0.000	1.805E+11	-8.7132	377634.	0.000
448.800	0.000110	-404.7843	221.6964	-2.278E-06	0.000	1.805E+11	-8.0145	385300.	0.000
454.080	9.777E-05	658.7009	173.7637	-2.275E-06	0.000	1.805E+11	-10.1419	547725.	0.000
459.360	8.581E-05	1439.4081	123.1610	-2.244E-06	0.000	1.805E+11	-9.0258	555392.	0.000
464.640	7.407E-05	1968.4045	78.4802	-2.194E-06	0.000	1.805E+11	-7.8988	563059.	0.000
469.920	6.264E-05	2277.0792	39.7534	-2.132E-06	0.000	1.805E+11	-6.7705	570725.	0.000
475.200	5.155E-05	2396.8691	6.9701	-2.064E-06	0.000	1.805E+11	-5.6475	578392.	0.000
480.480	4.084E-05	2359.0739	-19.9074	-1.994E-06	0.000	1.805E+11	-4.5334	586058.	0.000
485.760	3.050E-05	2194.7545	-40.9286	-1.928E-06	0.000	1.805E+11	-3.4292	593725.	0.000
491.040	2.049E-05	1934.7049	-56.1421	-1.867E-06	0.000	1.805E+11	-2.3335	601391.	0.000
496.320	1.078E-05	1609.4858	-65.5846	-1.815E-06	0.000	1.805E+11	-1.2432	609058.	0.000
501.600	1.317E-06	1249.5119	-69.2728	-1.774E-06	0.000	1.805E+11	-0.1538	616725.	0.000
506.880	-7.951E-06	885.1763	-67.1963	-1.742E-06	0.000	1.805E+11	0.9403	624391.	0.000
512.160	-1.708E-05	547.0023	-59.3152	-1.721E-06	0.000	1.805E+11	2.0450	632058.	0.000
517.440	-2.613E-05	265.8061	-45.5586	-1.710E-06	0.000	1.805E+11	3.1659	639724.	0.000
522.720	-3.514E-05	72.8542	-25.8273	-1.705E-06	0.000	1.805E+11	4.3081	647391.	0.000
528.000	-4.413E-05	0.000	0.000	-1.704E-06	0.000	1.805E+11	5.4750	327529.	0.000

\* This analysis makes computations of pile response using nonlinear moment-curvature relationships. The above values of total stress are computed for combined axial stress and do not equal the actual stresses in concrete and steel in the range of nonlinear bending.

Output Verification: Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.2329232 inches  
 Computed slope at pile head = 0.000000 radians  
 Maximum bending moment = -6461736. inch-lbs  
 Maximum shear force = 106000. lbs  
 Depth of maximum bending moment = 0.000000 inches below pile head  
 Depth of maximum shear force = 0.000000 inches below pile head  
 Number of iterations = 11  
 Number of zero deflection points = 3

-----  
 Summary of Pile Response(s)  
 -----

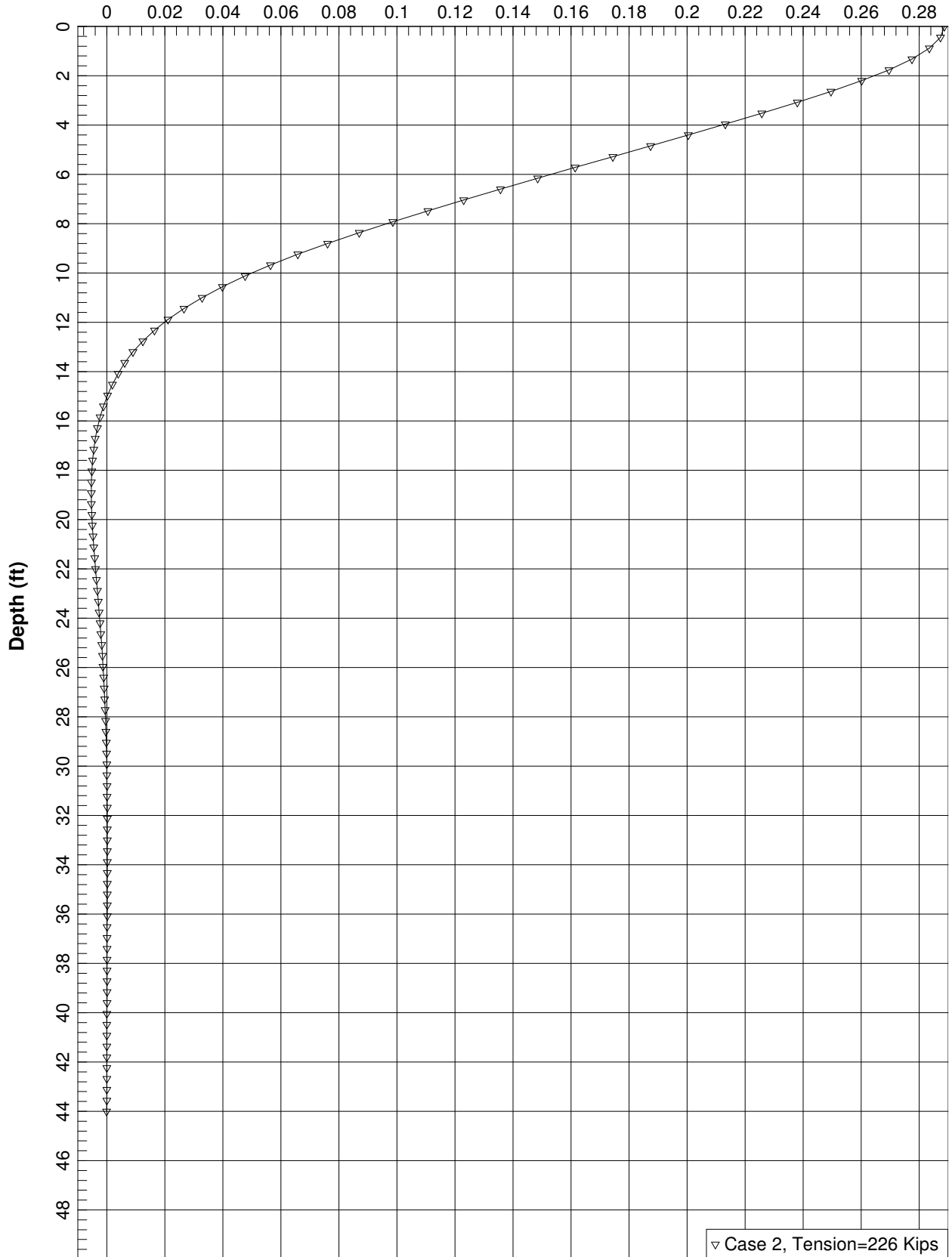
Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs  
 Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians  
 Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian  
 Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs  
 Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians

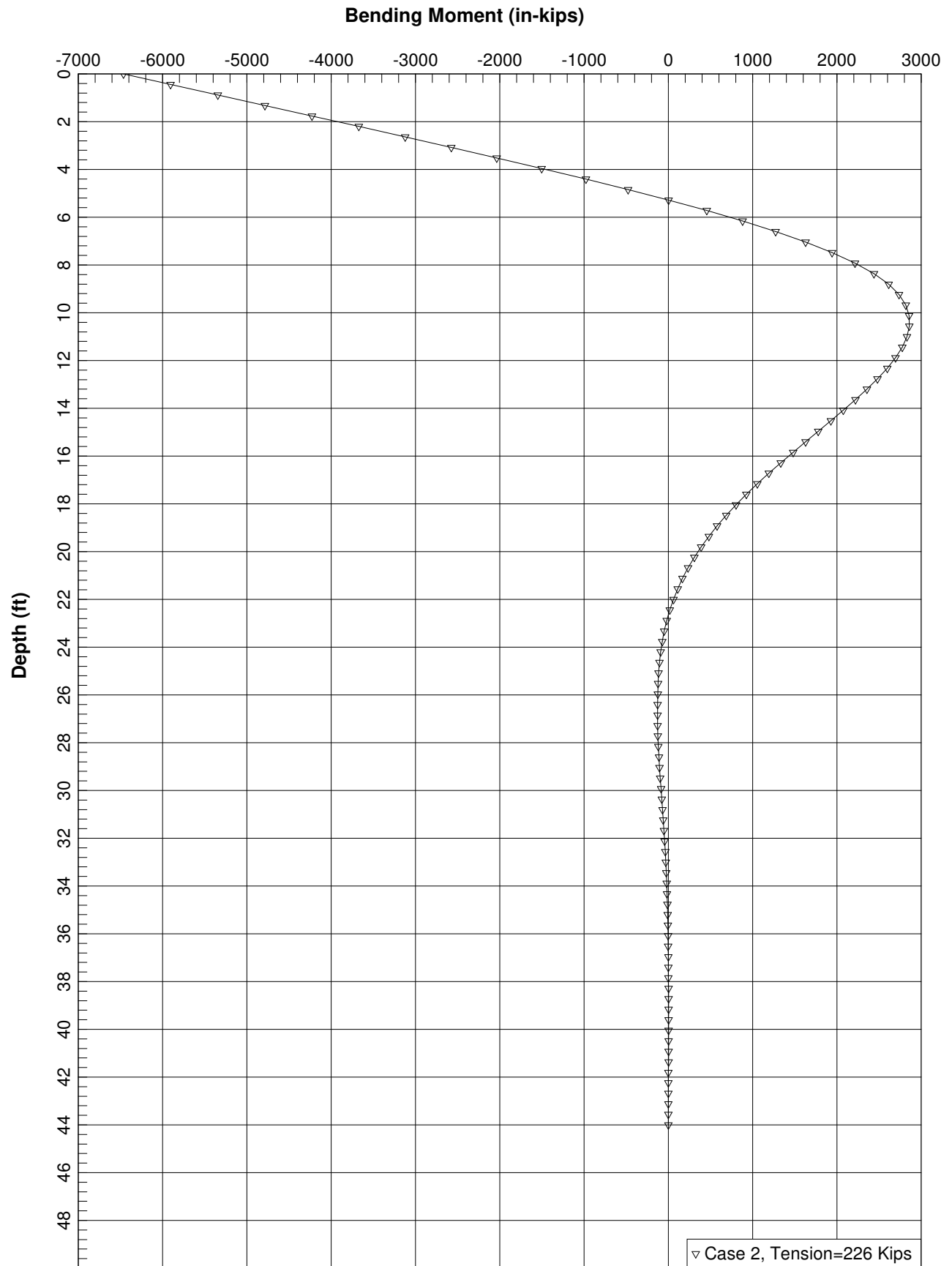
Load Case No.	Load Type No.	Pile-head Condition 1 V(lbs) or y(inches)	Pile-head Condition 2 in-lb, rad., or in-lb/rad.	Axial Loading lbs	Pile-head Deflection inches	Maximum Moment in-lbs	Maximum Shear lbs	Pile-head Rotation radians
1	2	v = 106000.	s = 0.000	385000.	0.23292315	-6461736.	106000.	0.00000000

The analysis ended normally.

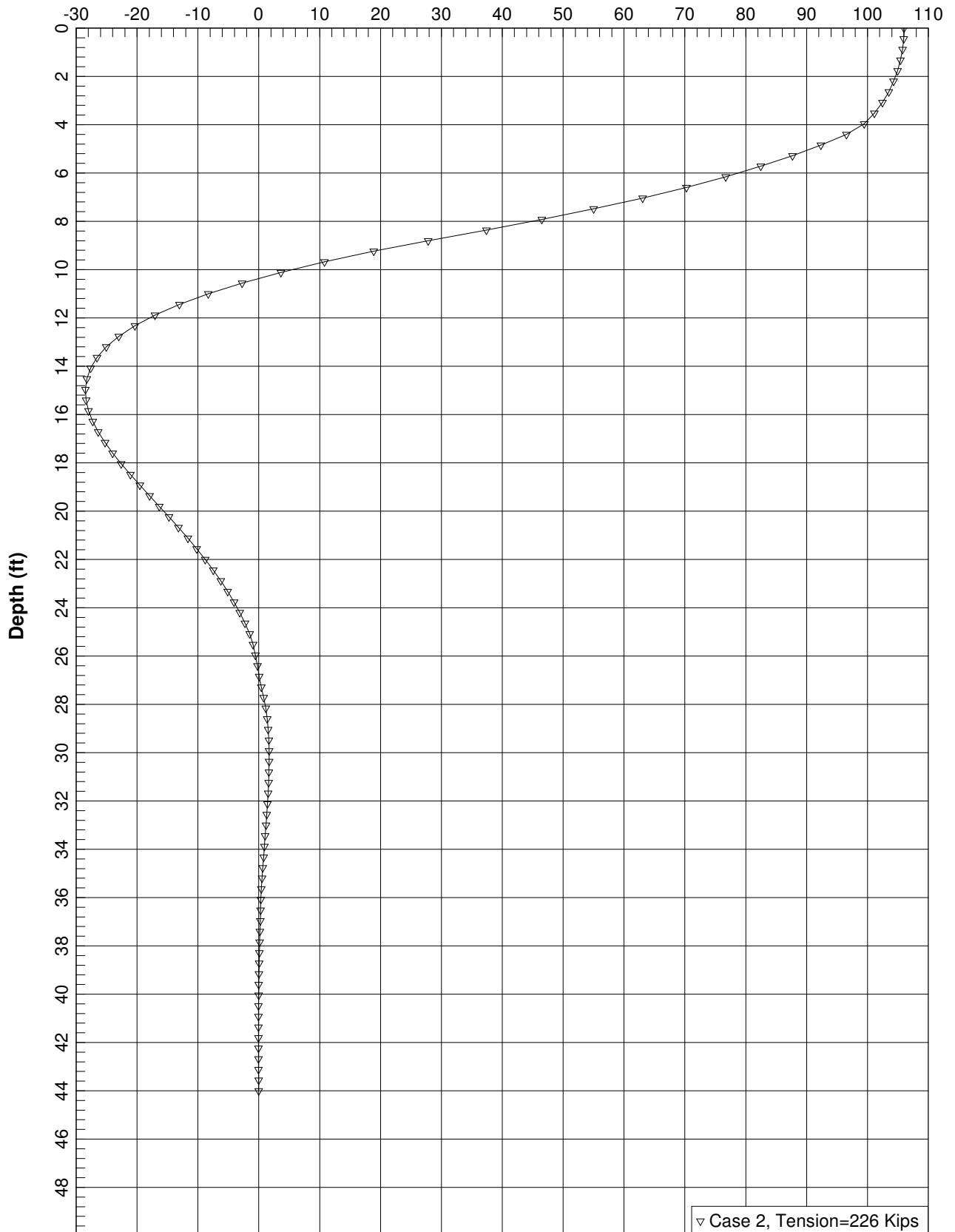
Lateral Deflection (inches)



▽ Case 2, Tension=226 Kips



### Shear Force (kips)



LPILE Plus for Windows, Version 6 (6.0.24)

Analysis of Individual Piles and Drilled Shafts  
Subjected to Lateral Loading Using the p-y Method

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ko  
ko

Serial Number of Security Device: 228748185  
Company Name Stored in Security Device: Koury Engineering & Testing

Files Used for Analysis

Path to file locations: G:\Projects\2017\17-0822 Russell Hall Replacement Project Soils Investigation\Soils  
Folder\Soils Reports-Certificates\DSA\DSA - Lateral Pile Capacities\  
Name of input data file: 30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 2 Tension.lp6d  
Name of output report file: 30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 2 Tension.lp6o  
Name of plot output file: 30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 2 Tension.lp6p  
Name of runtime message file: 30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 2 Tension.lp6r

Date and Time of Analysis

Date: November 12, 2019 Time: 17:11:52

Problem Title

Health Science Building

Job Number: 17-0822

Client:

Engineer:

Description: Building Piles

Program Options

Engineering units are US Customary Units: pounds, inches, feet

Basic Program Options:

This analysis computes nonlinear bending stiffness and nominal moment  
capacity with pile response computed using nonlinear EI

Computation Options:

- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No p-y curves to be computed and output for user-specified depths

Solution Control Parameters:

- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-03 in
- Maximum allowable deflection = 100.0000 in

Pile Response Output Options:

- Values of pile-head deflection, bending moment, shear force, and  
soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1



-----  
Pile Structural Properties and Geometry  
-----

Total Number of Sections = 1  
Total Pile Length = 44.00 ft  
Depth of ground surface below top of pile = 0.00 ft  
Slope angle of ground surface = 0.00 deg.

Pile dimensions used for p-y curve computations defined using 2 points.  
p-y curves are computed using values of pile diameter interpolated over  
the length of the pile.

Point	Depth X ft	Pile Diameter in
1	0.00000	30.0000000
2	44.000000	30.0000000

-----  
Input Structural Properties:  
-----

Pile Section No. 1:

Section Type = Drilled Shaft (Bored Pile)  
Section Length = 44.000 ft  
Section Diameter = 30.000 in

-----  
Ground Slope and Pile Batter Angles  
-----

Ground Slope Angle = 0.000 degrees  
= 0.000 radians  
Pile Batter Angle = 0.000 degrees  
= 0.000 radians

-----  
Soil and Rock Layering Information  
-----

The soil profile is modelled using 9 layers

Layer 1 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 0.000 ft  
Distance from top of pile to bottom of layer = 2.000 ft  
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for  
the above soil layer.

Layer 2 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 2.000 ft  
Distance from top of pile to bottom of layer = 4.000 ft  
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for  
the above soil layer.

Layer 3 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 4.000 ft  
Distance from top of pile to bottom of layer = 7.500 ft  
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for  
the above soil layer.

Layer 4 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 7.500 ft  
Distance from top of pile to bottom of layer = 9.500 ft  
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3

30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 2 Tension.lp60  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 5 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 9.500 ft  
 Distance from top of pile to bottom of layer = 25.500 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 6 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 25.500 ft  
 Distance from top of pile to bottom of layer = 27.000 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 7 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 27.000 ft  
 Distance from top of pile to bottom of layer = 36.000 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 8 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 36.000 ft  
 Distance from top of pile to bottom of layer = 37.500 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 9 is cemented silt with cohesion and friction

Distance from top of pile to top of layer = 37.500 ft  
 Distance from top of pile to bottom of layer = 44.000 ft  
 p-y subgrade modulus k for top of soil layer = 0.000 lbs/in\*\*3  
 p-y subgrade modulus k for bottom of layer = 0.000 lbs/in\*\*3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

(Depth of lowest layer extends 0.00 ft below pile tip)

-----  
 Effective Unit weight of Soil vs. Depth  
 -----

Effective unit weight of soil with depth defined using 18 points

Point No.	Depth x ft	Eff. Unit Weight pcf
1	0.00	123.00000
2	2.00	123.00000
3	2.00	123.00000
4	4.00	123.00000
5	4.00	131.50000
6	7.50	131.50000
7	7.50	123.00000
8	9.50	123.00000
9	9.50	130.20000
10	25.50	130.20000
11	25.50	122.00000
12	27.00	122.00000
13	27.00	127.50000
14	36.00	127.50000
15	36.00	69.30000
16	37.50	69.30000
17	37.50	66.30000
18	44.00	66.30000

-----  
 Summary of Soil Properties  
 -----

30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 2 Tension.lp60

Layer Num.	Epsilon 50	Soil Type J (p-y Curve Criteria)	Soil Type kpy Criteria) pci	Rock Mass psi	Depth ft	Eff. Unit krm Wt., pcf	Cohesion Test Type psf	Friction Prop. Ang., deg.	Elas. Subgr. psi	qu psi	RQD percent
1	0.00	Cemented Silt	--	default	0.00	123.000	1.000	20.000	--	--	--
	0.00	--	--	default	2.000	123.000	1.000	20.000	--	--	--
2	0.00	Cemented Silt	--	default	2.000	123.000	1.000	20.000	--	--	--
	0.00	--	--	default	4.000	123.000	1.000	20.000	--	--	--
3	0.00	Cemented Silt	--	default	4.000	131.500	350.000	15.000	--	--	--
	0.00	--	--	default	7.500	131.500	350.000	15.000	--	--	--
4	0.00	Cemented Silt	--	default	7.500	123.000	90.000	22.000	--	--	--
	0.00	--	--	default	9.500	123.000	90.000	22.000	--	--	--
5	0.00	Cemented Silt	--	default	9.500	130.200	420.000	12.000	--	--	--
	0.00	--	--	default	25.500	130.200	420.000	12.000	--	--	--
6	0.00	Cemented Silt	--	default	25.500	122.000	100.000	29.000	--	--	--
	0.00	--	--	default	27.000	122.000	100.000	29.000	--	--	--
7	0.00	Cemented Silt	--	default	27.000	127.500	370.000	6.000	--	--	--
	0.00	--	--	default	36.000	127.500	370.000	6.000	--	--	--
8	0.00	Cemented Silt	--	default	36.000	69.300	450.000	23.000	--	--	--
	0.00	--	--	default	37.500	69.300	450.000	23.000	--	--	--
9	0.00	Cemented Silt	--	default	37.500	66.300	470.000	11.000	--	--	--
	0.00	--	--	default	44.000	66.300	470.000	11.000	--	--	--

-----  
Loading Type  
-----

Static loading criteria were used when computing p-y curves for all analyses.

-----  
Pile-head Loading and Pile-head Fixity Conditions  
-----

Number of loads specified = 1

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs
1	2	v = 106000. lbs	s = 0.0000 in/in	226000.

V = perpendicular shear force applied to pile head  
M = bending moment applied to pile head  
y = lateral deflection relative to pile axis  
S = pile slope relative to original pile batter angle  
R = rotational stiffness applied to pile head  
Axial thrust is assumed to be acting axially for all pile batter angles.

-----  
Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness  
-----

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft:

Length of Section	=	44.00000000 ft
Shaft Diameter	=	30.00000000 in
Concrete Cover Thickness	=	3.00000000 in
Number of Reinforcing Bars	=	9 bars

30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 2 Tension.lp6o  
 Yield Stress of Reinforcing Bars = 60.0000000 ksi  
 Modulus of Elasticity of Reinforcing Bars = 29000. ksi  
 Gross Area of Shaft = 706.85834706 sq. in.  
 Total Area of Reinforcing Steel = 14.04000000 sq. in.  
 Area Ratio of Steel Reinforcement = 1.99 percent  
 Edge-to-Edge Bar Spacing = 6.31623504 in

Axial Structural Capacities:

Nom. Axial Structural Capacity =  $0.85 F_c A_c + F_y A_s$  = 3197.982 kips  
 Tensile Load for Cracking of Concrete = -335.124 kips  
 Nominal Axial Tensile Capacity = -842.400 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.41000	1.56000	11.29500	0.00000
2	1.41000	1.56000	8.65247	7.26029
3	1.41000	1.56000	1.96136	11.12340
4	1.41000	1.56000	-5.64750	9.78176
5	1.41000	1.56000	-10.61383	3.86312
6	1.41000	1.56000	-10.61383	-3.86312
7	1.41000	1.56000	-5.64750	-9.78176
8	1.41000	1.56000	1.96136	-11.12340
9	1.41000	1.56000	8.65247	-7.26029

Concrete Properties:

Compressive Strength of Concrete = 4.0000000 ksi  
 Modulus of Elasticity of Concrete = 3604.9965326 ksi  
 Modulus of Rupture of Concrete = -0.4743416 ksi  
 Compression Strain at Peak Stress = 0.0018863  
 Tensile Strain at Fracture of Concrete = -0.0001154  
 Maximum coarse Aggregate Size = 0.7500000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	226.000

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension  
 Y = stress in reinforcing steel has reached yield stress  
 T = tensile strain in reinforcement exceeds 0.005 when compressive strain in concrete is less than 0.003.  
 Z = depth of tensile zone in concrete section is less than 10 percent of section depth  
 Bending Stiffness (EI) = Bending Moment / Curvature  
 Position of neutral axis is computed from compression side of pile  
 Compressive stresses are positive in sign. Tensile stresses are negative in sign.

Axial Thrust Force = 226.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in <sup>2</sup>	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Run Msg
0.000001250	231.0975163	184878013.	69.9369892	0.0000874	0.0000499	0.3614183	2.5297784	
0.000002500	462.1732600	184869304.	42.4937756	0.0001062	0.0000312	0.4363698	3.0699237	
0.000003750	693.2213835	184859036.	33.3572828	0.0001251	0.0000126	0.5107084	3.6112920	
0.000005000	924.2254531	184845091.	28.7974603	0.0001440	-0.000006013	0.5844285	4.1538818	
0.000006250	1154.9452068	184791233.	26.0674790	0.0001629	-0.0000246	0.6575048	4.6975431	
0.000007500	1384.8684335	184649124.	24.2507328	0.0001819	-0.0000431	0.7298840	5.2419094	
0.000008750	1613.7105733	184424066.	22.9548763	0.0002009	-0.0000616	0.8015314	5.7867374	
0.0000100	1841.3324910	184133249.	21.9840881	0.0002198	-0.0000802	0.8724266	6.3318856	
0.0000113	2067.6642971	183792382.	21.2297610	0.0002388	-0.0000987	0.9425577	6.8772721	
0.0000125	2067.6642971	165413144.	19.3739096	0.0002422	-0.0001328	0.9542324	6.9686673	C
0.0000138	2067.6642971	150375585.	18.6738219	0.0002568	-0.0001557	1.0073053	7.3863737	C
0.0000150	2067.6642971	137844286.	18.0713334	0.0002711	-0.0001789	1.0588710	7.7957800	C
0.0000163	2067.6642971	127240880.	17.5463800	0.0002851	-0.0002024	1.1091006	8.1980441	C
0.0000175	2135.2140510	122012231.	17.0826925	0.0002989	-0.0002261	1.1580389	8.5933415	C
0.0000188	2217.6155636	118272830.	16.6716563	0.0003126	-0.0002499	1.2059497	8.9836506	C
0.0000200	2297.6346022	114881730.	16.3029843	0.0003261	-0.0002739	1.2528195	9.3687308	C
0.0000213	2375.7851782	111801655.	15.9707421	0.0003394	-0.0002981	1.2987787	9.7495324	C
0.0000225	2452.3996543	108995540.	15.6698225	0.0003526	-0.0003224	1.3439153	10.1266842	C
0.0000238	2527.7172954	106430202.	15.3959672	0.0003657	-0.0003468	1.3882962	10.5006600	C
0.0000250	2601.9728809	104078915.	15.1458768	0.0003786	-0.0003714	1.4319957	10.8720107	C
0.0000263	2675.0764393	101907674.	14.9154730	0.0003915	-0.0003960	1.4749610	-11.3689086	C

30- Diameter Pile - Reduced 0.5 Fixed(11_12_19) - Case 2 Tension.lp6o							
0.0000275	2747.3940508	99905238.	14.7034237	0.0004043	-0.0004207	1.5173258	-12.0793946 C
0.0000288	2819.1126472	98056092.	14.5080772	0.0004171	-0.0004454	1.5591668	-12.7913281 C
0.0000300	2890.0310946	96334370.	14.3263314	0.0004298	-0.0004702	1.6003883	-13.5055916 C
0.0000313	2960.3854422	94732334.	14.1574167	0.0004424	-0.0004951	1.6410848	-14.2214035 C
0.0000325	3030.2636058	93238880.	14.0002337	0.0004550	-0.0005200	1.6813009	-14.9384047 C
0.0000338	3099.5454552	91838384.	13.8527771	0.0004675	-0.0005450	1.7209641	-15.6572819 C
0.0000350	3168.4707415	90527735.	13.7150783	0.0004800	-0.0005700	1.7601991	-16.3769454 C
0.0000363	3236.9626099	89295520.	13.5856629	0.0004925	-0.0005950	1.7989550	-17.0978843 C
0.0000375	3305.0233331	88133956.	13.4636999	0.0005049	-0.0006201	1.8372353	-17.8201013 C
0.0000388	3372.9753393	87044525.	13.3499084	0.0005173	-0.0006452	1.8752161	-18.5419778 C
0.0000400	3440.2556950	86006392.	13.2408413	0.0005296	-0.0006704	1.9125678	-19.2666240 C
0.0000413	3507.4301145	85028609.	13.1386680	0.0005420	-0.0006955	1.9496238	-19.9909308 C
0.0000425	3574.4603778	84104950.	13.0425945	0.0005543	-0.0007207	1.9863595	-20.7151271 C
0.0000438	3640.9363841	83221403.	12.9501180	0.0005666	-0.0007459	2.0225161	-21.4417251 C
0.0000450	3707.3082134	82384627.	12.8630383	0.0005788	-0.0007712	2.0583796	-22.1679849 C
0.0000463	3773.5753874	81590819.	12.7809186	0.0005911	-0.0007964	2.0939491	-22.8939053 C
0.0000475	3839.4874303	80831314.	12.7021261	0.0006034	-0.0008216	2.1290528	-23.6211961 C
0.0000488	3905.1352454	80105338.	12.6268338	0.0006156	-0.0008469	2.1637545	-24.3492511 C
0.0000513	4036.1215116	78753590.	12.4879538	0.0006400	-0.0008975	2.2322826	-25.8043410 C
0.0000538	4166.2133699	77510946.	12.3604763	0.0006644	-0.0009481	2.2992821	-27.2617950 C
0.0000563	4295.6979752	76367964.	12.2442237	0.0006887	-0.0009988	2.3649710	-28.7194225 C
0.0000588	4424.7105200	75314222.	12.1383552	0.0007131	-0.0010494	2.4294427	-30.1762146 C
0.0000613	4552.8309789	74331934.	12.0394737	0.0007374	-0.0011001	2.4923537	-31.6359471 C
0.0000638	4680.5441892	73420301.	11.9491051	0.0007618	-0.0011507	2.5541019	-33.0942792 C
0.0000663	4807.8464267	72571267.	11.8662923	0.0007861	-0.0012014	2.6146807	-34.5511982 C
0.0000688	4934.4104472	71773243.	11.7884778	0.0008105	-0.0012520	2.6737911	-36.0101597 C
0.0000713	5060.4807672	71024291.	11.7163826	0.0008348	-0.0013027	2.7316568	-37.4685868 C
0.0000738	5186.1391474	70320531.	11.6498554	0.0008592	-0.0013533	2.7883489	-38.9255589 C
0.0000763	5311.3817460	69657466.	11.5883552	0.0008836	-0.0014039	2.8438604	-40.3810619 C
0.0000788	5436.1106590	69029977.	11.5308648	0.0009080	-0.0014544	2.8980887	-41.8363249 C
0.0000813	5560.2353960	68433666.	11.4765026	0.0009325	-0.0015050	2.9509421	-43.2925531 C
0.0000838	5683.9416402	67867960.	11.4260133	0.0009569	-0.0015556	3.0026080	-44.7472574 C
0.0000863	5807.2253302	67330149.	11.3790667	0.0009814	-0.0016061	3.0530789	-46.2004217 C
0.0000888	5930.0823310	66817829.	11.3353697	0.0010060	-0.0016565	3.1034372	-47.6520296 C
0.0000913	6052.5084331	66328860.	11.2946615	0.0010306	-0.0017069	3.1504054	-49.1020643 C
0.0000938	6174.4993508	65861326.	11.2567094	0.0010553	-0.0017572	3.1972457	-50.5505087 C
0.0000963	6295.9158235	65412112.	11.2204291	0.0010800	-0.0018075	3.2427046	-51.9997896 C
0.0000988	6416.8650062	64980911.	11.1863674	0.0011047	-0.0018578	3.2869062	-53.4479775 C
0.0001013	6537.3735535	64566652.	11.1545552	0.0011294	-0.0019081	3.3298784	-54.8944994 C
0.0001038	6657.4368751	64168066.	11.1248364	0.0011542	-0.0019583	3.3716130	-56.3393357 C
0.0001063	6777.0502812	63784003.	11.0970696	0.0011791	-0.0020084	3.4121015	-57.7824665 C
0.0001088	6896.2089885	63413416.	11.0711268	0.0012040	-0.0020585	3.4513353	-59.2238712 C
0.0001113	7014.9081171	63055354.	11.0468914	0.0012290	-0.0021085	3.4893057	-60.0000000 CY
0.0001138	7133.1426879	62708947.	11.0242573	0.0012540	-0.0021585	3.5260037	-60.0000000 CY
0.0001163	7250.9076189	62373399.	11.0031278	0.0012791	-0.0022084	3.5614202	-60.0000000 CY
0.0001188	7368.1977223	62047981.	10.9834143	0.0013043	-0.0022582	3.5955461	-60.0000000 CY
0.0001213	7485.0077008	61732022.	10.9650358	0.0013295	-0.0023080	3.6283717	-60.0000000 CY
0.0001238	7601.3245022	61424844.	10.9478496	0.0013548	-0.0023577	3.6598772	-60.0000000 CY
0.0001263	7717.1002094	61125546.	10.9313989	0.0013801	-0.0024074	3.6899556	-60.0000000 CY
0.0001288	7832.3848207	60834057.	10.9161098	0.0014054	-0.0024571	3.7187937	-60.0000000 CY
0.0001313	7946.3483211	60543606.	10.9015655	0.0014308	-0.0025067	3.7462109	-60.0000000 CY
0.0001338	8055.1364987	60225320.	10.8860451	0.0014560	-0.0025565	3.7720163	-60.0000000 CY
0.0001363	8155.8739219	59859625.	10.8682908	0.0014808	-0.0026067	3.7960729	-60.0000000 CY
0.0001388	8248.4234530	59448097.	10.8482546	0.0015052	-0.0026573	3.8184225	-60.0000000 CY
0.0001413	8334.3708344	59004395.	10.8266477	0.0015293	-0.0027082	3.8392015	-60.0000000 CY
0.0001438	8415.1244771	58539996.	10.8040873	0.0015531	-0.0027594	3.8585228	-60.0000000 CY
0.0001463	8490.2523058	58053007.	10.7803585	0.0015766	-0.0028109	3.8763964	-60.0000000 CY
0.0001488	8558.9189701	57538951.	10.7550781	0.0015998	-0.0028627	3.8928210	-60.0000000 CY
0.0001513	8630.2523058	57030007.	10.7293585	0.0016230	-0.0029145	3.9078964	-60.0000000 CY
0.0001538	8699.2523058	56526007.	10.7036385	0.0016462	-0.0029663	3.9216218	-60.0000000 CY
0.0001563	8768.2523058	56027007.	10.6779185	0.0016694	-0.0030181	3.9340972	-60.0000000 CY
0.0001588	8837.2523058	55533007.	10.6521985	0.0016926	-0.0030700	3.9453226	-60.0000000 CY
0.0001613	8906.2523058	55044007.	10.6264785	0.0017158	-0.0031218	3.9553080	-60.0000000 CY
0.0001638	8975.2523058	54560007.	10.6007585	0.0017390	-0.0031737	3.9640534	-60.0000000 CY
0.0001663	9044.2523058	54081007.	10.5750385	0.0017622	-0.0032255	3.9715588	-60.0000000 CY
0.0001688	9113.2523058	53607007.	10.5493185	0.0017854	-0.0032774	3.9778242	-60.0000000 CY
0.0001713	9182.2523058	53138007.	10.5235985	0.0018086	-0.0033292	3.9828596	-60.0000000 CY
0.0001738	9251.2523058	52674007.	10.4978785	0.0018318	-0.0033810	3.9866650	-60.0000000 CY
0.0001763	9320.2523058	52215007.	10.4721585	0.0018550	-0.0034329	3.9892404	-60.0000000 CY
0.0001788	9389.2523058	51761007.	10.4464385	0.0018782	-0.0034847	3.9905858	-60.0000000 CY
0.0001813	9458.2523058	51312007.	10.4207185	0.0019014	-0.0035366	3.9907012	-60.0000000 CY
0.0001838	9527.2523058	50868007.	10.3949985	0.0019246	-0.0035884	3.9895866	-60.0000000 CY
0.0001863	9596.2523058	50429007.	10.3692785	0.0019478	-0.0036403	3.9872420	-60.0000000 CY
0.0001888	9665.2523058	50000007.	10.3435585	0.0019710	-0.0036921	3.9836674	-60.0000000 CY
0.0001913	9734.2523058	49581007.	10.3178385	0.0019942	-0.0037440	3.9788528	-60.0000000 CY
0.0001938	9803.2523058	49172007.	10.2921185	0.0020174	-0.0037958	3.9727982	-60.0000000 CY
0.0001963	9872.2523058	48773007.	10.2664385	0.0020406	-0.0038477	3.9655036	-60.0000000 CY
0.0001988	9941.2523058	48384007.	10.2407185	0.0020638	-0.0038995	3.9569590	-60.0000000 CY
0.0002013	10010.2523058	48005007.	10.2150385	0.0020870	-0.0039514	3.9471744	-60.0000000 CY
0.0002038	10079.2523058	47636007.	10.1893185	0.0021102	-0.0040032	3.9361498	-60.0000000 CY
0.0002063	10148.2523058	47277007.	10.1635985	0.0021334	-0.0040551	3.9238752	-60.0000000 CY
0.0002088	10217.2523058	46928007.	10.1378785	0.0021566	-0.0041069	3.9103506	-60.0000000 CY
0.0002113	10286.2523058	46589007.	10.1121585	0.0021798	-0.0041588	3.8955760	-60.0000000 CY
0.0002138	10355.2523058	46260007.	10.0864385	0.0022030	-0.0042106	3.8795514	-60.0000000 CY
0.0002163	10424.2523058	45941007.	10.0607185	0.0022262	-0.0042625	3.8622768	-60.0000000 CY
0.0002188	10493.2523058	45632007.	10.0350385	0.0022494	-0.0043143	3.8437522	-60.0000000 CY
0.0002213	10562.2523058	45333007.	10.0093185	0.0022726	-0.0043662	3.8240776	-60.0000000 CY
0.0002238	10631.2523058	45044007.	9.9835985	0.0022958	-0.0044180	3.8032530	-60.0000000 CY
0.0002263	10700.2523058	44765007.	9.9578785	0.0023190	-0.0044700	3.7812784	-60.0000000 CY
0.0002288	10769.2523058	44496007.	9.9321585	0.0023422	-0.0045218	3.7581538	-60.0000000 CY
0.0002313	10838.2523058	44237007.	9.9064385	0.0023654	-0.0045737	3.7338792	-60.0000000 CY
0.0002338	10907.2523058	43988007.	9.8807185	0.0023886	-0.0046255	3.7084546	-60.0000000 CY
0.0002363	10976.2523058	43749007.	9.8550385	0.0024118	-0.0046774	3.6818800	-60.0000000 CY
0.0002388	11045.2523058	43520007.	9.8293185	0.0024350	-0.0047292	3.6541554	-60.0000000 CY
0.0002413	11114.2523058	43301007.	9.8035985	0.0024582	-0.0047811	3.6252808	-60.0000000 CY
0.0002438	11183.2523058	43092007.	9.7778785	0.0024814	-0.0048329	3.5952562	-60.0000000 CY
0.0002463	11252.2523058	42893007.	9.7521585	0.0025046	-0.0048848	3.5640816	-60.0000000 CY
0.0002488	11321.2523058	42704007.	9.7264385	0.0025278	-0.0049366	3.5317570	-60.0000000 CY
0.0002513	11390.2523058	42525007.	9.7007185	0.0025510	-0.0049885	3.4982824	-60.0000000 CY
0.0002538	11459.2523058	42356007.	9.6750385	0.0025742	-0.0050403	3.4636578	-60.0000000 CY
0.0002563	11528.2523058	42200007.	9.6493185	0.0025974	-0.0		

30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 2 Tension.lp6o

Moment values interpolated at maximum compressive strain = 0.003  
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	226.000	10137.329	0.00300000

Note note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318-08, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are spirals or tied hoops.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318-08, Section 9.3.2.2 or the value required by the design standard being followed.

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Computed values of Pile Loading and Deflection  
for Lateral Loading for Load Case Number 1  
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Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head	=	106000.000 lbs
Rotation of pile head	=	0.000E+00 radians
Axial load at pile head	=	226000.000 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth X inches	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in <sup>2</sup>	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2886	-6464376.	106000.	0.000	0.000	6.695E+10	0.000	0.000	0.000
5.280	0.2873	-5904392.	105939.	-0.000488	0.000	6.695E+10	-22.9288	421.3971	0.000
10.560	0.2835	-5344491.	105754.	-0.000931	0.000	6.695E+10	-47.3031	881.0261	0.000
15.840	0.2775	-4785407.	105428.	-0.001316	0.000	7.277E+10	-76.2878	1451.7463	0.000
21.120	0.2696	-4228034.	104935.	-0.001634	0.000	7.704E+10	-110.4165	2162.4926	0.000
26.400	0.2602	-3673395.	104300.	-0.001896	0.000	8.294E+10	-129.9176	2636.2690	0.000
31.680	0.2496	-3122098.	103501.	-0.002103	0.000	9.164E+10	-172.7961	3655.6632	0.000
36.960	0.2380	-2575403.	102458.	-0.002257	0.000	1.054E+11	-222.3947	4933.8416	0.000
42.240	0.2257	-2034755.	101131.	-0.002351	0.000	1.838E+11	-280.3077	6556.3424	0.000
47.520	0.2132	-1501852.	99471.	-0.002402	0.000	1.845E+11	-348.5402	8632.8843	0.000
52.800	0.2004	-978614.	96557.	-0.002437	0.000	1.848E+11	-755.1984	19900.	0.000
58.080	0.1874	-476396.	92349.	-0.002458	0.000	1.849E+11	-838.6369	23624.	0.000
63.360	0.1744	2458.1659	87672.	-0.002465	0.000	1.849E+11	-932.9736	28242.	0.000
68.640	0.1614	455302.	82473.	-0.002458	0.000	1.849E+11	-1036.3952	33902.	0.000
73.920	0.1485	879238.	76693.	-0.002439	0.000	1.848E+11	-1153.1195	41009.	0.000
79.200	0.1357	1270996.	70250.	-0.002408	0.000	1.847E+11	-1287.1710	50100.	0.000
84.480	0.1230	1626827.	63055.	-0.002367	0.000	1.844E+11	-1438.3976	61729.	0.000
89.760	0.1107	1942502.	54994.	-0.002316	0.000	1.840E+11	-1614.8404	77050.	0.000
95.040	0.0986	2213092.	46512.	-0.002238	0.000	1.184E+11	-1598.0277	85591.	0.000
100.320	0.0870	2439013.	37379.	-0.002130	0.000	1.094E+11	-1861.4884	112944.	0.000
105.600	0.0761	2612898.	27809.	-0.002005	0.000	1.038E+11	-1763.4954	122380.	0.000
110.880	0.0658	2737461.	18872.	-0.001866	0.000	1.003E+11	-1621.8740	130046.	0.000
116.160	0.0564	2816638.	10806.	-0.001719	0.000	9.824E+10	-1433.2098	134231.	0.000
121.440	0.0477	2855677.	3638.3011	-0.001566	0.000	9.730E+10	-1281.9299	141898.	0.000
126.720	0.0398	2858794.	-2725.5893	-0.001410	0.000	9.725E+10	-1128.6346	149565.	0.000
132.000	0.0328	2830261.	-8284.2757	-0.001257	0.000	9.797E+10	-976.9285	157231.	0.000
137.280	0.0266	2774311.	-13054.	-0.001107	0.000	9.940E+10	-829.9398	164898.	0.000
142.560	0.0211	2695048.	-17068.	-0.000963	0.000	1.016E+11	-690.2838	172564.	0.000
147.840	0.0164	2596373.	-20369.	-0.000827	0.000	1.045E+11	-560.0398	180231.	0.000
153.120	0.0124	2481929.	-23011.	-0.000701	0.000	1.083E+11	-440.7549	187897.	0.000
158.400	0.009003	2355053.	-25055.	-0.000586	0.000	1.130E+11	-333.4645	195564.	0.000
163.680	0.006202	2218749.	-26565.	-0.000482	0.000	1.198E+11	-238.7225	203230.	0.000
168.960	0.003917	2075673.	-27609.	-0.000403	0.000	1.830E+11	-156.4617	210897.	0.000
174.240	0.001948	1928164.	-28235.	-0.000345	0.000	1.840E+11	-80.6534	218564.	0.000
179.520	0.000272	1778340.	-28478.	-0.000292	0.000	1.842E+11	-11.6453	226230.	0.000
184.800	-0.001136	1628131.	-28376.	-0.000243	0.000	1.844E+11	50.3093	233897.	0.000
190.080	-0.002297	1479269.	-27966.	-0.000199	0.000	1.845E+11	105.0901	241563.	0.000
195.360	-0.003235	1333286.	-27285.	-0.000159	0.000	1.847E+11	152.6955	249230.	0.000
200.640	-0.003972	1191514.	-26372.	-0.000122	0.000	1.848E+11	193.2319	256896.	0.000
205.920	-0.004528	1055089.	-25263.	-9.039E-05	0.000	1.848E+11	226.8991	264563.	0.000
211.200	-0.004926	924953.	-23993.	-6.211E-05	0.000	1.848E+11	253.9774	272230.	0.000
216.480	-0.005184	801867.	-22597.	-3.744E-05	0.000	1.849E+11	274.8154	279896.	0.000
221.760	-0.005321	686414.	-21107.	-1.619E-05	0.000	1.849E+11	289.8168	287563.	0.000
227.040	-0.005355	579018.	-19551.	1.884E-06	0.000	1.849E+11	299.4285	295229.	0.000
232.320	-0.005301	479949.	-17958.	1.701E-05	0.000	1.849E+11	304.1290	302896.	0.000
237.600	-0.005176	389343.	-16351.	2.942E-05	0.000	1.849E+11	304.4167	310562.	0.000
242.880	-0.004991	307210.	-14753.	3.937E-05	0.000	1.849E+11	300.7999	318229.	0.000
248.160	-0.004760	233453.	-13184.	4.709E-05	0.000	1.849E+11	293.7873	325895.	0.000
253.440	-0.004494	167878.	-11659.	5.282E-05	0.000	1.849E+11	283.8799	333562.	0.000
258.720	-0.004202	110211.	-10192.	5.679E-05	0.000	1.849E+11	271.5634	341229.	0.000
264.000	-0.003894	60111.	-8796.1129	5.922E-05	0.000	1.849E+11	257.3020	348895.	0.000
269.280	-0.003577	17183.	-7479.1867	6.033E-05	0.000	1.849E+11	241.5337	356562.	0.000
274.560	-0.003257	-19013.	-6248.4212	6.030E-05	0.000	1.849E+11	224.6654	364228.	0.000

30- Diameter Pile - Reduced 0.5 Fixed(11_12_19) - Case 2 Tension.lp6o									
279.840	-0.002940	-48944.	-5108.6391	5.933E-05	0.000	1.849E+11	207.0703	371895.	0.000
285.120	-0.002630	-73102.	-4062.7885	5.759E-05	0.000	1.849E+11	189.0853	379561.	0.000
290.400	-0.002332	-91985.	-3112.1375	5.523E-05	0.000	1.849E+11	171.0098	387228.	0.000
295.680	-0.002047	-106097.	-2256.4753	5.240E-05	0.000	1.849E+11	153.1047	394894.	0.000
300.960	-0.001778	-115938.	-1494.3142	4.923E-05	0.000	1.849E+11	135.5927	402561.	0.000
306.240	-0.001527	-121995.	-934.3097	4.583E-05	0.000	1.849E+11	76.5302	264581.	0.000
311.520	-0.001294	-125914.	-556.0647	4.229E-05	0.000	1.849E+11	66.7444	272247.	0.000
316.800	-0.001081	-127968.	-228.6161	3.867E-05	0.000	1.849E+11	57.2891	279914.	0.000
322.080	-0.000886	-128420.	50.0442	3.501E-05	0.000	1.849E+11	48.2640	287580.	0.000
327.360	-0.000711	-127523.	406.5728	3.135E-05	0.000	1.849E+11	86.7847	644490.	0.000
332.640	-0.000555	-124202.	816.6804	2.776E-05	0.000	1.849E+11	68.5591	652157.	0.000
337.920	-0.000418	-118965.	1135.5401	2.428E-05	0.000	1.849E+11	52.2211	659823.	0.000
343.200	-0.000299	-112268.	1373.0709	2.098E-05	0.000	1.849E+11	37.7527	667490.	0.000
348.480	-0.000196	-104516.	1539.0089	1.789E-05	0.000	1.849E+11	25.1026	675157.	0.000
353.760	-0.000110	-96059.	1642.7511	1.502E-05	0.000	1.849E+11	14.1936	682823.	0.000
359.040	-3.768E-05	-87204.	1693.2311	1.241E-05	0.000	1.849E+11	4.9276	690490.	0.000
364.320	2.124E-05	-78208.	1698.8239	1.004E-05	0.000	1.849E+11	-2.8091	698156.	0.000
369.600	6.838E-05	-69288.	1667.2776	7.937E-06	0.000	1.849E+11	-9.1403	705823.	0.000
374.880	0.000105	-60621.	1605.6683	6.082E-06	0.000	1.849E+11	-14.1965	713489.	0.000
380.160	0.000133	-52347.	1520.3771	4.469E-06	0.000	1.849E+11	-18.1108	721156.	0.000
385.440	0.000152	-44576.	1417.0841	3.085E-06	0.000	1.849E+11	-21.0154	728822.	0.000
390.720	0.000165	-37390.	1300.7794	1.914E-06	0.000	1.849E+11	-23.0394	736489.	0.000
396.000	0.000172	-30845.	1175.7863	9.398E-07	0.000	1.849E+11	-24.3064	744156.	0.000
401.280	0.000175	-24976.	1045.7962	1.427E-07	0.000	1.849E+11	-24.9323	751822.	0.000
406.560	0.000174	-19801.	913.9115	-4.967E-07	0.000	1.849E+11	-25.0240	759489.	0.000
411.840	0.000170	-15324.	782.6962	-9.982E-07	0.000	1.849E+11	-24.6787	767155.	0.000
417.120	0.000163	-11534.	654.2311	-1.382E-06	0.000	1.849E+11	-23.9823	774822.	0.000
422.400	0.000155	-8411.7970	530.1726	-1.667E-06	0.000	1.849E+11	-23.0095	782488.	0.000
427.680	0.000146	-5931.0881	411.8142	-1.871E-06	0.000	1.849E+11	-21.8232	790155.	0.000
432.960	0.000135	-4058.5730	329.6552	-2.014E-06	0.000	1.849E+11	-9.2976	362300.	0.000
438.240	0.000125	-2445.1230	282.0679	-2.107E-06	0.000	1.849E+11	-8.7278	369967.	0.000
443.520	0.000113	-1074.9073	237.6429	-2.157E-06	0.000	1.849E+11	-8.0999	377634.	0.000
448.800	0.000102	69.5342	196.6514	-2.172E-06	0.000	1.849E+11	-7.4272	385300.	0.000
454.080	9.032E-05	1006.9143	152.3085	-2.156E-06	0.000	1.849E+11	-9.3693	547725.	0.000
459.360	7.901E-05	1683.0580	105.6325	-2.118E-06	0.000	1.849E+11	-8.3110	555392.	0.000
464.640	6.796E-05	2127.4482	64.5601	-2.063E-06	0.000	1.849E+11	-7.2468	563059.	0.000
469.920	5.722E-05	2369.7370	29.0996	-1.999E-06	0.000	1.849E+11	-6.1852	570725.	0.000
475.200	4.685E-05	2439.5114	-0.7767	-1.930E-06	0.000	1.849E+11	-5.1316	578392.	0.000
480.480	3.684E-05	2366.1423	-25.1182	-1.862E-06	0.000	1.849E+11	-4.0887	586058.	0.000
485.760	2.718E-05	2178.7071	-43.9822	-1.797E-06	0.000	1.849E+11	-3.0568	593725.	0.000
491.040	1.786E-05	1905.9788	-57.4228	-1.739E-06	0.000	1.849E+11	-2.0343	601391.	0.000
496.320	8.825E-06	1576.4716	-65.4808	-1.689E-06	0.000	1.849E+11	-1.0179	609058.	0.000
501.600	2.627E-06	1218.5322	-68.1762	-1.649E-06	0.000	1.849E+11	-0.003069	616725.	0.000
506.880	-8.588E-06	860.4658	-65.5031	-1.619E-06	0.000	1.849E+11	1.0156	624391.	0.000
512.160	-1.707E-05	530.6839	-57.4262	-1.599E-06	0.000	1.849E+11	2.0438	632058.	0.000
517.440	-2.548E-05	257.8617	-43.8812	-1.588E-06	0.000	1.849E+11	3.0869	639724.	0.000
522.720	-3.384E-05	71.0890	-24.7766	-1.583E-06	0.000	1.849E+11	4.1497	647391.	0.000
528.000	-4.220E-05	0.000	0.000	-1.582E-06	0.000	1.849E+11	5.2354	327529.	0.000

\* This analysis makes computations of pile response using nonlinear moment-curvature relationships. The above values of total stress are computed for combined axial stress and do not equal the actual stresses in concrete and steel in the range of nonlinear bending.

Output Verification: Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.2886385 inches  
 Computed slope at pile head = 0.000000 radians  
 Maximum bending moment = -6464376. inch-lbs  
 Maximum shear force = 106000. lbs  
 Depth of maximum bending moment = 0.000000 inches below pile head  
 Depth of maximum shear force = 0.000000 inches below pile head  
 Number of iterations = 12  
 Number of zero deflection points = 3

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 Summary of Pile Response(s)  
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Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs  
 Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians  
 Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian  
 Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs  
 Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians

Load Case No.	Load Type No.	Pile-head Condition 1 V(lbs) or y(inches)	Pile-head Condition 2 in-lb, rad., or in-lb/rad.	Axial Loading lbs	Pile-head Deflection inches	Maximum Moment in-lbs	Maximum Shear lbs	Pile-head Rotation radians
1	2	V = 106000.	S = 0.000	226000.	0.28863845	-6464376.	106000.	0.00000000

30- Diameter Pile - Reduced 0.5 Fixed(11\_12\_19) - Case 2 Tension.lp6o

The analysis ended normally.